



In-Building Wireless Solutions

Passive Distributed Antenna Systems



KATHREIN
Digital Systems GmbH

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Who we are and **what** we stand for

We ensure the best possible radio and TV reception

KATHREIN Digital Systems is the market leader for digital satellite, terrestrial, cable or IP reception and signal distribution in buildings and caravans. Our high-quality and reliable product portfolio for modern TV and radio reception is constantly being expanded to include innovative solutions in the field of building technology.

Thanks to extensive know-how in development and unsurpassed quality standards in production, our solutions and systems are among the best in their class. High-quality satellite reception systems in conjunction

with sophisticated solutions for signal distribution, whether in single-family homes or in large building complexes, bring the signals to the receiving equipment in best HD quality.

New technologies such as SAT>IP, optical SAT distribution or modular headend technology for hotel TV close the gap between traditional signal distribution and modern optical fibre and network technology.

KATHREIN Digital System's advanced solutions are also the best choice for mobile TV reception in caravans and mobile homes.

Find out more about us at www.kathrein-ds.com

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Passive Distributed Antenna Systems

With increasing data traffic and the need for mobile access any time and anywhere, additional availability of mobile networks in indoor environments is indispensable. The network coverage supplied by macro sites is not sufficient to overcome the high penetration losses due to the used façade material of most buildings resulting in poor indoor coverage. To overcome this, distributed antenna systems (DAS) are numerous installed in typical indoor venues like shopping malls, hotels, transportation and hospitals etc.

Today, everyone is talking about active DAS, allowing flexible capacity adaption and easy network modification. Depending on the size of the venue and the specific application, it is still often a more cost effective solution to use a passive DAS. Although passive DAS are relatively unflexible to retroactive changes in the system setup, the clear advantages are the simple design, low material costs, low maintenance efforts, high reliability and easy coverage deployment. Hence in venues without significant change in requirements over time the use of a passive DAS may often be reasonable.

According to an ABI research study from January 2016, the size of the in-building wireless market is predicted to more than double in revenue by 2020. These numbers reflect the importance of in-building systems in the future and show the indispensability of indoor DAS installations.

With more than 3 million indoor products sold and more than 20 years of experience in passive indoor systems, Kathrein is a trusted partner for future investments in the indoor sector. Not only do we supply high quality products for DAS but we also provide complete installation and planning services.

Functional Layers of a Passive DAS

In a passive DAS, all components which are used for the distribution of the source signals throughout the indoor location are passive devices. A passive indoor system consists of four main levels:

1. Signal source

The signal supply for the indoor system can be fed into the building in different ways:

- a. Donor antenna and repeater
- b. Standard base station (BTS)
- c. Baseband unit (BBU) plus remote radio head (RRH)

2. Combiner (Point of Interface, POI)

The different source signals and different frequencies are interconnected to a common interface

