

## FDMX2-PT

### De-Multiplexer for Broadcast and Navigation Signals with Programmable DC Loads Dual (AM/FM/DAB3), DAB3, DVB-T, GNSS, SAT (SDARS)

#### Features

- de-multiplexer for broadcast bands
- programmable DC loads in each channel
- optical indication of phantom voltage
- direct fakra connection to (DUT)
- USB remote interface

#### Applications

- AM, FM, DAB, DVB-T, SDARS
- GNSS: GPS, GLONASS, GALILEO
- automotive infotainment test
- R&D
- production



#### At a Glance

FDMX2-PT from Becker Nachrichtentechnik is a compact de-multiplexer unit as table top unit in 50 Ohm technology. The FDMX2-PT splits the broadcast bands into the individual sections and makes them available at 6 RF ports. The ports have coded Fakra connectors, that have become standard in automobile infotainment, for the direct connection to device under test (DUT). All outputs have integrated programmable DC loads for the emulation of active antennas. Thus the DUT has the full RF and DC environment for ready to use operation in laboratories with intensive DC test capability.

The presences of phantom voltages coming from the DUT are indicated by LEDs on the front side of the FDMX2-PT.

With help of the FDMX2-PT cost efficient solutions for multi signal distribution in R&D and factory buildings can be realized using only one common coaxial cable for transmission of all broadcast and GNSS signals to the test setups.

#### Special Features

The FDMX2-PT unit enables plug and play solution for the RF connection of car infotainment components. FDMX2-PT has dual ports for "analogue" AM/FM and digital "DAB3" radio signals, one separate port for digital radio DAB3 signals, one port for digital television DVB-T signals, one port for satellite navigation signals GNSS (GPS, GALILEO, GLONASS) and one port for satellite radio signals SAT (SDARS, XM radio). All RF ports feature programmable DC loads for the phantom supplies in the DUTs. The DC loads in each channel is configurable in the range 1...300 mA in 1 mA steps. For the evaluation of phantom voltages the FDMX2-PT has a 6 channel voltmeter.

The settings of the programmable loads and the read out of the voltmeter measurements are done via USB interface with simple ASCII protocols. A Fakra cable set with cable length 1 m for all RF connectors, an AC adapter and a USB cable are part of the product package.

#### Rugged Design

The FDMX2-PT unit is built in a milled aluminum case to give best shielding for avoiding EMI influences caused by radio signals coming from the environment. The built in DC loads and the internal voltmeter function do not need cabling to external devices. External cables have often proven to be problematic due to radio interference from i.e. local radio stations. The RF connector for the multi signal input is N female.

