TSI-6X25H

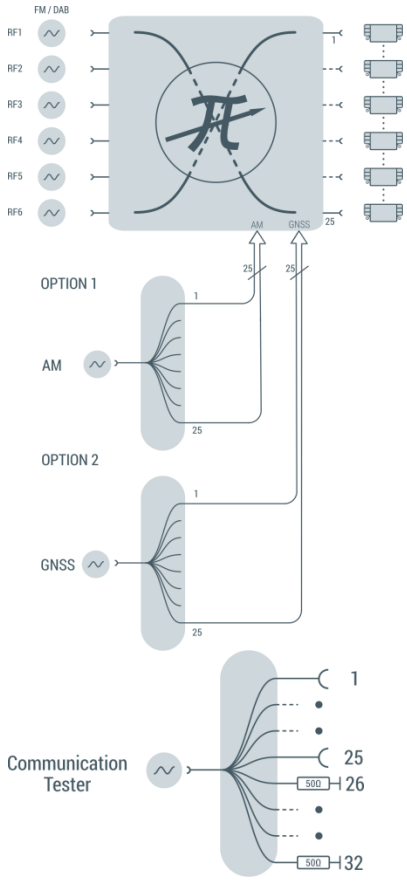
FM/DAB Handover Emulator with AM and GNSS injection and Cellular Distribution

Features

- 6 FM/DAB generator inputs
- 25 outputs for working stations
- Compact design 19”, 38 U
- AM generator input
- GNSS generator input
- Separate distribution for cellular 350 MHz … 6000 MHz

Applications

- car infotainment test
- product integration, verification & qualification
- FM/DAB hand-over test
- AM, GNSS signal distribution
- multi RF routing to communication tester



Scope

TSI-6X25H is a broadcast distribution infrastructure for large infotainment integration and verification laboratories. Connected to a set of up to 6 FM/DAB generators, every of up to 25 laboratory seats can be supplied with a composite RF signal that is individually composed of a programmable mix of the generator signals. This setup allows to recreate a realistic car radio environment, whereby the car radio receives multiple radio broadcast stations simultaneously with varying propagation loss. In particular it allows to simulate a handover between broadcast towers receiving the same radio program, while switching from FM to DAB or vice versa. Reproducing such a complex environment in the laboratory saves cost and time during product integration and verification. The laboratory installation is particularly cost-efficient, as the composite signals are made available to the laboratory seats via a single coaxial cable.

High level dynamic

The system’s overall insertion loss is small. A set of 6 x 25 variable attenuators with an attenuation range of 95.25 dB are provided. The attenuators can be configured hundreds of times per second, so that real-time channel transition scenarios can be produced.

AM and GNSS signal injection

The TSI-6X25H system has an AM and a GNSS signal input to provide also AM and GNSS simulated signals to every laboratory seat. These extensions fit physically into the same 19” rack. The AM and GNSS signals are carried over the same coaxial cable together with the composite FM/DAB signal, not requiring any additional cable installation in the laboratory.

Versatile control

The TSI-6X25H can be controlled via LAN remote interface. Simple SCPI-inspired ASCII commands can be used by existing SW environments to control the system.
Additional the system offers a graphical user interface (GUI). All attenuator parameters and even transition scenarios can be set via the GUI quasi-simultaneously by all laboratory workers individually for their respective seats.

Software functions

The software of the TSI-6X25H offers helpful features. As example automatic handover processes are easily definable and the GUI makes the dynamic handover processes visible. A second example is that names of signal inputs and outputs can be defined by the user that corresponds to their infrastructures.

Table-top adapters for laboratory seats

Becker Nachrichtentechnik GmbH provides compact table-top adapter devices that take in the composite signal and provide a number of outputs corresponding precisely with the antenna inputs of infotainment devices. The functionality of the table-top adapter goes beyond demultiplexing the various frequency bands, but also includes active antenna simulation through fixed (FDMX2) or variable (FDMX2-PT) DC loads.
The table-top adapters are delivered together with a cable set, that fits the infotainment device (e.g. with fakra connectors.
As a result of using the TSI-6X25H infrastructure and the FDMX2 table-top units, the infotainment device or car radio will work as if it was in a real car environment with all its active antennas and radio signals that vary in signal level as if the car was travelling on the road.