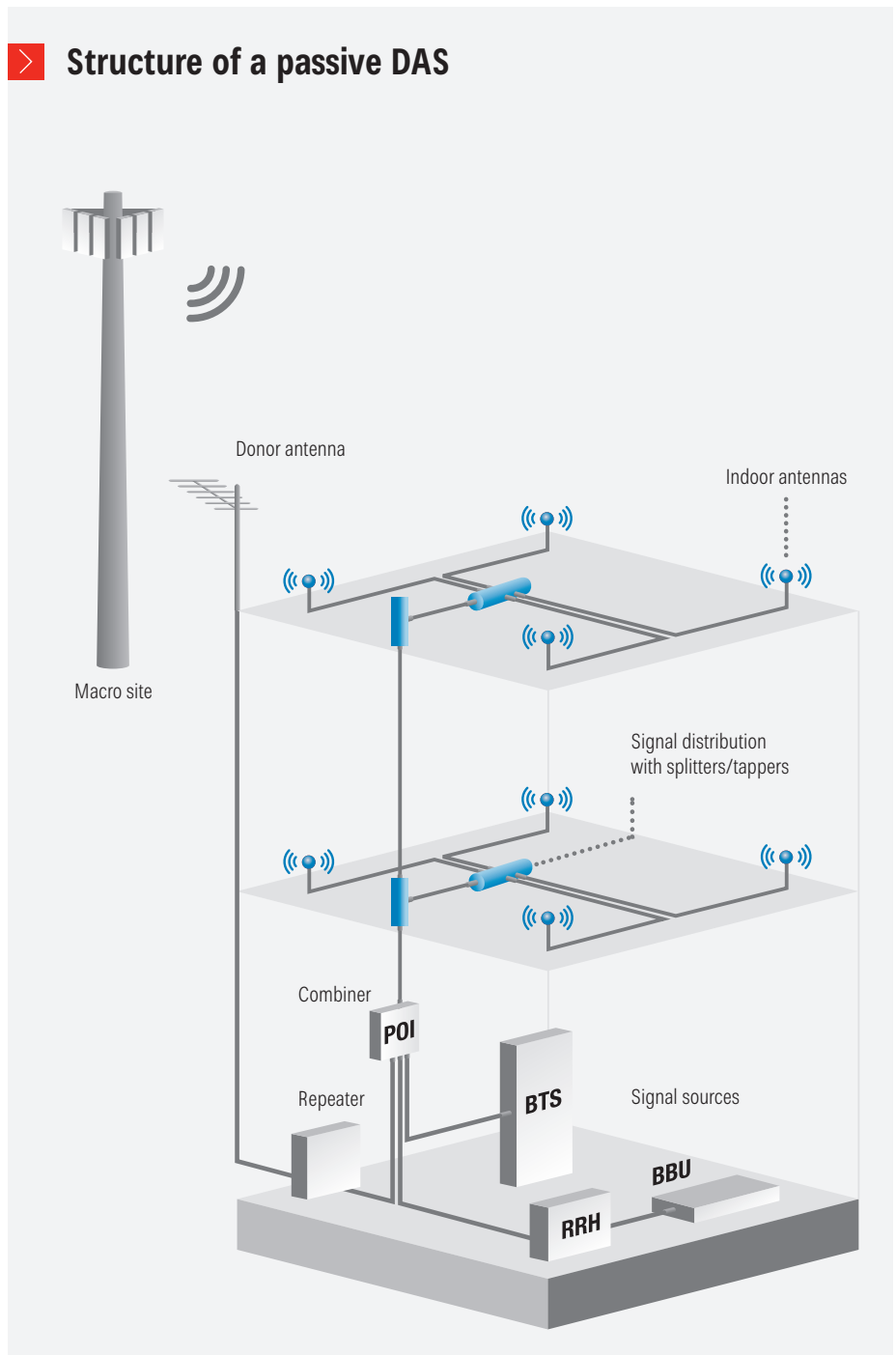
3. Signal distribution

Electrical accessories like splitters and tappers are used to achieve the correct signal level on the different types of antennas

4. Indoor antennas

Multi-band antennas are used for the distribution of the signal in the building

> Structure of a passive DAS



Indoor Antennas



In indoor applications, the antennas are mostly the only elements in the whole system which are visible. Thus, it is essential that the visual impact is kept to a minimum. The unobtrusive broadband design of Kathrein indoor antennas makes them highly versatile for a wide range of applications.

- Frequency ranges 698–6000 MHz
- Ceiling or wall mounting
- Omnidirectional or directional
- MIMO capability

The choice of antenna normally depends on the coverage and installation requirements of a building. There is

a clear trend towards complete integration of the antennas into intermediate floors and suspended ceilings as well as towards partial integration of the antennas, e.g. into the ceiling. An example of a partially integrated Kathrein indoor antenna is shown in the picture above.

If the system supports MIMO, it is recommended to use special MIMO antennas with two polarisations instead of using two single antennas which would need to be separated in space and provoke a higher visual impact. During the planning phase, it is important to include potentially needed MIMO setups beforehand in order to provide the correct cabling – for MIMO, double cabling may be needed.

Signal Distribution

In order to distribute the sum of signals to the various floors/ spots, the correct splitting of the signals is essential. The signals may need to be split equally or unequally to achieve the correct signal level at the antenna.

Splitters provide the possibility to equally split the input signal:

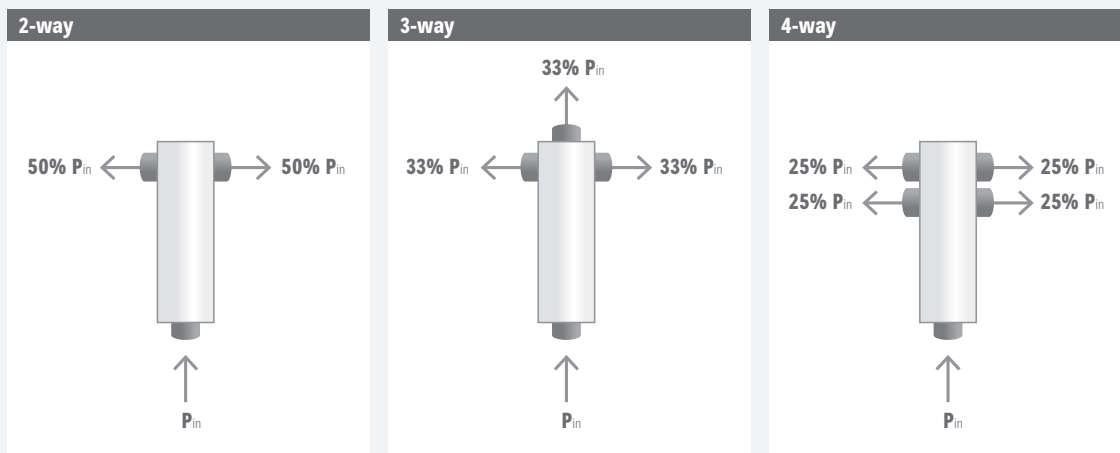
- 2, 3 or 4 output ports
- 698–3800 MHz

Tappers can split the input signal with unequal distribution at the output ports:

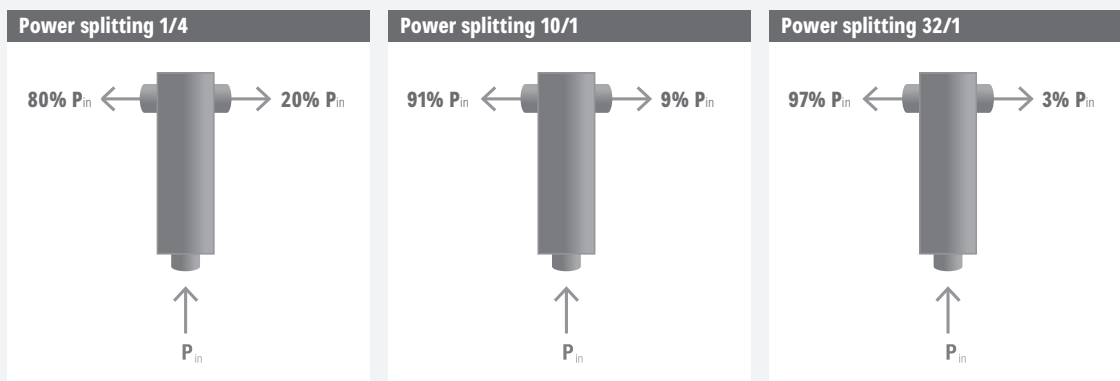
- 2 output ports
- Different splitting ratio
- 700–3800 MHz

> Example of Different Power Distributions for Splitters and Tappers

Splitters



Tappers



The choice of the correct device depends on the architecture of the building and the needed signal distribution. An example of the RF power split with Kathrein electrical accessories is shown above.

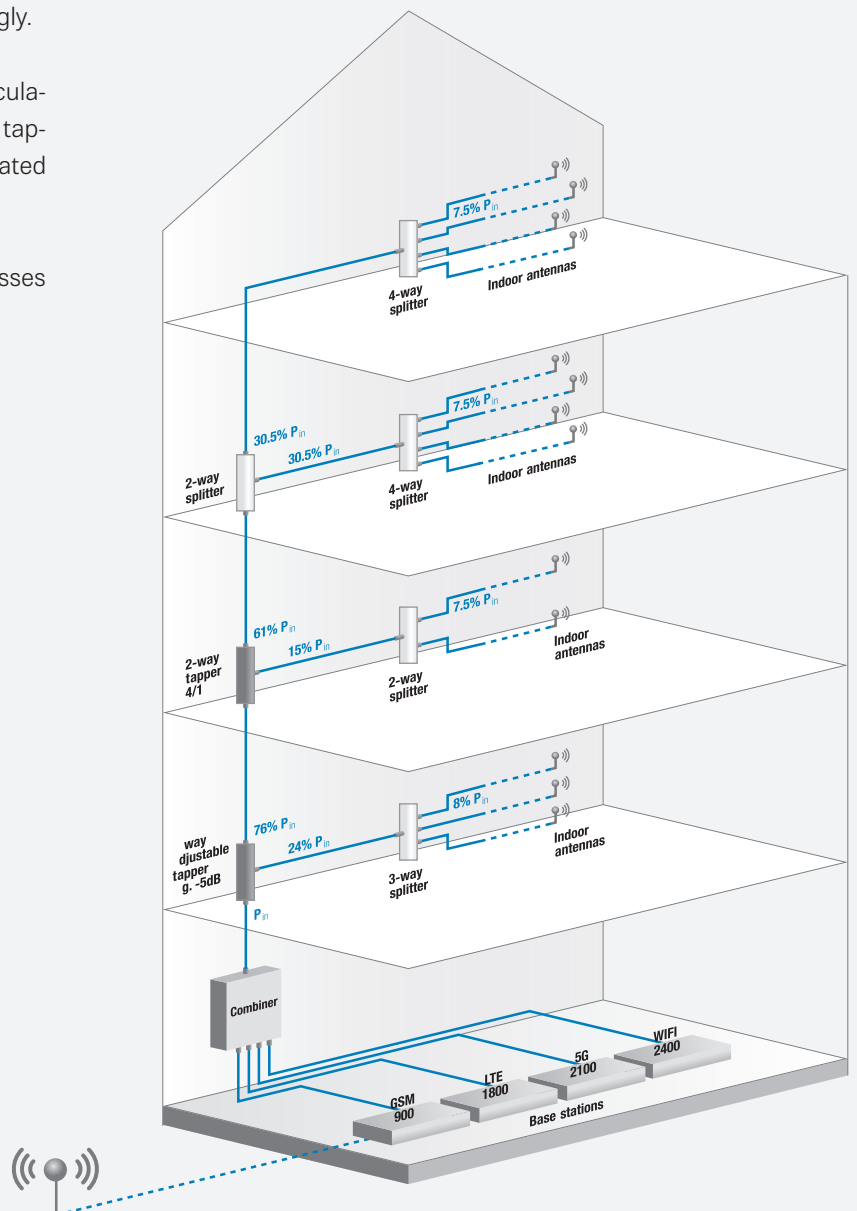
Signal Distribution in a Passive DAS

> Calculation Example

In order to achieve a similar RF power distribution on each floor of a four-storey building, different splitter and tapper versions can be deployed. By choosing different devices, the power levels can be adapted accordingly.

The picture on this page shows the calculation for this scenario. The splitters and tappers split the power with the ratios indicated in the chapter "Signal Distribution".

The values are rounded to 0.5% steps. Losses are not included in the calculation.