## RF Specification

| Parameter              | Symbol                    | Min.                            | Typ. | Max. | Unit | Condition                |
|------------------------|---------------------------|---------------------------------|------|------|------|--------------------------|
| impedance              | Z                         |                                 | 50   |      | Ohm  |                          |
| RF COM port            |                           |                                 |      |      |      |                          |
| low frequency          | f <sub>min</sub>          |                                 | 50   | 150  | kHz  |                          |
| high frequency         | f <sub>max</sub>          | 2345                            | 2700 |      | MHz  |                          |
| return loss            | S <sub>11</sub>           |                                 | -12  |      | dB   |                          |
| RF input power         | P <sub>in</sub>           |                                 |      | +10  | dBm  |                          |
| maximum DC Voltage     | U <sub>DC</sub>           |                                 |      | 20   | V    |                          |
| ESD discharge resistor | R <sub>ESD</sub>          |                                 | 4.7  |      | kΩ   |                          |
| connector              | X <sub>COM</sub>          | N female                        |      |      |      |                          |
| AM (Dual AM/FM/DAB)    |                           |                                 |      |      |      |                          |
| low frequency          | f <sub>min</sub>          |                                 | 50   | 150  | kHz  |                          |
| high frequency         | f <sub>max</sub>          | 30                              |      |      | MHz  |                          |
| return loss            | S <sub>22</sub>           |                                 | -17  | -10  | dB   |                          |
| insertion loss         | S <sub>21</sub>           | -8.0                            | -7.0 | -5.5 | dB   |                          |
| FM (Dual AM/FM/DAB)    |                           |                                 |      |      |      |                          |
| low frequency          | f <sub>min</sub>          |                                 |      | 77   | MHz  |                          |
| high frequency         | f <sub>max</sub>          | 108                             |      |      | MHz  |                          |
| return loss            | S <sub>22</sub>           |                                 | -20  | -15  | dB   |                          |
| insertion loss         | S <sub>21</sub>           | -8.0                            | -7.0 | -6.0 | dB   |                          |
| DAB (Dual AM/FM/DAB)   |                           |                                 |      |      |      |                          |
| low frequency          | f <sub>min</sub>          |                                 |      | 170  | MHz  |                          |
| high frequency         | f <sub>max</sub>          | 240                             |      |      | MHz  |                          |
| return loss            | S <sub>22</sub>           |                                 | -17  | -13  | dB   |                          |
| insertion loss         | S <sub>21</sub>           | -8.5                            | -7.5 | -6.5 | dB   |                          |
| attenuations           | a <sub>DVB-T</sub>        |                                 | -45  | -30  | dB   | DVB-T (474 ... 786 MHz)  |
|                        | a <sub>GNSS</sub>         |                                 | -90  | -50  | dB   | GNSS (1452 ... 1625 MHz) |
|                        | a <sub>SAT</sub>          |                                 | -80  | -50  | dB   | SAT (2320 ... 2345 MHz)  |
| RF input power         | P <sub>RF</sub>           |                                 |      | +10  | dBm  |                          |
| DC voltage range       | I <sub>DC</sub>           | 0                               |      | 15   | V    |                          |
| voltmeter accuracy     | dU <sub>DC</sub>          |                                 | ±60  | ±200 | mV   |                          |
| current setting range  | I <sub>DC</sub>           | 1                               |      | 300  | mA   | Note 1                   |
| current accuracy       | dI <sub>DC</sub>          |                                 | ±1+1 | ±3+3 | %+mA | U <sub>DC</sub> > 1.8 V  |
| connector              | X <sub>AMFMDA<br/>B</sub> | Dual Fakra B plug (white, male) |      |      |      |                          |
| DAB                    |                           |                                 |      |      |      |                          |
| low frequency          | f <sub>min</sub>          |                                 |      | 170  | MHz  |                          |
| high frequency         | f <sub>max</sub>          | 240                             |      |      | MHz  |                          |
| return loss            | S <sub>33</sub>           |                                 | -15  | -9   | dB   |                          |
| insertion loss         | S <sub>31</sub>           | -6.5                            | -5.0 | -4.0 | dB   |                          |
| attenuations           | a <sub>AMFM</sub>         |                                 | -50  | -30  | dB   | AM/FM (0.15 ... 108 MHz) |
|                        | a <sub>DVB-T</sub>        |                                 | -40  | -30  |      | DVB-T (474 ... 786 MHz)  |
|                        | a <sub>GNSS</sub>         |                                 | -90  | -50  |      | GNSS (1555 ... 1625 MHz) |
|                        | a <sub>SAT</sub>          |                                 | -90  | -50  |      | SAT (2320 ... 2345 MHz)  |
| RF input power         | P <sub>RF</sub>           |                                 |      | +10  | dBm  |                          |
| DC voltage range       | I <sub>DC</sub>           | 0                               |      | 15   | V    |                          |
| voltmeter accuracy     | dU <sub>DC</sub>          |                                 | ±60  | ±200 | mV   |                          |
| current setting range  | I <sub>DC</sub>           | 1                               |      | 300  | mA   | Note 1                   |
| current accuracy       | dI <sub>DC</sub>          |                                 | ±1+1 | ±3+3 | %+mA | U <sub>DC</sub> > 1.8 V  |
| connector              | X <sub>DAB</sub>          | Fakra A plug (black, male)      |      |      |      |                          |

Note 1: Total power dissipation of all channels might maximum 5 W. DC loads shut down when +60°C housing temperature exceeded.

