CATALOGUE

Broadcast Solutions

Antenna Systems and Components – Monitoring and Measurement – Services

NEW EDITION

KATHREIN
Broadcast GmbH

KATHREIN

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

Kathrein is a specialist for reliable, high-quality communication technologies

Kathrein Broadcast GmbH is an international enterprise active in antenna and communications technology. We have over 65 years of experience in developing, producing and marketing antennae and signal processing solutions for future technologies, such as DAB+, DVB-T2, ISDB-T, ATSC or 5G Broadcast. Always being one step ahead in technology has ensured that Kathrein is among the leading companies in the world market.

Kathrein Antenna Systems are known for their well-thought-out engineering, and solutions which are exactly tailored to the customer specifications. The products are of the highest quality, designed for long-term trouble free operation, even in harsh environmental conditions. Radiators and reflectors are made of hot-dip galvanized steel or corrosion-resistant aluminum alloy. The selected materials provide a long product life combined with best RF performance.

More information about Kathrein Broadcast at **www.kathrein-bca.com**

Catalogue Issue 08/2023
All data published in previous catalogue issues hereby becomes invalid.
We reserve the right to make alterations in accordance with the requirements of our customers, therefore for binding data please check valid data sheets on our homepage: www.kathrein-bca.com

Please also see additional information on inside back cover.

RoHS

Our products are compliant to the EU Directive RoHS as well as to other environmentally relevant regulations (e.g. REACH).

Our quality assurance system is certified by SGS according to EN ISO 9001

Antenna Systems
The antenna systems listed are examples of typical configurations.
The mechanical and electrical data can be used to estimate gain, size and mechanical loads of a system.
The final configuration and technical data of an individually designed antenna system, meeting the customer's specific needs, will be determined by the Kathrein engineers.

Antennas, Power Splitters and Accessories
The basic antennas and related components shown in this catalog are only a small portion of the Kathrein broadcast product line.
Various power splitters with different splitting ratio are available to create customized radiation patterns.

Monitoring, Measurement and Services
KATHREIN has set up a portfolio of products and services for the automation and digitization of terrestrial broadcast network operation.
Customers are welcome to take advantage of the technical expertise of our highly qualified team.

Your enquiries are most welcome and we would like to discuss your special requirements.

Summary of Types

The articles are listed by type number in numerical order.

Broadcast Antennas and Accessories, Pages 7–95

Summary of Types

The articles are listed by type number in numerical order.

Kathrein Signal Analyser, Pages 103–114

Antenna Systems for FM Radio

87.5–108 MHz

Broadcast Station "Otterndorf", Germany

FM Antenna System with very low wind load

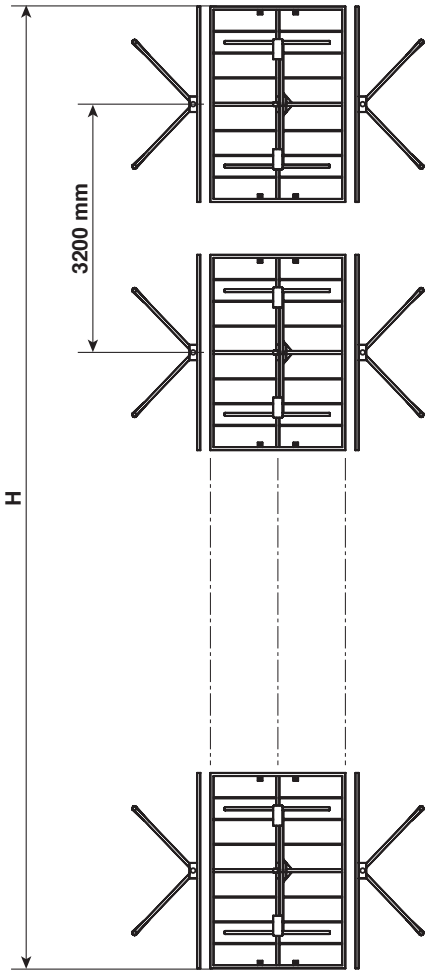
FM Transmitting Antenna

87.5–108 MHz

H

- Antenna array of dipole panels (page 22) for different radiation patterns.
- Especially suitable for mounting on square masts.
- The feeder network is made up of coaxial power splitters and flexible connecting cables in accordance with the radiation patterns specification and the transmitter power.

Input	Connectors according to IEC, EIA or DIN.
Max. power	According to customer's requirements.
Frequency	87.5–108 MHz
VSWR, typically	< 1.2 throughout the whole frequency range. Lower VSWR for parts of band upon request.
Impedance	50 Ω
Polarization	Horizontal
Internal connections	Connectors according to IEC, EIA or DIN are used throughout the system, allowing easy assembly and maintenance.
Vertical radiation pattern	Null fill and beam tilt upon request.
Horizontal radiation pattern	Omnidirectional, directional or custom-designed.
Half antenna splitting	Upon request, the antenna can be divided into two halves (for emergency operation and maintenance). The two halves are connected by a 2-way power splitter or patch panel.
Pressurization	Splitters and connecting cables can be supplied with dry air (please specify when ordering).
Grounding	Via mounting parts.
Max. wind velocity	240 km/h



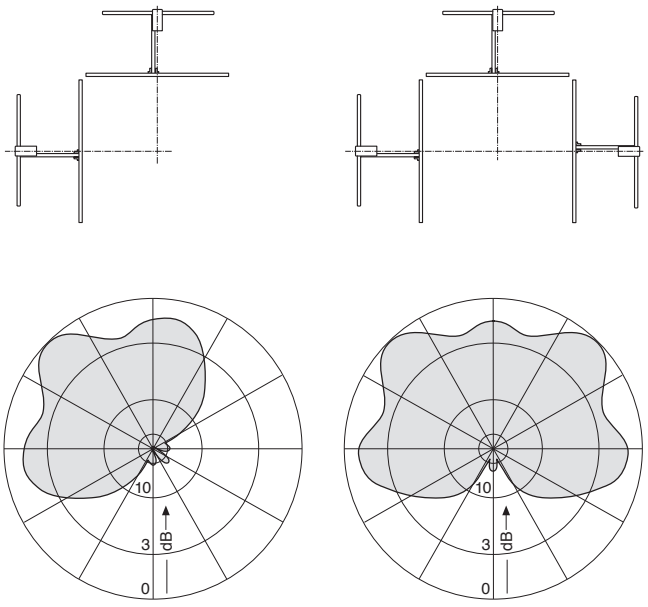
No. of bays	Panels per bay	Gain* (at mid-band) dBd	Gain* (at mid-band) times	Weight (without mounting hardware) kg	Antenna height H m	Windload (v = 160 km/h) kN
1	2 3 4	5.0 3.5 2.0	3.2 2.2 1.6	140 210 280	2.5	2.4 3.9 4.8
2	2 3 4	8.0 6.5 5.0	6.3 4.5 3.2	280 420 550	5.7	4.8 7.8 9.6
4	2 3 4	11.0 9.5 8.0	12.6 8.9 6.3	550 830 1120	12.1	9.6 15.6 19.3
6	2 3 4	12.8 11.3 9.7	19.1 13.0 9.3	830 1250 1660	18.5	14.4 23.4 28.9
8	2 3 4	14.0 12.5 11.0	25.1 17.8 12.6	1120 1660 2200	24.9	19.3 31.3 38.5

* Attenuation of the internal cabling and the gain-decrease in case of null fill in the vertical radiation pattern are not considered. Approximate values for gain decrease:
cable attenuation: 0.2–0.5 dB
null fill: 0.3–1.0 dB
Gain figures are valid for the direction of maximum radiation (see diagrams on following page).

Horizontal Radiation Patterns

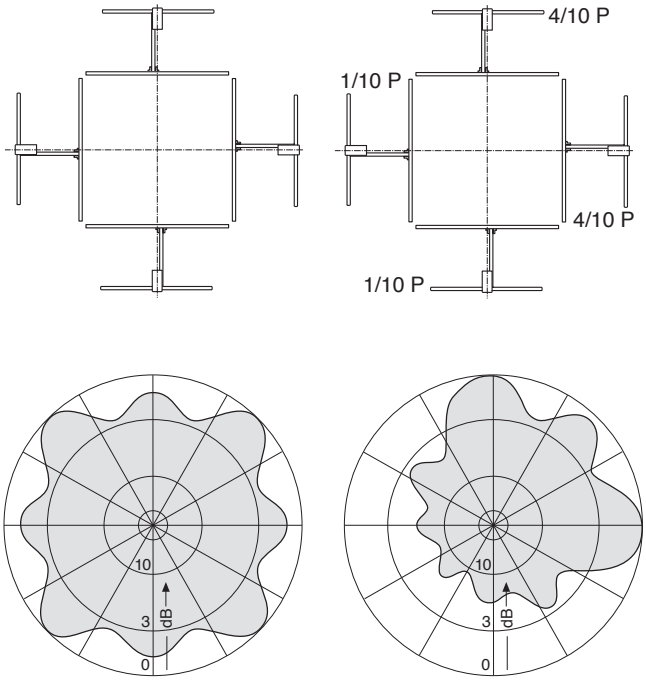
Examples of typical horizontal antenna arrays and their **horizontal** radiation patterns for optimal mast dimensions.

Equal power splitting



Equal power splitting

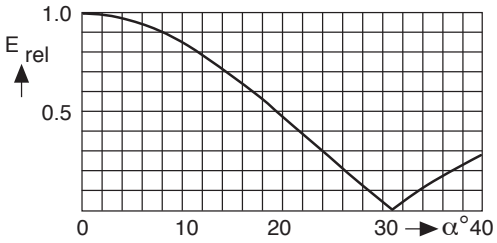
Different power splitting



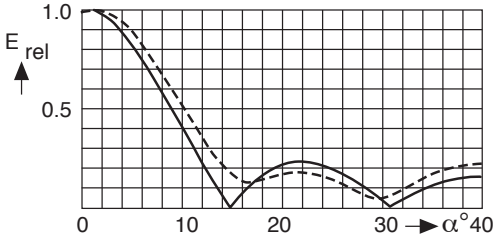
Vertical Radiation Patterns

Examples of typical **vertical** radiation patterns*) for several bays of identical, vertically stacked antenna arrays.

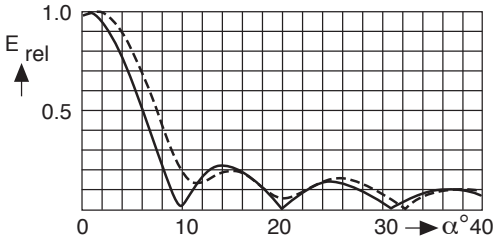
2 bays



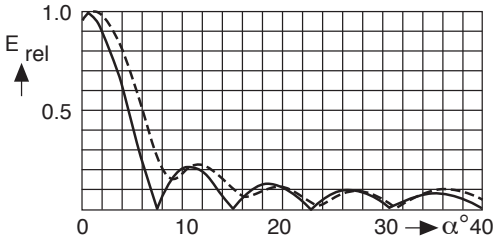
4 bays



6 bays



8 bays



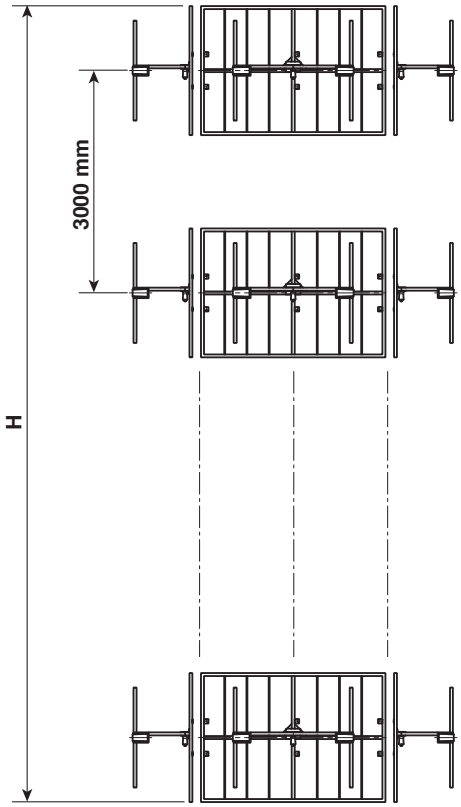
*) ——— without null fill
- - - - - with null fill and beam tilt

FM Transmitting Antenna

87.5–108 MHz

V

- Antenna array of dipole panels (page 23) for different radiation patterns.
- Especially suitable for mounting on square masts.
- The feeder network is made up of coaxial power splitters and flexible connecting cables in accordance with the radiation patterns specification and the transmitter power.



Input	Connectors according to IEC, EIA or DIN.
Max. power	According to customer's requirements.
Frequency	87.5–108 MHz
VSWR, typically	< 1.2 throughout the whole frequency range. Lower VSWR for parts of band upon request.
Impedance	50 Ω
Polarization	Vertical
Internal connections	Connectors according to IEC, EIA or DIN are used throughout the system, allowing easy assembly and maintenance.
Vertical radiation pattern	Null fill and beam tilt upon request.
Horizontal radiation pattern	Omnidirectional, directional or custom-designed.
Half antenna splitting	Upon request, the antenna can be divided into two halves (for emergency operation and maintenance). The two halves are connected by a 2-way power splitter or patch panel.
Pressurization	Splitters and connecting cables can be supplied with dry air (please specify when ordering).
Grounding	Via mounting parts.
Max. wind velocity	240 km/h

No. of bays	**Panels per bay**	**Gain* (at mid-band)**		**Weight** (without mounting hardware) kg	**Antenna height H** m	**Windload** (v = 160 km/h) kN
		dBd	times			
1	2 3 4	5.4 3.7 2.3	3.5 2.3 1.7	140 210 280	1.8	2.3 3.8 4.7
2	2 3 4	8.4 6.7 5.3	6.9 4.7 3.4	280 420 550	4.8	4.7 7.7 9.3
4	2 3 4	11.4 9.7 8.3	13.8 9.3 6.8	550 830 1120	10.8	9.3 15.3 18.6
6	2 3 4	13.2 11.5 10.1	20.9 14.1 10.2	830 1250 1660	16.8	14.0 23.0 27.9
8	2 3 4	14.4 12.7 11.3	27.5 18.6 13.5	1120 1660 2200	25.8	18.6 30.6 37.2

* Attenuation of the internal cabling and the gain-decrease in case of null fill in the vertical radiation pattern are not considered. Approximate values for gain decrease:
cable attenuation: 0.2–0.5 dB
null fill: 0.3–1.0 dB
Gain figures are valid for the direction of maximum radiation (see diagrams on following page).

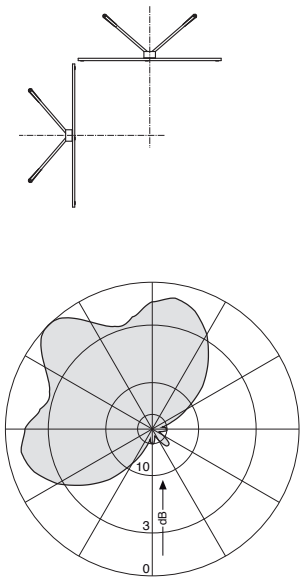
Horizontal Radiation Patterns

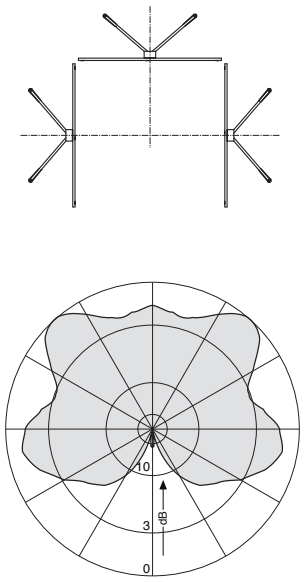
Examples of typical horizontal antenna arrays and their **horizontal** radiation patterns for optimal mast dimensions.

Vertical Radiation Patterns

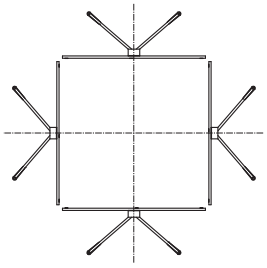
Examples of typical **vertical** radiation patterns*) for several bays of identical, vertically stacked antenna arrays.

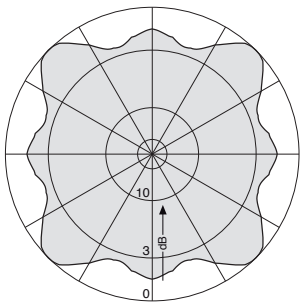
Equal power splitting



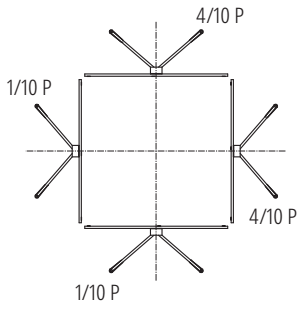


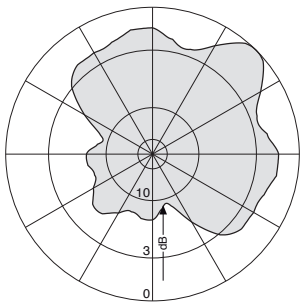
Equal power splitting



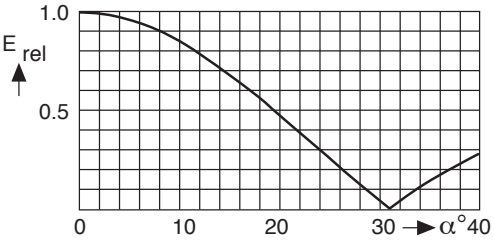


Different power splitting

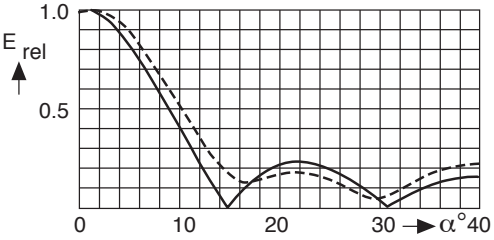




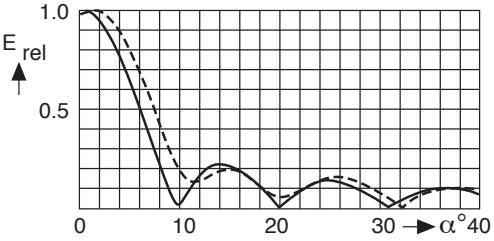
2 bays



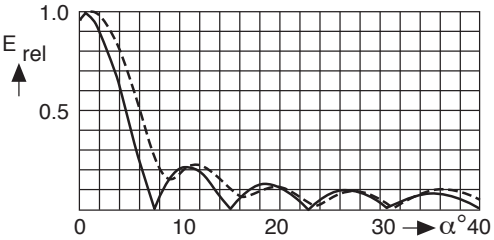
4 bays



6 bays



8 bays



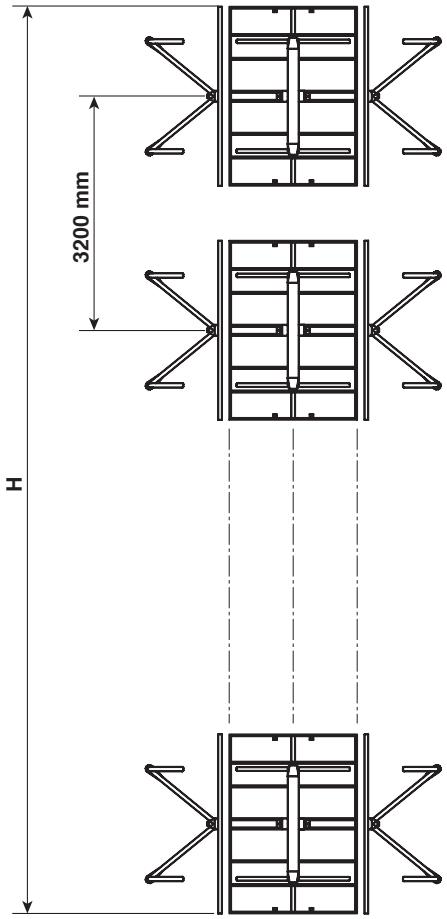
*) ——— without null fill
- - - - - with null fill and beam tilt

FM Transmitting Antenna

87.5–108 MHz

H

- Antenna array of dipole panels (page 24) for different radiation patterns.
- Especially suitable for mounting on triangular or round masts.
- The feeder network is made up of coaxial power splitters and flexible connecting cables in accordance with the radiation patterns specification and the transmitter power.



Input	Connectors according to IEC, EIA or DIN.
Max. power	According to customer's requirements.
Frequency	87.5–108 MHz
VSWR, typically	< 1.2 throughout the whole frequency range. Lower VSWR for parts of band upon request.
Impedance	50 Ω
Polarization	Horizontal
Internal connections	Connectors according to IEC, EIA or DIN are used throughout the system, allowing easy assembly and maintenance.
Vertical radiation pattern	Null fill and beam tilt upon request.
Horizontal radiation pattern	Omnidirectional, directional or custom-designed.
Half antenna splitting	Upon request, the antenna can be divided into two halves (for emergency oparation and maintenance). The two halves are connected by a 2-way power splitter or patch panel.
Pressurization	Splitters and connecting cables can be supplied with dry air (please specify when ordering).
Grounding	Via mounting parts.
Max. wind velocity	240 km/h

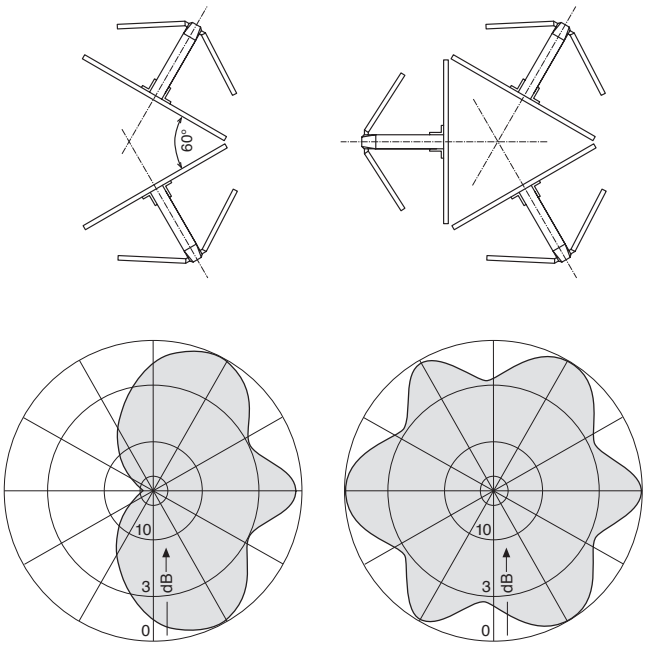
No. of bays	**Panels per bay**	**Gain* (at mid-band)**		**Weight** (without mounting hardware) kg	**Antenna height H** m	**Windload** (v = 160 km/h) kN
		dBd	times			
1	2 3	3.9 1.7	2.5 1.5	150 220	2.5	2.9 4.4
2	2 3	6.9 4.7	4.9 3.0	290 420	5.7	5.9 8.8
4	2 3	9.9 7.7	9.8 5.9	560 850	12.1	11.8 17.5
6	2 3	11.7 9.5	14.8 8.9	850 1290	18.5	17.6 26.3
8	2 3	12.9 10.7	19.5 11.7	1150 1700	24.9	23.5 35.0

* Attenuation of the internal cabling and the gain-decrease in case of null fill in the vertical radiation pattern are not considered. Approximate values for gain decrease:
cable attenuation: 0.2–0.5 dB
null fill: 0.3–1.0 dB
Gain figures are valid for the direction of maximum radiation (see diagrams on following page).

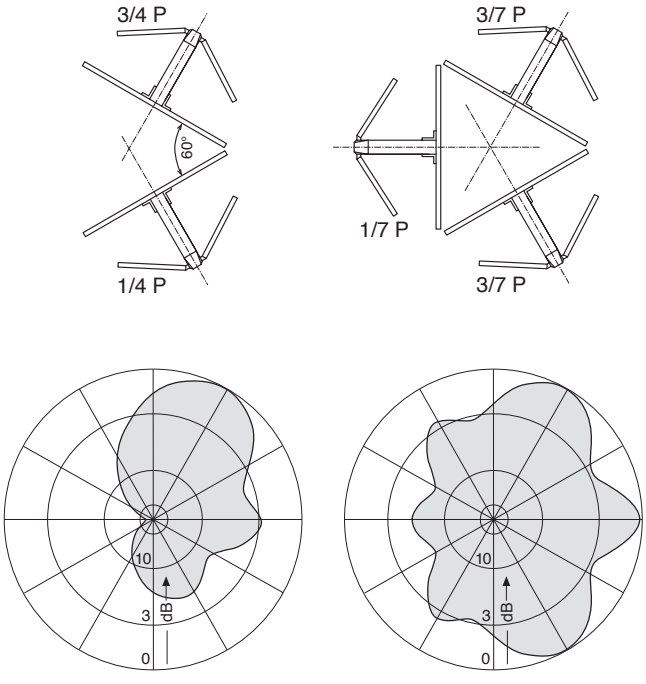
Horizontal Radiation Patterns

Examples of typical horizontal antenna arrays and their **horizontal** radiation patterns for optimal mast dimensions.

Equal power splitting



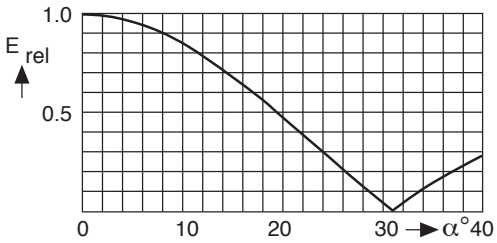
Different power splitting



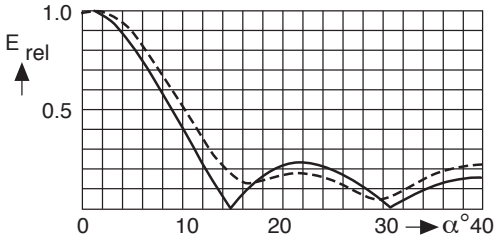
Vertical Radiation Patterns

Examples of typical **vertical** radiation patterns*) for several bays of identical, vertically stacked antenna arrays.

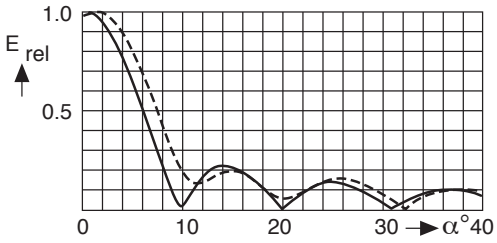
2 bays



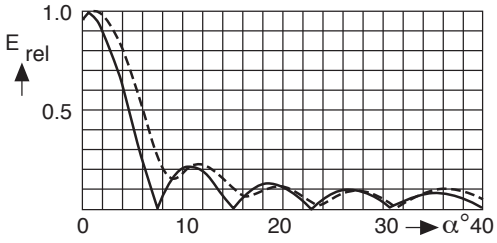
4 bays



6 bays



8 bays



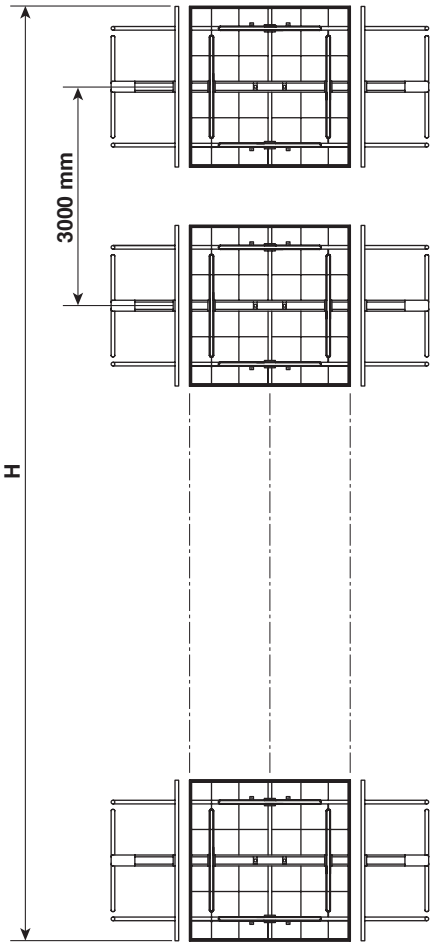
*) ——— without null fill
- - - - - with null fill and beam tilt

FM Transmitting Antenna

87.5–108 MHz

H **V** **X**

- Antenna array of circularly polarized dipole panels (page 25) for different radiation patterns.
- Especially suitable for mounting on square masts.
- The feeder network is made up of coaxial power splitters and flexible connecting cables in accordance with the radiation patterns specification and the transmitter power.



Input	Connectors according to IEC, EIA or DIN.
Max. power	According to customer's requirements.
Frequency	87.5–108 MHz
VSWR, typically	< 1.2 throughout the whole frequency range. Lower VSWR for parts of band upon request.
Impedance	50 Ω
Polarization	Linear, circular or elliptical
Internal connections	Connectors according to IEC, EIA or DIN are used throughout the system, allowing easy assembly and maintenance.
Vertical radiation pattern	Null fill and beam tilt upon request.
Horizontal radiation pattern	Omnidirectional, directional or custom-designed.
Half antenna splitting	Upon request, the antenna can be divided into two halves (for emergency operation and maintenance). The two halves are connected by a 2-way power splitter or patch panel.
Pressurization	Splitters and connecting cables can be supplied with dry air (please specify when ordering).
Grounding	Via mounting parts.
Max. wind velocity	240 km/h

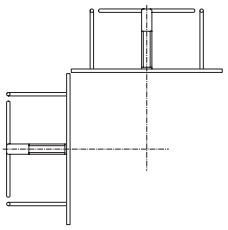
No. of bays	**Panels per bay**	**Gain* (at mid-band)**		**Weight** (without mounting hardware) kg	**Antenna height H** m	**Windload** (v = 160 km/h) kN
		dBd	times			
1	2 3 4	2.0 0.5 –1.0	1.6 1.1 0.8	210 320 420	2.2	2.7 4.3 5.4
2	2 3 4	5.0 3.5 2.0	3.2 2.4 1.6	420 650 850	5.2	5.4 8.5 10.8
4	2 3 4	8.0 6.5 5.0	6.3 4.5 3.2	850 1300 1660	11.2	10.8 17.0 21.5
6	2 3 4	9.8 8.3 6.7	9.6 6.8 4.7	1300 1870 2540	17.2	16.1 25.5 32.3
8	2 3 4	11.0 9.5 8.0	12.6 8.9 6.3	1660 2540 3350	23.2	21.5 34.0 43.0

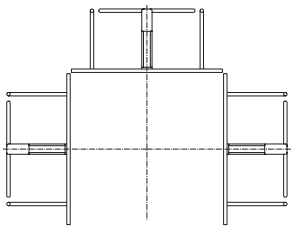
* Attenuation of the internal cabling and the gain-decrease in case of null fill in the vertical radiation pattern are not considered. Gain figures refer to circularly polarized transmission and linear polarized Rx antenna.
Approximate values for gain decrease:
cable attenuation: 0.2–0.5 dB
null fill: 0.3–1.0 dB
Gain figures are valid for the direction of maximum radiation (see diagrams on following page).

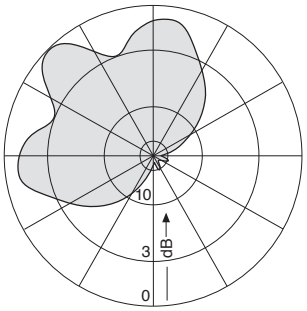
Horizontal Radiation Patterns

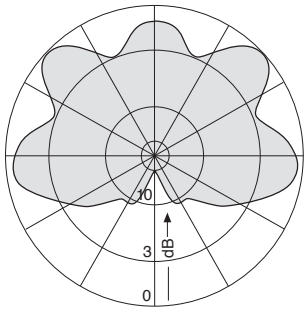
Examples of typical horizontal antenna arrays and their **horizontal** radiation patterns for optimal mast dimensions.