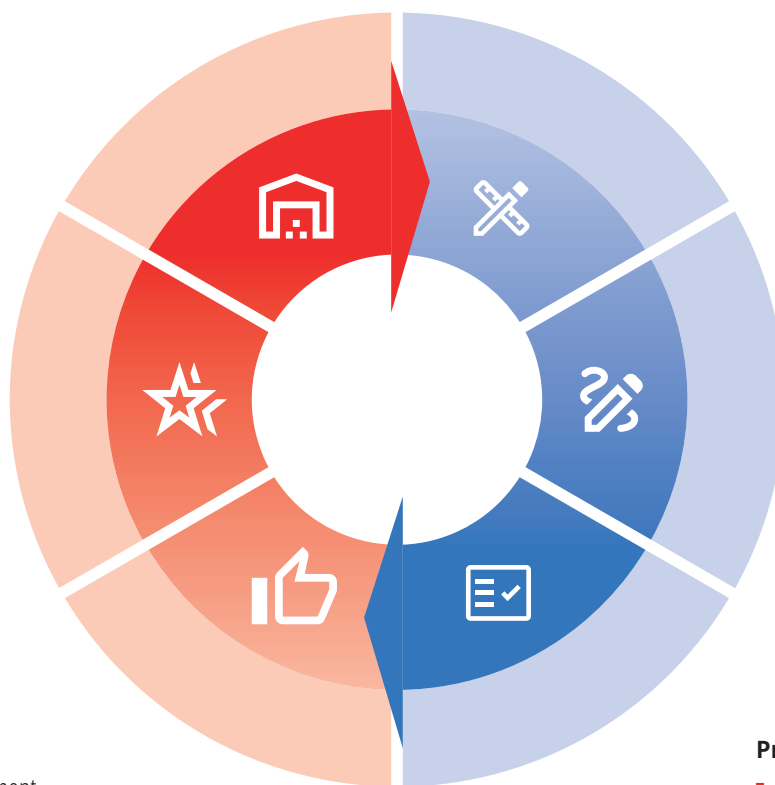


Kathrein Passive DAS

Kathrein offers a variety of support services for the entire life-cycle of passive DAS products. Our broad experience as an innovation and technology driver and the dedication of our motivated and committed staff are uniquely combined with Kathrein. Our highly experienced teams at the headquarters in Rosenheim and technical support hotline/logistic hub in Ulm (Germany) provide you expert support.

Top quality is synonymous with Kathrein products and this quality also guides our implementation of Kathrein services. We help to realise passive DAS projects with the benefits and reliability for which Kathrein is known in the market. We focus on the needs of our customers - our support is available for individual requests as well as for complete projects in cooperation with external partners.

> Kathrein Passive DAS



Provided by Kathrein:

- Kathrein and 3rd party equipment
- Fast logistics (Distribution Centre in Germany)
- Turn-Key and on-time delivery of all material
- Take care of the spare part chain
- Consumables
- Spare parts
- Repair service
- Technical support

Provided by external Partners:

- Project management
- Installation services
- Start up and site acceptance
- Feasibility planning
- Site survey
- Network design
- Realisation planning
- Measurements/Walk tests
- Analysis of measurements
- Optimisation proposals

Examples of Successfully Installed Passive DAS

> Indoor DAS – for the Romanian Operator RCS & RDS

Romanian operator RCS & RDS knows that mobile access in indoor environment is a crucial topic. In Kathrein's Romanian subsidiary, Romkatel, they found a trusted and reliable partner to build up indoor DAS (Distributed Antenna System) in a variety of buildings, from the design phase, over full material delivery, up to the implementation services. During the last year, Romkatel professionally and successfully implemented more than 70 passive DAS in shopping malls, supermarkets and office buildings on behalf of RCS & RDS. In total, 700 Kathrein indoor antennas, 300 splitters and 350 tappers were installed for the RCS & RDS single-operator projects. Typical antennas in these installations were e.g. bidirectional antennas, wall-mounted directional antennas and ceiling mounted omni-antennas. The reliability of Kathrein indoor products, the 100% availability and expertise of the Romkatel design and implementation team were key factors for RCS & RDS in their supplier selection process. With Romkatel as a partner and its complex portfolio of materials and services, including iBwave design, successful turnkey projects are a guarantee.

Indoor DAS in Romania	
Country	Romania
Facility	Shopping malls, super markets, office buildings
Operator	RCS & RDS
Year of Installation	2015 until present
Kathrein Sales Partner	Romkatel

> Indoor Passive DAS in Mauritius

When Mauritius Telecom was searching for a supplier to provide reliable mobile network coverage in public buildings, they chose Kathrein's African sales partner Kathrein Africa Ltd. as their supplier. The key for choosing Kathrein Africa's professionalism was their long-term experience in RF. During 2015, Kathrein Africa successfully completed passive DAS for Mauritius Telecom in the following buildings:

1. Nexteracom Office Building floors 1–14, 103 antennas, 14 tappers, 55 splitters
2. Nexteracom Office Building floors 2–13, 86 antennas, 13 tappers, 51 splitters
3. Nexteracom Office Building floors 3–8, 57 antennas, 6 tappers, 30 splitters
4. Citadelle Shopping Mall floors, 22 floors, 134 antennas, 17 tappers, 66 splitters

These projects ensured mobile connectivity in the buildings. As a complete solution supplier, Kathrein Africa Ltd. successfully guided this project from planning to installation.