Cellular Distribution

Additional to the broadcast handover and distribution function the TSI-6X25H offers a separate bi-directional distribution for RF signal routing from 25 seats to a communication tester. Due to the wide frequency range covering from 350 MHz to 6000 MHz the bi-directional distribution is useable for 2G, 3G, 4G and 5G cellular standards.
The transmissions via RF cables avoid influences of radio fields during testing coming from environment and make thereby the tests reproduce able. The high out-to-out isolation reduces the influence of each other adjacent test units.

RF Specifications

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
impedance	Z_{in} / Z_{out}		50		Ohm	
FM / DAB						
number of inputs	n_{FMDAB}		6			
low frequency	f_{min}		65	70	MHz	
high frequency	f_{max}	300	400		MHz	
input return loss	$S_{11FMDAB}$		-15		dB	
gain	S_{21FM}		3		dB	@ 100 MHz, 0 dB ATT
	S_{21DAB}		1		dB	@ 200 MHz, 0 dB ATT
level adjustment range	Δa	0		-95.25	dB	
level step size	da		0.25		dB	
maximal input power	$P_{in\ max}$			+15	dBm	CW, no damage
DC voltage	U_{DC}			20	V	
ESD discharge resistor	R_{ESD}		4.7		kΩ	
RF connectors	X_{FMDAB}		N female			FM, DAB generator inputs
AM						
number of inputs	n_{AM}		1			
low frequency	f_{min}			100	kHz	
high frequency	f_{max}	30			MHz	
input return loss	S_{11AM}		-15		dB	
gain	S_{21AM}		5		dB	
maximal input power	$P_{in\ max}$			+15	dBm	CW, no damage
DC voltage	U_{DC}			20	V	
ESD discharge resistor	R_{ESD}		4.7		kΩ	
RF connector	X_{AM}		N female			AM generator input
GNSS						
number of inputs	n_{GNSS}		1			
low frequency	f_{min}			1100	MHz	
high frequency	f_{max}	1610	2500		MHz	

input return loss	S_{11GNSS}		-12		dB	
insertion loss	S_{21GNSS}		-22		dB	@1575 MHz
maximal input power	$P_{in\ max}$			0	dBm	CW, no damage
DC voltage	U_{DC}			0	V	
ESD discharge resistor	R_{ESD}		1		Ω	
RF connector	X_{GNSS}		N female			GNSS generator input
OUTPUTS						
number of seats	n_{SEAT}		25			AM. FM, DAB, GNSS
output return loss	S_{22}		-13		dB	AM, FM, DAB, GNSS ranges
DC voltage	U_{DC}			20	V	
ESD discharge resistor	R_{ESD}		4.7		kΩ	
RF connectors	X_{SEAT}		N female			