| Parameter             | Symbol             | Min.                       | Typ. | Max. | Unit | Condition                |
|-----------------------|--------------------|----------------------------|------|------|------|--------------------------|
| DVB-T                 |                    |                            |      |      |      |                          |
| low frequency         | f <sub>min</sub>   |                            |      | 470  | MHz  |                          |
| high frequency        | f <sub>max</sub>   | 790                        |      |      | MHz  |                          |
| return loss           | S <sub>44</sub>    |                            | -12  | -8   | dB   |                          |
| insertion loss        | S <sub>41</sub>    | -2.5                       | -1.0 | -0.5 | dB   |                          |
| attenuation           | a <sub>AMFM</sub>  |                            | -70  | -60  | dB   | AM/FM (0.15...108 MHz)   |
|                       | a <sub>DAB3</sub>  |                            | -35  | -30  | dB   | DAB3 (174...228 MHz)     |
|                       | a <sub>GNSS</sub>  |                            | -45  | -40  | dB   | GNSS (1555...1625 MHz)   |
|                       | a <sub>SAT</sub>   |                            | -55  | -40  | dB   | SAT (2320...2345 MH)     |
| RF input power        | P <sub>RF</sub>    |                            |      | +10  | dBm  |                          |
| DC voltage range      | I <sub>DC</sub>    | 0                          |      | 15   | V    |                          |
| voltmeter accuracy    | dU <sub>DC</sub>   |                            | ±60  | ±200 | mV   |                          |
| current setting range | I <sub>DC</sub>    | 1                          |      | 300  | mA   | Note 1                   |
| current accuracy      | dI <sub>DC</sub>   |                            | ±1+1 | ±3+3 | %+mA | U <sub>DC</sub> > 1.8 V  |
| connector             | X <sub>DVB-T</sub> | Fakra E plug (green, male) |      |      |      |                          |
| GNSS                  |                    |                            |      |      |      |                          |
| low frequency         | f <sub>min</sub>   |                            |      | 1555 | MHz  |                          |
| high frequency        | f <sub>max</sub>   | 1625                       |      |      | MHz  |                          |
| return loss           | S <sub>55</sub>    |                            | -17  | -10  | dB   |                          |
| insertion loss        | S <sub>51</sub>    | -2.0                       | -1.0 | -0.1 | dB   |                          |
| attenuation           | a <sub>AMFM</sub>  |                            | -90  | -75  | dB   | AM/FM (0.15 ... 108 MHz) |
|                       | a <sub>DAB3</sub>  |                            | -90  | -75  | dB   | DAB3 (174 ... 228 MHz)   |
|                       | a <sub>DVB-T</sub> |                            | -35  | -30  | dB   | DVB-T (474 ... 786 MHz)  |
|                       | a <sub>SAT</sub>   |                            | -30  | -20  | dB   | SAT (2320 ... 2345 MH)   |
| RF input power        | P <sub>RF</sub>    |                            |      | +10  | dBm  |                          |
| DC voltage range      | I <sub>DC</sub>    | 0                          |      | 15   | V    |                          |
| voltmeter accuracy    | dU <sub>DC</sub>   |                            | ±60  | ±200 | mV   |                          |
| current setting range | I <sub>DC</sub>    | 1                          |      | 300  | mA   | Note 1                   |
| current accuracy      | dI <sub>DC</sub>   |                            | ±1+1 | ±3+3 | %+mA | U <sub>DC</sub> > 1.8 V  |
| connector             | X <sub>GNSS</sub>  | Fakra C plug (blue, male)  |      |      |      |                          |
| SAT (SDARS)           |                    |                            |      |      |      |                          |
| low frequency         | f <sub>min</sub>   |                            |      | 2320 | MHz  |                          |
| high frequency        | f <sub>max</sub>   | 2345                       |      |      | MHz  |                          |
| return loss           | S <sub>66</sub>    |                            | -12  | -8   | dB   |                          |
| insertion loss        | S <sub>61</sub>    | -3.0                       | -2.0 | -0.5 | dB   |                          |
| attenuation           | a <sub>800M</sub>  |                            | -90  | -75  | dB   | ≤ 786 MHz                |
|                       | A <sub>GNSS</sub>  |                            | -20  | -15  | dB   | GNSS (1555 ... 1625 MHz) |
| RF input power        | P <sub>RF</sub>    |                            |      | +10  | dBm  |                          |
| DC voltage range      | I <sub>DC</sub>    | 0                          |      | 15   | V    |                          |
| voltmeter accuracy    | dU <sub>DC</sub>   |                            | ±60  | ±200 | mV   |                          |
| current setting range | I <sub>DC</sub>    | 1                          |      | 300  | mA   | Note 1                   |
| current accuracy      | dI <sub>DC</sub>   |                            | ±1+1 | ±3+3 | %+mA | U <sub>DC</sub> > 1.8 V  |
| connector             |                    | Fakra F plug (brown, male) |      |      |      |                          |