Indoor DAS in Mauritius	
Country	Mauritius
Facility	Office buildings, shopping mall
Operator	Mauritius Telecom
Year of Installation	2015
Kathrein Sales Partner	Kathrein Africa Ltd.



Lobby of Nexteracom office building with Kathrein antennas

Overview Directional/Omnidirectional Antennas

	Port	Type	380	698	790	876	960	1425	1710	2500	2700	3400	3800	4000	5150	5920	6000	
80020249	1	Omni			SISO				SISO							SISO		
787500001	1	Omni		SISO				SISO										
787500002	1	Omni		SISO				SISO										
787500003	1	Omni		SISO				SISO										
787500004	2	Omni		MIMO				MIMO										
787500005	2	Omni		MIMO				MIMO										
787500006	1	Direct.		SISO				SISO										
787500007	2	Direct.		MIMO				MIMO										
787500033	2	Direct		MIMO				MIMO										

1-Port Omni Antennas

> 80020249

790–960, 1425–3800, 5150–6000 MHz (SISO),

Vertical Polarisation, 4.3-10 Connector

Type No.		80020249
Frequency range	MHz	790–960
		1425–3800
		5150–6000
Polarization		Vertical
Gain, typ.	dBi	≈ 2
Impedance	Ω	50
VSWR		790–806 MHz: < 1.7 806–960 MHz: < 1.5 1425–1710 MHz: < 2.0 1710–2200 MHz: < 1.4 2200–3800 MHz: < 1.6 5150–5300 MHz: < 2.4 5300–6000 MHz: < 2.0
Intermodulation IM3	dBc	1790–3960 MHz: < -140 (2 x 40 dBm carrier) 1710–3800 MHz: < -140 (2 x 40 dBm carrier) 5150–6000 MHz: not relevant
Max. power	W	50 (at 50 °C ambient temperature)
Input		4.3-10 female
Protection class		IP 30
Weight	g	Approx. 500
	lb	Approx. 1.1
Packing size	mm	278 x 278 x 171
	inches	10.9 x 10.9 x 6.7
Diameter	mm	258
	inches	10.2
Height	mm	94 (without connector)
	inches	3.7 (without connector)
Fire load	kWh	2.12
Material		Reflector: Aluminium. Radome: High impact polystyrol, colour: White.
Mounting		Three holes in the base enable a mounting on the ceiling. Two types of screws are supplied. For the 4.3-10 connector, a hole in the ceiling with a diameter of 35 mm 1.4 inches is required.
Available accessories		Broadband power splitters and tappers.



> 787500001

698–806, 806–960, 1427–1695, 1710–2700, 3400–4000 MHz (SISO),
Vertical Polarisation, 4.3-10 Connector

Type No.		787500001				
Frequency range	MHz	698–806	806–960	1427–1695	1710–2700	3400–4000
Polarization		Vertical				
Gain, typ.	dBi	2.5		3.5	4.4	4.5
Impedance	Ω	50				
VSWR		≤ 1.8	≤ 1.5	≤ 1.8	≤ 1.5	
Intermodulation IM3	dBc	≤ -153 (2 x 43 dBm carrier)				
Vertical Beam width	$^{\circ}$	53	57	55	44	38
Horizontal Beam width	$^{\circ}$	360				
Max. power	W	50				
Input		4.3-10 female (300 mm pigtail)				
Protection class		IP 30				
Operating Temperature	$^{\circ}\text{C}$	-40~60				
Weight	kg	0.35				
Diameter	mm	203				
Height	mm	118				
Packing size	mm	180 × 180 × 220				
Material Packing size		Reflector: Aluminium Radome: ABS, colour: White, Pigtail colour: White				
Mounting Method		Ceiling mount				
Available accessories		Broadband splitters and tappers.				



> **787500002**

698–806 , 806–960, 1350–1710, 1710–2700, 3400–4200 MHz (SISO),
Horizontal Polarisation, 4.3-10 Connector

Type No.		787500002				
Frequency range	MHz	698–806	806–960	1350–1710	1710–2700	3400–4200
Polarization		Horizontal				
Gain, typ.	dBi	4.3	4.7	4.5	5.0	5.0
Impedance	Ω	50				
VSWR		≤ 1.5		≤ 1.6	≤ 1.5	≤ 1.6
Intermodulation IM3	dBc	≤ -153 (2 x 43 dBm carrier)				
Horizontal Beam width	$^\circ$	360				
Max. power	W	50				
Input		4.3-10 female				
Protection class		IP 30				
Operating Temperature	$^\circ\text{C}$	-40–60				
Weight	kg	0.2				
Dimensions	mm	175*150*15				
Packing size	mm	145 × 145 × 170				
Material		Reflector: Copper foil (PCB antenna) Radome: ABS, colour: White				
Mounting Method		Ceiling mount				
Available accessories		Broadband splitters and tappers.				