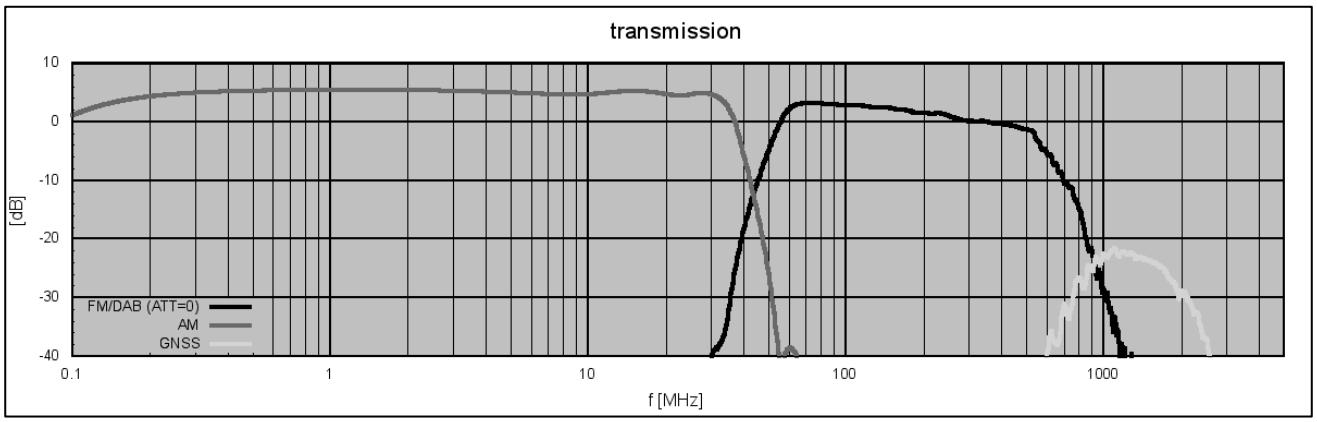
Cellular						
impedance	Z_{in} / Z_{out}		50		Ohm	
number of inputs	n_{CEL}		1			
low frequency	f_{min}		300	350	MHz	
high frequency	f_{max}	6000			MHz	
input return loss	S_{11CEL}		-12		dB	
insertion loss	S_{21CEL}		-18		dB	f ≤ 3000 MHz
	S_{21CEL}		-22		dB	@ 6000 MHz
maximal power	$P_{in\ max}$			+43	dBm	CW as splitter
	$P_{in\ max}$			+33	dBm	CW as combiner
DC voltage	U_{DC}			20	V	All ports are DC coupled
number of seats	n_{SEAT}		25			
RF connector	X_{CEL}		N female			CEL and 25 seat ports