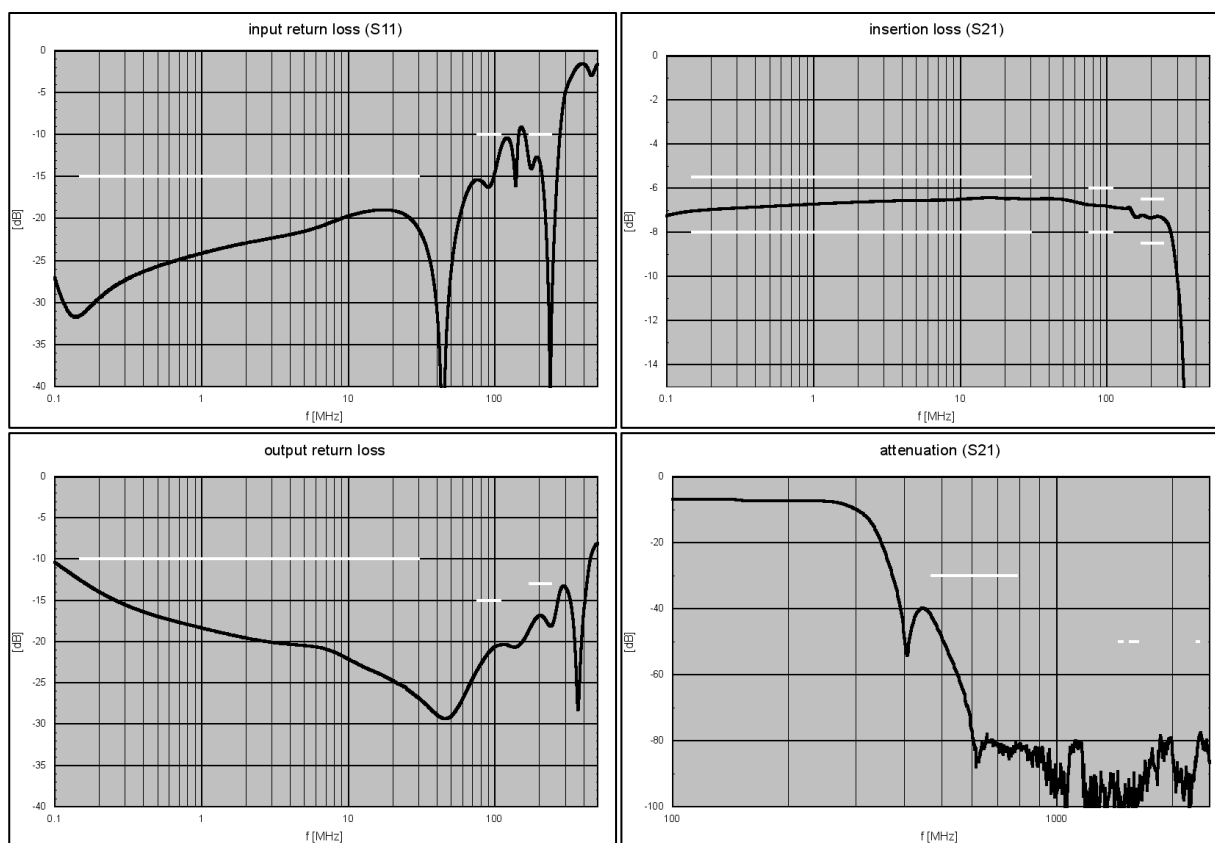
Note 1: Total power dissipation of all channels might maximum 5 W. DC loads shut down when +60°C housing temperature exceeded.