Equal power splitting

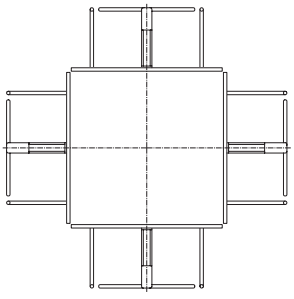




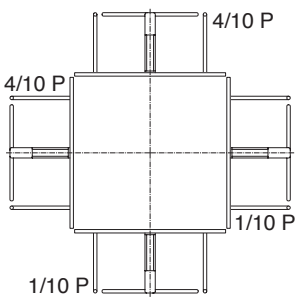


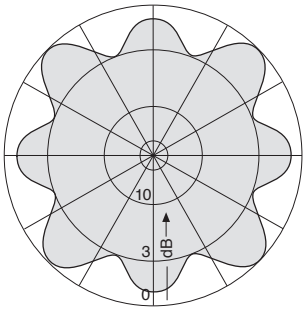


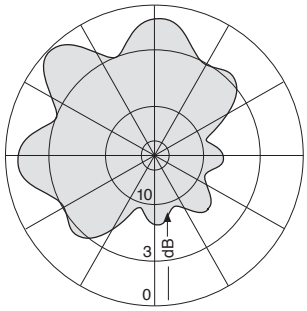
Equal power splitting



Different power splitting



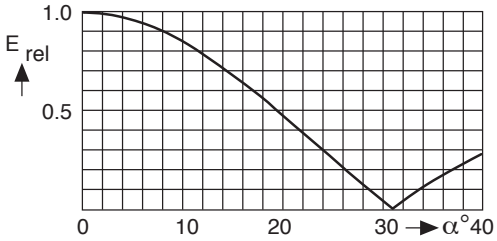




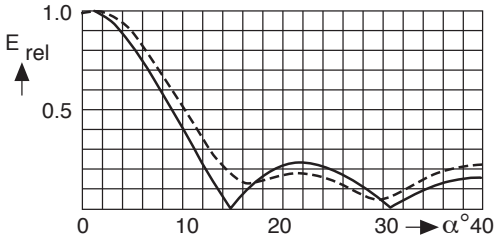
Vertical Radiation Patterns

Examples of typical **vertical** radiation patterns*) for several bays of identical, vertically stacked antenna arrays.

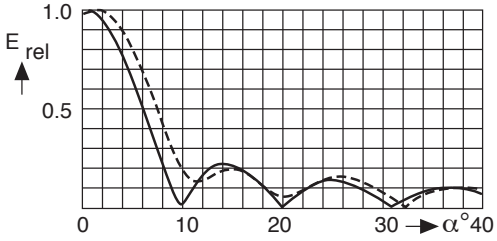
2 bays



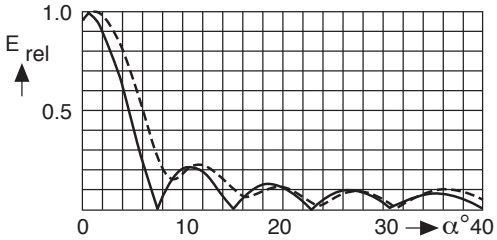
4 bays



6 bays



8 bays



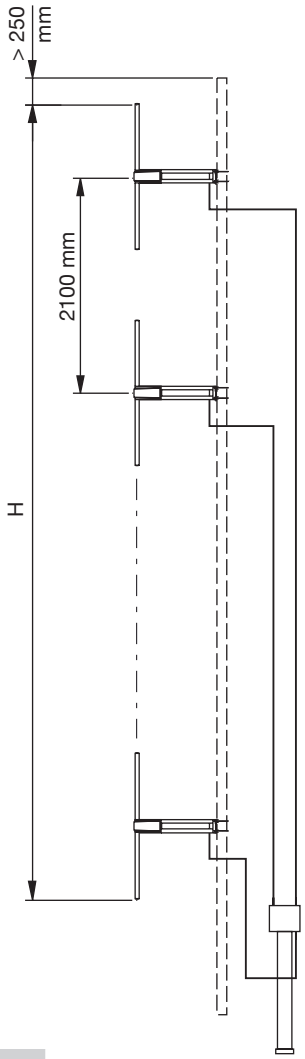
*) ——— without null fill
- - - - - with null fill and beam tilt

FM Transmitting Antenna

87.5–108 MHz

V

- An economic FM-transmitting antenna system can be built by stacking 2 or more vertical dipoles (page 26) in front of a tubular mast (⌀ 60–120 mm).
- Such antenna systems provide signal coverage in all azimuth directions as shown in the horizontal radiation pattern next page.



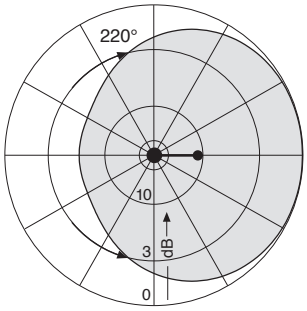
Input	Connectors according to IEC, EIA or DIN.
Max. power	According to customer's requirements.
Frequency	87.5–108 MHz
VSWR, typically	< 1.3 throughout the whole frequency range. Lower VSWR for parts of band upon request.
Impedance	50 Ω
Polarization	Vertical
Internal connections	Connectors according to IEC, EIA or DIN are used throughout the system, allowing easy assembly and maintenance.
Vertical radiation pattern	Null fill and beam tilt upon request.
Horizontal radiation pattern	Omnidirectional, wih preferred direction.
Half antenna splitting	Upon request, the antenna can be divided into two halves (for emergency operation and maintenance). The two halves are connected by a 2-way power splitter or patch panel.
Pressurization	Splitters and connecting cables can be supplied with dry air (please specify when ordering).
Grounding	Via mounting parts.
Max. wind velocity	240 km/h

No. of bays	**Gain* (at mid-band)**		**Weight** (without mounting hardware) kg	**Antenna height H** m	**Windload** (v = 160 km/h)	
	dBd	times			frontal N	lateral N
2	5.0	3.2	40	3.48	230	440
4	8.0	6.3	80	7.68	460	880
6	9.7	9.3	120	11.88	690	1320
8	11.0	12.6	180	16.08	920	1760
10	11.8	15.1	220	20.28	1150	2200
12	12.7	18.6	270	24.48	1380	2640
16	14.0	25.1	350	32.88	1840	3520

* Attenuation of the internal cabling and the gain-decrease in case of null fill in the vertical radiation pattern are not considered. Approximate values for gain decrease:
cable attenuation: 0.2–0.5 dB
null fill: 0.3–1.0 dB
Gain figures are valid for the direction of maximum radiation (see diagrams on following page).

Horizontal Radiation Pattern (at mid-band)

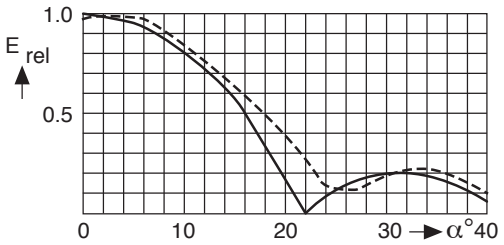
(Radiators mounted onto a slim steel tube, tower effects not considered)



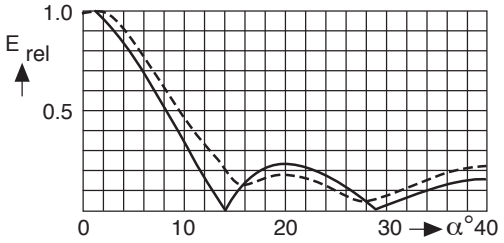
Vertical Radiation Patterns

Examples of typical **vertical** radiation patterns*) for several bays of identical, vertically stacked radiators.

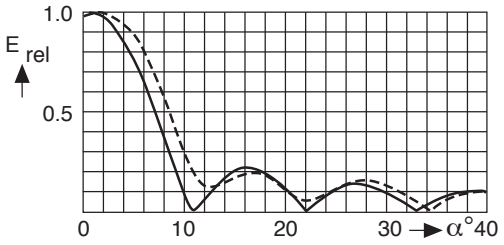
4 bays



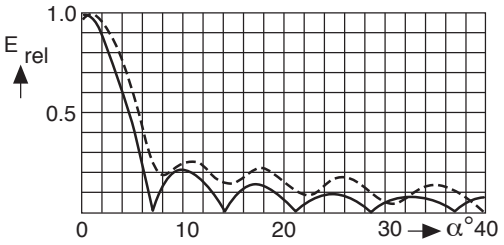
6 bays



8 bays



12 bays



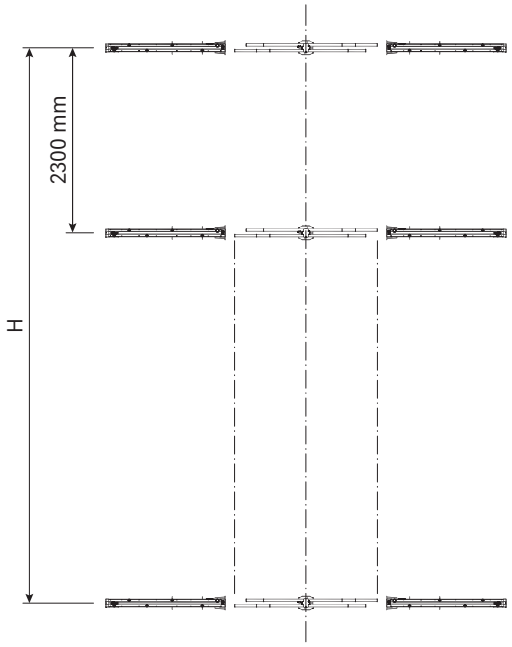
*) ——— without null fill
- - - - - with null fill and beam tilt

FM Transmitting Antenna

87.5–108 MHz

H

- Antenna array of Log.-Per. Antenna (page 29) for different radiation patterns.
- High-power FM Antenna System with very low wind load.
- The feeder network is made up of coaxial power splitters and flexible connecting cables in accordance with the radiation patterns specification and the transmitter power.



Input	Connectors according to IEC, EIA or DIN.
Max. power	According to customer's requirements.
Frequency	87.5–108 MHz
VSWR, typically	< 1.2 throughout the whole frequency range.* Lower VSWR for parts of band upon request.
Impedance	50 Ω
Polarization	Horizontal
Internal connections	Connectors according to IEC, EIA or DIN are used throughout the system, allowing easy assembly and maintenance.
Vertical radiation pattern	Null fill and beam tilt upon request.
Horizontal radiation pattern	Omnidirectional, directional or custom-designed.
Half antenna splitting	Upon request, the antenna can be divided into two halves (for emergency operation and maintenance). The two halves are connected by a 2-way power splitter or patch panel.
Pressurization	Splitters and connecting cables can be supplied with dry air (please specify when ordering).
Grounding	Via mounting parts.
Max. wind velocity	225 km/h

* It is recommended to use decoupling rods, Type 7530000004 or similar, between the bays of the system, to ensure a proper VSWR over the complete band.

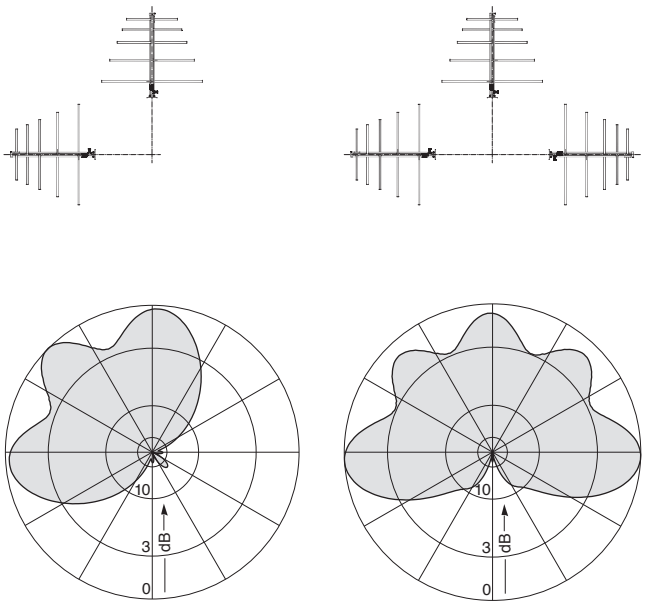
No. of bays	Log.Per. per bay	Gain** (at mid-band)		Weight (without mounting hardware) kg	Antenna height H m	Windload (v = 160 km/h) kN
		dBd	times			
2	2 3 4	7.0 5.4 4.2	5.0 3.5 2.6	160 230 300	2.5	1.3 1.9 2.5
4	2 3 4	10.0 8.5 7.2	10.0 7.1 5.3	300 440 680	7.1	2.5 3.8 5.0
8	2 3 4	13.1 11.5 10.3	20.4 14.1 10.7	680 960 1240	16.3	5.0 7.6 10.0
10	2 3 4	14.0 12.5 11.2	25.1 17.8 13.2	830 1180 1530	20.9	6.3 9.5 12.5
12	2 3 4	14.8 13.3 12.0	30.2 21.4 15.9	970 1390 1810	25.5	7.5 11.4 15.0

** Attenuation of the internal cabling and the gain-decrease in case of null fill in the vertical radiation pattern are not considered. Approximate values for gain decrease:
cable attenuation: 0.2–0.5 dB
null fill: 0.3–1.0 dB
Gain figures are valid for the direction of maximum radiation (see diagrams on following page).

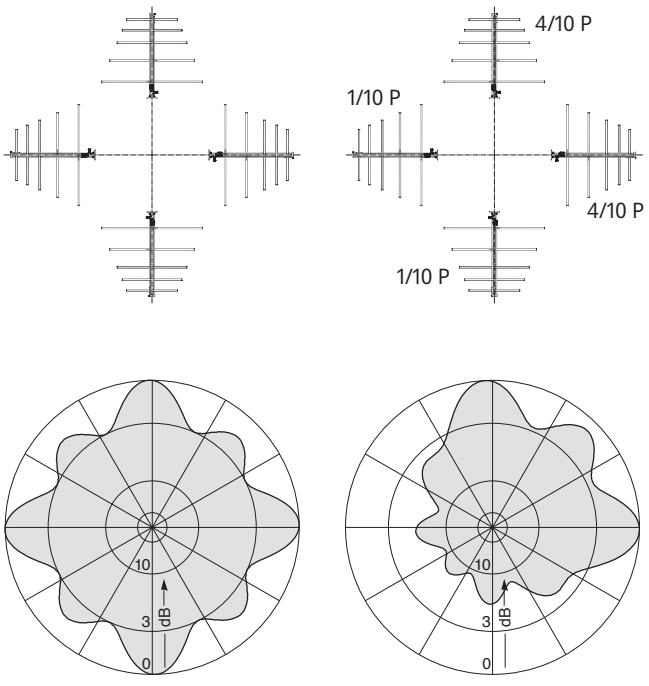
Horizontal Radiation Patterns

Examples of typical horizontal antenna arrays and their **horizontal** radiation patterns for optimal mast dimensions.

Equal power splitting



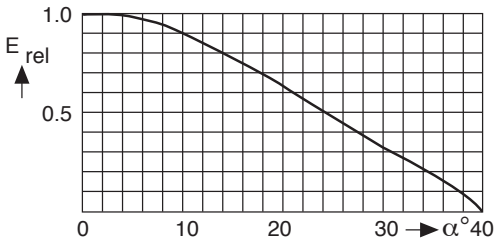
Equal power splitting | **Different power splitting**



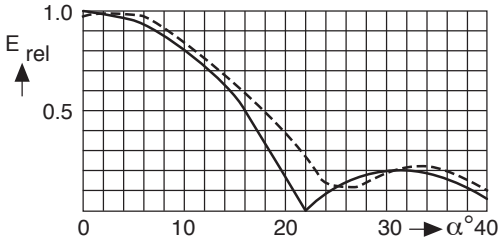
Vertical Radiation Patterns

Examples of typical **vertical** radiation patterns*) for several bays of identical, vertically stacked antenna arrays.

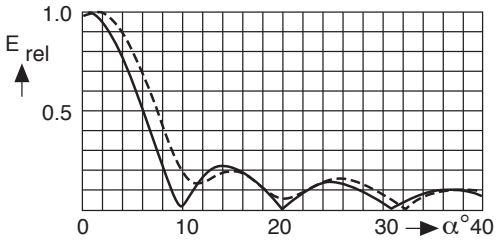
2 bays



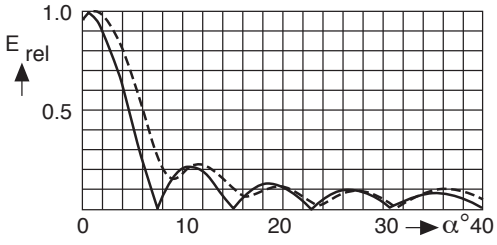
4 bays



8 bays



10 bays



*) ——— without null fill
- - - - - with null fill and beam tilt

Antennas for FM Radio

87.5–108 MHz

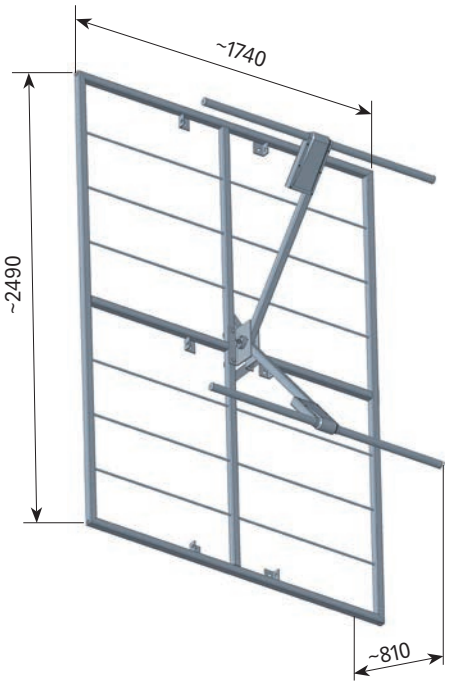
Panel Antenna

87.5–108 MHz

H

- Especially suitable for square masts.
- For horizontal polarization.

Order No.	7500100022 K5231187H	7500100023 K5231188H	7500100024
Input	7-16 female	7/8" EIA flange	13-30 female
Max. power	3 kW	5 kW	7 kW
Frequency range	87.5–108 MHz		
VSWR, typically	< 1.15		
Gain (at mid-band)	7.5 dBd		
Impedance	50 Ω		
Polarization	Horizontal		
Weight	64 kg		
Wind load (at 160 km/h)	Frontal/lateral: 1500 N/875 N		
Max. wind velocity	240 km/h		



Material: Hot-dip galvanized steel.
Radome: Fiberglass.

Mounting: Mounting hardware and mounting dimensions upon request.

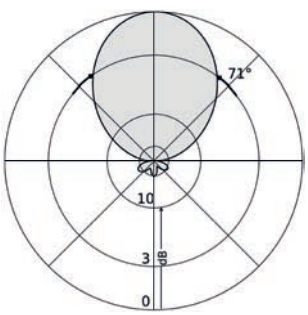
Grounding: Via mounting parts.

Ice protection: Even under severe icy conditions the antenna is still functional due to its heavy-duty construction and the fiberglass covers for the feeding points.

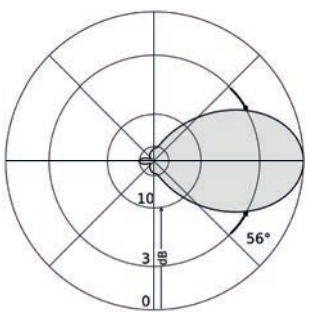
Scope of supply: Antenna without mounting clamps.

Special features: The antenna is shipped dismounted.

Mid-Band Radiation Patterns



Horizontal Radiation Pattern



Vertical Radiation Pattern

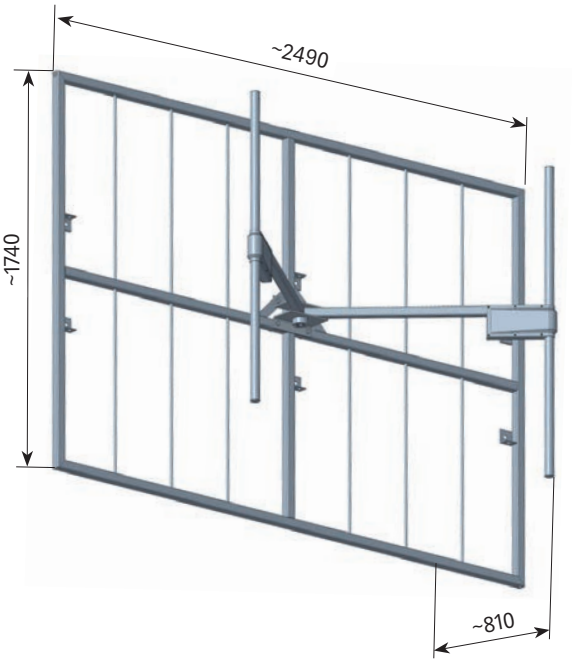
Panel Antenna

87.5–108 MHz

V

- Especially suitable for square masts.
- For vertical polarization.

Order No.	7500100025 K5231187V	7500100026 K5231188V	7500100027
Input	7-16 female	7/8" EIA flange	13-30 female
Max. power	3 kW	5 kW	7 kW
Frequency range	87.5–108 MHz		
VSWR, typically	< 1.15		
Gain (at mid-band)	7.5 dBd		
Impedance	50 Ω		
Polarization	Vertical		
Weight	64 kg		
Wind load (at 160 km/h)	Frontal/lateral: 1500 N/825 N		
Max. wind velocity	240 km/h		



Material: Hot-dip galvanized steel.
Radome: Fiberglass.

Mounting: Mounting hardware and mounting dimensions upon request.

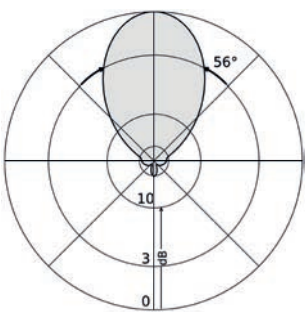
Grounding: Via mounting parts.

Ice protection: Even under severe icy conditions the antenna is still functional due to its heavy-duty construction and the fiberglass covers for the feeding points.

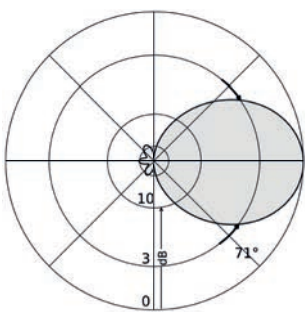
Scope of supply: Antenna without mounting clamps.

Special features: The antenna is shipped dismounted.

Mid-Band Radiation Patterns



Horizontal Radiation Pattern



Vertical Radiation Pattern

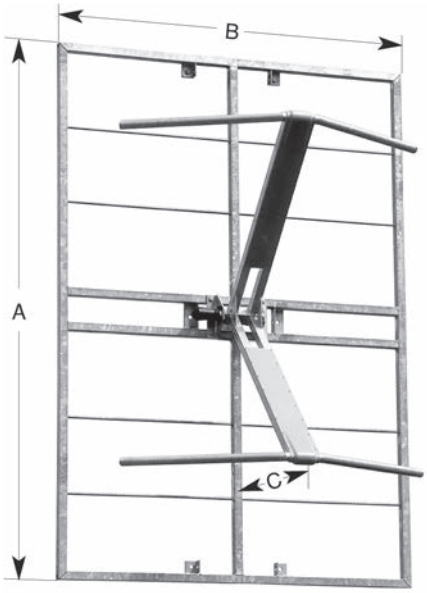
Panel Antenna

87.5–108 MHz

H

Especially suitable for triangular and round masts.

Order No.	601694 K523417	75010008	752183
Input	7-16 female	7⁄8" EIA flange	13-30 female
Max. power	3 kW	5 kW	7 kW
Frequency range	87.5–108 MHz		
VSWR	< 1.2		
Gain (at mid-band)	7 dBd		
Impedance	50 Ω		
Polarization	Horizontal		
Weight	66 kg		
Wind load (at 160 km/h)	Frontal: 1700 N, Lateral: 875 N		
Max. wind velocity	240 km/h		



A: ~ 2490 mm
B: ~ 1740 mm
C: ~ 850 mm

Material: Hot-dip galvanized steel.
Radome: Fiberglass.

Mounting: Mounting hardware and mounting dimensions upon request.

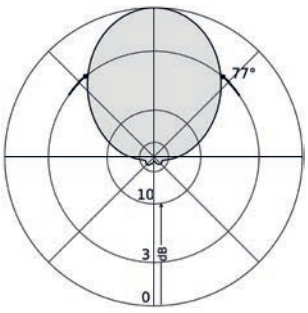
Grounding: Via mounting parts.

Ice protection: Even under severe icy conditions the antenna is still functional due to its heavy-duty construction and the fiberglass covers for the feeding points.

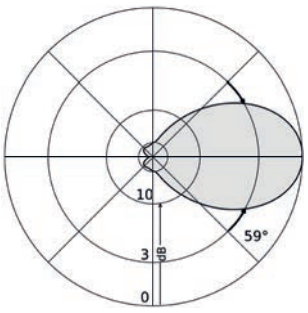
Scope of supply: Antenna without mounting clamps.

Special features: The antenna is shipped dismounted.

Mid-Band Radiation Patterns



Horizontal Radiation Pattern



Vertical Radiation Pattern

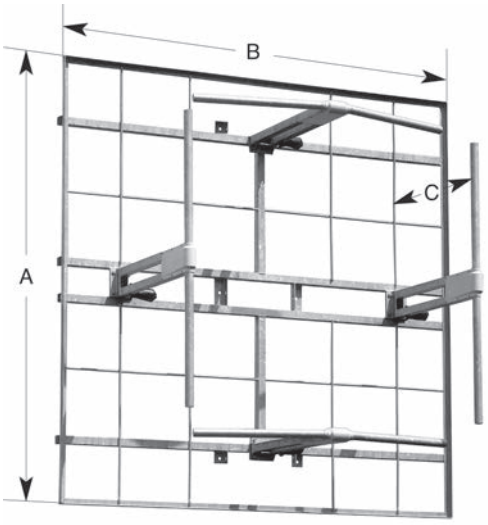
Panel Antenna

87.5–108 MHz

H **V** **X**

- Optionally for circular, horizontal, vertical or slant polarization.
- Especially suitable for square masts.

Order No.	601768 K5332187	601979 K5332188
Input	4 × 7-16 female	4 × 7/8" EIA flange
Max. power	3 kW per input	4 kW per input
Frequency range	87.5–108 MHz	
VSWR	< 1.25 (linear polarization) < 1.1 (circular polarization)	
Gain (at mid-band)	7.5 dBd (linear polarization) 4.5 dBd (circular polarization)	
Impedance	50 Ω	
Polarization	Horizontal, vertical, circular, elliptical, slant	
Weight	89 kg	
Wind load (at 160 km/h)	Frontal: 1600 N Lateral: 1130 N	
Max. wind velocity	240 km/h	



A = B: ~ 2200 mm
C: ~ 830 mm

4 dipoles are arranged symmetrically in front of a reflector screen. With suitable feeding the antenna radiates circularly polarized. An isolation of 40–50 dB between horizontal and vertical pairs of dipoles is achieved through the special design. This design allows the transmission of 2 programs – horizontally and vertically polarized – independently from each other.

Material: Hot-dip galvanized steel.
Weather protection: fiberglass cover.

Mounting: The antenna must be mounted so that the bent radiators are horizontally polarized. Mounting dimensions and mounting hardware on request.

Grounding: Via mounting parts.

Ice protection: Even under severe icy conditions the antenna is still functional due to its heavy-duty construction and the fiberglass covers for the feeding points.

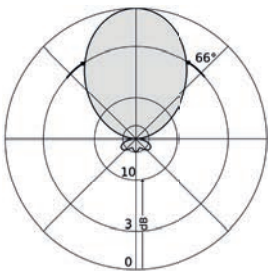
Scope of supply: Antenna without mounting clamps.

Special features: The antenna is shipped dismounted.

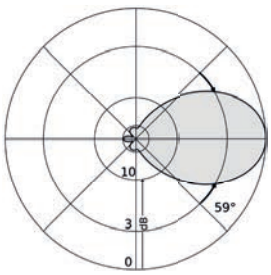
Polarization: Suitable feeding of the horizontal and vertical dipole pairs optionally result in left or right hand circular or elliptical or slant polarization or simultaneous horizontal and vertical polarization.

Mid-Band Radiation Patterns

Horizontal Polarization (bent dipoles)

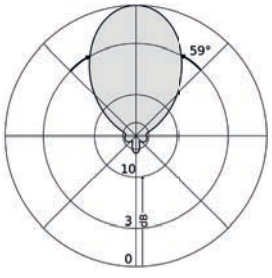


in E-plane
Horizontal Radiation Pattern

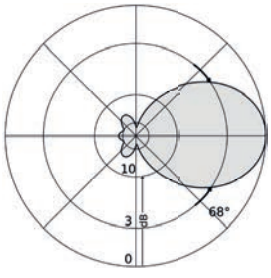


in H-plane
Vertical Radiation Pattern

Vertical Polarization (straight dipoles)



in H-plane
Horizontal Radiation Pattern



in E-plane
Vertical Radiation Pattern

Dipole Antenna

87.5–108 MHz

V

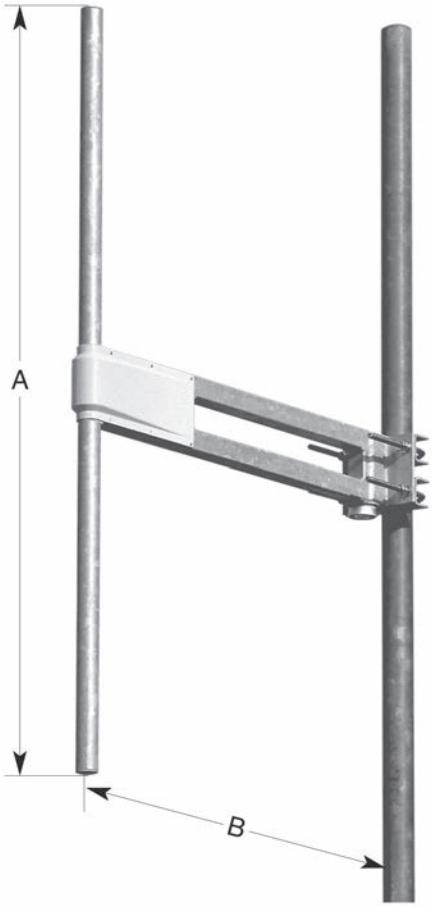
- Quasi-omnidirectional radiation pattern.
- For tubular masts.

Order No.	762943	763715	775130
Input	7-16 female	7/8" EIA flange	1 5/8" EIA flange
Max. power	3 kW	5 kW	10 kW
Frequency range	87.5–108 MHz		
VSWR*	< 1.3		< 1.25
Gain (at mid-band)	2 dBd		
Impedance	50 Ω		
Polarization	Vertical		
Weight	13 kg		22 kg
Wind load (at 160 km/h) Frontal/Lateral	115 N/220 N		165 N/340 N
Max. wind velocity	240 km/h		300 km/h

Material: Hot-dip galvanized steel.

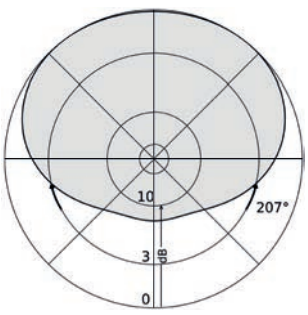
Mounting: To pipes of 60–125 mm by means of 2 mounting clamps, supplied.

Grounding: Via mounting parts.