> **787500003**

698–806, 806–960, 1350–1710, 1710–2700, 3400–4200 MHz (SISO), Horizontal Polarisation, 4.3-10 Connector

Type No.		787500003				
Frequency range	MHz	698–806	806–960	1350–1710	1710–2700	3400–4200
Polarization		Horizontal				
Gain, typ.	dBi	3.7	4	4.5	5	5
Impedance	Ω	50				
VSWR		≤ 1.5		≤ 1.8	≤ 1.5	
Intermodulation IM3	dBc	≤ -153 (2 x 43 dBm carrier)				
Max. power	W	50				
Input		4.3-10 female				
Protection class		IP 30				
Operating Temperature	$^{\circ}\text{C}$	-40–60				
Weight	kg	0.3				
Diameter	mm	195				
Height	mm	18				
Packing size	mm	160 x 160 x 210				
Material		Reflector: Copper foil (PCB antenna) Radome: ABS, colour: White, Pigtail colour: White				
Mounting Method		Ceiling mount				
Available accessories		Broadband splitters and tappers.				



2-Port Omni Antennas

> 787500004

698–960, 1427–1710, 1710–2700, 3300–4200 MHz (MIMO),
Horizontal Polarisation, 4.3-10 Connector

Type No.		787500004			
Frequency range	MHz	698–960	1427–1710	1710–2700	3300–4200
Polarization		Horizontal			
Gain, typ.	dBi	4.0		4.5	5.5
Impedance	Ω	50			
VSWR		≤ 1.8			
Intermodulation IM3	dBc	≤ -153 (2 x 43 dBm carrier)			
Max. power	W	100			
Isolation	dB	≥ 16	≥ 18	≥ 20	≥ 25
Input		2 x 4.3-10 female			
Protection class		IP 30			
Operating Temperature	$^{\circ}\text{C}$	-40 ~ 60			
Weight	kg	0.52			
Diameter	mm	256			
Height	mm	18			
Packing size	mm	202 x 202 x 270			
Material		Reflector: Aluminium Radome: ABS, colour: White, Pigtail colour: White			
Mounting Method		Ceiling mount			
Available accessories		Broadband splitters and tappers.			



> **787500005**

698–960, 1427–1710, 1710–2700, 3400–4200 MHz (MIMO),
Horizontal Polarisation, 4.3-10 Connector

Type No.		787500005			
Frequency range	MHz	698–960	1427–1710	1710–2700	3400–4200
Polarization		Horizontal			
Gain, typ.	dBi	4.0	3.3	4.5	6.0
Impedance	Ω	50			
VSWR		≤ 1.8			
Isolation	dB	≥ 16	≥ 18	≥ 20	≥ 30
Intermodulation IM3	dBc	≤ -153 (2 x 43 dBm carrier)			
Max. power	W	100			
Input		2 x 4.3-10 female			
Protection class		IP 30			
Operating Temperature	$^{\circ}\text{C}$	-40 ~ 60			
Weight	kg	0.43			
Dimensions	mm	252 x 189 x 15			
Packing size	mm	200 x 200 x 205			
Material		Reflector: Copper foil (PCB antenna) Radome: ABS, colour: White, Pigtail colour: White			
Mountig Method		Ceiling mount			
Available accessories		Broadband splitters and tappers.			



1-Port Directional Antenna

> 787500006

698–806, 806–960, 1427–1710, 1710–2700, 3400–4200 MHz (SISO),
Horizontal Polarisation, 4.3-10 Connector

Type No.		787500006				
Frequency range	MHz	698–806	806–960	1427–1710	1710–2700	3400–4200
Polarization		Vertical				
Gain, typ.	dBi	6.5		6	7.1	6.8
Horizontal Beam width	°	97	95	71	68	51
Vertical Beam width	°	79	75	65	53	18
Front to Back ratio (boresight)	dB	≥ 10	≥ 15	≥ 9	≥ 8	≥ 7
Impedance	Ω	50				
VSWR		≤ 1.7		≤ 1.8		
Intermodulation IM3	dBc	≤ -153 (2 x 43 dBm carrier)				
Max. power	W	50				
Input		4.3-10 female				
Protection class		IP 30				
Operating Temperature	°C	-40 ~ 60				
Weight	kg	0.3				
Dimensions	mm	175 × 175 × 60				
Packing size	mm	220 × 75 × 195				
Material		Reflector: Aluminium Radome: ABS, colour: White, Pigtail colour: White				
Mounting Method		Wall mount				
Available accessories		Broadband splitters and tappers.				



2-Port Directional Antenna

> 787500007

698–806, 806–906, 1427–1710, 1710–2700, 3400–4000 MHz (MIMO)
 ±45° Polarisation, 4.3-10 Connector

Type No.		787500007				
Frequency range	MHz	698–806	806–906	1427–1710	1710–2700	3400–4000
Polarization		±45°				
Gain, typ.	dBi	5.5	6	7	8	6
Horizontal Beam width	°	80		65	60	30
Vertical Beam width	°	73	70	60		30
Return Loss	dB	9.5				
Impedance	Ω	50				
VSWR		≤ 2				
Intermodulation IM3	dBc	≤ -153 (2 x 43 dBm carrier)				
Max. power	W	50				
Input		2 x 4.3-10 female				
Protection class		IP 30				
Operating Temperature	°C	-40 ~ 60				
Weight	kg	2.1				
Dimensions	mm	399 × 280 × 80				
Packing size	mm	530 × 320 × 185				
Material		Reflector: Aluminium Radome: ABS, colour: White, Pigtail colour: White				
Mounting Method		Wall mount				
Available accessories		Broadband splitters and tappers.				