## Common Specification

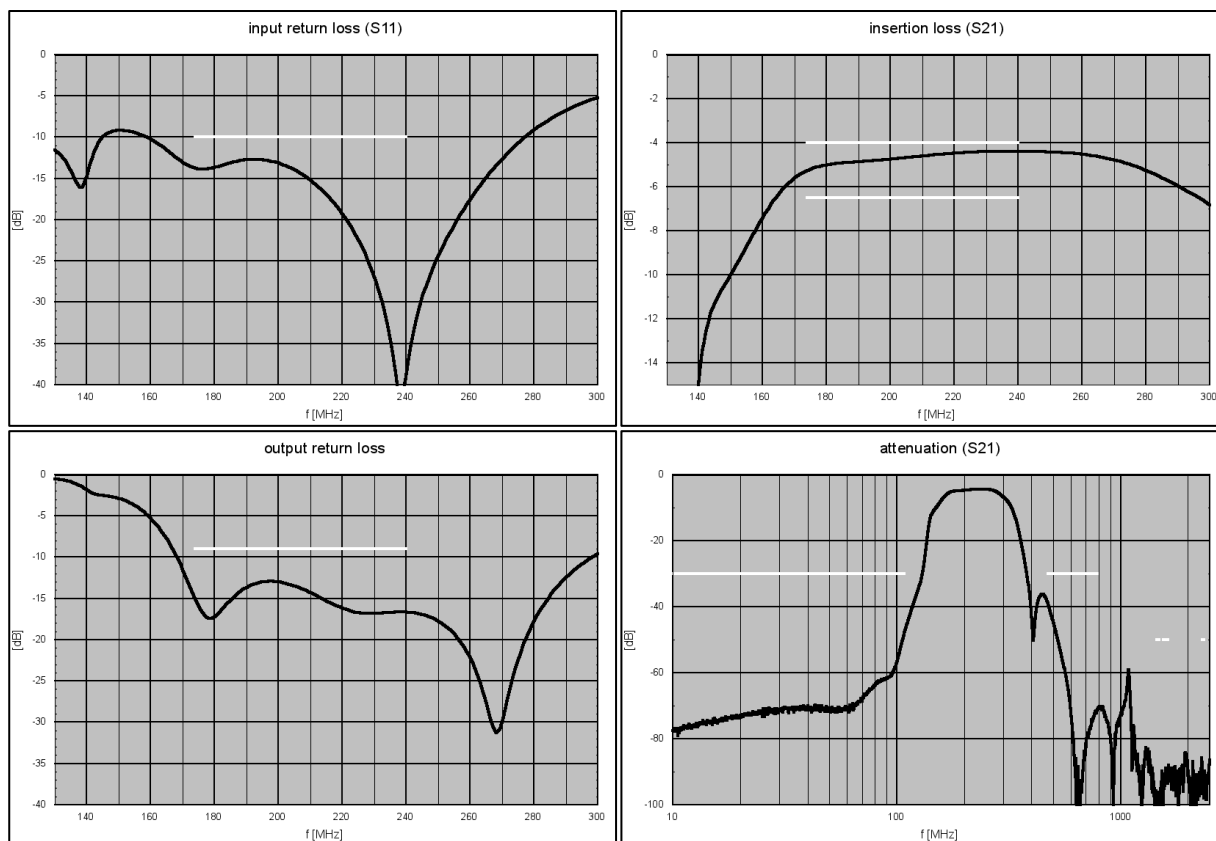
| Parameter             | Symbol          | Min.  | Typ. | Max. | Unit | Condition   |
|-----------------------|-----------------|---|------|------|------|---|
| dimensions            | W x H x D       | approx. 154 x 37 x 93                               |      |      | mm   | without connectors  |
| weight                | m               |   | 0.7  |      | kg   |   |
| remote interface      |                 | USB 1.1 & 2.0 compatible,<br>virtual Com Port (VCP) |      |      |      | SCPI oriented ASCII commands  |
| remote connector      | X <sub>RM</sub> | USB type B  |      |      |      |   |
| operating temp. range | T <sub>o</sub>  | +5  |      | +40  | °C   | housing surface   |
| storage temp. range   | T <sub>s</sub>  | -40   |      | +70  | °C   |   |
| ordering information  | FDMX2-PT        | P/N: 1809.6003.2                                    |      |      |      | Fakra cable set, AC adaptor and<br>an USB cable is part of product<br>package |