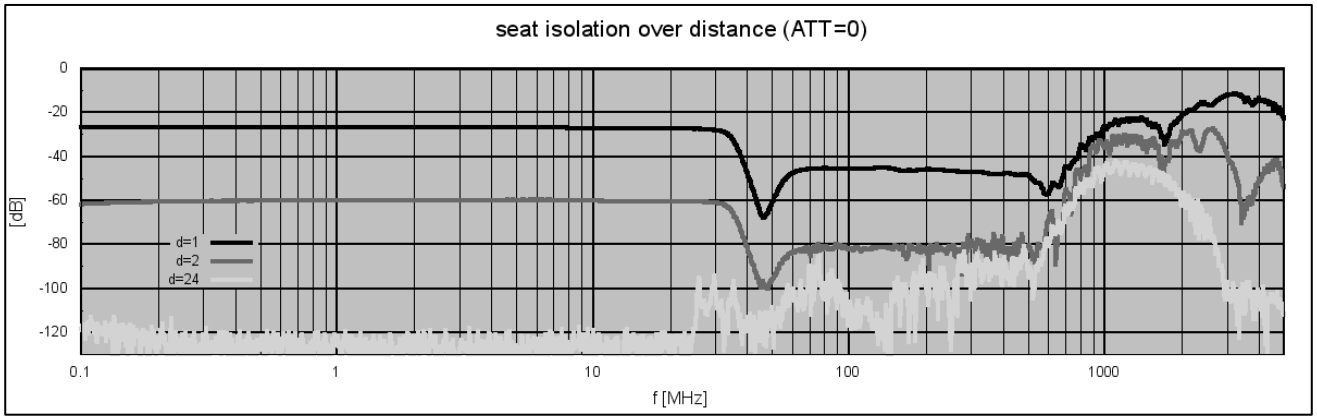
Common Specifications

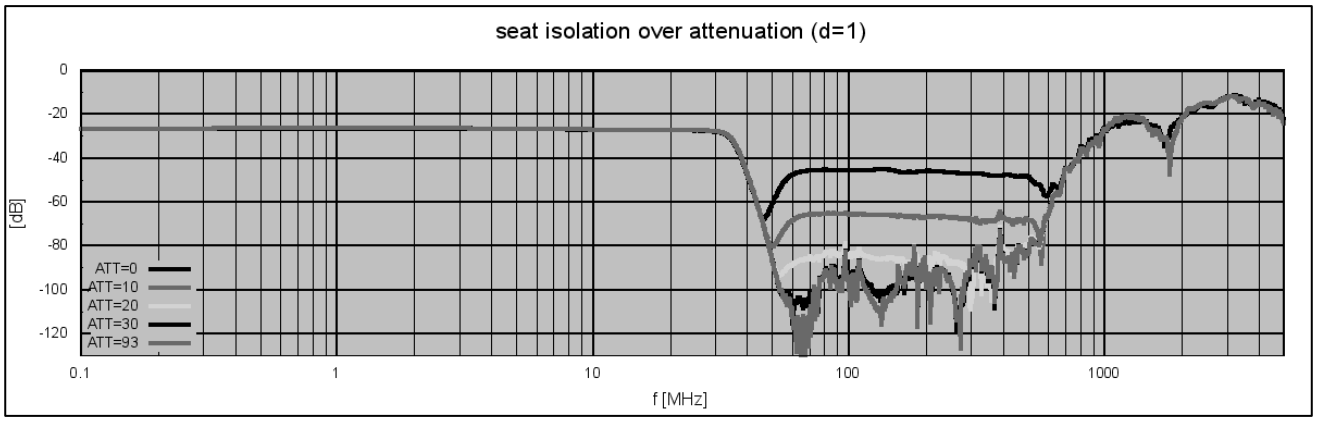
Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
power supply	u_{AC}	90	230	260	V	50 / 60 Hz
power consumption	P		500		W	
power plug		type „F“ CEE7/4				
dimensions	W x H x D	approx. 600 x 1800 x 800			mm	19”, 38 U
weight			220		kg	
remote interface		RJ45 10/100BaseT				ASCII commands
operating temp. range	T_o	+ 20		+ 30	°C	within specification
storage temp. range	T_s	- 40		+ 70	°C	
EMC		EN61326-1:2013				according directions: 2014/30/EU
safety		EN61010-1:2010				according directions: 2014/35/EU
Ordering information	P/N	1805.1012.1		TSI-6X25H		

S-Parameters (typical responses)