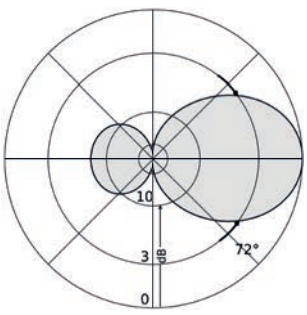


A: ~ 1380 mm
B: ~ 830 mm

Mid-Band Radiation Patterns*



Horizontal Radiation Pattern



Vertical Radiation Pattern

* Radiator mounted onto a slim steel tube, tower effects not considered

Yagi Antenna

87.5–108 MHz

V

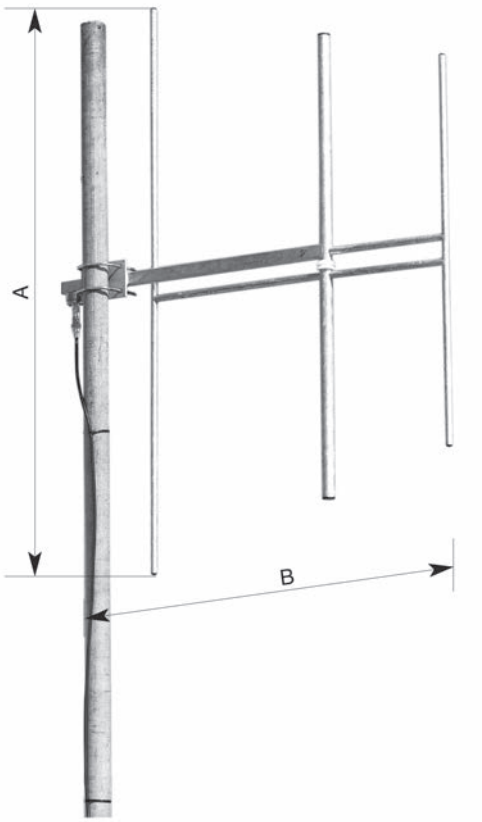
3 element broadband Yagi antenna.

Order No.	770777	770776
Input	7-16 female	7/8" EIA flange
Max. power	3 kW	5 kW
Frequency range	87.5–108 MHz	
VSWR	< 1.3	
Gain (at mid-band)	4 dBd	
Impedance	50 Ω	
Polarization	Vertical	
Weight	13 kg	
Wind load (at 160 km/h) Frontal/Lateral	165 N/275 N	
Max. wind velocity	225 km/h	

Material: Hot-dip galvanized steel.

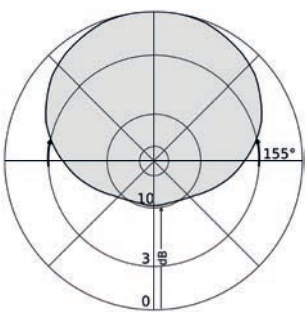
Mounting: To pipes of 60–125 mm ⌀ by means of 2 U-bolts, supplied.

Grounding: Via mounting parts.

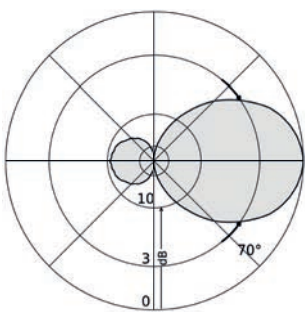


A: ~ 1822 mm
B: ~ 1300 mm

Mid-Band Radiation Patterns



Horizontal Radiation Pattern



Vertical Radiation Pattern

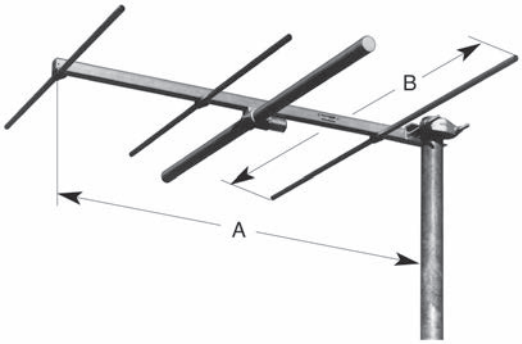
Yagi Antenna

87.5–108 MHz

H **V**

- 4 element broadband Yagi antenna.
- Component for low power transmitting antennas.

Order No.	**600263** | K524017
Input	7-16 female
Max. power	500 W
Frequency range	87.5–108 MHz
VSWR	< 1.3
Gain (at mid-band)	5.5 dBd
Impedance	50 Ω
Polarization	Horizontal or vertical
Weight	13.5 kg
Wind load (at 160 km/h) **Horizontally polarized** **Vertically polarized**	 Frontal/lateral: 215 N/160 N Frontal/lateral: 215 N/340 N
Max. wind velocity	225 km/h



A: ~ 1400 mm
B: ~ 1700 mm

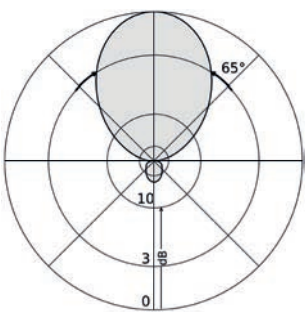
Material: Supporting pipe: Hot-dip galvanized steel. Director pipe and reflector: Weather-proof aluminum. Radiator in fiberglass radome.

Mounting: To pipes of 60–115 mm diameter by means of mounting clamps, supplied.

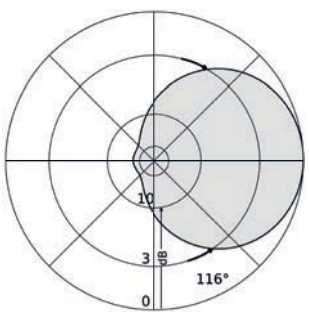
Grounding: Via mounting parts.

Special features: The antenna is shipped dismounted.

Mid-Band Radiation Patterns



in E-plane



in H-plane

Log.-Per. Antenna

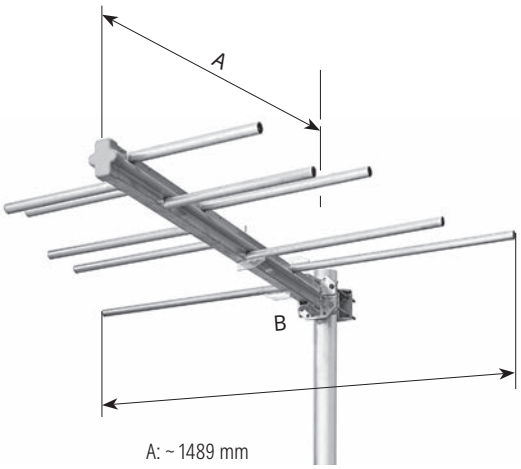
87.5–108 MHz

H **V**

- Logarithmic-periodic broadband directional antenna.
- Suitable for sites with icing.

Order No.	75010285	75010286	75010287
Input	7-16 female	7/8" EIA flange	1 5/8" EIA flange
Max. power	3 kW	5 kW	7 kW
Frequency range	87.5–108 MHz		
VSWR	< 1.2		
Gain (at mid-band)	5 dBd		
Impedance	50 Ω		
Polarization	Horizontal or vertical		
Weight	29 kg		
Wind load (at 160 km/h) Horizontally polarized Vertically polarized	 Frontal/lateral: 300 N/325 N Frontal/lateral: 300 N/475 N		
Max. wind velocity	225 km/h		

Horizontal Polarization



A: ~ 1489 mm
B: ~ 1778 mm

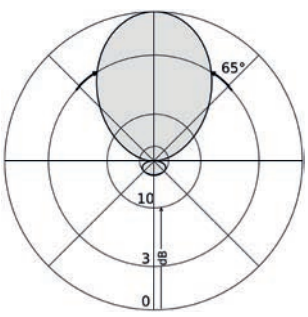
Material: Hot-dip galvanized steel.

Mounting: To pipes of 60–120 mm diameter by means of mounting clamps, supplied.

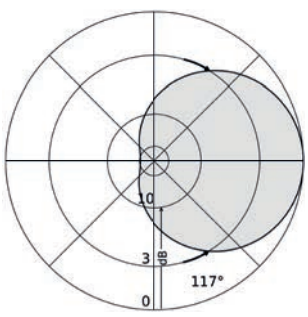
Grounding: Via mounting parts.

Vertical Polarization

Mid-Band Radiation Patterns



in E-plane



in H-plane

Antenna Systems for VHF TV and DAB

174–240 MHz

Broadcast Station “Eberswalde”, Germany

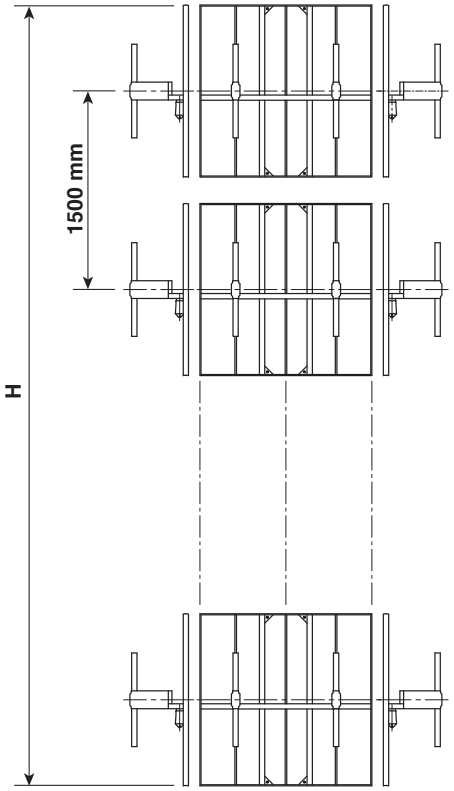
Top-mount DAB Antenna System with
anti-oscillation GRP-Support

VHF Transmitting Antenna

174–240 MHz

H **V**

- Antenna array of dipole panels (page 38, 39) for different radiation patterns.
- Especially suitable for mounting on square masts.
- The feeder network is made up of coaxial power splitters and flexible connecting cables in accordance with the radiation patterns specification and the transmitter power.



Input	Connectors according to IEC, EIA or DIN.
Max. power	According to customer's requirements.
Frequency	174–240 MHz
VSWR, typically	< 1.15 in the whole range.
Impedance	50 Ω
Polarization	Horizontal, vertical
Internal connections	Connectors according to IEC, EIA or DIN are used throughout the system, allowing easy assembly and maintenance.
Vertical radiation pattern	Null fill and beam tilt upon request.
Horizontal radiation pattern	Omnidirectional, directional or custom-designed.
Half antenna splitting	Upon request, the antenna can be divided into two halves (for emergency operation and maintenance). The two halves are connected by a 2-way power splitter or patch panel.
Pressurization	Splitters and connecting cables can be supplied with dry air (please specify when ordering).
Grounding	Via mounting parts.
Max. wind velocity	240 km/h

No. of bays	**Panels per bay**	**Gain* (at mid-band)**		**Weight** (without mounting hardware) kg	**Antenna height H** m	**Windload** (v = 160 km/h) kN
		dBd	times			
1	2 3 4	4.5 2.7 1.9	2.8 1.9 1.5	80 120 160	1.3	1.2 1.9 2.4
2	2 3 4	7.5 5.7 4.9	5.6 3.7 3.1	160 240 320	2.8	2.4 3.8 4.8
4	2 3 4	10.5 8.7 7.9	11.2 7.4 6.2	320 490 650	5.8	4.8 7.5 9.5

* Attenuation of the internal cabling and the gain-decrease in case of null fill in the vertical radiation pattern are not considered. Approximate values for gain decrease:
cable attenuation: 0.2–0.4 dB
null fill: 0.2–0.5 dB
Gain figures are valid for the direction of maximum radiation (see diagrams on following page).

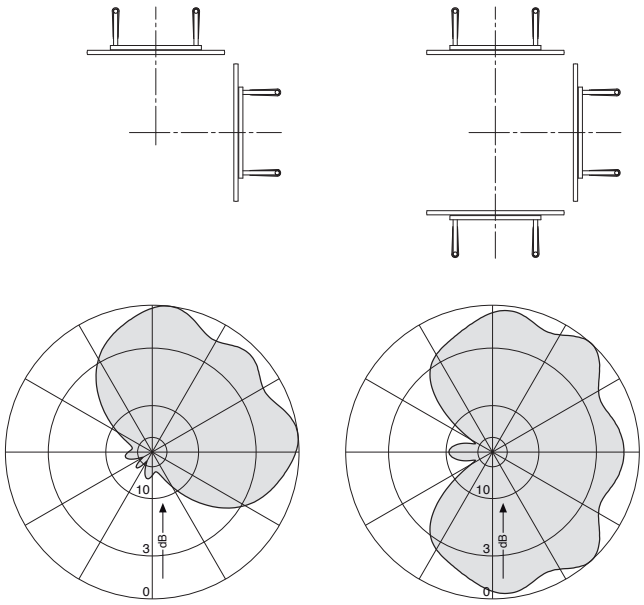
Horizontal Radiation Patterns

Examples of typical horizontal antenna arrays and their **horizontal** radiation patterns for optimal mast dimensions.

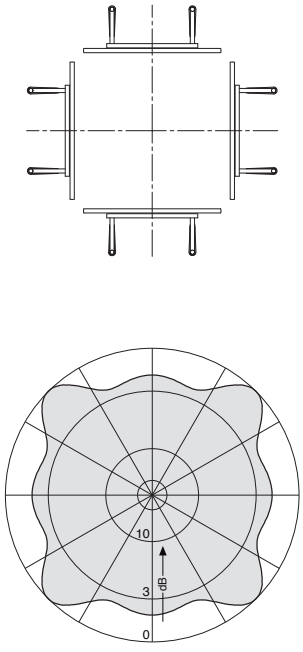
Vertical Radiation Patterns

Examples of typical **vertical** radiation patterns*) for several bays of identical, vertically stacked antenna arrays.

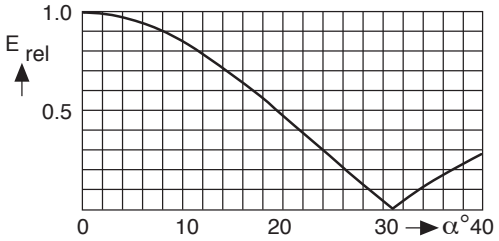
Equal power splitting



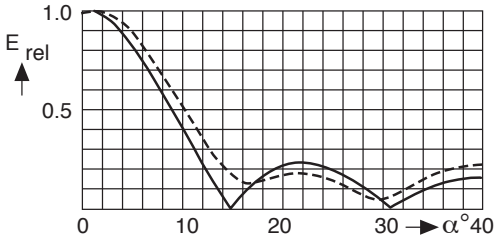
Equal power splitting



2 bays



4 bays



*) ——— without null fill
- - - - - with null fill and beam tilt

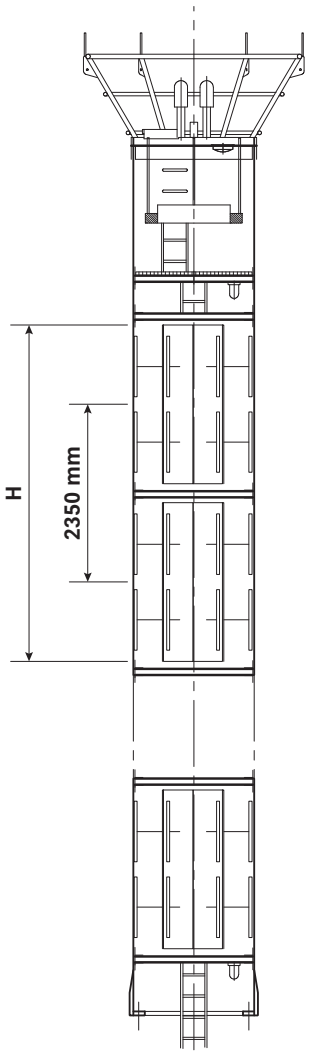
VHF Transmitting Antenna

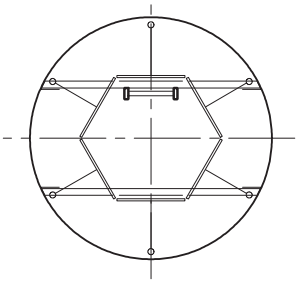
174–230 MHz

V

Antenna system consisting of special dipole panels mounted in a hexagonal configuration, in GRP cylinder with 1.6 m diameter.

Input	Connectors according to IEC, EIA or DIN.
Max. power	According to customer's requirements.
Frequency	174–230 MHz
VSWR, typically	< 1.2 in the whole range.
Impedance	50 Ω
Polarization	Vertical
Vertical radiation pattern	Null fill and beam tilt upon request.
Horizontal radiation pattern	Omnidirectional
Half antenna splitting	Upon request, the antenna can be divided into two halves (for emergency operation and maintenance). The two halves are connected by a 2-way power splitter or patch panel.
Internal connections	The radiating elements are fed with coaxial connecting cables and power splitters. Connectors according to IEC, EIA or DIN are used throughout the system, allowing easy assembly and maintenance.
Mounting	On top of existing structure by means of a flange.
Ice protection	Cylinder radome provides full protection.
Grounding	Via mounting parts resp. via grounding ropes at the exterior cylinder-surface.
Max. wind velocity	As required.



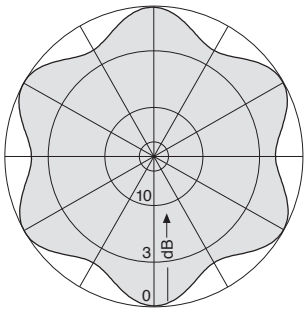


No. of bays	**Gain* (at mid-band)**		**Weight** (with cylinder 1.6 m ∅) kg	**Antenna height H** m	**Windload**** (v = 160 km/h) with cylinder 1.6 m ∅ kN
	dBd	times			
1	3.8	2.4	depending on fiber-glass cylinder	2.3	3.1
2	6.7	4.7		4.7	6.3
3	8.5	7.1		7.0	9.3
4	9.6	9.3		9.4	12.5

* Attenuation of the internal cabling and the gain-decrease in case of null fill in the vertical radiation pattern are not considered.
Approximate values for gain decrease:
cable attenuation: 0.2–0.4 dB
null fill: 0.3–1.0 dB
Gain figures are valid for the direction of maximum radiation (see diagrams on following page).

** Only according to antenna aperture H without base flange and top.

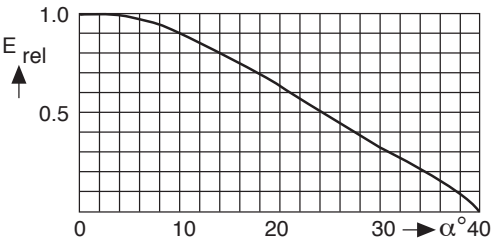
Typical Horizontal Radiation Pattern (at mid-band)



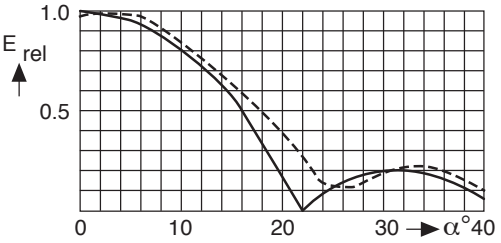
Vertical Radiation Patterns

Examples of typical **vertical** radiation patterns*) for several bays of identical, vertically stacked antenna arrays.

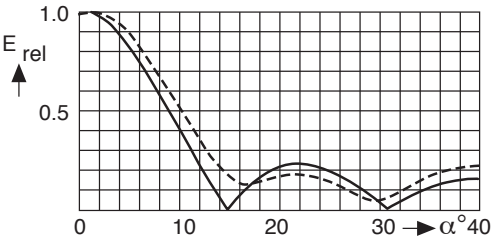
1 bay



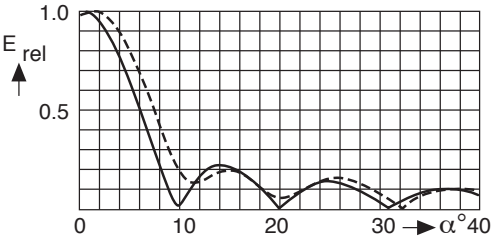
2 bays



3 bays



4 bays



*) ——— without null fill
- - - - - with null fill and beam tilt

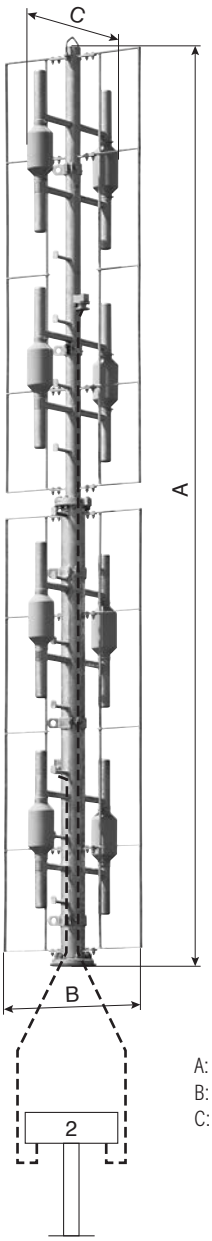
Omnidirectional Antenna

174–240 MHz

V

- Especially suitable for mounting at the top of masts.
- Consists of types 16911184 (lower half) and 75010365/368 (upper half), power splitter and cabling.

Splitter input	1⅝" EIA flange	3⅛" EIA flange
Max. power	8 kW	16 kW
Frequency range	174–240 MHz	
VSWR	< 1.2	
Gain (at mid-band)	7.5 dBd	
Impedance	50 Ω	
Polarization	Vertical	
Weight	230 kg	
Wind load	2300 N (at 160 km/h)	
Bending moment	5900 Nm (at 160 km/h)	
Max. wind velocity	225 km/h	



A: 5265 mm
B: 900 mm
C: 870 mm

Material of radiators: Hot-dip galvanized steel.
Weather protection: Fiberglass.

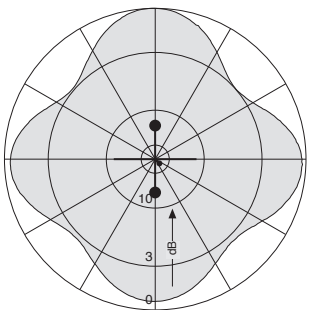
Mounting: Radiators: On top of a mast with suitable flange.
Splitter: Directly below the radiators.

Grounding: Via mounting parts.

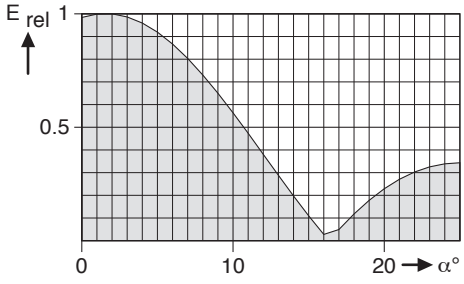
Ice protection: Even under icy conditions the antenna is still functional due to the fiberglass covers for the feeding points.

Note: Systems with other downtilt and cable configuration are available on request.
The system may also be operated with two mainfeeders, in half antenna configuration.

Mid-Band Radiation Patterns



Horizontal Radiation Pattern



Typical Vertical Radiation Pattern, Electrical Downtilt: 1.5°

Antennas for VHF TV and DAB

174–240 MHz

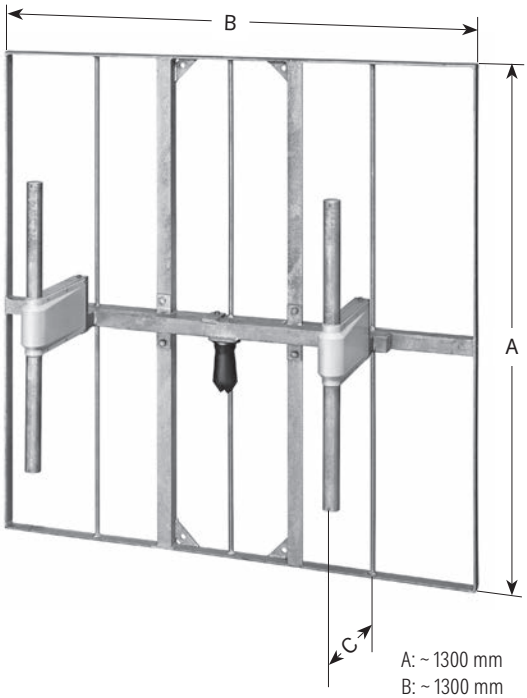
Panel Antenna

174–240 MHz

V

Especially suitable for square and round masts.

Order No.	75010350	75010351	75010352
Input	7-16 female	7/8" EIA flange	13-30 female
Max. power	2 kW	3 kW	4 kW
Frequency range	174–240 MHz		
VSWR	174–230 MHz: < 1.15 230–240 MHz: < 1.20		
Gain (at mid-band)	8 dBd		
Impedance	50 Ω		
Polarization	Vertical		
Weight	35 kg		
Wind load (at 160 km/h)	Frontal/lateral: 500 N/690 N		
Max. wind velocity	240 km/h		



A: ~ 1300 mm
B: ~ 1300 mm
C: ~ 400 mm

Material: Hot-dip galvanized steel.
Weather protection: Fiberglass.

Mounting: Mounting hardware and mounting dimensions upon request.

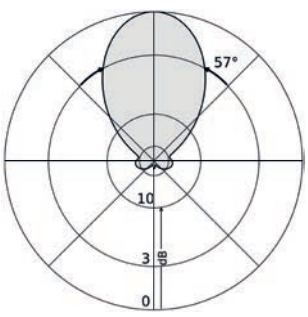
Grounding: Via mounting parts.

Ice protection: Even under severe icy conditions the antenna is still functional due to its heavy-duty construction and the fiberglass covers for the feeding points.

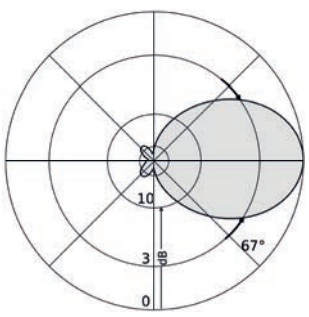
Scope of supply: Antenna without mounting clamps.

Special features: The antenna is shipped dismounted.

Mid-Band Radiation Patterns



Horizontal Radiation Pattern



Vertical Radiation Pattern

Panel Antenna

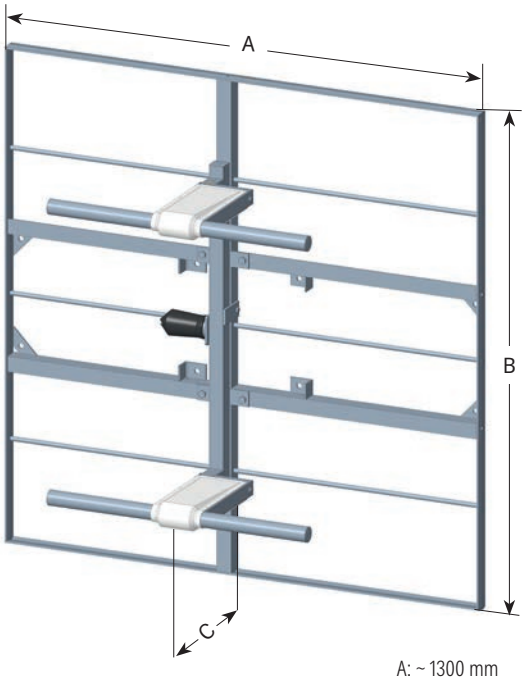
NEW

174–240 MHz

H

Especially suitable for square and round masts.

Order No.	7500100040
Input	7-16 female
Max. power	2 kW
Frequency range	174–240 MHz
VSWR	174–230 MHz: < 1.15 230–240 MHz: < 1.20
Gain (at mid-band)	8 dBd
Impedance	50 Ω
Polarization	Horizontal
Weight	35 kg
Wind load (at 160 km/h)	Frontal/lateral: 500 N/570 N
Max. wind velocity	240 km/h



A: ~ 1300 mm
B: ~ 1300 mm
C: ~ 443 mm

Material: Hot-dip galvanized steel.
Weather protection: Fiberglass.

Mounting: Mounting hardware and mounting dimensions upon request.

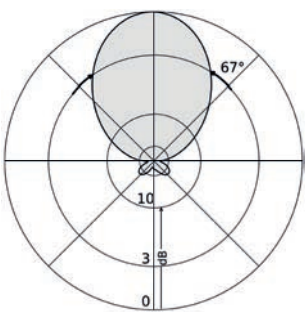
Grounding: Via mounting parts.

Ice protection: Even under severe icy conditions the antenna is still functional due to its heavy-duty construction and the fiberglass covers for the feeding points.

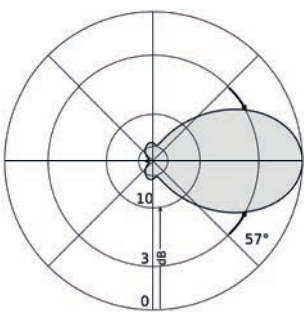
Scope of supply: Antenna without mounting clamps.

Special features: The antenna is shipped dismounted.

Mid-Band Radiation Patterns



Horizontal Radiation Pattern



Vertical Radiation Pattern

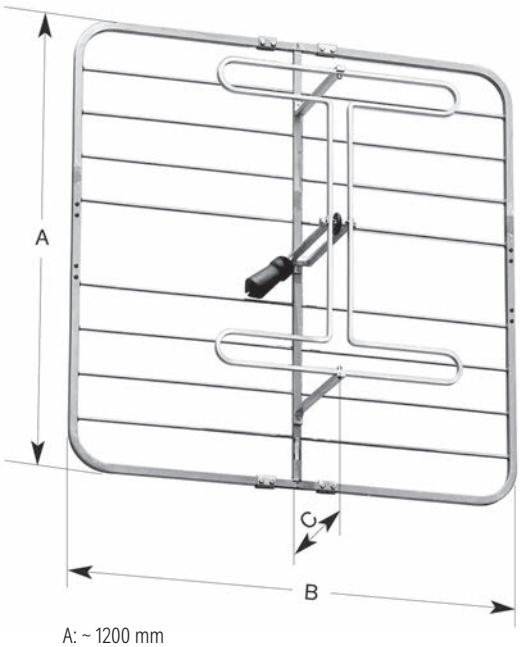
Panel Antenna

174–230 MHz

H | **V**

Light weight panel of weather-resistant aluminum.

Order No.	**600256** | K523157
Input	7-16 female
Max. power	1 kW
Frequency range	174–230 MHz
VSWR	< 1.15
Gain (at mid-band)	7.5 dBd
Impedance	50 Ω
Polarization	Horizontal or vertical by conversion of two clamps
Weight	7 kg
Wind load (at 160 km/h) **Horizontal:** **Vertical:**	 Frontal/lateral: 440 N/250 N Frontal/lateral: 440 N/350 N
Max. wind velocity **Horizontal:** **Vertical:**	 225 km/h 200 km/h



A: ~ 1200 mm
B: ~ 1200 mm
C: ~ 360 mm

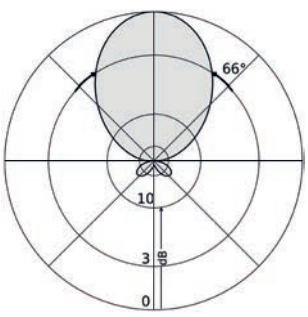
Material: Weather-resistant aluminum.

Mounting: To pipes of 60–115 mm ⌀ by means of mounting clamps, supplied.

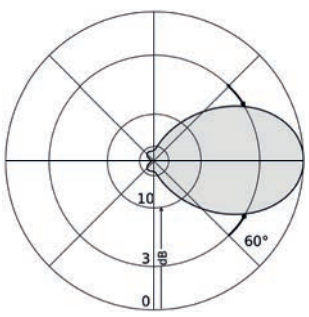
Grounding: Via mounting parts.

Special features: The antenna will be shipped dismounted.

Mid-Band Radiation Patterns



in E-plane



in H-plane

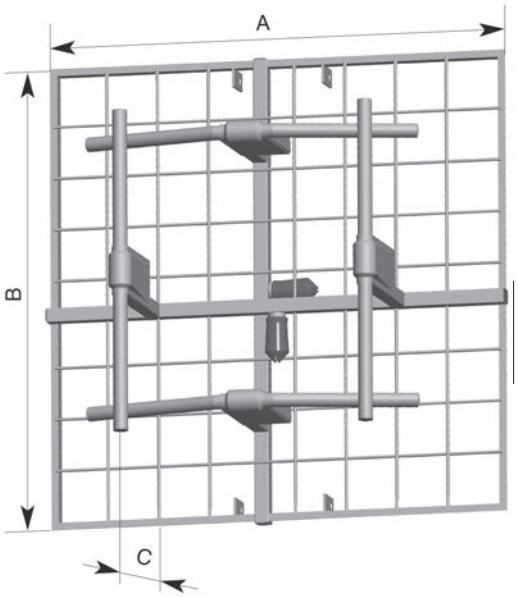
Panel Antenna

174–240 MHz

H **V** **X**

- Dual-polarized antenna (horizontal/vertical).
- Optionally circular or slant polarization.
- For TV and DAB in one system.