## S-Parameters (typical responses)

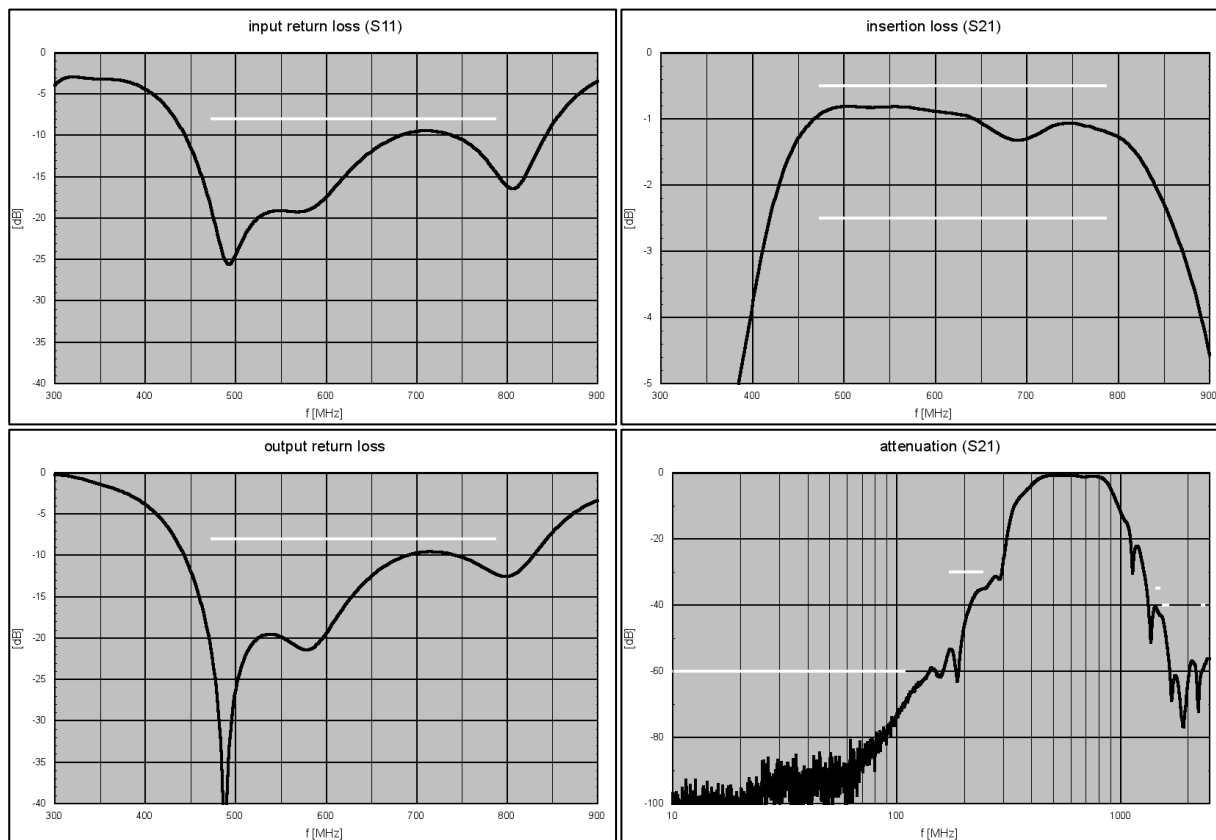
AM/FM/DAB signal path



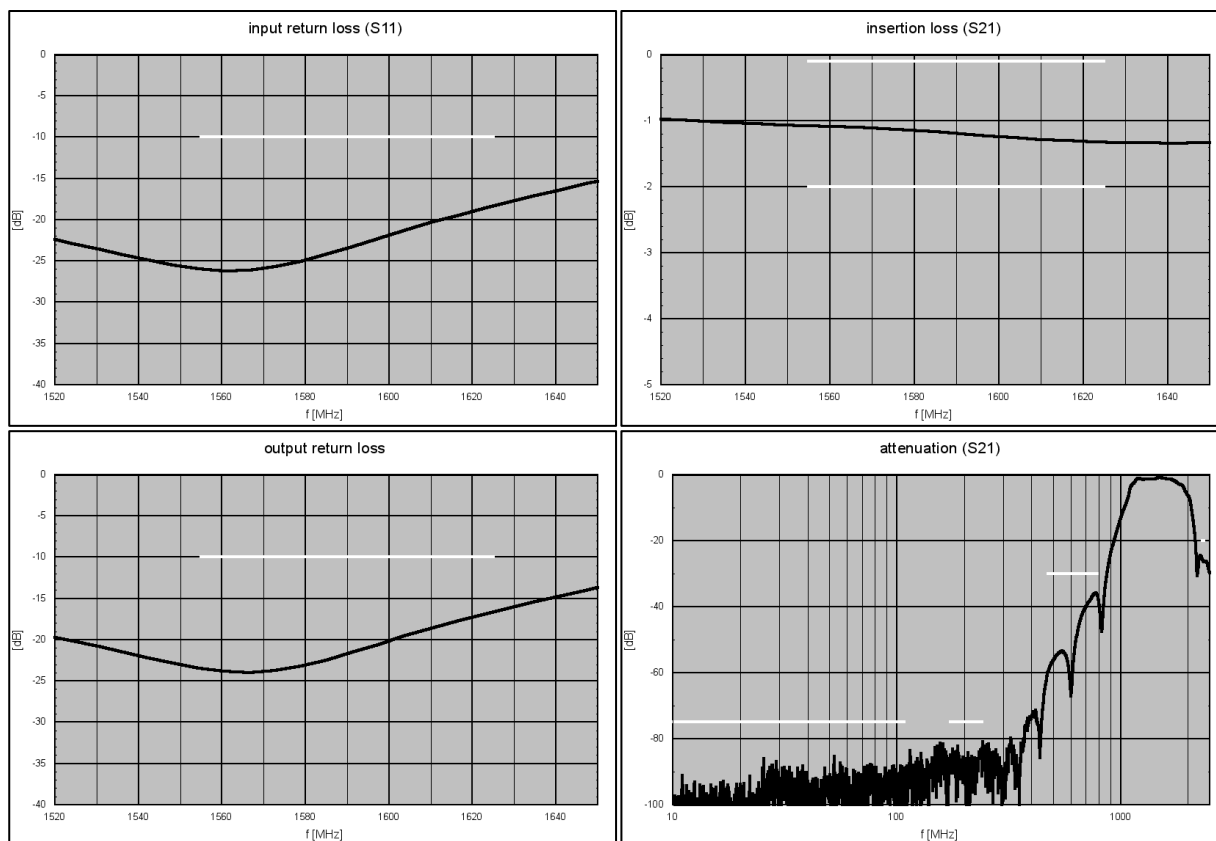
## DAB signal path



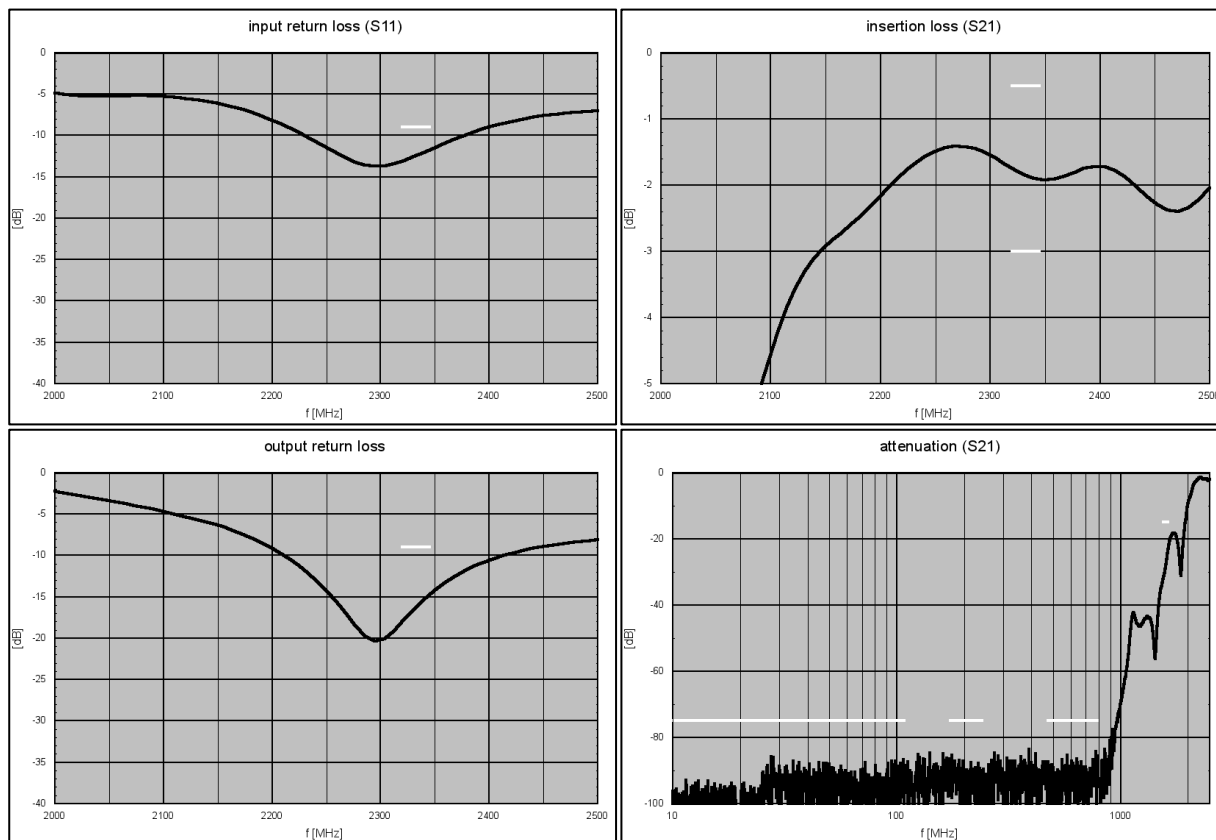
## DVB-T signal path



## GNSS signal path



## SAT (SDARS) signal path



## Appearances

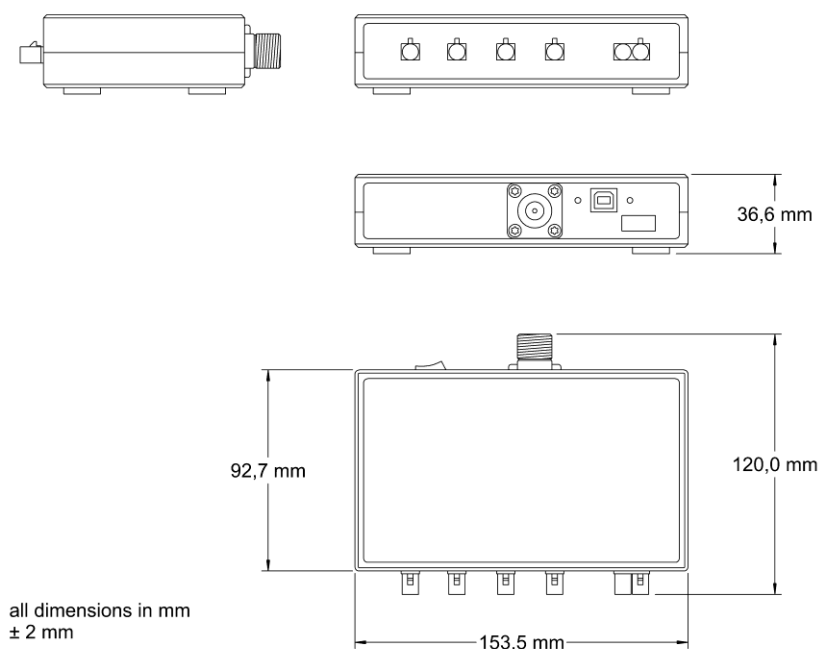


Front side



Rear Side

## Dimensions



**Related Products**

| Product  | Description   | P/N         |
|----------|---|-------------|