> **787500033**

698–800, 800–960, 1710–2700, 3400–4000 MHz (MIMO)

±45° Polarisation, 4.3-10 Connector

Type No.		787500033			
Frequency range	MHz	698–800	800–960	1710–2700	3400–4000
Polarization		±45°			
Gain, typ.	dBi	7		8	7.5
Horizontal Beamwidht	°	77	73	62	60
Vertical Beamwidht	°	71	65	59	60
Front to Back ratio (boresight)	dB	≥ 16			19
Isolation	dB	≥ 19	≥ 20	≥ 23	
Impedance	Ω	50			
VSWR		≤ 1.7			
Intermodulation IM3	dBc	≤ -153 (2 x 43 dBm carrier)			
Max. power	W	50			
Input		2 x 4.3-10 female			
Protection class		IP 30			
Operating Temperature	°C	-40 ~ 60			
Weight	kg	1.2			
Dimensions	mm	305 × 199 × 80			
Packing size	mm	350 × 210 × 105			
Material		Reflector: Aluminium Radome: ABS, colour: White, Pigtail colour: White			
Mounting Method		Wall mount			
Available accessories		Broadband splitters and tappers.			





- **Fast logistics (Distribution Centre in Germany)**
- **Turn-Key and on time delivery of all material**

Low Power Splitters (Wilkinson Type)

> 787500008 / 787500009 / 787500010

698–3800 MHz, 50 W, 4.3-10 Connector, 2-way, 3-way, 4-way

Type No.		787500008	787500009	787500010
Frequency range	MHz	698–3800		
For connecting ... antennas		2	3	4
In/Out		1/2	1/3	1/4
Splitter loss	dB	3.0	4.8	6.0
Insertion loss	dB	0.4 (698–2700)	0.75 (698–2700)	0.7 (698–2700)
		0.5 (2700–3800)	1.1 (2700–3800)	1.1 (2700–3800)
Return Loss	dB	19.1	17.7	
VSWR		≤ 1.25	≤ 1.3	
Isolation	dB	20.8	17.7	
Intermodulation IM3	dBc	≤ -150 (2 × 43 dBm carrier)		
Power rating, Combining	W	0.5		
Max. power	W	50		
Impedance	Ω	50		
Connector		4.3-10 female		
Weight	kg	0.3	0.63	0.74
Dimensions	mm	110 × 80 × 22	154 × 105 × 22	158 × 136 × 22
Material		Housing: aluminium; inner conductor: brass		
Environmental conditions		IP 65		
Operating Temperature	°C	-20 ~ 85		
Application area		Indoor Outdoor		
Packaging size	mm	125 × 90 × 35	180 × 120 × 35	180 × 150 × 35



High Power Splitters

> 787500011 / 787500012 / 787500013

698–3800 MHz, 300 W, 4.3-10 Connector, 2-way, 3-way, 4-way

Type No.		787500011	787500012	787500013
Frequency range	MHz	698–3800		
For connecting ... antennas		2	3	4
In/Out		1/2	1/3	1/4
Insertion loss	dB	≤ 3.3	≤ 5.3	≤ 6.5
Return loss	dB	19.1	17.7	
VSWR		≤ 1.25	≤ 1.3	
Intermodulation IM3	dBc	≤ -160 (2 × 43 dBm carrier)		
Max. power	W	300		
Impedance	Ω	50		
Connector		4.3-10 female		
Weight	kg	0.35	0.4	0.45
Dimensions	mm	210.5 × 25 × 25	225 × 25 × 25	225 × 25 × 25
Material		Housing: aluminium; inner conductor: brass		
Protection class		IP 65		
Operating Temperature	°C	-20 ~ 65		
Application area		Indoor Outdoor		
Packaging size	mm	244 × 80 × 33	280 × 80 × 33	280 × 80 × 54



Tapper

> 787500014 / 787500015 / 787500016 / 787500017 / 787500018 / 787500019

698–3800 MHz, 5 dB Coupling Loss, 4.3-10 Connector
 698–3800 MHz, 7 dB Coupling Loss, 4.3-10 Connector
 698–3800 MHz, 10 dB Coupling Loss, 4.3-10 Connector
 698–3800 MHz, 13 dB Coupling Loss, 4.3-10 Connector
 698–3800 MHz, 15 dB Coupling Loss, 4.3-10 Connector
 698–3800 MHz, 20 dB Coupling Loss, 4.3-10 Connector