Order No.	75010085
Input	2 × 7-16 female
Max. power	2 kW per input
Frequency range for vertical polarization	174–223 MHz 174–240 MHz
VSWR	< 1.2 (linear polarization) < 1.1 (circular polarization)
Gain (at mid-band)	7.5 dBd
Impedance	50 Ω
Polarization	Linear: horizontal, vertical, slant circular
Weight	35 kg
Wind load (at 160 km/h)	Frontal/lateral: 850 N/720 N
Max. wind velocity	225 km/h



A: ~ 1300 mm
B: ~ 1300 mm
C: ~ 465 mm

Material: Hot-dip galvanized steel.
Radome: Fiberglass.

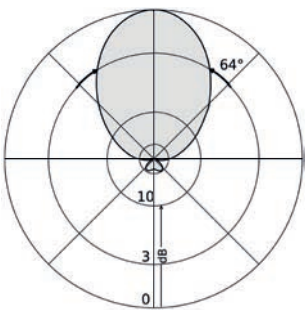
Mounting: Using M16 screws (supplied) to suitable attachment construction.
Mounting dimensions upon request.

Grounding: Via mounting parts.

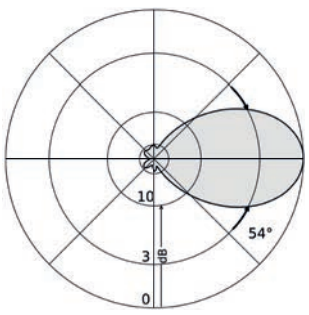
Ice protection: Even under severe icy conditions the antenna is still functional due to its heavy-duty construction and the fiberglass covers for the feeding points.

Scope of supply: Antenna supplied without clamps.

Radiation Patterns for horizontal polarization
(at mid-band)

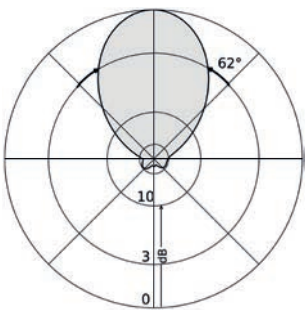


Horizontal Radiation Pattern
E-plane

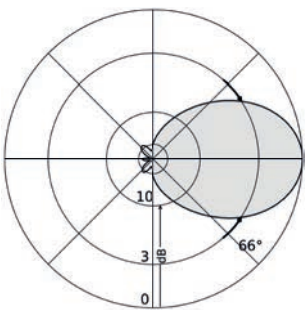


Vertical Radiation Pattern
H-plane

Radiation Patterns for vertical polarization
(at mid-band)



Horizontal Radiation Pattern
H-plane



Vertical Radiation Pattern
E-plane

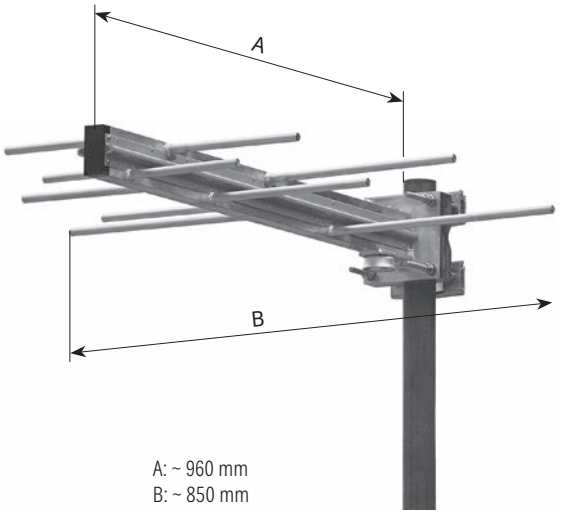
Log.-Per. Antenna

174–240 MHz

H **V**

Logarithmic-periodic broadband directional antenna.

Order No.	75010242
Input	7-16 female
Max. power	2 kW
Frequency range	174–240 MHz
VSWR	174–230 MHz: ≤ 1.25 230–240 MHz: ≤ 1.3
Gain (at mid-band)	5 dBd
Impedance	50 Ω
Polarization	Horizontal or vertical
Weight	10 kg
Wind load (at 160 km/h)	Frontal/lateral: 100 N/190 N
Max. wind velocity	225 km/h

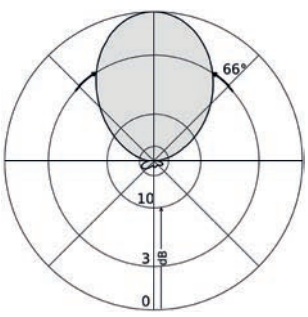


Material: Hot-dip galvanized steel.

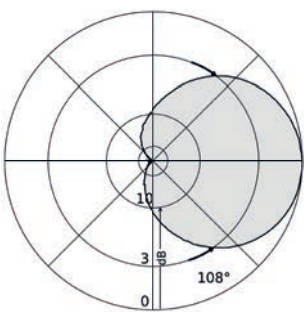
Mounting: To pipes of 40–95 mm diameter by means of mounting clamps, supplied.

Grounding: Via mounting parts.

Mid-Band Radiation Patterns



E-plane



H-plane

Dipole Antenna

174–240 MHz

V

- Hot-dip galvanized steel.
- For side-mounting to masts.

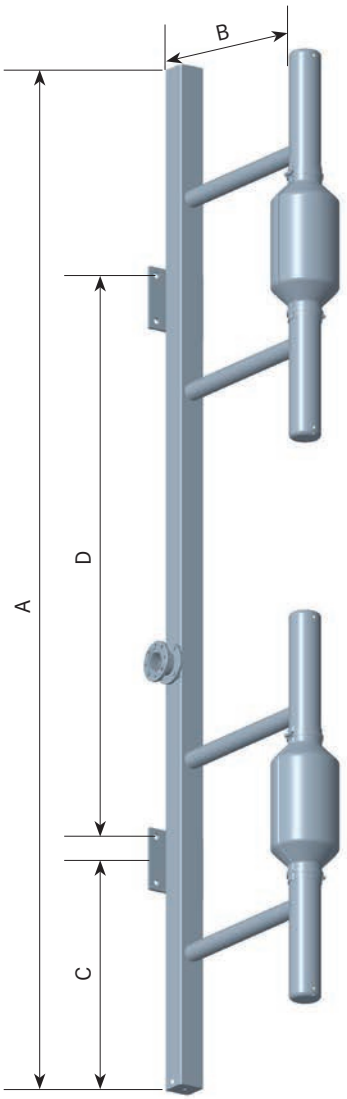
Order No.	75010295	75010296	75010297
Input	7-16 female	7⁄8" EIA flange	1 5⁄8" EIA flange
Max. power	2 kW	3 kW	5 kW
Frequency range	174–240 MHz		
VSWR	< 1.2		
Gain (at mid-band)	5.0 dBd		
Impedance	50 Ω		
Polarization	Vertical		
Weight	24 kg		
Wind load (at 160 km/h)	Frontal/lateral: 480 N/540 N		
Max. wind velocity	240 km/h		

Material: Hot-dip galvanized steel.
Weather protection: Fiberglass.

Mounting: Laterally using 8 screws M12 × 60 to suitable flange.

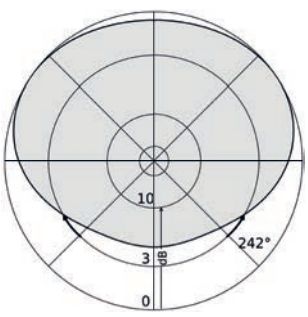
Grounding: Via mounting parts.

Ice protection: Even under icy conditions the antenna is still functional due to the fiberglass covers for the feeding points.

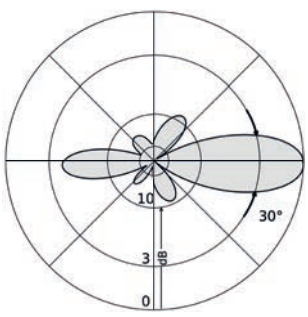


A: ~ 2326 mm
B: ~ 460 mm
C: ~ 520 mm
D: ~ 1280 mm

Mid-Band Radiation Patterns*



Horizontal Radiation Pattern



Vertical Radiation Pattern
1.5° electrical downtilt

* Radiator mounted onto a slim steel tube, tower effects not considered

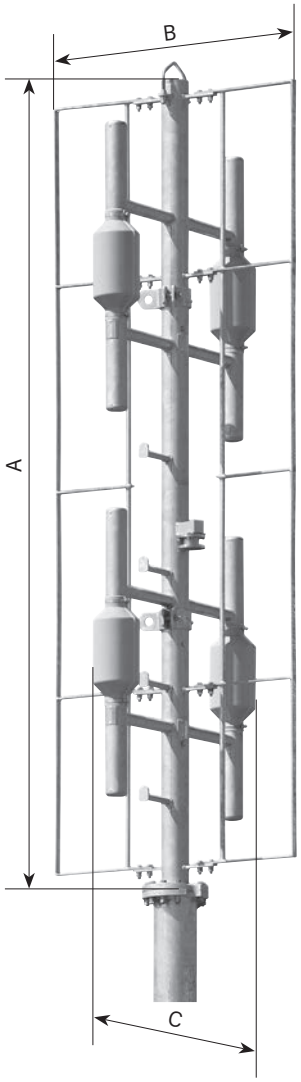
Omnidirectional Antenna

174–240 MHz

V

Omnidirectional antenna for top mounting.

Order No.	75010365	75010366	75010367	75010368
Input	7-16 female	7⁄8" EIA flange	13-30 female	1 5⁄8" EIA flange
Max. power	2 kW	3 kW	5 kW	8 kW
Frequency range	174–240 MHz			
VSWR	< 1.2			
Gain (at mid-band)	4.5 dBd			
Impedance	50 Ω			
Polarization	Vertical			
Weight	80 kg			
Wind load (at 160 km/h)	1080 N			
Max. wind velocity	225 km/h			



A: ~ 2625 mm
B: ~ 900 mm
C: ~ 870 mm

Material: Hot-dip galvanized steel.
Weather protection: Fiberglass.

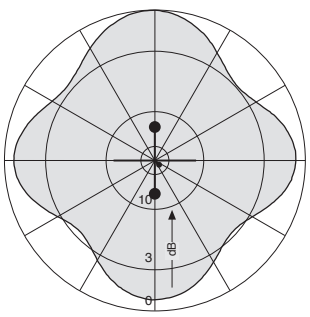
Mounting: On top of a suitable flange.

Grounding: Via mounting parts. DC grounded by a cross section of 1634 mm² steel

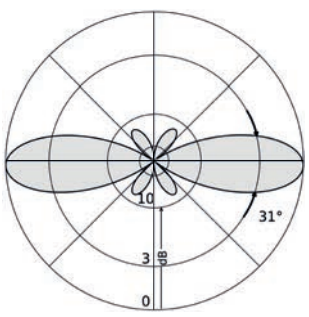
Ice protection: Even under icy conditions the antenna is still functional due to the fiberglass covers for the feeding points.

Note: Antenna may be mounted on top of Type 16911184 for higher gain.
For climbing in the antenna special climbing rungs and attachment points for climbing safety are provided.
Reflector grid and dipole parts must not be used for climbing!

Mid-Band Radiation Patterns



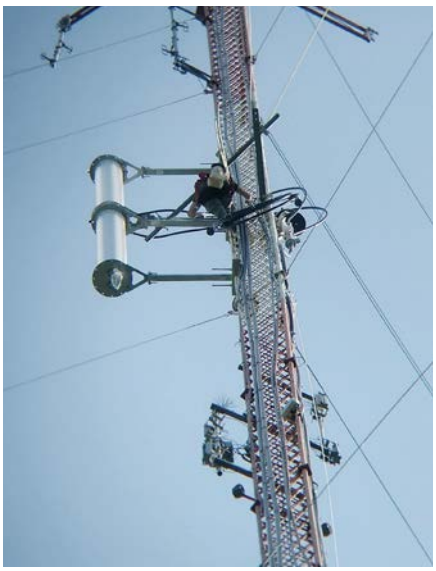
Horizontal Radiation Pattern



Vertical Radiation Pattern
2° electrical downtilt

Antenna Systems for UHF DTV and Next Generation Broadcasting

470–862 MHz



Broadcast Station "Tyler", USA

Side Mounted UHF Antenna System,
circularly polarized

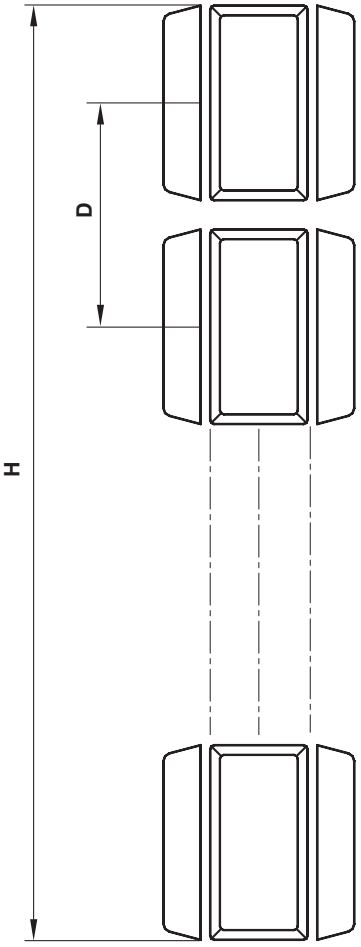
UHF Transmitting Antenna

470–862 MHz

H **V** **X**

- Antenna systems consisting of dipole panels (page 52–55) for various radiation patterns.
- The feeder network is made up of coaxial power splitters and flexible connecting cables in accordance with the radiation patterns specification and the transmitter power.

Input	Connectors according to IEC, EIA or DIN.
Max. power	According to customer's requirements.
Frequency	470–694 (862) MHz
VSWR, typically	< 1.05 in the operating channels after tuning or < 1.15 in band. In GRP cylinder or radomized structure: < 1.2 in band.
Impedance	50 Ω
Polarization	Horizontal, vertical, circular, elliptical, slant
Internal connections	Connectors according to IEC, EIA or DIN are used throughout the system, allowing easy assembly and maintenance.
Vertical radiation pattern	Null fill and beam tilt upon request.
Horizontal radiation pattern	Omnidirectional, directional or custom-designed.
Half antenna splitting	Upon request, the antenna can be divided into two halves (for emergency operation and maintenance). The two halves are connected by a 2-way power splitter or patch panel.
Pressurization	Splitters and connecting cables can be supplied with dry air (please specify when ordering).
Structure	3 versions are available: a) Panels mounted on hot-dip galvanized steel spine. b) like a), covered by fiberglass radome 1.2 m ∅ c) Panels mounted inside self-supporting fiberglass cylinder (1.6 m ∅)
Grounding	Via mounting parts.
Max. wind velocity	As required.



D = 1150 mm on spine/
behind radome 1.2 m ∅
D = 1100 mm in GRP cylinder 1.6 m ∅

No. of bays	**Panels per bay**	**Gain* (at mid-band)**		**Weight**** (without mounting hardware) kg	**Antenna height H**/m		**Windload**/kN (v = 160 km/h)		
		dBd	times		on spine	in GRP cylinder 1.6 m ∅	without cylinder **	behind radome 1.2 m ∅ ***	GRP cylinder 1.6 m ∅ ***
4	2 3 4	15.0 13.6 11.8	31.6 22.9 15.1	120 160 210	4.45	4.3	5.2 6.4 6.2	4.5	6.0
6	2 3 4	16.8 15.4 13.6	47.9 34.7 22.9	170 240 330	6.75	6.5	7.8 9.6 9.3	7.0	9.0
8	2 3 4	18.0 16.6 14.8	63.1 45.7 30.2	240 320 420	9.05	8.7	10.4 12.8 12.4	9.0	12.0
12	2 3 4	19.8 18.4 16.6	95.5 69.2 45.7	350 490 670	13.65	13.1	15.6 19.2 18.6	14.0	18.0
16	2 3 4	21.0 19.6 17.8	125.9 91.2 60.3	450 690 890	18.25	17.5	20.8 25.6 24.8	20.0	24.0

* Attenuation of the internal cabling and the gain-decrease in case of null fill in the vertical radiation pattern are not considered. Gain figures refer to matched polarization of transmission and Rx antenna.
Approximate values for gain decrease:
cable attenuation: 0.2–0.5 dB
null fill: 0.3–1.0 dB
Gain figures are valid for the direction of maximum radiation (see diagrams on following page).

** Average values, depending on design and arrangement.

*** Only according to antenna aperture H without base flange and top.

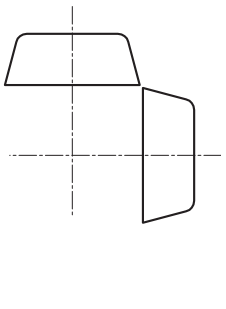
Horizontal Radiation Patterns

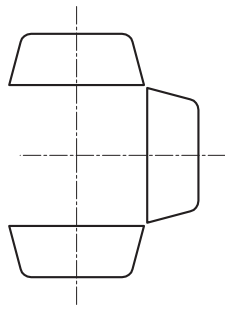
Examples of typical horizontal antenna arrays and their **horizontal** radiation patterns for optimal mast dimensions.

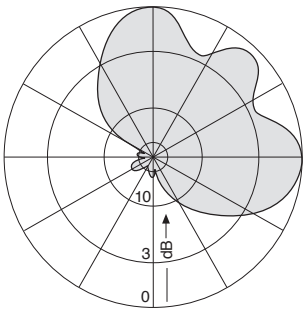
Vertical Radiation Patterns

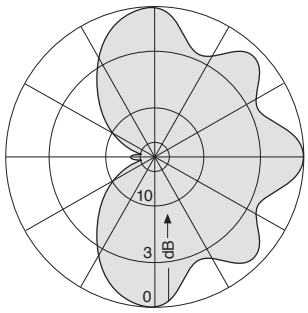
Examples of typical **vertical** radiation patterns*) for several bays of identical, vertically stacked antenna arrays.

Equal power splitting

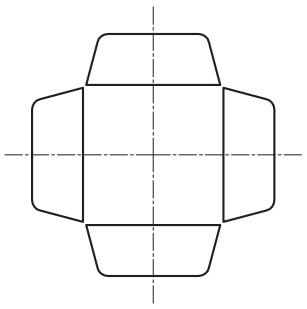


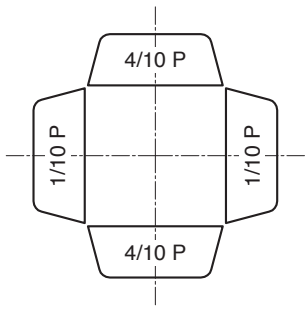


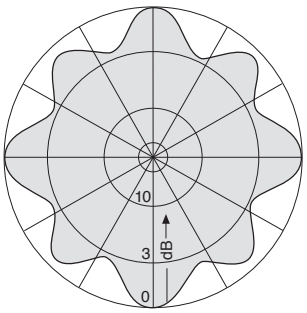


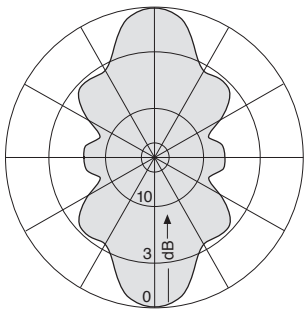


Equal power splitting **Different power splitting**

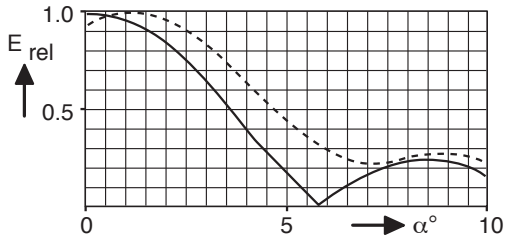




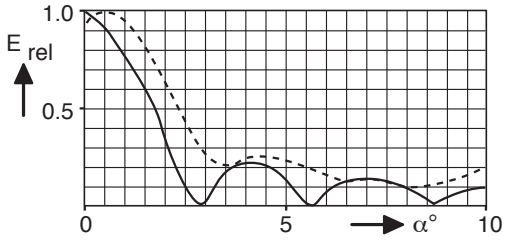




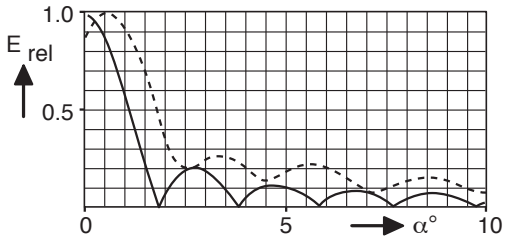
4 bays



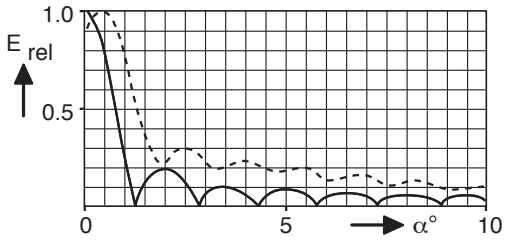
8 bays



12 bays



16 bays



*) ——— without null fill
- - - - - with null fill and beam tilt

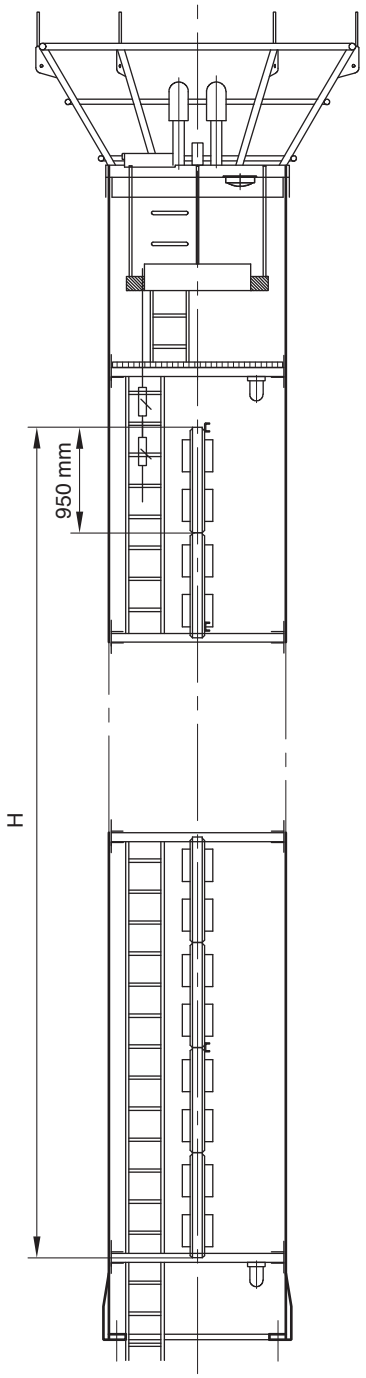
UHF Transmitting Antenna

470–862 MHz

H

Superturnstile antenna in a self-supporting fiberglass cylinder with 1.60 m diameter.

Input	Connectors according to IEC, EIA or DIN.
Max. power	According to customer's requirements, 6 kW max. per bay.
Frequency	470–862 MHz
VSWR, typically	< 1.05 in operating channels after tuning or < 1.15 in band.
Impedance	50 Ω
Polarization	Horizontal
Vertical radiation pattern	Null fill and beam tilt upon request.
Horizontal radiation pattern	Omnidirectional, circularity < ±1.5 dB
Half antenna splitting	Upon request, the antenna can be divided into two halves (for emergency operation and maintenance). The two halves are connected by a 2-way power splitter or patch panel.
Internal connections	The radiating elements are fed with coaxial connecting cables and hybrid couplers. Connectors according to IEC, EIA or DIN are used throughout the system, allowing easy assembly and maintenance.
Structure	Superturnstile antenna in self-supporting fiberglass-cylinder. Up to 16 bays may be stacked.
Mounting	On top of existing structure by means of a flange.
Ice protection	Fiberglass-cylinder (= supporting structure)
Grounding	Via mounting parts resp. via 4 grounding ropes at the exterior cylinder-surface.

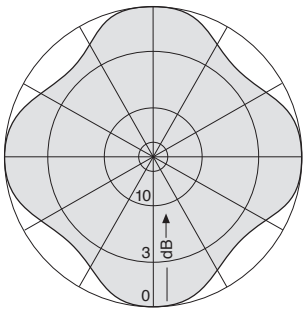


No. of bays	Gain* (at mid-band)		Weight** kg	Antenna height H m	Windload** (v = 160 km/h) kN
	dBd	times			
2	7.7	5.9	350	1.9	2.5
4	10.7	11.8	700	3.8	5.0
8	13.7	23.4	1400	7.6	10.0
12	15.5	35.5	2200	11.4	15.0
16	16.7	46.8	3050	15.2	20.0

* Attenuation of the internal cabling and the gain-decrease in case of null fill in the vertical radiation pattern are not considered.
Approximate values for gain decrease:
cable attenuation: 0.2–0.5 dB
null fill: 0.3–1.0 dB
Gain figures are valid for the direction of maximum radiation (see diagrams on following page).

** Only according to antenna aperture H without base flange and top.

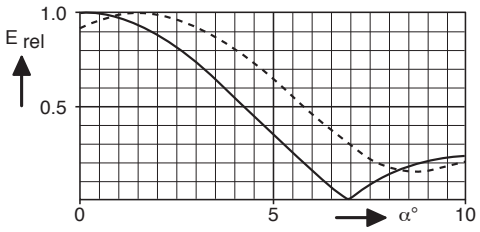
Typical Horizontal Radiation Pattern (at mid-band)



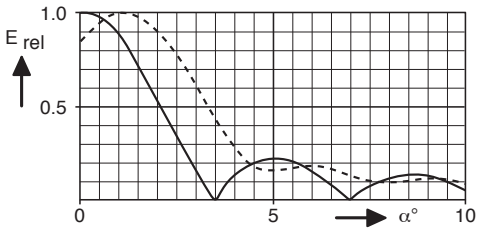
Vertical Radiation Patterns

Examples of typical **vertical** radiation patterns*) for several bays of identical, vertically stacked antenna arrays.

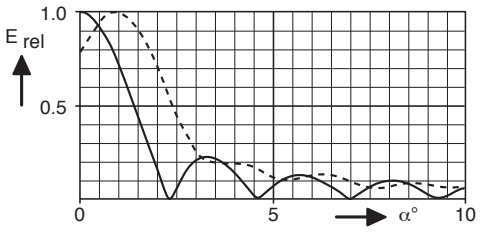
4 bays



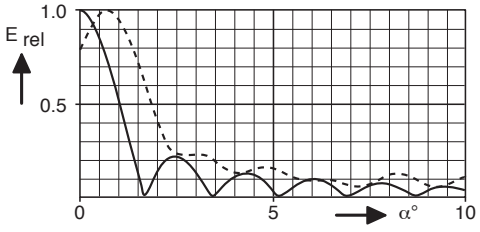
8 bays



12 bays



16 bays



*) ——— without null fill
- - - - - with null fill and beam tilt

Antennas for UHF DTV and Next Generation Broadcasting

UHF Band 470–862 MHz

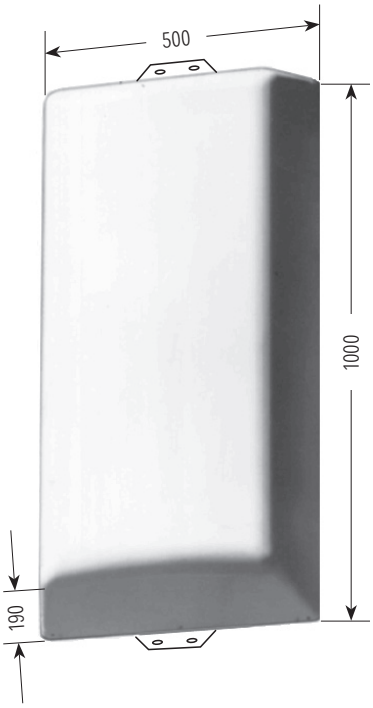
Panel Antenna

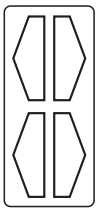
470–862 MHz

H

All-purpose panel for mounting by fixations or to square steel spines.

Order No.	75010210	75010211	75010212	75010213
Input	7-16 female straight	7/8" EIA flange straight	13-30 female straight	1 5/8" EIA flange straight
Max. power (at 40 °C ambient temperature)	1.2 kW	2 kW	3 kW	4 kW
Frequency range	470–862 MHz			
VSWR	< 1.1			
Gain (at mid-band)	11.5 dBd			
Impedance	50 Ω			
Polarization	Horizontal			
Weight	8 kg	9 kg	9 kg	9 kg
Wind load (at 160 km/h)	Frontal: 565 N, Rearside: 815 N, Lateral: 250 N			
Max. wind velocity	225 km/h			
Attachment	Plate	Plate	Plate	Plate





Horizontal polarization

Material: Reflector screen and dipoles: Weather-resistant aluminum.
Protective cover: Fiberglass.
Attachment plate: Hot-dip galvanized steel.

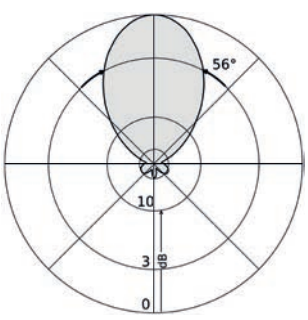
Radome color: RAL 9016 (traffic white), other radome colors on request.

Mounting: Using M 8 × 35 screws (supplied) to suitable attachment construction. See chapter "Components" for optional mounting accessories (please order separately).

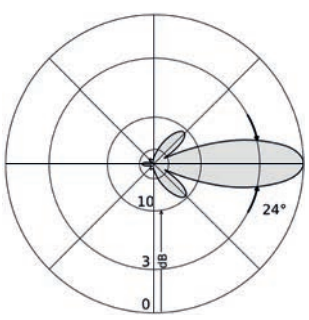
Grounding: Via mounting parts.

Ice protection: The dipoles remain fully functioning even in icy conditions as the fiberglass cover protects the whole antenna.

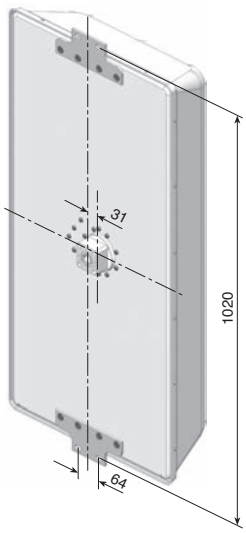
Mid-Band Radiation Patterns



Horizontal Radiation Pattern



Vertical Radiation Pattern



All dimensions in mm

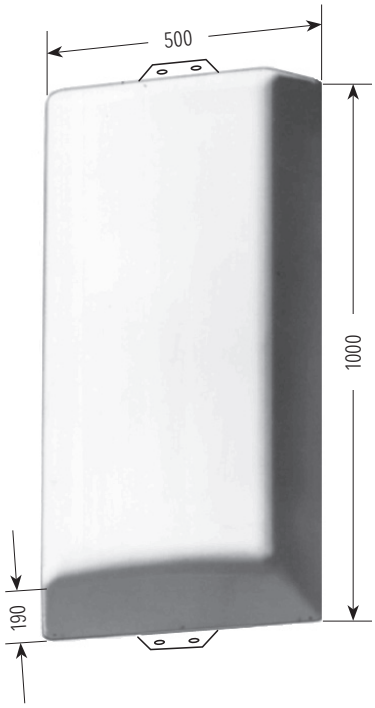
Panel Antenna

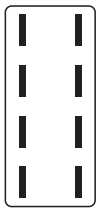
470–862 MHz

V

All-purpose panel for mounting by fixations or to square steel spines.