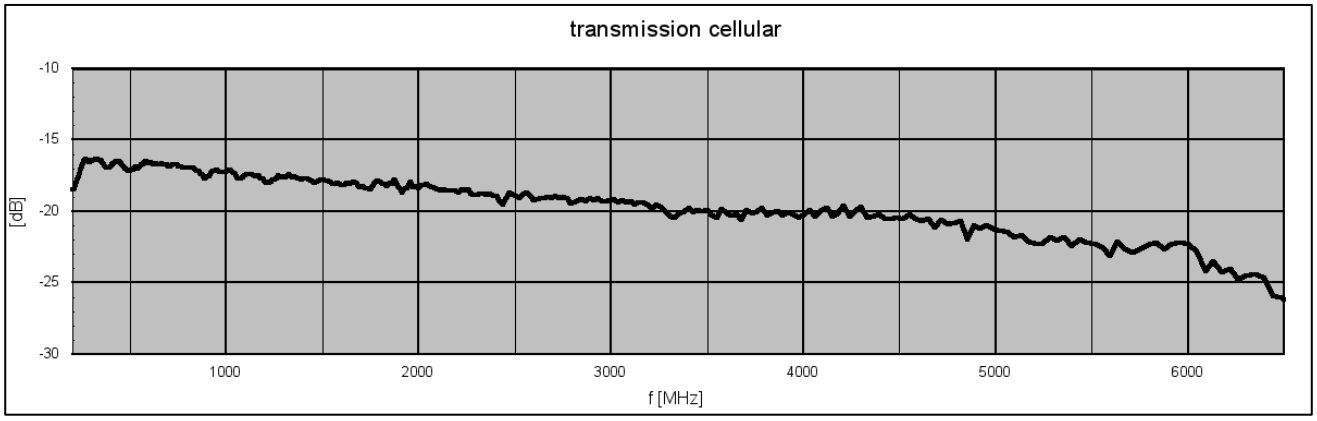
AM / FM / DAB /GNNSS

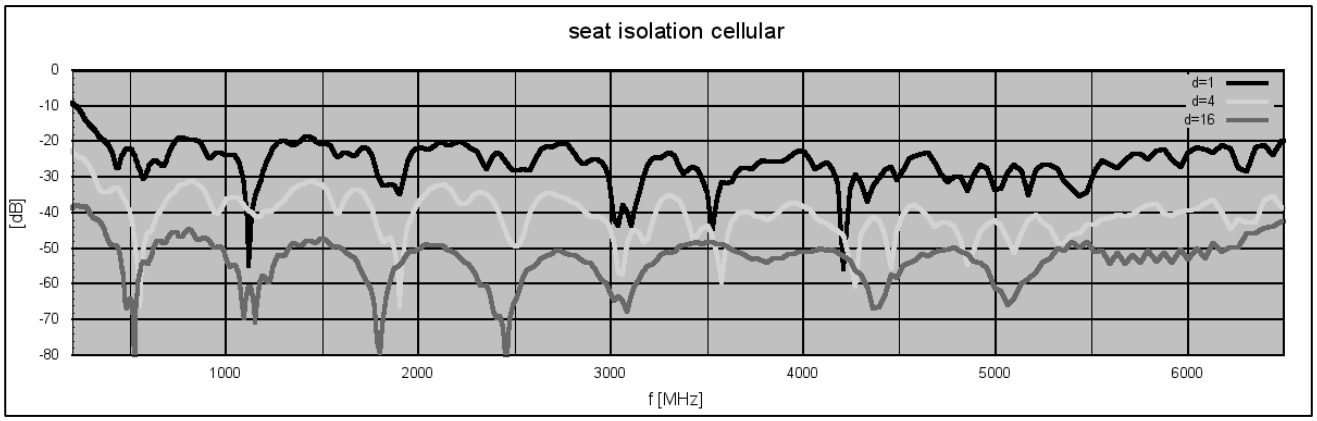




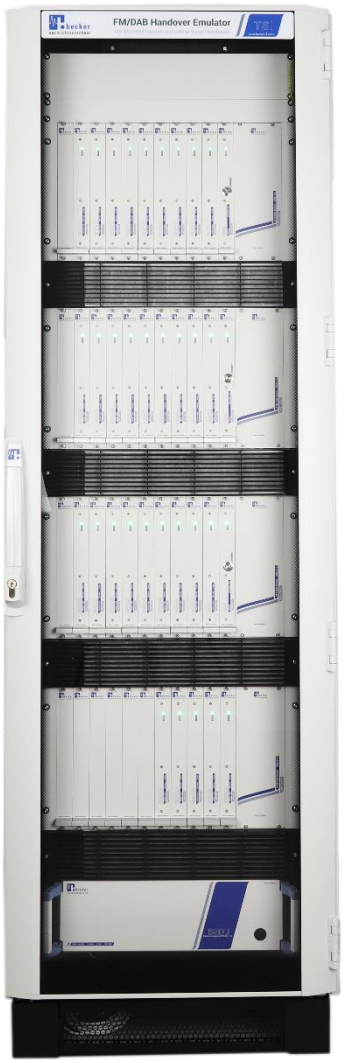


CELLULAR


transmission cellular
-10
-15
-20
-25
-30
[dB]
1000
2000
3000
4000
5000
6000
f [MHz]


seat isolation cellular
0
-10
-20
-30
-40
-50
-60
-70
-80
[dB]
d=1
d=4
d=16
1000
2000
3000
4000
5000
6000
f [MHz]

Appearance



Front view

Rear view

Related Products

Product	Description	P/N
FDMX2	De-Multiplexer for Broadcast and Navigation Signals with fixed DC loads	1310.6201.1

FDMX2 offers fakra connectors for dual AM/FM/DAB, DAB, DVB-T, GNSS and SAT (SDARS) for DUT connection. Each input has an internal DC load for phantom supply.
For intensive phantom supply tests, the variant FDMX2-PT offers programmable current sinks 0…300 mA at each input.

The signal mix of AM, FM, DAB, DVB-T, GNSS and SAT is fed into the FDMX2 over with a common input. Inside the FDMX2 the signals are separated into the different broadcast bands.