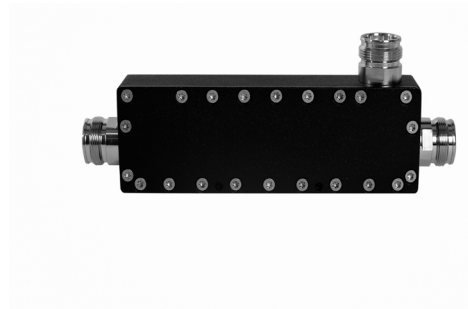


Type No.		787500014	787500015	787500016	787500017	787500018	787500019
Frequency range	MHz	698–3800 MHz					
Tap loss							
Input ↔ P ₁	dB	±1.5	±1.5	±1.5	±2.0	±2.0	±2.0
Input ↔ P ₂		5	7	10	13	15	20
Insertion loss	dB	≤2.5	≤1.4	≤1.0	≤0.8	≤0.5	≤0.4
Impedance	Ω	50					
VSWR		≤1.6	≤1.5	≤1.4	≤1.3		
Intermodulation IM3	dBc	≤-160 (2 × 43 dBm carrier)					
Max. power	W	300					
Connectors		4.3-10 female					
Weight	kg	0.15					
Dimensions	mm	39 × 25 × 25					
Packaging size	mm	90 × 55 × 33					
Material		Housing: aluminium; inner conductor: brass					
DC capability		DC transmission only between input and port P ₁ ; P ₂ is coupled capacitively					
Environmental conditions		IP 65					
Operating Temperature	°C	-20 ~ 65					
Application area		Indoor Outdoor					

Directional Coupler

> 787500020 / 787500021 / 787500022 / 787500023 / 787500024 / 787500025 / 787500026

- 698–3800 MHz, 5 dB Coupling, 4.3-10 Connector
- 698–3800 MHz, 6 dB Coupling, 4.3-10 Connector
- 698–3800 MHz, 8 dB Coupling, 4.3-10 Connector
- 698–3800 MHz, 10 dB Coupling, 4.3-10 Connector
- 698–3800 MHz, 13 dB Coupling, 4.3-10 Connector
- 698–3800 MHz, 15 dB Coupling, 4.3-10 Connector
- 698–3800 MHz, 20 dB Coupling, 4.3-10 Connector



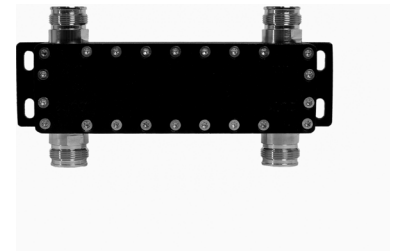
Type No.		787500020	787500021	787500022	787500023	787500024	787500025	787500026
Frequency range	MHz	698–3800 MHz						
Ripple Coupling	dB	±1 5	±1 6	±1 8	±1 10	±1 13	±1.2 15	±1.2 20
Insertion loss	dB	≤ 2.35	≤ 1.75	≤ 1.1	≤ 0.95	≤ 0.7	≤ 0.5	≤ 0.3
Impedance	Ω	50						
VSWR		≤ 1.3						
Intermodulation IM3	dBc	≤ -160 (2 × 43 dBm carrier)						
Max. power	W	300						
Connectors		4.3-10 female						
Weight	kg	0.39						
Dimensions	mm	135 × 43 × 25						
Packaging size	mm	197 × 75 × 31						
Material		Housing: aluminium; inner conductor: brass						
Environmental conditions		IP 65						
Operating Temperature	°C	-20 ~ 65						
Application area		Indoor Outdoor						

Hybrid Combiner

> 787500027

698–3800 MHz, 2x2, 3.1 /0.5 dB, 4.3-10 Connector

Type No.		787500027
Frequency range	MHz	698–3800 MHz
Input avg. Power	W	200 (max. at each Port)
Coupling Value	dB	3.1 ± 0.5
Isolation	dB	≥ 23
VSWR		≤ 1.25
Intermodulation IM3	dBc	≤ -160 (2 × 43 dBm carrier)
Impedance	Ω	50
Connectors		4.3-10 female
Weight	kg	0.44
Dimensions	mm	159 × 43 × 29.5
Packaging size	mm	177 × 111 × 36
Material		Housing: aluminium; inner conductor: silver
Environmental conditions		IP 65
Operating Temperature	°C	-25 ~ 65
Application area		Indoor Outdoor



> **787500028**

698–3800 MHz, 4x4, 6 /1 dB, 4.3-10 Connector

Type No.		787500028
Frequency range	MHz	698–3800 MHz
Input avg. Power	W	200 (max. at each Port)
Coupling Value	dB	6.0 ± 1.0
Isolation	dB	≥ 23
VSWR		≤ 1.25
Intermodulation IM3	dBc	≤ -160 (2 × 43 dBm carrier)
Impedance	Ω	50
Connectors		4.3-10 female
Weight	kg	2.1
Dimensions	mm	200 × 90 × 66
Packaging size	mm	320 × 173 × 78
Material		Housing: aluminium; inner conductor: silver
Environmental conditions		IP 65
Operating Temperature	°C	-25 ~ 65
Application area		Indoor Outdoor



Termination

> 787500029 / 787500030 / 787500031 / 787500032

330–3800 MHz, 10, 25, 50, 100 W 4.3-10 Connector

Type No.		787500029/787500030/787500031/787500032			
Frequency range	MHz	330–3800			
Power	W	10	25	50	100
VSWR		≤ 1.25			
Intermodulation IM3	dBc	≤ -155 (2 × 10 W)	≤ -160 (2 × 20 W)		
Impedance	Ω	50			
Connectors		4.3-10 female			
Weight	kg	0.85			2.65
Dimensions	mm	170 × 50		176 × 176 × 68	
Packaging size	mm	225 × 75 × 62		260 × 230 × 119	
Environmental conditions		IP 60			
Operating Temperature	°C	-25 ~ 65			
Application area		Indoor			



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