Order No.	601709 K733147	776165	776202	776167
Input	7-16 female straight	7-16 female elbow	7⁄8" EIA flange elbow	13-30 female elbow
Max. power (at 40 °C ambient temperature)	1 kW	1 kW	1.5 kW	2 kW
Frequency range	470–862 MHz			
VSWR	< 1.12			
Gain (at mid-band)	11 dBd			
Impedance	50 Ω			
Polarization	Vertical			
Weight	12 kg			
Wind load (at 160 km/h)	Frontal: 565 N, Rearside: 815 N, Lateral: 250 N			
Max. wind velocity	240 km/h			
Attachment	Bracket	Plate	Plate	Plate





Vertical polarization

Material: Reflector screen and dipoles: Weather-resistant aluminum. Protective cover: Fiberglass. Attachment bracket: Hot-dip galvanized steel. Attachment plate: Weather-resistant aluminum.

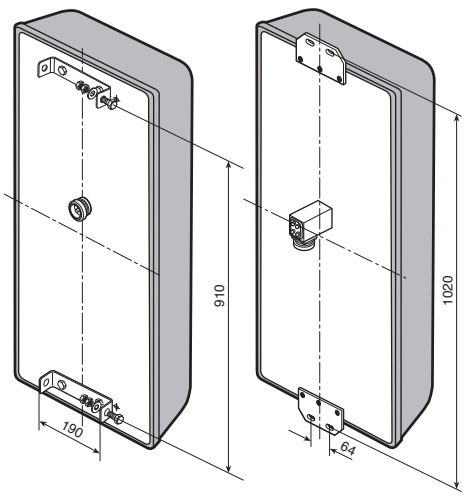
Radome color: RAL 9016 (traffic white), other radome colors on request.

Mounting: Attachment bracket: E.g. by using clamps 75310411–75310415 to tubular masts of 40–521 mm diameter. Attachment plate: Using M 8 × 35 screws (supplied) to suitable attachment construction. See chapter "Components" for optional mounting accessories (please order separately).

Grounding: Via mounting parts.

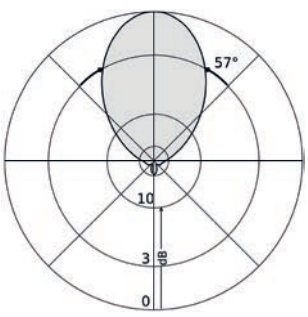
Ice protection: The dipoles remain fully functioning even in icy conditions as the fiberglass cover protects the whole antenna.

Examples with different connectors and attachments:

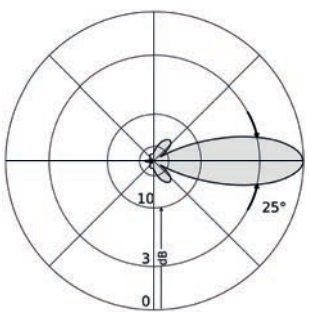


All dimensions in mm

Mid-Band Radiation Patterns



Horizontal Radiation Pattern



Vertical Radiation Pattern

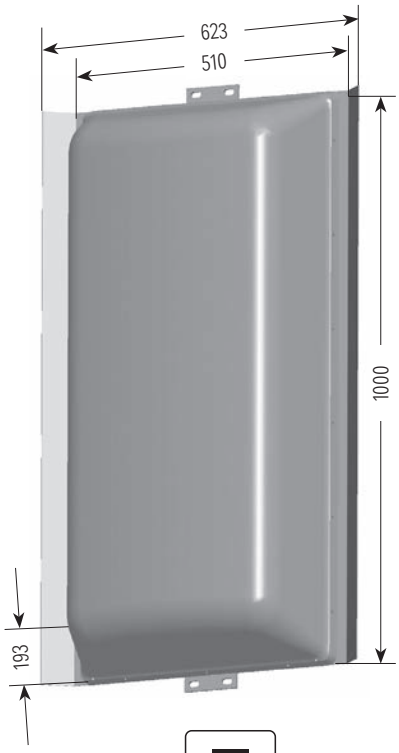
Panel Antenna

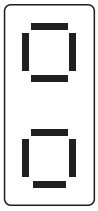
470–694 MHz

X

Directional antenna for elliptical polarizations.

Order No.	7500000044	7500000049
Input	7/8" EIA flange, elbow	
Max. power (at 40 °C ambient temperature)	1.5 kW	2 kW
Frequency range	470–694 MHz	
VSWR	< 1.15	
Gain (at mid-band) horizontal/vertical	7.5 dBd/7.5 dBd	9 dBd/5.2 dBd
Impedance	50 Ω	
Polarization	Circular	Elliptical with a power ratio of 70% horizontal/30% vertical
Weight	16 kg	
Wind load (at 160 km/h)	Frontal: 900 N, Rearside: 1000 N, Lateral: 340 N	
Max. wind velocity	225 km/h	
Attachment	Plate	





Eliptical polarization

Material: Reflector screen, dipoles: Weather-resistant aluminum, tin-plated brass. Protective cover: Fiberglass. Attachment plate: Hot-dip galvanized steel.

Radome color: RAL 9016 (traffic white), other radome colors on request.

Mounting: Using M 8 × 35 screws (supplied) to suitable attachment construction. See chapter "Components" for optional mounting accessories (please order separately).

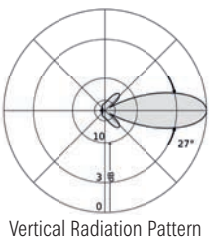
Grounding: Via mounting parts.

Ice protection: The dipoles remain fully functioning even in icy conditions as the fiberglass cover protects the whole antenna.

Mid-Band Radiation Patterns

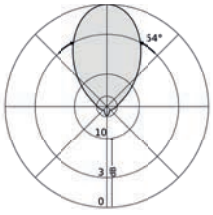
Horizontal Polarization

Horizontal Radiation Pattern

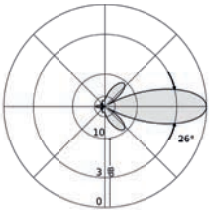


Vertical Radiation Pattern

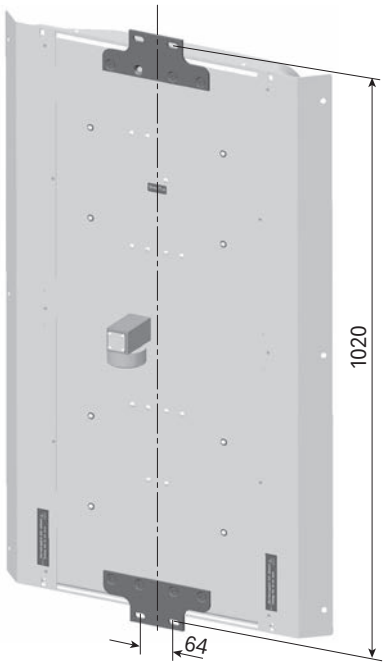
Vertical Polarization



Horizontal Radiation Pattern



Vertical Radiation Pattern



All dimensions in mm

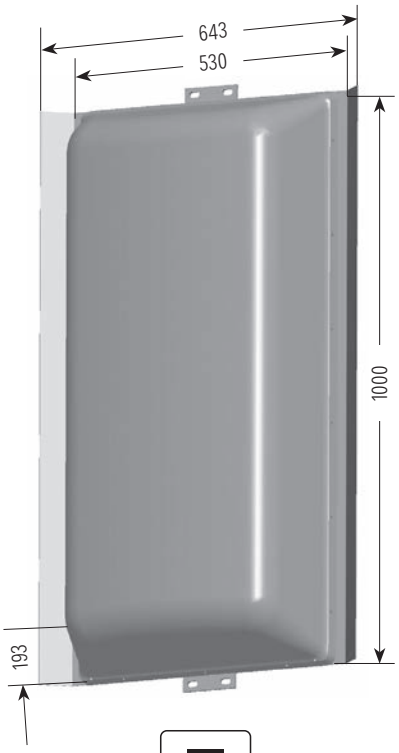
Panel Antenna

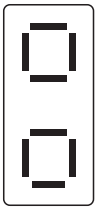
470–694 MHz

H **V** **X**

Directional antenna for various polarizations.

Order No.	7500100018	7500100031
Input	2 × 7-16 female straight	2 × 7⁄8" EIA flange straight
Max. power (at 40 °C ambient temperature)	Hor.: 1.4 kW, Ver.: 1 kW	Hor.: 2 kW, Ver.: 1 kW
Frequency range	470–694 MHz	
VSWR	< 1.15	
Gain at mid-band	Hor.: 10.5 dBd, Ver.: 10.5 dBd	
Impedance	50 Ω	
Polarization	Horizontal, vertical, circular, elliptical, slant	
Weight	15 kg	15.5 kg
Wind load (at 160 km/h)	Frontal: 920 N, Rearside: 1050 N, Lateral: 340 N	
Max. wind velocity	225 km/h	
Attachment	Plate	





Hor./ver./elliptical polarization

Material: Reflector screen and dipoles: Weather-resistant aluminum, tin-plated brass. Protective cover: Fiberglass. Attachment plate: Hot-dip galvanized steel.

Radome color: RAL 9016 (traffic white), other radome colors on request.

Mounting: Using M 8 × 35 screws (supplied) to suitable attachment construction. See chapter "Components" for optional mounting accessories (please order separately).

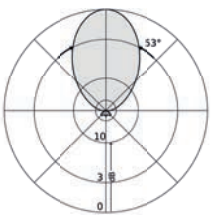
Grounding: Via mounting parts.

Ice protection: The dipoles remain fully functioning even in icy conditions as the fiberglass cover protects the whole antenna.

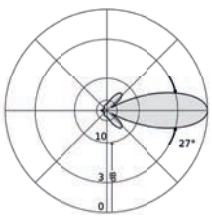
Polarization: Defined by power and phase difference between H and V, created by the external feed network. Internal electrical length difference: refer to data sheet.

Mid-Band Radiation Patterns

Horizontal Polarization

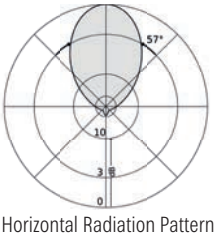


Horizontal Radiation Pattern

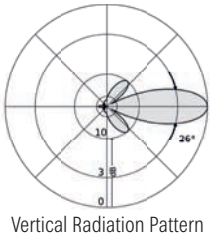


Vertical Radiation Pattern

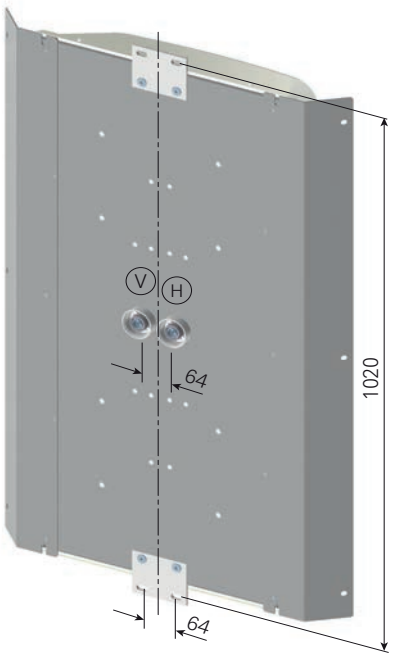
Vertical Polarization



Horizontal Radiation Pattern



Vertical Radiation Pattern



All dimensions in mm

Cardioid Antenna

NEW

470–694 MHz

V

- Broadband Cardioid antenna.
- Plug and Play antenna.
- Low windload.

7500100041/
7500100042

Order No.	7500100041	7500100042
Input	7/8" EIA flange	1 5/8" EIA flange
Max. power (at 40 °C ambient temperature)	2.5 kW	5 kW
Frequency range	470–694 MHz	
VSWR	< 1.2	
Gain (at mid band)	8 dBd	11 dBd
Impedance	50 Ω	
Polarization	Vertical	
Height	3.2 m	5.0 m
Weight	80 kg	100 kg
Wind load (at 160 km/h)	940 N	1500 N
Max. wind velocity	240 km/h	

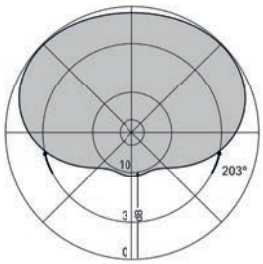
Material: Antenna in protective fiberglass radome with a diameter of 330 mm. Flange: Hot-dip galvanized steel.

Radome color: Light grey (RAL 7035).

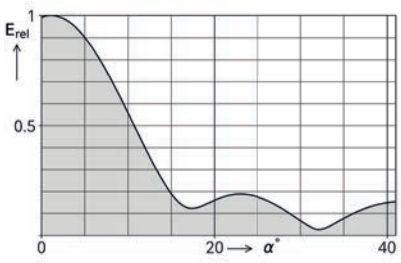
Mounting 7500100041 and 7500100042: Top mount: Onto a fitting counterflange. Side mount, by means of accessories (please order seperately)

Grounding: Via mounting parts.

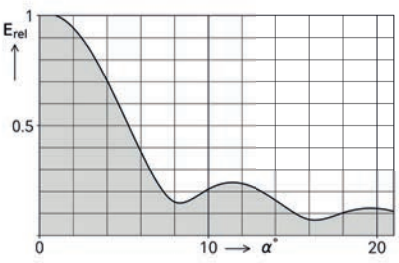
Mid-Band Radiation Patterns



Horizontal Radiation Pattern



Vertical Radiation Pattern 7500100041



Vertical Radiation Pattern 7500100042

Cardioid Antenna

470–694 MHz

X

- Broadband slot antenna.
- Plug and Play antenna.
- Low windload.

7500100007

7500100020

Order No.	7500100007	7500100020
Input	1 5⁄8" EIA flange	3 1⁄8" EIA flange
Max. power (at 40 °C ambient temperature)	5 kW	10 kW
Frequency range	470–694 MHz	
VSWR	< 1.15	
Gain (at mid band)	5.5 dBd	8.5 dBd
Impedance	50 Ω	
Polarization	Elliptical (nominal 70% H, 30% V)	
Height	1.2 m	2.5 m
Weight	50 kg	70 kg
Wind load (at 160 km/h)	280 N	600 N
Max. wind velocity	240 km/h	

Material: Antenna in protective fiberglass radome with a diameter of 330 mm.
Flange: Hot-dip galvanized steel.

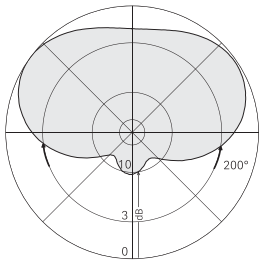
Radome color: Light grey (RAL 7035).

Mounting 7500100007: Top mount or side mount, by means of accessories (please order seperately).

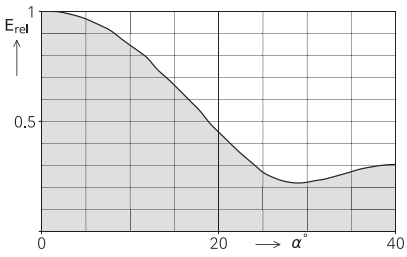
Mounting 7500100020: Side mount, by means of accessories (please order seperately).

Grounding: Via mounting parts.

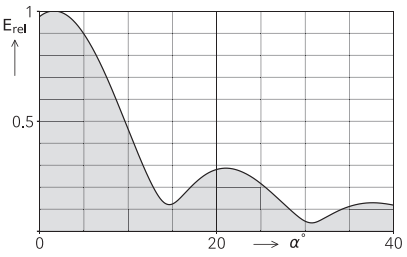
Mid-Band Radiation Patterns (typical)



Horizontal Radiation Pattern



Vertical Radiation Pattern 7500100007



Vertical Radiation Pattern 7500100020

Omnidirectional Antenna

470–862 MHz

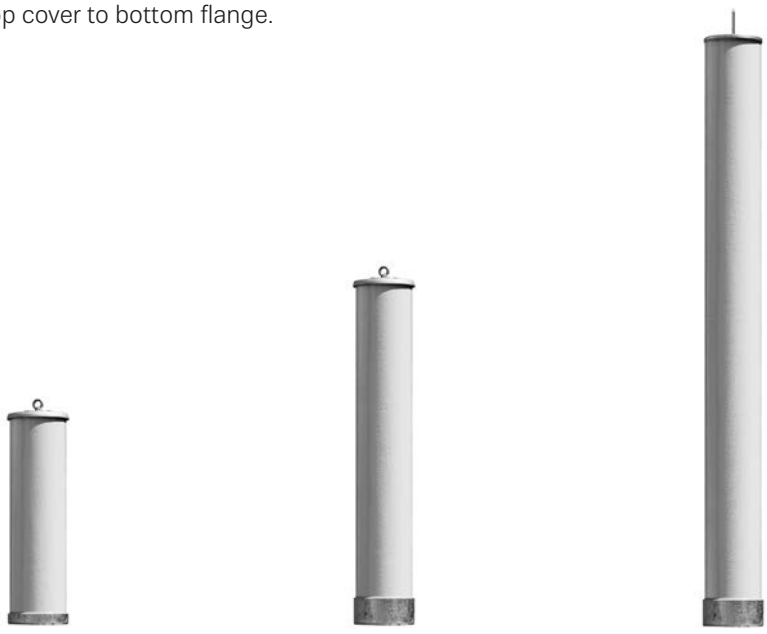
H

- Low power Superturnstile antennas.
- Plug and Play antennas fully assembled.
- Low wind load and low weight.
- Horizontal polarization.

Material: Omnidirectional antenna in protective fiberglass radome with a diameter of 230 mm.
Radome color: Light grey (RAL 7035).
Flange: Hot-dip galvanized steel (antenna 75010270: aluminum)

Attachment: Onto a fitting counterflange or to tubular masts by using a steel adapter.
See chapter "Components" for optional mounting accessories (to be ordered separately).

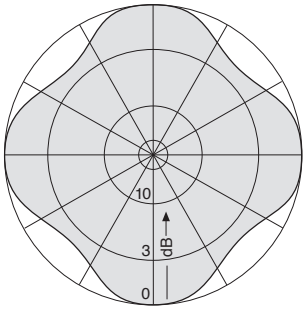
Grounding: Via mounting parts. Antenna interior is fully conductive from top cover to bottom flange.



Order No.	75010270	75010271	75010272
Input connector	7-16 female	7-16 female	7-16 female
Max. power*	600 W	1 kW	1 kW
Frequency range	470–862 MHz	470–862 MHz	470–862 MHz
VSWR	≤ 1.2	≤ 1.2	≤ 1.15
Gain (at mid-band)	2.0 dBd	4.5 dBd	7.5 dBd
Impedance	50 Ω	50 Ω	50 Ω
Radome diameter	230 mm	230 mm	230 mm
Height (approx.)	0.8 m	1.2 m	2.0 m
Weight	13 kg	16 kg	24 kg
Wind load (at 160 km/h)	110 N	195 N	350 N
Max. wind velocity	240 km/h	240 km/h	240 km/h

* at 40 °C ambient temperature

Horizontal Radiation Pattern (at mid-band)

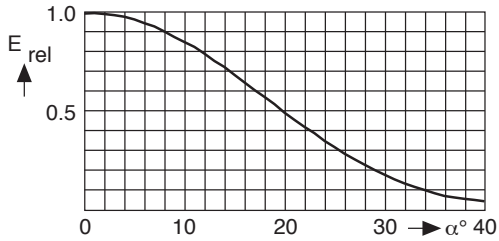


Typical Horizontal Radiation Pattern

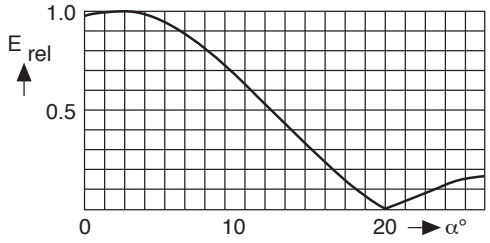
Vertical Radiation Patterns (at mid-band)

75010270

75010271



75010272



Omnidirectional Antenna

470–862 MHz

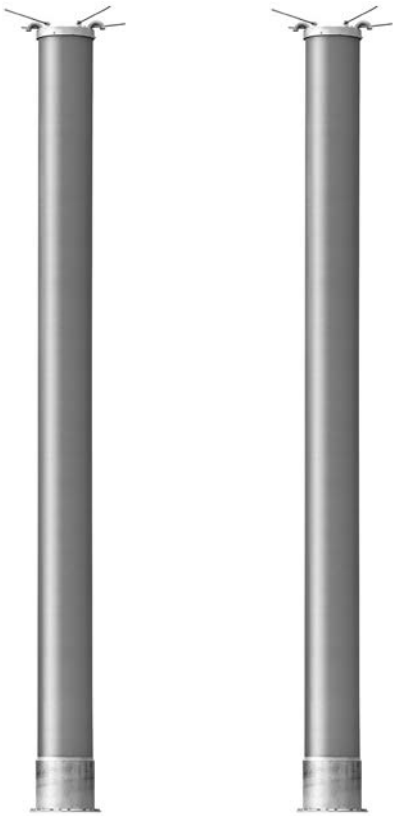
H

- Medium and high power Superturnstile antennas.
- Plug and Play Antennas fully assembled.
- Low wind load and low weight.
- Horizontal polarization.

Material: Omnidirectional antenna in protective fiberglass radome.
Radome color: Light grey or customized.
Flange: Hot-dip galvanized steel.

Attachment: Onto a fitting counterflange or to tubular masts by using a steel adapter.
See chapter "Components" for optional mounting accessories (to be ordered separately).

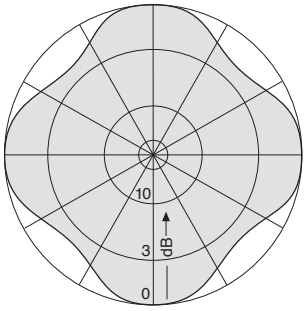
Grounding: Via mounting parts.



Order No.	75010066	75010067	75010068	75010069
Input connector	1 5⁄8" EIA flange	1 5⁄8" EIA flange	1 5⁄8" EIA flange	3 1⁄8" EIA flange
Max. power*	2.5 kW	5 kW	5 kW	7.5 kW
Frequency range	470–862 MHz	470–862 MHz	470–862 MHz	470–862 MHz
VSWR	≤ 1.1	≤ 1.1	≤ 1.1	≤ 1.1
Gain (at mid-band)	5.0 dBd	8.0 dBd	11.0 dBd	11.0 dBd
Impedance	50 Ω	50 Ω	50 Ω	50 Ω
Radome diameter	330 mm	330 mm	330 mm	330 mm
Height (approx.)	1.4 m	2.4 m	4.8 m	4.8 m
Weight	45 kg	70 kg	140 kg	145 kg
Wind load (at 160 km/h)	330 N	590 N	1200 N	1200 N
Max. wind velocity	240 km/h	240 km/h	240 km/h	240 km/h

* at 40 °C ambient temperature
All gain figures without null fill and beam tilt losses

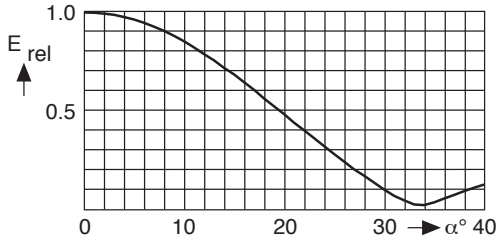
Horizontal Radiation Pattern (at mid-band)



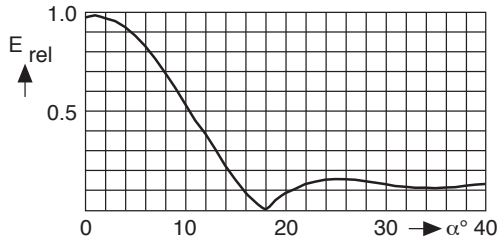
Typical Horizontal Radiation Pattern

Vertical Radiation Patterns (at mid-band)
Examples of typical vertical
radiation patterns*)

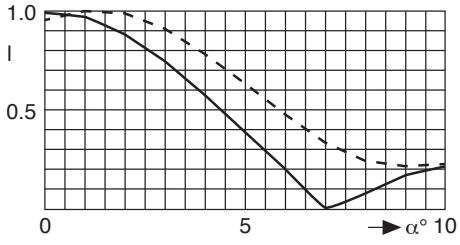
75010066



75010067



75010068/75010069



*) ——— without null fill
- - - - - with null fill and beam tilt

Omnidirectional Antenna

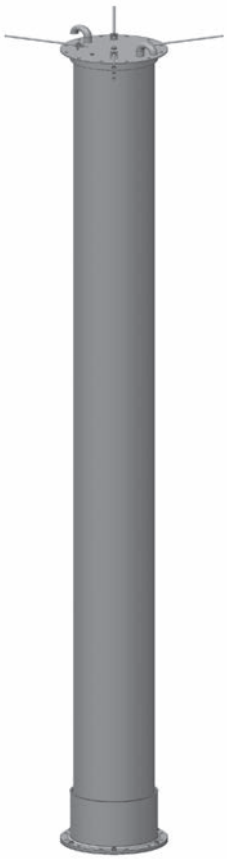
470–654 MHz

H **V** **X**

- Broadband omnidirectional antenna.
- All kinds of elliptical polarizations possible.
- May be stacked if side mounted.

Order No.	7500100006	7500000043
Input	2 × 7/8" EIA flange	2 × 1 5/8" EIA flange
Max. power (at 40 °C ambient temperature)	2 × 1.5 kW	2 × 3 kW
Frequency range	470–654 MHz, other frequencies on request	
VSWR	< 1.15	
Gain (at mid-band)	6.6 dBd (Hpol)	9.6 dBd (Hpol)
Impedance	50 Ω	
Polarization	Horizontal, vertical, circular, elliptical, slant	
Weight	60 kg	110 kg
Wind load (at 160 km/h)	~ 660 N	~ 1160 N
Max. wind velocity	240 km/h	
Height (approx.)	2.5 m	4.5 m

7500100006



7500000043

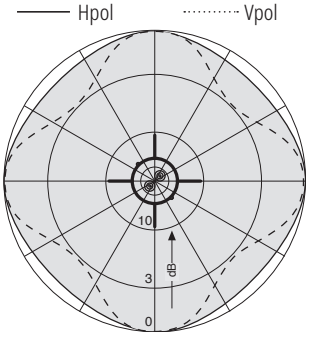
Material: Omnidirectional antenna in protective fiberglass radome with a diameter of 330 mm. Radome color: Light grey or customized. Flange: Hot-dip galvanized steel.

Attachment Top mount: Onto a fitting counterflange. 7500000043: side mount by means of accessories 7530100004 (please order separately).

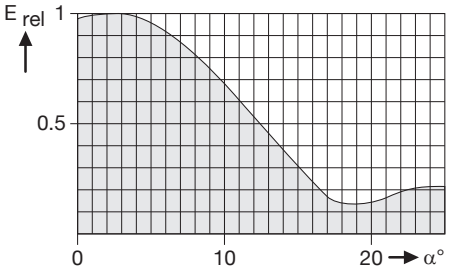
Grounding: Via mounting parts.

Polarization: Defined by power and phase difference between H and V, created by the external feed network. Internal electrical length difference: refer to data sheet

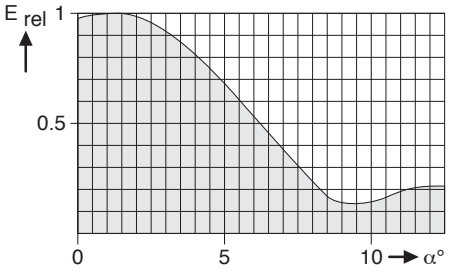
Mid-Band Radiation Patterns (typical)



Horizontal Radiation Pattern



Vertical Radiation Pattern 7500100006



Vertical Radiation Pattern 7500000043

Log.-Per.Antenna

470–862 MHz

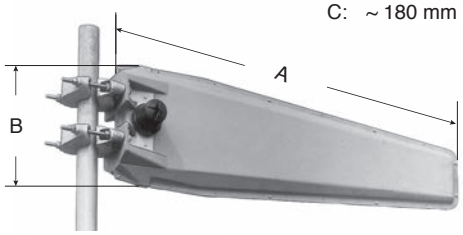
H **V**

High side-lobe suppression.

Order No.	75010393
Input	7-16 female
Max. power	500 W (at 40 °C ambient temperature)
Frequency range	470–862 MHz
VSWR	< 1.25
Gain	9.0 dBd at mid-band
Side-lobe suppression	> 23 dB at 470–500 MHz > 25 dB at 500–860 MHz
Impedance	50 Ω
Polarization	Either horizontal or vertical by repositioning two clamps
Weight	9 kg
Wind load (at 160 km/h) For horizontal pol.: For vertical pol.:	 Frontal/lateral: 63/100 N Frontal/lateral: 63/500 N
Max. wind velocity	For horizontal pol.: 240 km/h For vertical pol.: 180 km/h

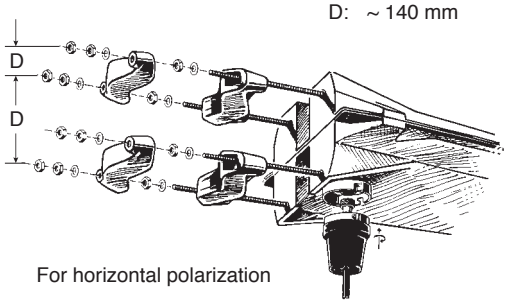
For horizontal polarization

A: ~ 1153 mm
B: ~ 353 mm
C: ~ 180 mm

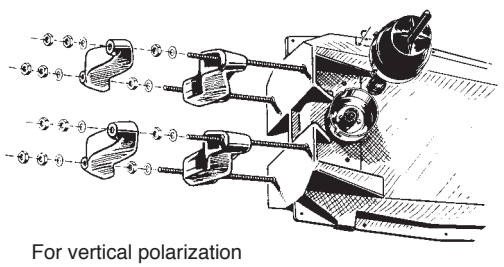


For vertical polarization

D: ~ 140 mm



For horizontal polarization



For vertical polarization

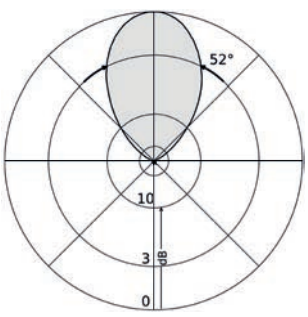
Material: Radiator: Weather-resistant aluminum.
Radome: Fiberglass, color: Grey.
Mounting kit: Weather-resistant aluminum.
All screws and nuts: Stainless steel.

Mounting: To tubular masts of 48–115 mm diameter using supplied clamps.

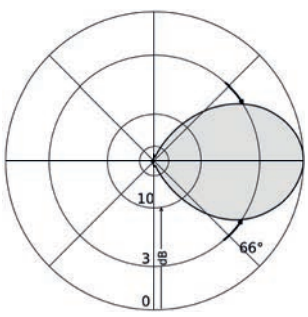
Grounding: Via mounting parts.

Ice protection: Since radiating system is fully protected by the radome and due to its very sturdy construction, the antenna remains fully operational even under heavy icy conditions.