| FDMX     | De-Multiplexer for Broadcast and Navigation Signals with Resistive DC Loads. Dual (AM/FM), DAB3/DAB-L, DVB-T, GNSS, SAT (SDARS)                 | 1310.6003.1 |
| FDMX-PT  | De-Multiplexer for Broadcast and Navigation Signals with Programmable DC Loads 0 ... 300 mA. Dual (AM/FM), DAB3/DAB-L, DVB-T, GNSS, SAT (SDARS) | 1310.6003.2 |
| FDMX2    | De-Multiplexer for Broadcast and Navigation Signals with Resistive DC Loads. Dual (AM/FM/DAB3), DVB-T, GNSS, SAT (SDARS)                        | 1809.6003.1 |
| FDMX2-PT | De-Multiplexer for Broadcast and Navigation Signals with Programmable DC Loads 0 ... 300 mA. Dual (AM/FM/DAB3), DVB-T, GNSS, SAT (SDARS)        | 1809.6003.2 |
| FDML     | Dual Port Adapter for AM/FM and DAB3 Broadcast Signals with Resistive DC Loads  | 1310.6103.2 |
| FDMX-CS  | Fakra Cable Set, length 1 m. Includes 4 RF cables with 1 dual RF cable  | 1310.0107.1 |
| FDMX-AA  | AC/DC Wall Wart Power Adapter for USB   | 1310.0108.1 |