Mid-Band Radiation Patterns



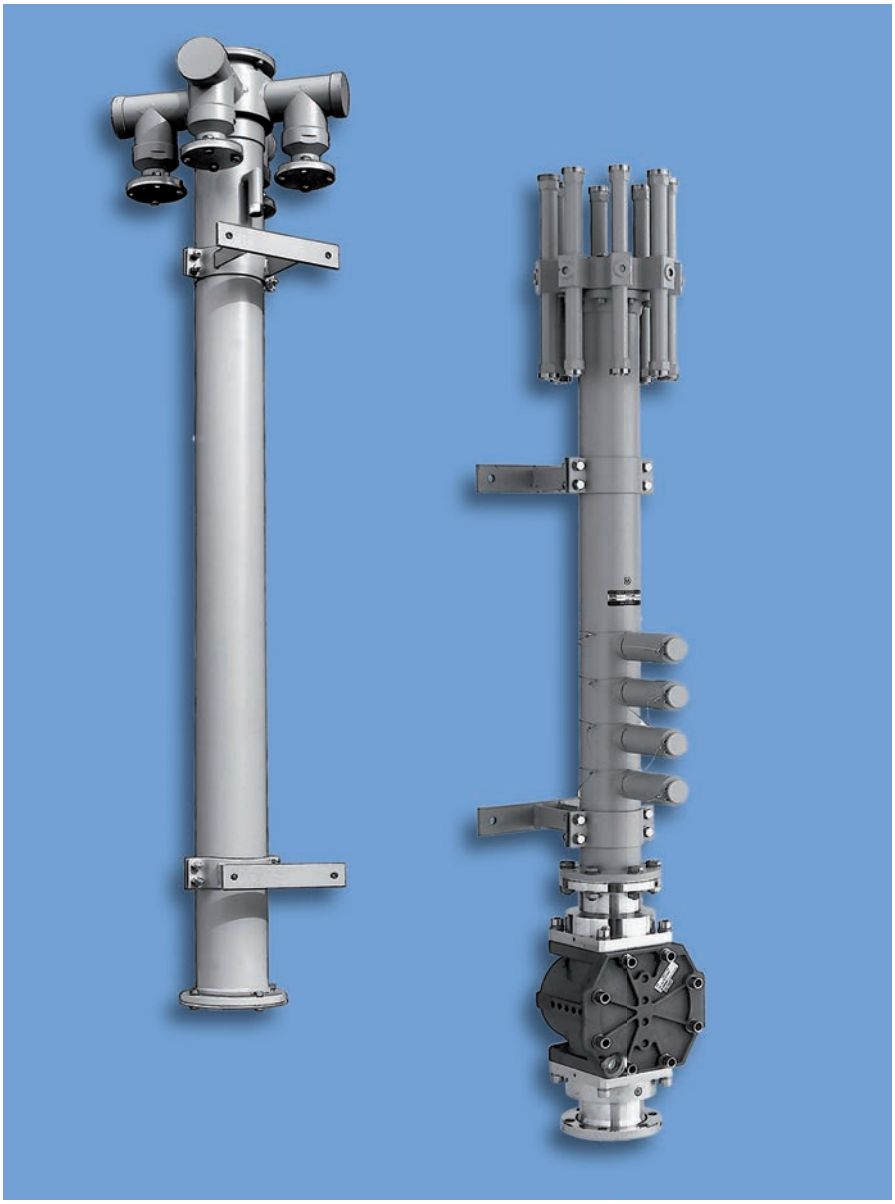
In E-Plane



In H-Plane

Power Splitters for FM, VHF and UHF

87.5–108 MHz, 174–230 (240) MHz, 470–862 MHz



High Power Splitters

Various versions with different numbers of output and different splitting ratios are available.

Frequency range	87.5–108 MHz	174–230 (240) MHz	470–862 MHz
Length approx.	1700 mm	850 mm	700 mm
with tuning unit approx.	–	1500 mm	1000 mm
Input power	1–200 kW	1–150 kW	1–70 kW
Connectors	7-16, 13-30, ⅞", 1 ⅝", 3 ⅛", 4 ½", 6 ⅛" EIA (or other connectors upon request)		
Impedance	50 Ω		
Insertion loss	< 0.05 dB		
Number of outputs	2 to 16		
VSWR equal power ratio	< 1.05 in frequency range		
VSWR unequal power ratio	< 1.06 in frequency range		
Fine matching	On request, the power splitter can be equipped with a tuning section, which allows fine matching of parts of the frequency band.		
Splitting power ratio	Equal or unequal, on request.		

Material: Outer conductor: Brass with protective grey paint. Inner conductor: Brass or aluminum.

Mounting: On flat surfaces using the standard mounting equipment consisting of 2 bracket arms (supplied) or steel frame (please order separately).

Pressurization: The pressurization-tight transformer housing has a ventilation tube to balance out excess pressure.
For pressurized operation (typically at 300 mbar) this ventilation tube must be closed with the supplied sealing screw.
IP 65 (closed ventiation tube for pressurized operation)
IP 53 (opened ventilation tube for non-presserized operation)

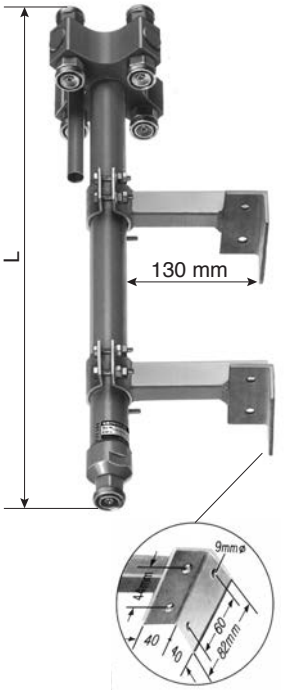
Example:
Tunable 16-way splitter with unequal power splitting and with a measuring link.

Example: 4-way splitter with standard-attachment

Medium Power Splitters

Various versions with different numbers of output and different splitting ratios are available.

Frequency range	87.5–108 MHz	174–230 (240) MHz	470–862 MHz
Length approx.	1650 mm	845 mm	560 mm
with tuning unit approx.	–	1500 mm	860 mm
Input power	2.5 kW	2 kW	1 kW
Connectors	7-16 female (other connectors upon request)		
Impedance	50 Ω		
Insertion loss	< 0.05 dB		
Number of outputs:	2 to 12		
VSWR equal power ratio:	< 1.05 in frequency range		
VSWR unequal power ratio:	< 1.06 in frequency range		
Fine matching:	On request, the power splitter can be equipped with a tuning section, which allows fine matching of parts of the frequency band.		
Splitting power ratio:	Equal or unequal, on request.		



Material: Outer conductor: Brass with protective grey paint. Inner conductor: Brass or aluminum.

Mounting: On flat surfaces using the standard mounting equipment supplied (Bracket arm, 130 mm). To tubes of 30–340 mm diameter by means of 2 tension band clamps Type No. 759044 (please order separately).

759044

Pressurization: The pressurization-tight transformer housing has a ventilation tube to balance out excess pressure.
For pressurized operation (typically at 300 mbar) this ventilation tube must be closed with the supplied sealing screw.
IP 65 (closed ventiation tube for pressurized operation)
IP 53 (opened ventilation tube for non-presserized operation)

Low Power Splitters

174–230 MHz

Order No.	768334	768335	768336
Connector	7-16 female		
Max. power (at 50 °C ambient temp.)	2 kW		
Number of outputs	2	3	4
Frequency range	174–230 MHz		
Impedance	50 Ω		
VSWR	< 1.07		
Insertion loss	< 0.05 dB		
Max. size	800/82/82 mm		

470–862 MHz

Order No.	768331	768332	768333
Connector	7-16 female		
Max. power (at 50 °C ambient temp.)	1 kW		
Number of outputs	2	3	4
Frequency range	470–862 MHz		
Impedance	50 Ω		
VSWR	< 1.07		
Insertion loss	< 0.05 dB		
Max. size	520/82/82 mm		

768332

Material: Case: Aluminum.
Inner conductor: Brass.

Mounting: Bracket included for wall mounting.
May be attached to tubular masts using clamps listed below (please order separately).

Clamps

Order No.	Description	Remarks
7530000010	2 clamps	Mast diameter: 45–125 mm

Combiners and Filters for FM Broadcast

Band-pass Filter

87.5 ... 108 MHz

3 kW

Band-pass filter can be used

- for improving the input selectivity of receivers and amplifiers.
- for increasing the isolation of transmitters whose respective antennas are close together.
- for suppressing noise side bands and intermodulation products.
- as a component in the construction of combiners.

Design and Construction

The band-pass filter is made of three capacitively coupled, temperature stabilised resonators. The operating frequency, the coupling between the resonators and also the input and output couplings are adjustable.

Any heat produced is dissipated into the surroundings via heat sinks. The band-pass filter is convection-cooled, so no ventilators are required.

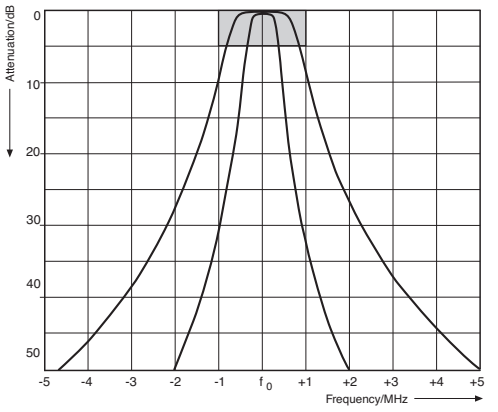
The band-pass filter must be tuned to the operating channel. Tuning may be done at our factory or can be carried out on site. Clear tuning instructions and also any special tools necessary are part of the delivery extent.

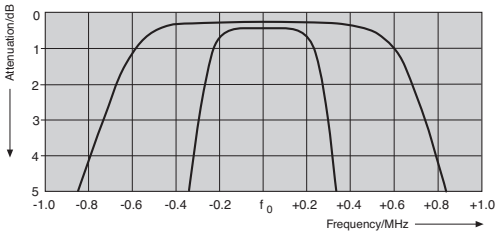
728726 FM Band-pass filter, 3 kW

Technical Data

Type No.	728726
Frequency range	87.5 ... 108 MHz
Insertion loss [1]	< 0.25 ... 0.5 dB
VSWR	< 1.1 (at pass band)
Impedance	50 Ω
Input power	max. 3 kW
Temperature range	–20 °C ... +50 °C
Connectors	7/8" EIA flange
Material	Aluminum (outer conductor) Brass, silver-plated (inner conductor)
Colour	RAL 7032 (grey)
Weight	55 kg
Dimensions (l × w × h)	680 × 220 × 1320 mm
Packing size (l × w × h)	720 × 300 × 1500 mm

[1] Insertion loss value with standard tuning will be approx. 0.35 dB; reference 3-dB bandwidth is 900 kHz.





Band-pass Filter

87.5 ... 108 MHz

5 kW

Band-pass filter can be used

- for improving the input selectivity of receivers and amplifiers.
- for increasing the isolation of transmitters whose respective. antennas are close together.
- for suppressing noise side bands and intermodulation products.
- as a component in the construction of combiners.

Design and Construction

The band-pass filter is made of three capacitively coupled, temperature stabilised resonators. The operating frequency, the coupling between the resonators and also the input and output couplings are adjustable.

Any heat produced is dissipated into the surroundings via heat sinks. The band-pass filter is convection-cooled, so no ventilators are required.

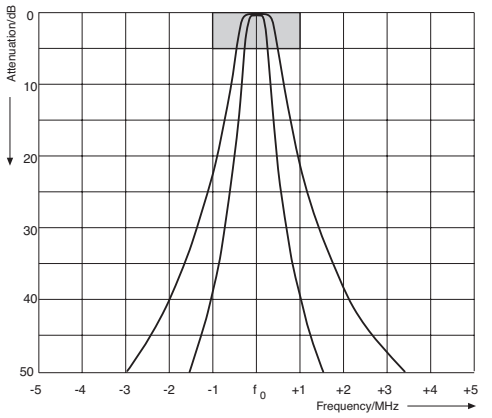
The band-pass filter must be tuned to the operating channel. Tuning may be done at our factory or can be carried out on site. Clear tuning instructions and also any special tools necessary are part of the delivery extent.

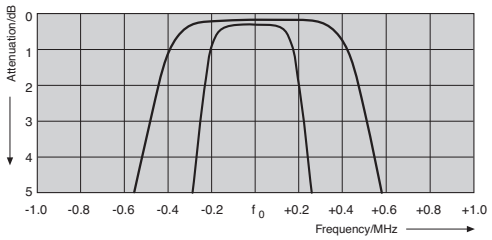
730150 FM Band-pass filter, 5 kW

Technical Data

Type No.	730150
Frequency range	87.5 ... 108 MHz
Insertion loss [1]	< 0.25 ... 0.4 dB
VSWR	< 1.1 (at pass band)
Impedance	50 Ω
Input power	max. 5 kW
Temperature range	–20 °C ... +50 °C
Connectors	1⅝" EIA flange
Material	Aluminum (outer conductor) Brass, silver-plated (inner conductor)
Colour	RAL 7032 (grey)
Weight	100 kg
Dimensions (l × w × h)	975 × 285 × 1260 mm
Packing size (l × w × h)	1100 × 470 × 1450 mm

[1] Insertion loss value with standard tuning will be approx. 0.30 dB; reference 3-dB bandwidth is 800 kHz.





Starpoint Combiner

87.5 ... 108 MHz

3 kW

General

Starpoint combiners enable several transmitters or receivers to be connected to one common output. This arrangement provides a cost efficient solution while retaining the advantages of band-pass filter usage.

Design and Construction

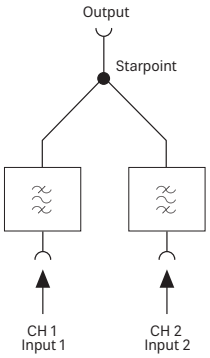
This starpoint combiners consist of one temperature stabilised 3-pole band-pass filter per channel. The inputs of the filters are narrowband. The outputs are connected via pre-defined rigid-lines onto a common starpoint. This starpoint then forms the output of the combiner.

The starpoint combiners may be extended by adding further band-pass filters and by exchanging the starpoint.

Any heat produced is dissipated into the surroundings via heat sinks. The starpoint combiner is convection-cooled, so no ventilators are required.

The band-pass filters must be tuned to the operating channel. Tuning may be done at our factory or can be carried out on site. Clear tuning instructions and also any special tools necessary are supplied along with the combiner.

728868 FM Starpoint combiner, 2 × 3 kW



Technical Data

Type No.	728868	730040	730041
Inputs	2	3	4
Frequency range	87.5 ... 108 MHz		
Insertion loss [1]	< 0.5 dB	< 0.6 dB	< 0.7 dB
Input power	max. 3 kW (per input)		
Channel spacing	> 1.5 MHz		
Isolation	> 30 dB		
VSWR	< 1.1 (at pass band)		
Impedance	50 Ω		
Temperature range	–20 °C ... +50 °C		
Connectors Input/Output	7/8" EIA/1 5/8" EIA		
Material	Aluminum (outer conductor) Brass, silver-plated (inner conductor)		
Colour	RAL 7032 (grey)		
Weight	110 kg	180 kg	250 kg
Dimensions (l × w × h)	790 × 482 × 1320 mm	1553 × 482 × 1320 mm	1553 × 482 × 1320 mm
Packing size (l × w × h)	1010 × 610 × 1400 mm	1 × 1010 × 610 × 1400 mm 1 × 1010 × 315 × 1400 mm	2 × 1010 × 610 × 1400 mm

[1] Insertion loss value refers to a 3-dB bandwidth of 900 kHz. Minimum 3-dB bandwidth is 600 kHz.

Starpoint Combiner

87.5 ... 108 MHz

5 kW

General

Starpoint combiners enable several transmitters or receivers to be connected to one common output. This arrangement provides a cost efficient solution while retaining the advantages of band-pass filter usage.

Design and Construction

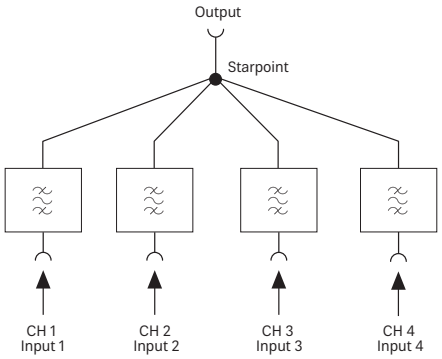
This starpoint combiners consist of one temperature stabilised 3-pole band-pass filter per channel. The inputs of the filters are narrowband. The outputs are connected via pre-defined rigid-lines onto a common starpoint. This starpoint then forms the output of the combiner.

The starpoint combiners may be extended by adding further band-pass filters and by exchanging the starpoint.

Any heat produced is dissipated into the surroundings via heat sinks. The starpoint combiner is convection-cooled, so no ventilators are required.

The band-pass filters must be tuned to the operating channel. Tuning may be done at our factory or can be carried out on site. Clear tuning instructions and also any special tools necessary are supplied along with the combiner.

790719 FM Starpoint combiner, 4 × 5 kW



Technical Data

Type No.	790717	790718	790719
Inputs	2	3	4
Frequency range	87.5 ... 108 MHz		
Insertion loss [1]	< 0.4 dB	< 0.5 dB	< 0.6 dB
Input power	max. 5 kW (per input)		
Channel spacing	> 1.5 MHz		
Isolation	> 35 dB		
VSWR	< 1.1 (at pass band)		
Impedance	50 Ω		
Temperature range	–20 °C ... +50 °C		
Connectors Input/Output	1 5⁄8" EIA/1 5⁄8" EIA	1 5⁄8" EIA/3 1⁄8" EIA	1 5⁄8" EIA/3 1⁄8" EIA
Material	Aluminum (outer conductor) Brass, silver-plated (inner conductor)		
Colour	RAL 7032 (grey)		
Weight	220 kg	335 kg	450 kg
Dimensions (l × w × h)	975 × 695 × 1275 mm	2185 × 695 × 1260 mm	2185 × 695 × 1260 mm
Packing size (l × w × h)	1080 × 890 × 1500 mm	2 × 1080 × 890 × 1500 mm 1 × 1080 × 470 × 1500 mm	2 × 1080 × 890 × 1500 mm

[1] Insertion loss value refers to a 3-dB bandwidth of 800 kHz. Minimum 3-dB bandwidth is 600 kHz.

Directional Filter Combiner

87.5 ... 108 MHz

5 kW

General

The directional filter combiners enable several transmitters to be connected to one common output.
The design offers an expandable system which is constructed in a modular form. The configuration provides the best frequency response and optimum isolation between the inputs.

Design and Construction

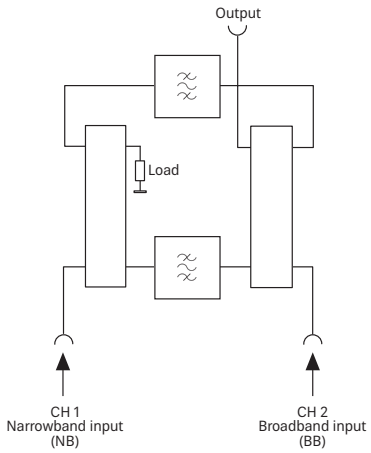
This combiner consists of two temperature stabilised 3-pole band-pass filters, two 3-dB couplers and a balancing load. One input is narrowband (NB) in accordance with the frequency response of the band-pass filters. The second input is broadband (BB) within the operating frequency range of the 3-dB coupler.
The directional filter combiner may be extended by adding further combiners – directional filter combiners as well as starpoint combiners.
Any heat produced is dissipated into the surroundings via heat sinks. Thus the combiner is maintenance-free and especially safe to operate.
The band-pass filters must be tuned to the operating channel. Tuning may be done at our factory or can be carried out on site. Clear tuning instructions and also any special tools necessary are supplied along with the combiner.

726473 FM Directional filter combiner, 5 kW

Technical Data

Type No.	726473	
Inputs	Narrowband input (NB)	Broadband input (BB)
Frequency range	87.5 ... 108 MHz tuned to one channel	87.5–108 MHz free choice of channel
Insertion loss [1]	< 0.35 ... 0.5 dB	< 0.2 dB
Input power	5 kW	15 kW
Channel spacing	> 0.8 MHz	
Isolation	> 30 dB (NB to BB-input) > 50 dB (BB to NB-input)	
VSWR	< 1.1 (at pass band) < 1.25 (at stop band)	
Impedance	50 Ω	
Temperature range	–20 °C ... +50 °C	
Connectors	7/8" EIA flange (NB-input) 1 5/8" EIA flange (BB-input and Output)	
Colour	RAL 7032 (grey)	
Weight	140 kg	
Dimensions (l × w × h)	850 × 560 × 1320 mm	
Packing size (l × w × h)	1015 × 615 × 1400 mm	

[1] Insertion loss and isolation values refer to the min. channel spacing of 0.8 MHz.



Directional Filter Combiner

87.5 ... 108 MHz

10 kW

General

The directional filter combiners enable several transmitters to be connected to one common output.
The design offers an expandable system which is constructed in a modular form. The configuration provides the best frequency response and optimum isolation between the inputs.

Design and Construction

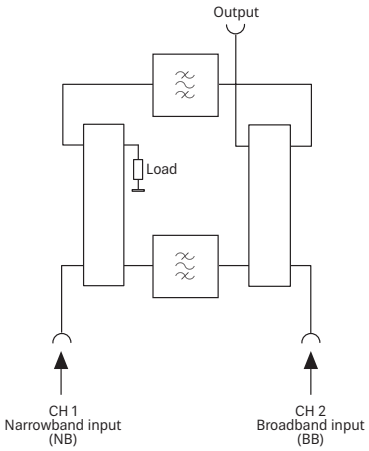
This combiner consists of two temperature stabilised 3-pole band-pass filters, two 3-dB couplers and a balancing load. One input is narrowband (NB) in accordance with the frequency response of the band-pass filters. The second input is broadband (BB) within the operating frequency range of the 3-dB coupler.
The directional filter combiner may be extended by adding further combiners – directional filter combiners as well as starpoint combiners.
Any heat produced is dissipated into the surroundings via heat sinks. Thus the combiner is maintenance free and especially safe to operate.
The band-pass filters must be tuned to the operating channel. Tuning may be done at our factory or can be carried out on site. Clear tuning instructions and also any special tools necessary are supplied along with the combiner.

790573 FM Directional filter combiner, 10 kW
(mirror version of 728393)

Technical Data

Type No.	728393	
Inputs	Narrowband input (NB)	Broadband input (BB)
Frequency range	87.5 ... 108 MHz tuned to one channel	87.5–108 MHz free choice of channel
Insertion loss [1]	< 0.3 ... 0.4 dB	< 0.15 dB
Input power	10 kW	50 kW
Channel spacing	> 0.8 MHz	
Isolation	> 35 dB (NB to BB-input) > 55 dB (BB to NB-input)	
VSWR	< 1.1 (at pass band) < 1.25 (at stop band)	
Impedance	50 Ω	
Temperature range	–20 °C ... +50 °C	
Connectors	1 ⅝" EIA flange (NB-input) 3 ⅛" EIA flange (BB-input and Output)	
Colour	RAL 7032 (grey)	
Weight	290 kg	
Dimensions (l × w × h)	1150 × 695 × 1435 mm	
Packing size (l × w × h)	1350 × 870 × 1620 mm	

[1] Insertion loss and isolation values refer to the min. channel spacing of 0.8 MHz.



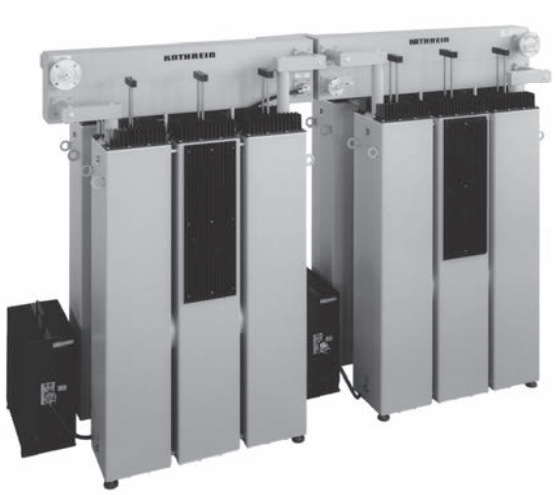
Directional Filter Combiner

87.5 ... 108 MHz

n × 5 kW

General

The directional filter combiners enable several transmitters to be connected to one common output.
The design offers an expandable system which is constructed in a modular form. The configuration provides the best frequency response and optimum isolation between the inputs.



728917 FM Directional filter combiner, 2× 5 kW

Design and Construction

Each combiner module consists of two temperature stabilised 3-pole band-pass filters, two 3-dB couplers and a balancing load. The narrowband inputs (NB) correspond to the frequency response of the band-pass filters. The broadband input (BB) is usable in the operating frequency range of the 3-dB coupler. The impedance at all inputs is independent of the frequency.
The directional filter combiner may be extended by adding further combiner modules. Any heat produced is dissipated into the surroundings via heat sinks. Thus the combiner is maintenance free and especially safe to operate.
The band-pass filters must be tuned to the operating channel. Tuning may be done at our factory or can be carried out on site.
Clear tuning instructions and also any special tools necessary are supplied along with the combiner.

Technical Data

Type No.	728917	730048	792384
Inputs NB/BB	2/1	3/1	4/1
Frequency range	87.5 ... 108 MHz		
Insertion loss [1]	< 0.7 dB	< 0.8 dB	< 0.9 dB
Power NB/BB/Output	5 kW/10 kW/20 kW	5 kW/5 kW/20 kW	5 kW/5 kW/25 kW
Channel spacing	> 0.8 MHz		
Isolation	> 30 dB (NB to BB-input) > 50 dB (NB to NB-input/BB to NB-input)		
VSWR	< 1.1 (at pass band) < 1.25 (at stop band)		
Impedance	50 Ω		
Temperature range	–20 °C ... +50 °C		
Connectors	7/8" EIA flange (NB-input) 1 5/8" EIA flange (BB-input and Output)		
Colour	RAL 7032 (grey)		
Weight	280 kg	430 kg	585 kg
Dimensions (l × w × h)	2000 × 560 × 1320 mm	3000 × 560 × 1320 mm	4000 × 560 × 1320 mm
Packing size (l × w × h)	2× 1015 × 615 × 1400 mm	3× 1015 × 615 × 1400 mm	4× 1015 × 615 × 1400 mm

[1] Insertion loss and isolation values refer to the minimum channel spacing of 0.8 MHz. The insertion loss of the individual inputs vary. A minimum insertion loss of 0.35 dB can be achieved.

Directional Filter Combiner

87.5 ... 108 MHz

n × 10 kW

General

The directional filter combiners enable several transmitters to be connected to one common output.
The design offers an expandable system which is constructed in a modular form. The configuration provides the best frequency response and optimum isolation between the inputs.

Design and Construction

Each combiner module consists of two temperature stabilised 3-pole band-pass filters, two 3-dB couplers and a balancing load. The narrowband inputs (NB) correspond to the frequency response of the band-pass filters. The broadband input (BB) is usable in the operating frequency range of the 3-dB coupler. The impedance at all inputs is independent of the frequency.
The directional filter combiner may be extended by adding further combiner modules. Any heat produced is dissipated into the surroundings via heat sinks. Thus the combiner is maintenance free and especially safe to operate.
The band-pass filters must be tuned to the operating channel. Tuning may be done at our factory or can be carried out on site.
Clear tuning instructions and also any special tools necessary are supplied along with the combiner.

790695 FM Directional filter combiner, 2× 10 kW

Technical Data

Type No.	790695	790709	790785
Inputs NB/BB	2/1	3/1	4/1
Frequency range	87.5 ... 108 MHz		
Insertion loss [1]	< 0.55 dB	< 0.65 dB	< 0.75 dB
Power NB/BB/Output	10 kW/40 kW/60 kW	10 kW/30 kW/60 kW	10 kW/20 kW/60 kW
Channel spacing	> 0.8 MHz		
Isolation	> 35 dB (NB to BB-input) > 55 dB (NB to NB-input/BB to NB-input)		
VSWR	< 1.1 (at pass band) < 1.25 (at stop band)		
Impedance	50 Ω		
Temperature range	–20 °C ... +50 °C		
Connectors	1 ⅝" EIA flange (NB-input) 3 ⅛" EIA flange (BB-input and Output)		
Colour	RAL 7032 (grey)		
Weight	590 kg	890 kg	1190 kg
Dimensions (l × w × h)	2400 × 695 × 1435 mm	3600 × 695 × 1435 mm	4800 × 695 × 1435 mm
Packing size (l × w × h)	2× 1350 × 870 × 1620 mm	3× 1350 × 870 × 1620 mm	4× 1350 × 870 × 1620 mm

[1] Insertion loss and isolation values refer to the minimum channel spacing of 0.8 MHz. The insertion loss of the individual inputs vary. A minimum insertion loss of 0.3 dB can be achieved.

Customized Design

FM directional filter combiner, 2 × 5 kW, for multipattern application

FM starpoint combiner with 6 inputs, 5 kW each

Filter and Combiners VHF, UHF

- Several transmitters can be combined to one common antenna.
- Kathrein supplies products of high quality brands.

DVB-T combiner system, COM-TECH

DAB combiner, COM-TECH

Components for Antenna Systems

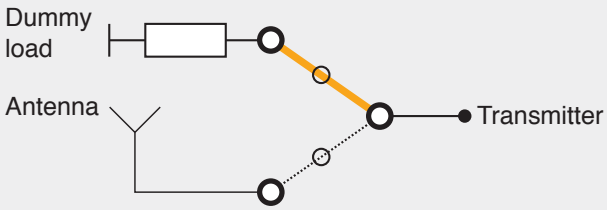
Patch Panels
Dehydrators
Coaxial Cables and Accessories
Direct Access Units
Mounting Hardware
Electrical Adapters

Patch Panels

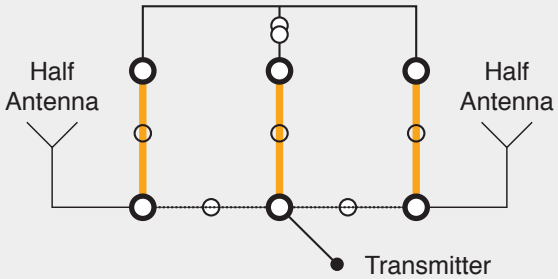
- KATHREIN supplies products of high quality brands.
- Switching device for:
  - different transmitters
  - antenna halves
  - backup systems
  - dummy loads

Easy connection and disconnection of switching ports by special U-Links

Example: 3-ports, 1 U-Link



Example: 6-ports, 3 U-Links



FM switching unit with power measurement unit, Sira

UHF switching unit, Sira

Dehydrators

- KATHREIN supplies products of high quality brands.
- Continuous air pressure in RF transmission lines.
- Prevents the occurance of humidity and condensation.
- Maintenance-free with fully automatic regeneration.
- 19" rack-mounted or wall-mounted.

Typical pressurization system

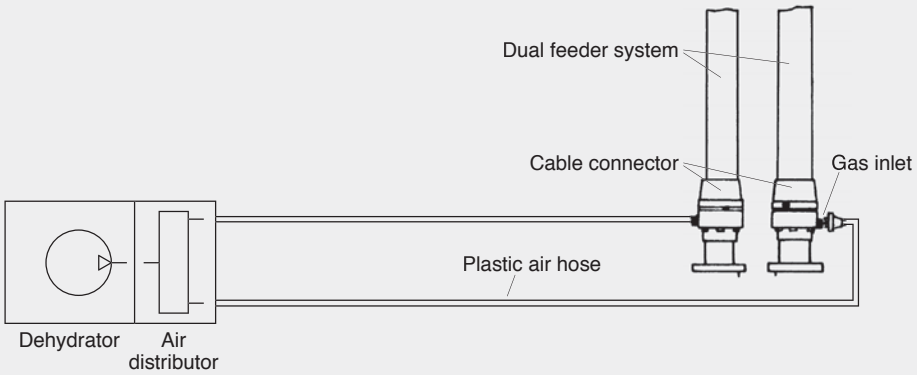
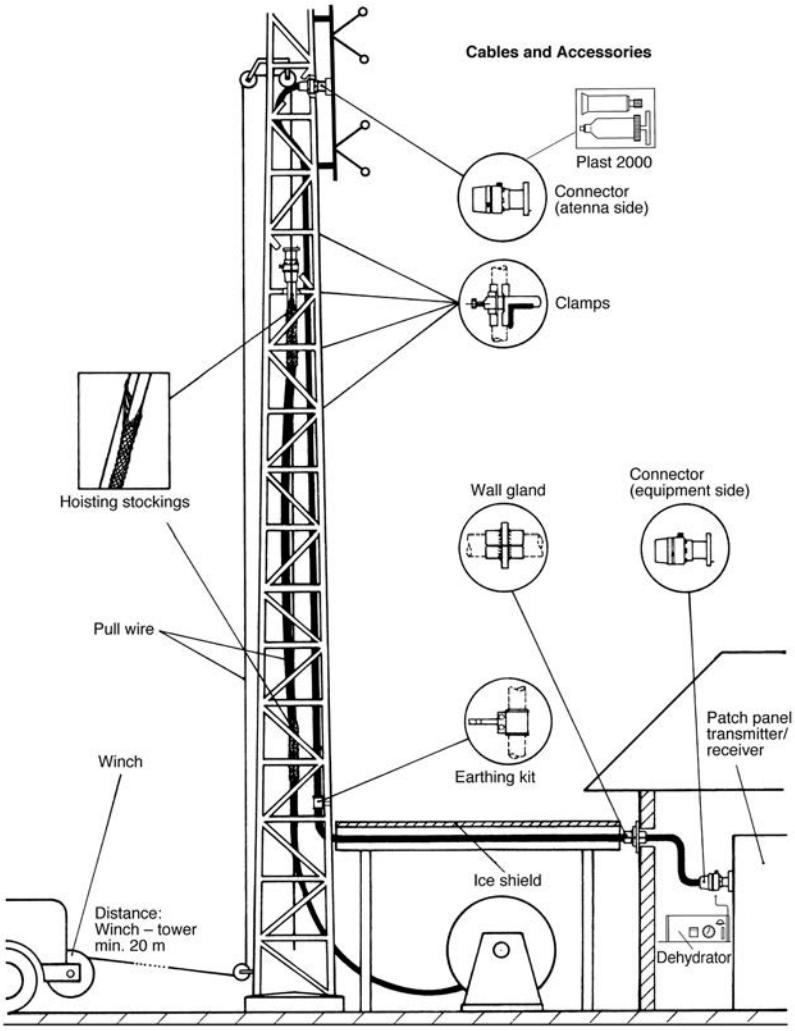


Foto: Cibred

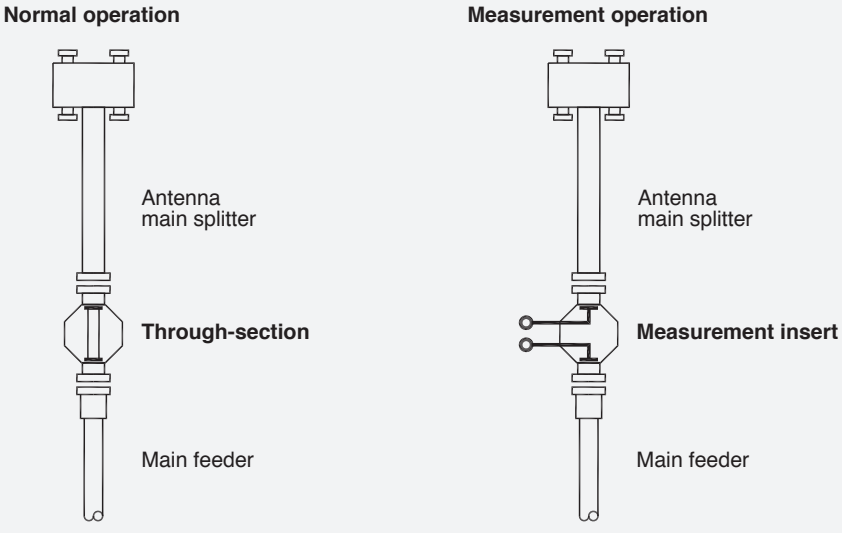
Coaxial Cables and Accessories

- KATHREIN supplies products of high quality brands.
- Branch cables completely configurated, phase-adjusted and fully tested.
- Feeder cables incl. accessories up to 6 ⅛".
- Fire retardant jacket available.
- Air or foam dielectric cables.



Direct Access Units

- KATHREIN supplies products of high quality brands.
- Quick and direct access to feeder cables.
- Accurate measurements of VSWR and electrical length.
- Antenna testing and tuning without dismantling the connected feeders.
- For outdoor application.
- Suitable for all broadcast standards.



Electrical Adapters

Adapters for straight connector to elbow connector
Examples:

7-16 female

⅞" EIA flange

Order No.	Type	Remark
092930	7-16 m/f	EIA elbows do not include coupling element (bullet) – please order separately.
75210216	⅞" EIA f/f	
0921100	13-30 m/f	
0921262	1 ⅝" EIA f/f	

Adapter for 7-16 connector to N-connector

Order No.	Type
092872	7-16 m to N f

The use of elbow adapters

1.

UHF-Panel with straight connector.

2.

Do not forget to put bullet and O-ring for EIA connctions.

3.

UHF-Panel with straight connector and elbow adapter.

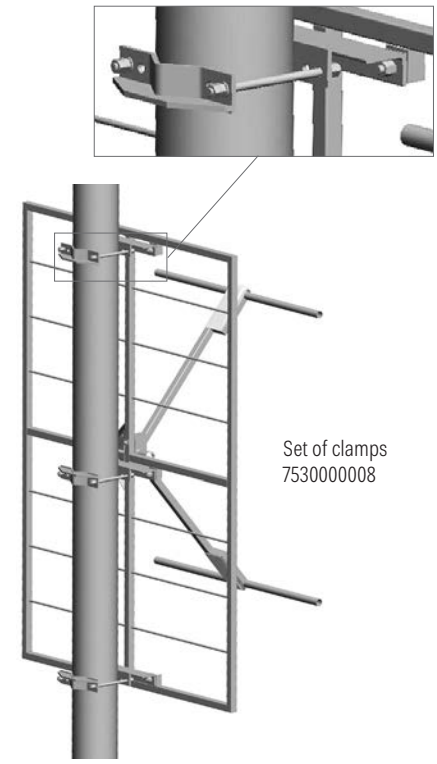
Mounting Hardware for FM Panels

- Components for mounting FM panels to tube masts.
- Material: Hot-dip galvanized steel. Stainless steel bolts and nuts are supplied.

Set of clamps for one horizontal polarized FM panel

Order No.	Suitable for FM panel	Suitable for tube mast of mm ∅	Weight kg
7530000007	7500100022 7500100023 7500100024 601768 601979 601694 75010008 752183	60–115	12
7530000008		115–245	28

Set of clamps
7530000007



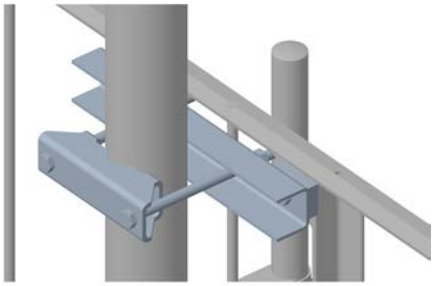
Set of clamps
7530000008

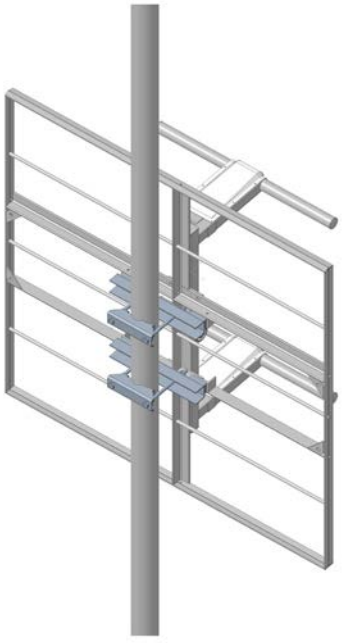
Mounting Hardware for VHF Antennas

Components for mounting VHF antennas to tube masts.

Pair of clamps for one VHF panel

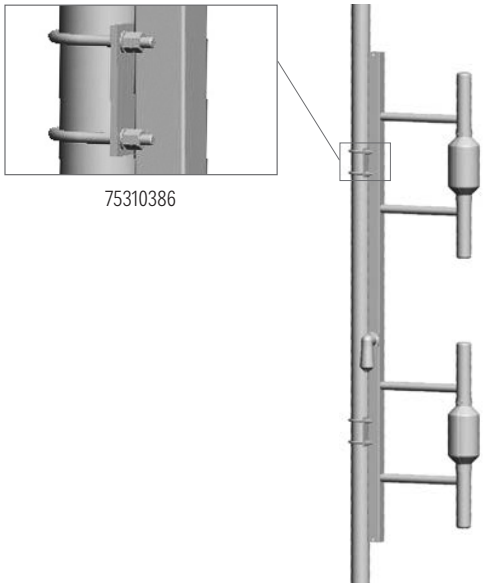
Order No.	Suitable for VHF panel	Suitable for tube mast of mm ∅	Weight kg
7530100035	75010350 75010351 75010352 7500100040	60–115	6.5





Mounting Hardware for VHF Antennas

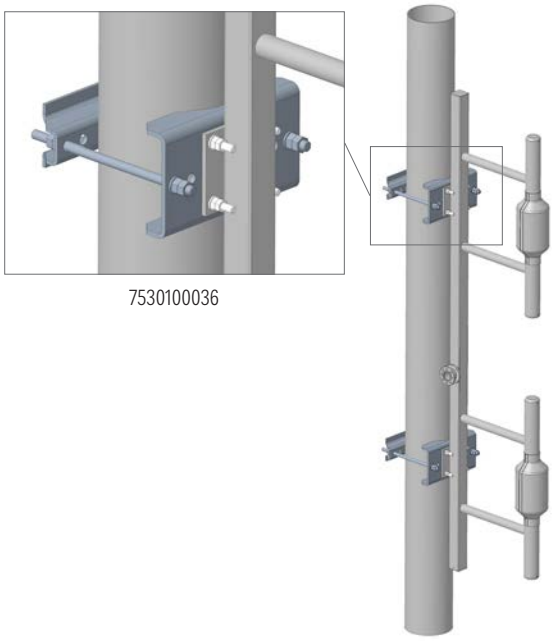
Components for mounting VHF dipole antennas.



75310386

Pairs of clamps for one VHF dipole

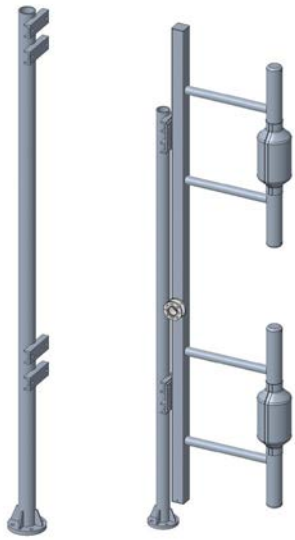
Order No.	Suitable for VHF dipole	Suitable for tube mast of mm ∅	Weight kg
75310386	75010295 75010296 75010297	88.9	1.5
7530100036	75010295 75010296 75010297	115–245	17



7530100036

Support tube with bottom flange mount for VHF dipole

Order No.	Suitable for VHF dipole	Weight kg
7530100042	75010295 75010296 75010297	20



7530100036

Mounting Hardware for UHF Panels with Attachment Bracket

- Components for mounting UHF panels to tube masts.
- Material: Hot-dip galvanized steel. Stainless steel bolts and nuts are supplied.

Pair of clamps 75310413

Set of clamps for one UHF panel

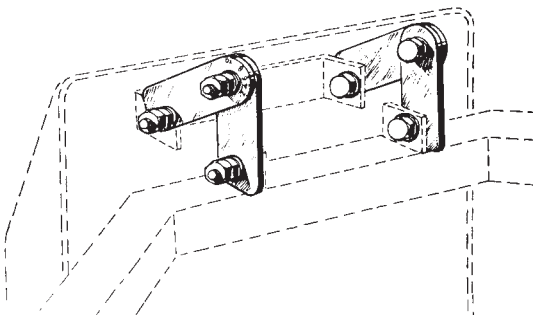
Order No.	Old type number*	Suitable for tube mast of mm ∅	Weight kg
75310411	K611401	40–95	1.6
75310412	K611402	60–115	1.6
75310413	K611403	115–210	4.0
75310414	K611404	210–380	7.2
75310415	K611405	380–521	10.2

* Number only for reference, do not use for ordering!

Tilt brackets (pair)

Order No.	Old type number*	Beam tilt
600504	K61301	down to 10°

* Number only for reference, do not use for ordering!



600504

Mounting Hardware for UHF Panels with Attachment Bracket

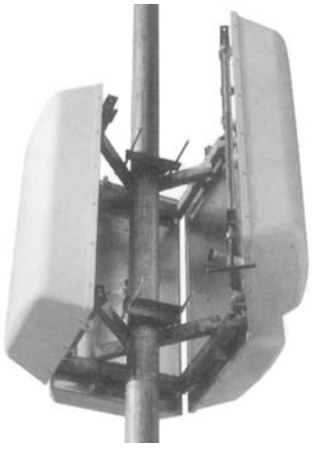
- Components for mounting UHF panels to tube masts.
- Material: Hot-dip galvanized steel. Stainless steel bolts and nuts are supplied.
- Remark: The radius from the center of the array to the reference point of the panel is given by the distance A.

Pair of clamps for two UHF panels with attachment bracket

Order No.		Suitable for tube mast of mm ∅	Weight kg	Distance A/mm	Angle α between directions of the two UHF panels
600843	K611521	70–150	6.4		
600844	K611522	150–300	8.8	266	90°
600845	K611523	300–400	8.8		

Pair of clamps for three UHF panels with attachment bracket

Order No.		Suitable for tube mast of mm ∅	Weight kg	Distance A/mm	Angle α between directions of the three UHF panels
600849	K611541	70–150	8.4		
600850	K611542	150–300	9.2	266	90°
600851	K611543	300–400	9.2		



Pair of clamps for four UHF panels with attachment bracket

Order No.		Suitable for tube mast of mm ∅	Weight kg	Distance A/mm	Angle α between directions of the four UHF panels
600991	K611561	70–150	26	258	90°
600874	K611562	150–260	26	258	90°

Special features: A part of the mount can be swivelled out for easier mast climbing.

Mounting Hardware for UHF Panels with Attachment Plate

- Components for mounting UHF panels to tube masts (Horizontal or vertical polarized).
- Material: Hot-dip galvanized steel. Stainless steel bolts and nuts are supplied.

Pair of clamps for one UHF panel with attachment plate

Order No.	Suitable for tube mast of mm ∅	Weight kg
75310243	40–95	3.5 kg

Pair of clamps for two UHF panels with attachment plate

Order No.	Suitable for tube mast of mm ∅	Weight kg	Distance A/mm	Angle α between directions of the two UHF panels
75310244	40–95	7.0 kg	261	90°

Remark:
The radius from the center of the array to the reference point of the panel is given by the distance A.

Pair of clamps for three UHF panels with attachment plate

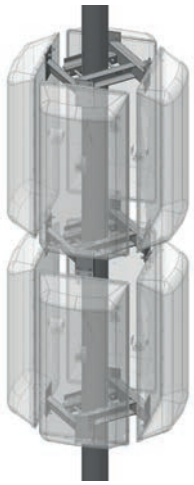
Order No.	Suitable for tube mast of mm ∅	Weight kg	Distance A/mm	Angle α between directions of the three UHF panels
75310245	40–95	12 kg	261	90°

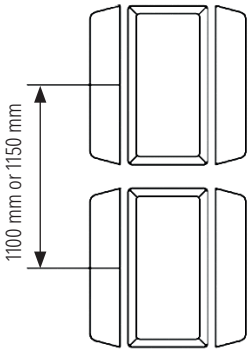
Remark:
The radius from the center of the array to the reference point of the panel is given by the distance A.

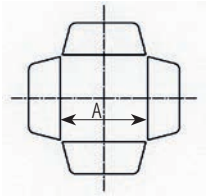
Mounting Hardware for UHF Panels with Attachment Plate

Universal fixation system for UHF panels.

Order No.	Suitable for antenna type	Suitable for tube mast diameter mm	Weight kg	A mm
7530000024	75010210 75010211 75010212 75010213	60–125	9,9	550
7530000028	776165 776202 776167 7500100018 7500100031 7500000044 7500000049	125–245	11,3	







Material: Hot-dip galvanized steel.
Stainless steel bolts and nuts are supplied.

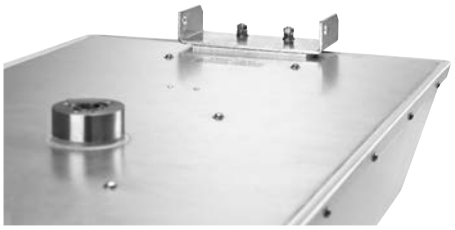
Scope of supply: One piece of clamp. Note: The first bay requires 2 clamps. Additional bays require 1 clamp each. Each bay can be fitted with up to 4 antennas.

Please note The selection of a sufficient tube mast is under the responsibility of the customer. It is necessary to carry out a static and dynamic analysis of the support structure (mast) with the antenna.
Please contact us for the relevant mechanical parameters or refer to the antenna datasheet.

Mounting Hardware for UHF Panels with Attachment Plate

Pair of mechanical adapters
to convert a panel with attachment plate to attachment bracket version.

Scope of supply:
- 2 attachment brackets
- 4 screws
- 4 washers
- 8 nuts
- lubricant



Mechanical adapter mounted on UHF panel.

Order No.	Weight
7530000006	1.5 kg

Mounting Hardware for Power Splitters

Components for mounting power splitters to tube masts.
Stainless steel bolts and nuts are supplied.

Tension band for mounting medium power splitters

Order No.	Suitable for tube mast of mm ∅	Weight kg
759044	30–340	0.65

Mounting Accessories for Antennas

Weather protection caps

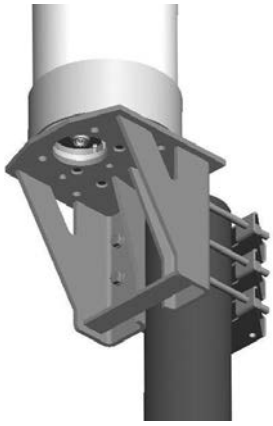
Order No.	Description
021097	straight
021226	elbow

Mounting Hardware for UHF Omnidirectional Antennas

Notes:

The selection of proper tube mast is under responsibility of the customer.
It is necessary to carry out a statical and dynamical analysis of the support structure (mast) with the antenna. Please contact us for the relevant mechanical parameters for the analysis, or refer to the antenna datasheet.

Order No.	Suitable for Antenna type	Clamp range mm	Weight kg
75310335	75010270	75–120	6.0
75310237	75010271	100–160	11.0
75310384	75010272	139–160	17.0
75310322	75010066 75010067	139–160	18.5
75310416	75010068 75010069	wall mount	65.0
75310426	75010068 75010069	top mount	54.0



Steel adapter
75310384

Steel adapter
75310322

Steel adapter
75310416

Steel adapter
75310426

Antenna Monitoring

Solutions for Monitoring Broadcast Antenna Systems

Keeping Control with Monitoring

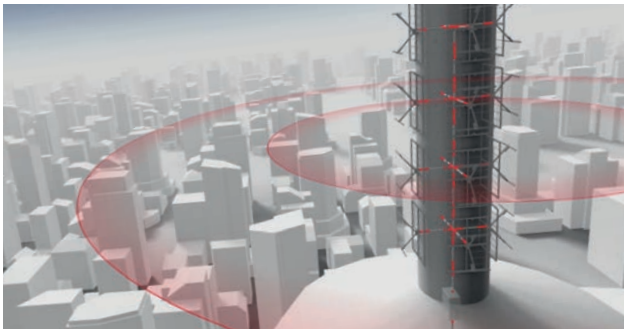
The antenna systems of new transmitting tower "Camlica" (Turkey) are equipped with an Antenna Monitoring System

The Antenna Monitoring System proposed by Kathrein was developed together with the Swiss company "DAC System SA". It measures all important operating parameters of the transmitter station components in real time and compares them with the target values of the controlled operation. All measured data are fully recorded and can be an early indication of possible degradations. The station operator can easily access the measurement results over an IP network at any time. Critical changes in conditions and violations of threshold values release an alarm which is reported via app, text message or email.

The system leads to a significant decrease in the time and costs normally required for the maintenance, as routine checks on transmitter stations can be avoided or reduced. The Monitoring system can be integrated into new antenna systems as well as be retrofitted into an existing system.

Main features

- Early recognition of critical operation status
- Exact localisation of reflecting points or sections
- Proof of SLA
- Scheduled proactive maintenance
- Optimised costs for regular maintenance



Malfunctions are detected directly in the tower, during operations

Antenna Monitoring Power Meter

Key Features

- Permanent monitoring of RF-System chains, combiner, main feeder or antenna.
- Real time RL/VSWR and True RMS power measurement.
- Frequency range: 40 MHz to 2 GHz.
- Trend curves for power and return loss with set thresholds for alarms.
- Display power and VSWR.

Dimensions	19" subrack – 1HU / H 43.7 mm × W 483 mm × D 220 mm
RF interfaces	SMA F-Connector- 4 ports- (2×FWD + RFL)
Data Interface	2× LAN
Serial port	RS-485
Display	Front panel – 2 lines
Operating Temp	–5 to 45 °C (ETSI EN 300 019-2-3)
Safety	EN60950-1 – EN61326-1
Protocols	SNMP v2.0, SNMP v3.0 Client, Agent TCP/IP web page Http/Https web interface
Power Supply	1 × AC 90...264 V, 47....63 Hz – IEC or -48 V DC
Weight	1.5 kg

Power Measurement

Power measurement range	Depending on coupling attenuation of measurement coupler (to be ordered separately)
Type of measurement	True RMS
Typical RF Accuracy	0.5 dB

Software

The software provides real-time Return Loss or VSWR and power value measurements:

- Web GUI with dashboard.
- FWD,REFL and VSWR/RL meters.
- Alarms and warnings thresholds configurable along the line.
- SNMP interface (alarms, values) available.
- TCP/IP – IPv4 – DHCP or Static.

Antenna Monitoring In-Service Time Domain Reflectometer DAC RFHawkeye™

RFHawkeye is registered trademark of DAC System SA, Switzerland

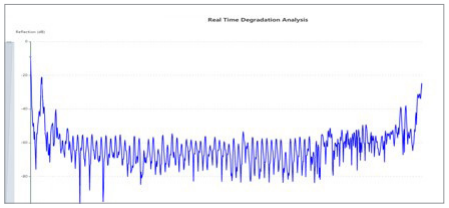
The RFHawkeye™ is an In-Service Time Domain Reflectometer (TDR) system that provides localization of the variation of VSWR/RL degradation in an antenna system, while the RF power is on. Thus, it allows proactive monitoring to prevent antenna system failures. It is simple to install and no tower works are required.
Depending on the Tx power and complexity of the antenna and feeder system, there are two different RFHawkeye™ versions available, i.e. **RFHawkeye™ Compact** and **RFHawkeye™ Standard**.

RFHawkeye™ Compact

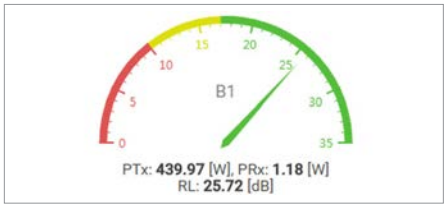
COMPACT RFHAWKEYE

For low/medium power applications, is an economic solution for single feeder systems, and allows monitoring of VSWR degradation. In addition, the system provides the real time RF Power Meter.

Measurements:



IN-SERVICE TDR: Detection and localization of degradations in the transmission line with 20 cm accuracy



POWER METER: Forward/reflected power detection, return loss calculation and display

Basical setup of the RFHawkeye™ Compact system:

Compact Processing Unit (CRFH)
generates the Radar signal and processes the echoes, keeps the database and history, analyzing the data and sending alarms and warnings.

Dimensions	19" subrack – 1HU/H43.7 mm × W 483 mm × D 220 mm
Power supply	1 × AC 90 ...264 V, 47...63 Hz – IEC
Analog interfaces	SMA F-Connector- 2 ports-(FWD + RFL) + 1 RFHawkeye™
Frequencies	FM + UHF
CRFH safety	EN60950-1
Detection of return loss/ VSWR variation	> 1 dB
Smallest detectable reflection	-45 dB
Accuracy of location of return loss/VSWR	+/– 20 cm (resolution 60 cm)

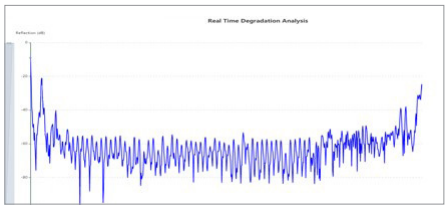
Coupling Unit (CU)
injects the Radar signal into the transmission line, extracts the echoes and delivers to the Processing Unit. Available line sizes: ⅞", 1 ⅝", 3 ⅛".

CU RF connector	2 × N-female/50 ohm
CU return loss/VSWR	> 35 dB/< 1.036:1
CU dimensions	Length: 400 mm

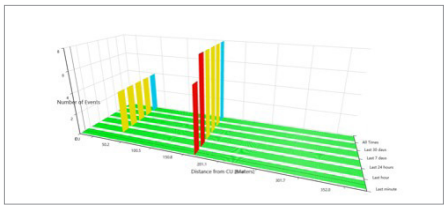
RFHawkeye™ Standard

For medium/high power applications, features indication of VSWR degradation, and arc detection. It is expandable for multiple feeder systems and may be integrated in other monitoring applications.

Measurements:



IN-SERVICE TDR: Detection and localization of degradations in the transmission line with 20 cm accuracy



ARC DETECTION: Detection and localization of fast events (> 100 µs), with 20 cm accuracy

Basical setup of the RFHawkeye™ Standard system:

Processing Unit (RFH PU)
generates the Radar signal and processes the echoes.

Detection of return loss/ VSWR variation	> 1 dB
Sparc detection	Detects and localizes 100% of arcs or arc bursts > 100 µs
Smallest detectable reflection	–45 dB
Accuracy of location of return loss/VSWR	+/– 20 cm (resolution 60 cm)
PU power consumption	30 Watt
PU dimensions	19" subrack – 1HU/H43.7 mm × W 483 mm × D 220 mm
PU weight	2700 g
PU safety	EN60950-1
PU RF connector	2 × N-female/50 ohm
PU power supply	110/220 VAC (Redundant)

Coupling Unit (CU)
injects the Radar signal into the transmission line, extracts the echoes and delivers to the Processing Unit. Available line sizes: ⅞", 1 ⅝", 3 ⅛", 4 ½", 6 ⅛".

CU RF connector	2 × N-female/50 ohm
CU return loss/VSWR	> 35 dB/< 1.036:1
CU dimensions	Length: 400 mm

Power Meter (data see page 99)
is the controller of the system, provides the UI, keeps the database and history, analyzes the data and triggers the alarms.

Kathrein Signal Analyser

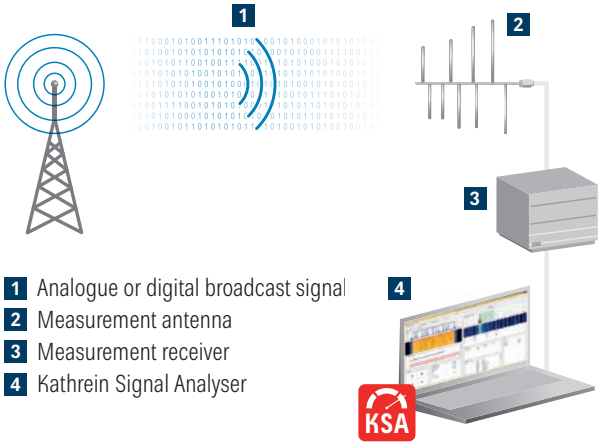
Broadcast Signal Analysis System based on SDR and digital broadband receiver

Kathrein is presenting a high-performance solution to analyse the signals of broadcasting networks. The measurement and investigation tool for analogue and digital broadcasting – Kathrein Signal Analyser KSA – is a powerful and complete system to assist through any phase of radio network planning, realisation and maintenance, as well as in the quality assurance. Radio frequency (RF) and quality of service (QoS) measurements can be done quickly and seamlessly for various broadcast technologies.

Advanced digital signal processing algorithms
Kathrein Signal Analyser strictly follows the concept of SDR (Software Defined Radio). The input with high quality I/Q-data comes from a suitable test receiver. Demodulation, channel decoding and measurement of all relevant parameters, as well as generation of statistics and graphics, are performed by the Kathrein Signal Analyser software. Advanced digital signal processing algorithms allow robust and precise measurements, both in stationary and mobile environments.

Optimized for mobile use
The concept of software-defined radio provides maximum flexibility and allows measurement of multiple technologies with one hardware setup. Together with the flexible post-processing software, user-friendly interface, and navigation functions implemented, Kathrein Signal Analyser is optimally suited for drive tests.

Functionality



1 Analogue or digital broadcast signal
2 Measurement antenna
3 Measurement receiver
4 Kathrein Signal Analyser

- RF Level and QoS
- Spectrum
- Constellation
- Channel impulse response
- Waterfall diagram
- and many more

System Setup and Hardware
The Kathrein Signal Analyser system setup requires a basic software module, the KSA Basic Module:
Order No. 7620100009

Kathrein Signal Analyser is hardware independent. The following RF frontend receivers are supported:
- Precision Wave BR-VBI
- Narda Signal Shark with option Vita 49
- Rohde&Schwarz TSMW with option K1
- IZT R3000

Measure
The measurement system stores and decodes measured data of mobile, as well as stationary and long-term measurements. Powerful channel-scans give a fast overview over the band. Radiation pattern and height profile can be recorded. GPS and other external sensors to capture supplemental data are supported. Many other analysis features are included.

The following modules for broadcast technologies can be implemented:
- FM
- DAB/DAB+
- DVB-T
- DVB-T2
- LTE FeMBMS
- ATSC 3.0 (planned)

Export and Review function
Various export and review functions are available for the different software modules, to visualize the measurement with all parameters individually, and to investigate parameters in detail after the measurement.

Software Support Service
Kathrein offers support contracts which may include software maintenance and updates, as well as operational support. One year of support is included when purchasing.

Kathrein Signal Analyser Measure FM

Software for measuring and analysing FM signals.
Order No. 7620100005

Key Features

- FM spectrum view
- AM spectrum view of FM channel
- RDS Quality of Service parameters
- Eye pattern of RDS signal
- Channel allocation measurement mode
- Export function for txt file

RF Parameters

- FM spectrum
- Rx level in dBm, dBuV or dBuV/m

Quality

- Frequency deviation (Peak, RMS, 19 kHz Pilot, RDS)
- Distortion level
- MPX power
- AM spectrum for every FM channel

RDS Measurement and Analysis

- RDS BER
- RDS BLER
- RDS text
- RDS content
- Eye pattern of RDS signal

Special Measurement Modes

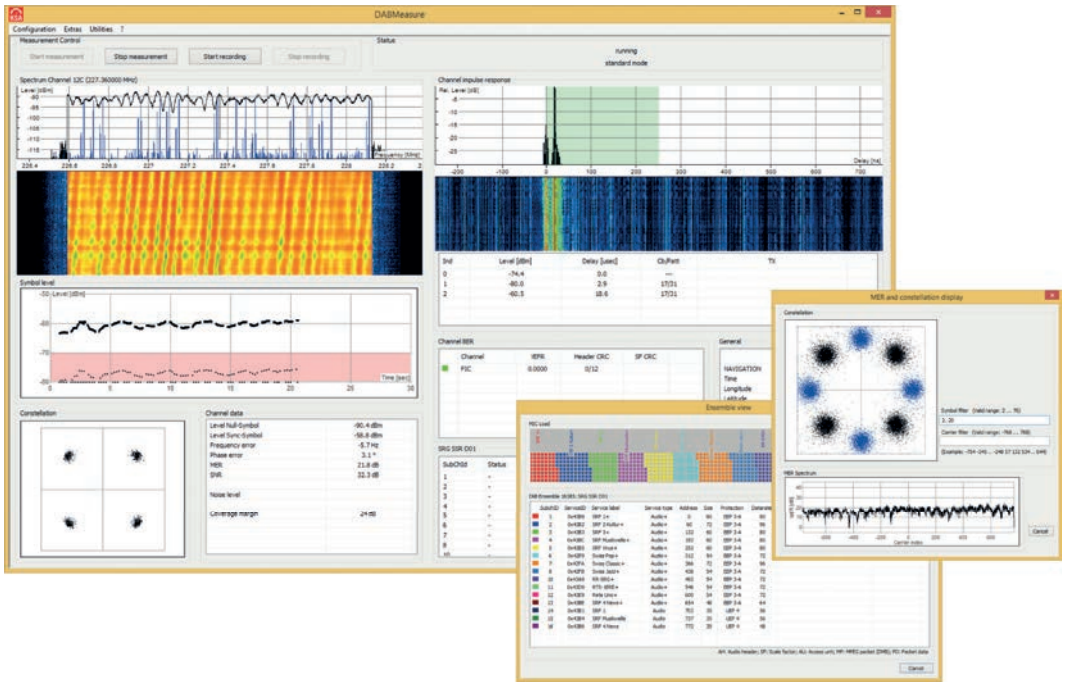
- Fixed time measurement
- Height profile measurement
- Azimuth pattern measurement
- Channel allocation measurement

Kathrein Signal Analyser
Measure DAB/DAB+

Software for measuring and analysing DAB/DAB+ signals.
Order No. 7620100007

Key Features
- Coverage margin calculation
- Channel scan
- Fast level measurement mode
- TII analysis
- Antenna monitor: Height profile and radiation pattern
- Export function for txt file, MapInfo, kml and CHIRplus_BC
- Review function for replaying recorded measurement data, referenced to a map

Supported Standards
- DAB: EN 300 401
- DAB+: TS 102 563
- DMB: TS 102 427



RF Parameters
- Spectrum
- Channel impulse response (CIR): graphical overview, table overview, level and delay analysis
- Level
  Null symbol, sync symbol
- Frequency error
- Phase error
- Modulation error ratio (MER)
- Signal to noise ratio (SNR)
- Constellation diagrams
- Transmitter identification
- Coverage reserve
- Symbol quality

Channel BER
- VEFR FIC channel
- VEFR per subchannel
- BER of DMB streams

DAB+ streams
- Viterbi Error Flag Ratio VEFR
- Pre Reed Solomon BER
- Post Reed Solomon BER
- AU CRC failure

Ensemble
Ensemble and service labels

More Features
- Symbol quality measurement
- DMB info
- DAB+ info
- DAB packet data information
- Coverage reserve
- FIG info
- TII table
- Fast level measurement mode
- Channel scan

Kathrein Signal Analyser
Measure DVB-T

Software for measuring and analysing DVB-T signals.
Order No. 7520100003

Key Features
- Coverage margin
- Channel scan/measure
- Sync analysis
- Two channel diversity
- Antenna monitor: Height profile and radiation pattern
- Export function for txt file, MapInfo, kml and CHIRplus_BC

Supported Standards
DVB-T: EN 302 744/302 304

RF Parameters
- Spectrum
- Channel impulse response (CIR): graphical overview, table overview, level and delay analysis
- Channel result
- RX level
- Symbol level
- Constellation diagrams
- Channel rise time (CRT)
- Frequency error

Quality
- BER PreViterbi
- BER PreRS
- BER PostRS
- SINR
- MER

TS Analysis
- Number of transport errors
- Number of sync byte errors
- Number of re-sync events
- Number of sync loss events
- Sync OK state length
- Sync fail state length
- PAT CRC failures
- CAT CRC failures
- PMT CRC failures
- TS error mask

Diversity Mode
- Fixed antenna 0
- Fixed antenna 1
- Maximum ratio
- Equal gain
- Subcarrier selection
- Antenna selection

More Features
- Show PAT
- Show TPS
- Show coverage margin
- Sync analysis
- Extended CIR
- Spectrum measurements
- Antenna monitor
- Channel scan

Kathrein Signal Analyser Measure DVB-T2

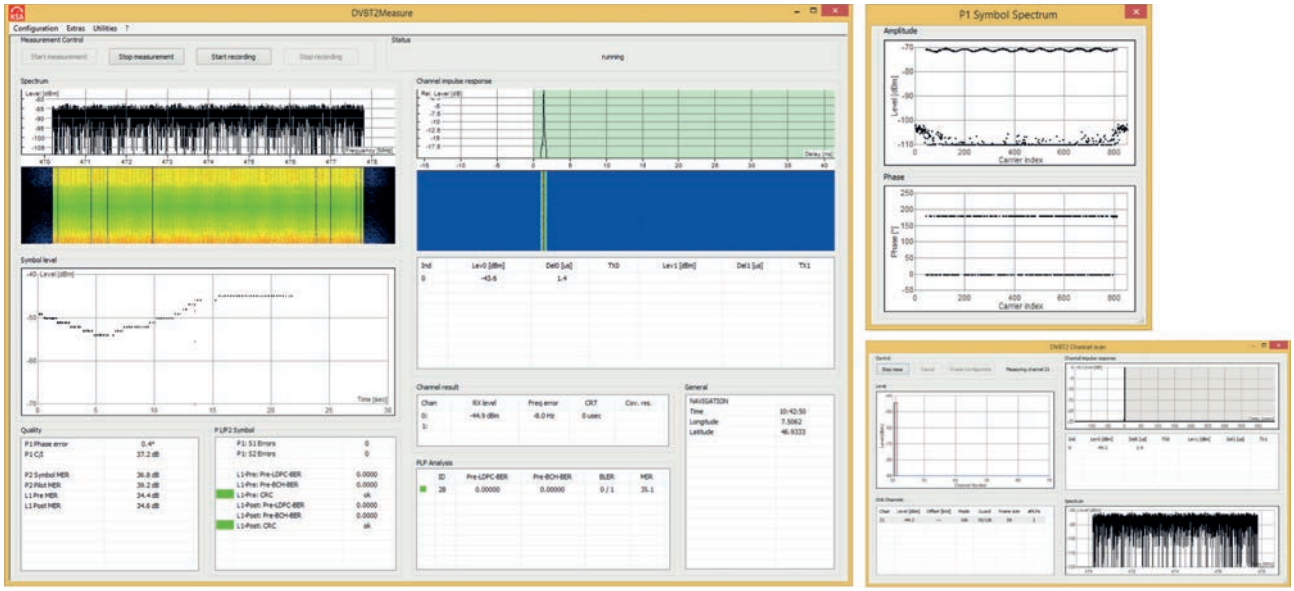
Software for measuring and analysing DVB-T2 signals.
Order No. 7620100011

Key Features

- Coverage margin
- Channel scan/measure
- Sync analysis
- Two channel diversity
- Antenna monitor: height profile and radiation pattern
- Export function for txt file, MapInfo, kml and CHIRplus_BC

Supported Standard

DVB-T2: EN 302 755



RF Parameters

- Spectrum (all DVB-T2 bandwidths)
- Channel impulse response (CIR): graphical overview, table overview, level and delay analysis
- Channel result
- Symbol level
- Constellation diagrams: pilots-1st-P2-symbol, L1 pre signalling, L1 post signalling, per PLP
- Channel rise time (CRT)
- Frequency error

Quality

- P1 phase error
- P1 channel/interference (C/I)
- P2 symbol MER
- P2 Pilot MER
- L1 pre signalling MER
- L1 post siganlling MER

P1 Symbol

- Spectrum
- Phase
- C/I

P1/P2 Symbol

- P1: S1/S2 errors
- L1 pre-signalling: pre LDPC-BER
- L1 pre-signalling: pre BCH-BER
- L1 pre: CRC check
- L1 post: pre LDPC-BER
- L1 post: pre BCH-BER
- L1 post: CRC check

Multiple PLP Analysis

- Pre LDPC-BER per PLP
- Pre BCH-BER per PLP
- Failed FEC blocks per PLP
- MER per PLP

Diversity Mode

- Fixed antenna 0/1
- Maximum ratio
- Equal gain
- Subcarrier selection
- Antenna selection

L1 Pre-Signalling Information

- Transmissing type
- Extended carrier mode used/not used
- S1/S2
- Guard interval
- PAPR used/not used
- L1 modulation
- L1 coding
- Pilot Pattern (PP)
- Cell/network/T2 system ID
- Number of data symbols

L1 Post-Signalling

- Frame ID
- Number of PLP
- PLP ID
- PLP type
- Payload type
- FF flag
- First RFIDX
- First frame IDX
- PLP group ID
- PLP code rate
- PLP modulation
- Constellation rotation used/not used
- PLP FEC type
- PLP number block max
- Frame interval
- Time interleaving length
- Time interleaving type
- In-band signalling flag

Kathrein Signal Analyser
LTE Scanner FeMBMS

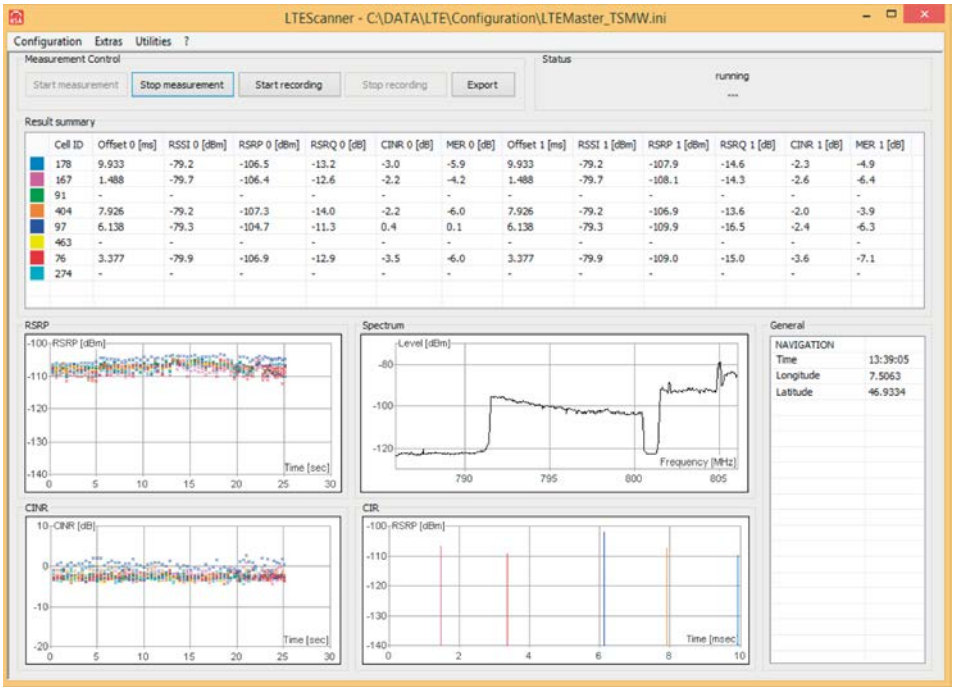
Software for measuring and analysing FeMBMS signals.
Order No. 7620100017

Key Features

- Export function for txt file, MapInfo, kml and CHIRplus_BC
- Review function for replaying recorded measurement data, referenced to a map

Standard

- ETSI TS 136 211
- ETSI TS 136 212



LTE Parameters and Graphs

- Physical Cell Identifier PCI
- Received Signal Strength Indicator RSSI
- Reference Symbol Received Power RSRP
- RSRP port 0 and port 1
- Reference Symbol Received Quality RSRQ
- Reference symbol CINR
- Modulation error ratio MER
- Time offset
- Spectrum
- Channel impulse response
- Constellation
- Channel impulse response
- SFN ID
- Channel BER/BLER: PBCH, PCFICH, PDCCH, PDSCH, PMCCH, PMTCH

FeMBMS Parameters and Graphs

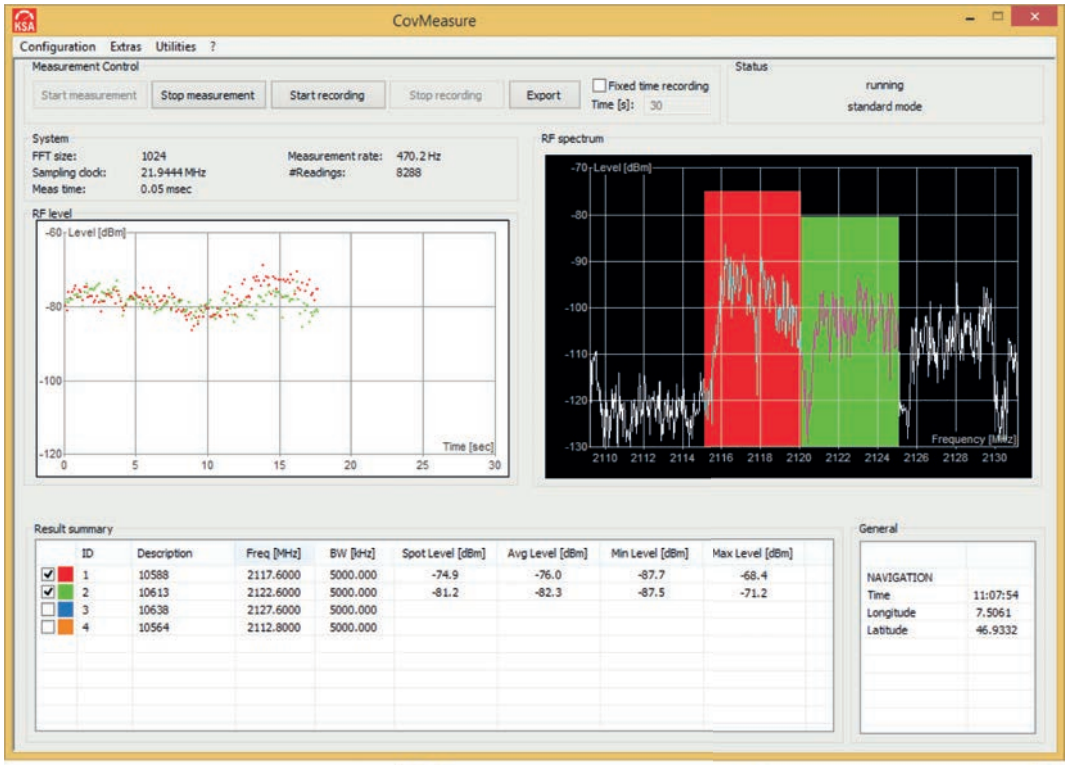
- MBSFN symbol
- MER
- Constellation

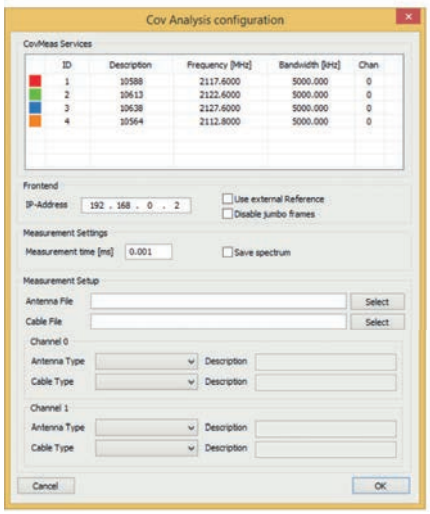
Kathrein Signal Analyser
Coverage Measure

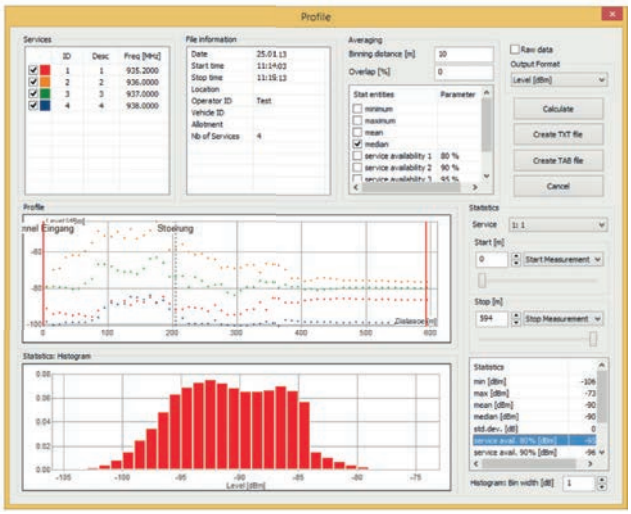
The software is able to measure a number of channels with a certain bandwith within the acquisition bandwith of the receiver (eg. 24MHz).
Order No. 7620100015

Key Features

- Very high speed channel measurement
- Free definable number of channels
- Free definable bandwith of a certain channel
- Export function for txt file, MapInfo







Kathrein Signal Analyser
Measure DxB Scanner

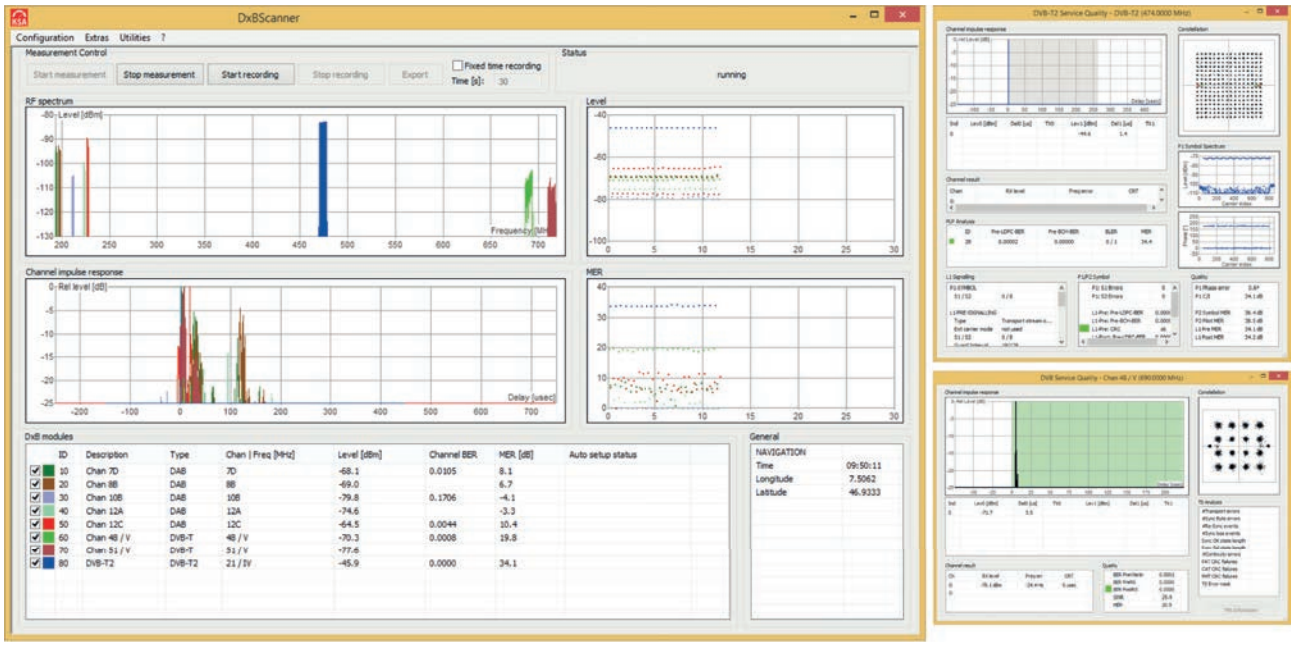
Software for measuring and analysing DxB (DVB-T, DVB-T2, DAB and DAB+) signals of multiple MUX and different technologies.
With Channel scan and Auto Setup mode, the configuration can be done easily without knowledge of detailed parameters of the DxB signal.
Order No. 7620100013

Key Features

- Parallel measurement of multiple MUX and different technologies with just one software
- Detail view for each channel
- Channel scan and auto setup mode
- Channel diversity for DVB-T/DVB-T2
- Antenna monitor: Height profile and radiation pattern
- Export function for txt file, MapInfo, kml and CHIRplus_BC

Supported Standards

- DVB-T2: EN 302 755
- DVB-T: EN 302 744/302 304
- DAB: EN 300 401
- DAB+: TS 102 563



RF Parameters

- RF spectrum
- Channel impulse response (CIR): graphical overview, table overview, level and delay analysis
- Channel result
- Symbol level
- Constellation diagrams
- MER
- Frequency error

Special Measurement Modes

- Channel scan
- Antenna monitor for height profile

DVB-T2

- Quality:
  P1: phase error, C/I
  P2: symbol MER, Pilot MER
  L1: pre MER, post MER
- P1/P2 symbol:
  P1: S1/S2 errors
  L1 pre: pre LDPC BER, pre BCH BER
  L1 pre: CRC check
  L1 post: pre LDPC BER, pre BCH BER
  L1 post: CRC check
  Detailed L1 pre-signalling information
  Detailed L1 post-signalling information
- PLP analysis:
  Pre LDPC-BER per PLP
  Pre BCH-BER per PLP
  Failed FEC blocks per PLP
  MER per PLP

DVB-T

- Quality:
  BER PreViterbi, PreRS, PostRS, SINR, MER
- TS analysis: number of transport and sync, byte errors, number of re-sync and sync loss events, PAT/CAT/PMT CRC failures
- TPS information

DAB(+)

- Quality: level null/sync symbol, MER, SNR, transmitter identification
- BER measurements: VEFR FIC and per sub-channel, Viterbi Error Flag Ratio VEFR, pre/post Reed Solomon BER, AU CRC failure

Broadcast Receiver BR-VBI

BR-VBI is a digital broadcast receiver allowing measurements and supervision of broadcast networks from 400 kHz up to 950 MHz. BR-VBI is natively supported by the Kathrein Signal Analyzer (KSA) software which is an ideal combination for spectrum and channel impulse response analysis, stationary and mobile service performance estimation, and many more use-cases.

In combination with the Kathrein Signal Analyzer (KSA) software, the following broadcast technologies are supported as ITU compliant measurements:

AM, FM, DAB/DAB+, DMB, DVB-T, DVB-T2, FeMBMS (5G Broadcast), LTE, ATSC

The BR-VBI contains two selectable RF input paths, 0.4–108 MHz and 0.4–950 MHz, each optimized for two different frequency ranges.
The best dynamic range for a wide area of input signal levels is achieved by switchable input attenuators and low-noise amplifiers. Multi-stage input signal filtering guarantees optimal channel selectivity for a convincing measurement experience.
A fast-attack overdrive prevention circuit attenuates the input level to adequate signal levels. This enables accurate drive tests in which signal levels fluctuate strongly.
The device works as a stand-alone receiver. A 1-Gbit Ethernet interface is used for I/Q data streaming and remote control. A well-established and open-source driven API called “libIIO” for data streaming and device configuration. libIIO is widely used and natively supported out-of-the-box by the most popular signal processing software (KSA, Matlab, GNU Radio, and many others).

BR-VBI Module 072100078

Key Features

- Particularly suitable for integrating into existing measurement systems. Perfectly shielded housing, heat-sink for ambient temperatures up to 50°C, RF connectors SMA female.
- Dimensions: 154 × 209 × 51 mm (L × B × H)

BR-VBI Halfrack Option 072100113

Key Features

- Particularly suitable for vehicular use-cases. Includes rugged housing, built-in cooling fan, RF connectors N-female.
- Dimensions: 256 × 324 × 115 mm (L × B × H)

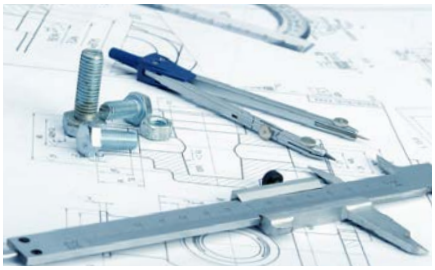
General Hardware and RF Specificatios

Typical power consumption	24 W max
Module Supply Voltage	8–15 V DC
Mains Power Supply	100–240 V AC, 50/60 Hz to 12 V DC
GPS Antenna	3.3 V LNA bias, 1.5 m cable
Operating temperature	0–50 °C
MTBF	260.000 h
RF port impedance	50 Ohms
RF port input reflection (S11)	< –10 dB
RF input power	< 15 dBm nominal; 20 dBm max.
ADC Sampling Rate	276.48 MHz
ADC Resolution	12 Bit
Noise figure RX input 0.4–108 MHz	15 MHz: 6.4 dB
	86 MHz: 5.3 dB
	100 MHz: 6.1 dB
Noise figure RX input 0.4–950 MHz	150 MHz: 2.8 dB
	205 MHz: 4.9 dB
	370 MHz: 3.9 dB
	480 MHz: 3.2 dB
	650 MHz: 3.2 dB
	890 MHz: 4.5 dB

Included are:

- Power Cable 12 VDC, 2.5 m, for car auxiliary power outlet connector
- Power Cable 230 VAC, 0.5 m
- AC-DC Industrial desktop adaptor 110/230 VAC – 12 VDC
- GPS Antenna

Kathrein Broadcast Services



All from one source

KATHREIN offers a complete service portfolio for terrestrial broadcast antenna and transmitter systems

The spectrum of our services ranges from planning to implementation to operation. This also covers maintenance, troubleshooting and repair. We care for all components of the complete system, i.e. the antenna array, transmitters, RF-cables, multiplexers and switching panels as well as measuring and monitoring systems. Since numerous broadcast antenna systems are equipped with Kathrein antennas all over the world, we bring in very good technical expertise and knowledge about antenna towers and sites. Also for transmitters we bring expertise for various types and brands. A large number of our professional staff have official certifications to work high up on antenna towers.

Consultancy and Training

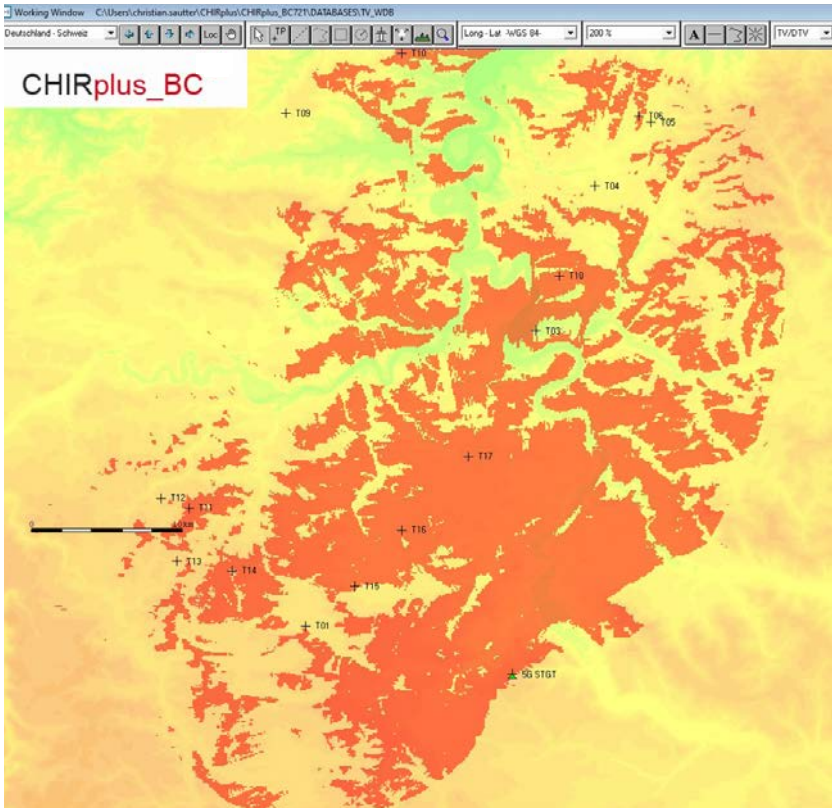
KATHREIN also delivers knowlegde about broadcast technology, system planning and hardware handling.

- Basics and technology trainings
- Service and measurement training
- Product handling and installation training
- Webinars
- Antenna archive from 1967 until today: technical documentations, design drawings of antennas and systems, KATHREIN and other German manufacturers

Network Rollout Planning/Survey/Measurements

KATHREIN is ready to optimize the coverage and performance of your broadcast network.

- Site acquisition and survey
- Coverage calculations with CHIRplus_BC
- Network rollout planning
- Complex RF calculations
- Signal measurement campaigns and drive tests



Antenna Project Planning and Antenna Installation

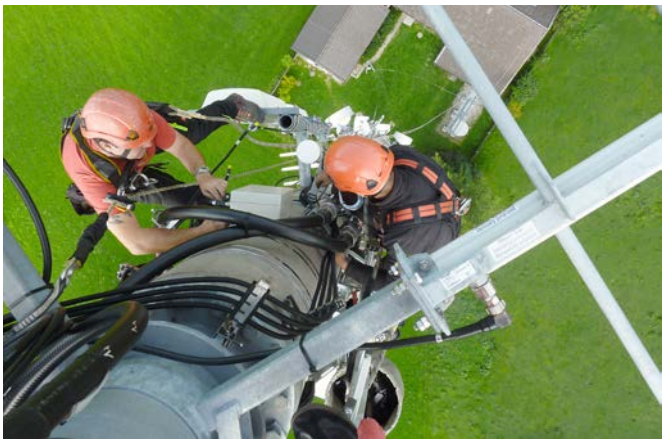
KATHREIN's team of RF project enginners manage all kinds of antenna implementation challenges. We and our partners completely realize antenna installation turnkey projects, even under the most challenging conditions.

Planning

- Site surveys for measurements
- RF system calculation and integration
- Structural calculations (static/dynamic)
- Complete technical proposals

Installation

- Turnkey project management
- Hardware and accessories delivery
- Security management
- Installation and commissioning
- Extended guarantee
- UAV measurements

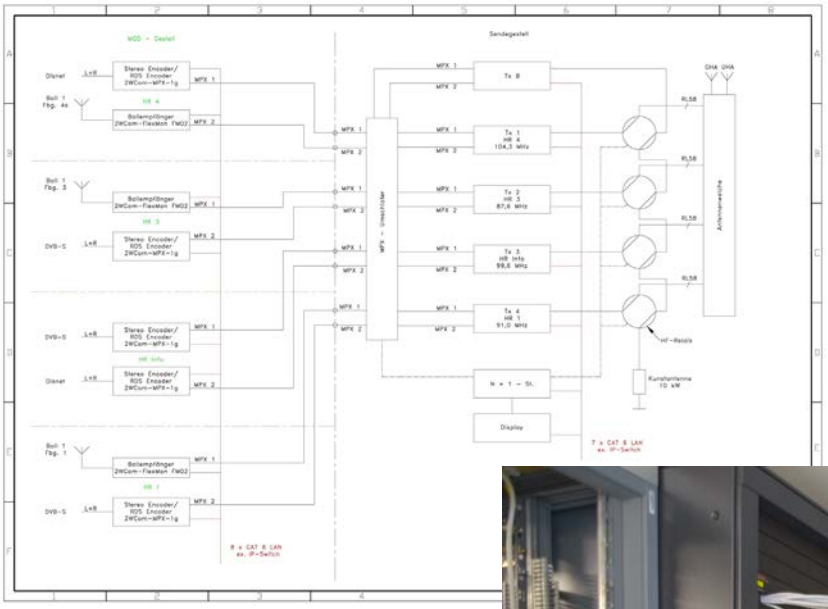


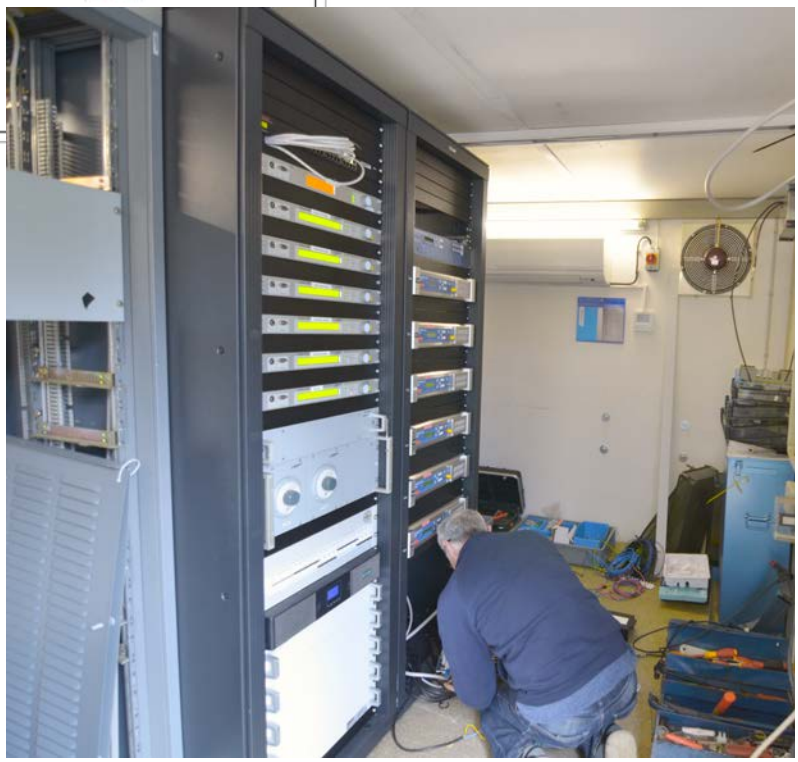
Transmitter Project Planning and Transmitter Installation

KATHREIN can offer transmitter system implementation independently of product type and brand.

Planning

- Site surveys for measurements
- RF system calculation and integration
- Power supply and cooling system planning
- Static building assessment





Installation

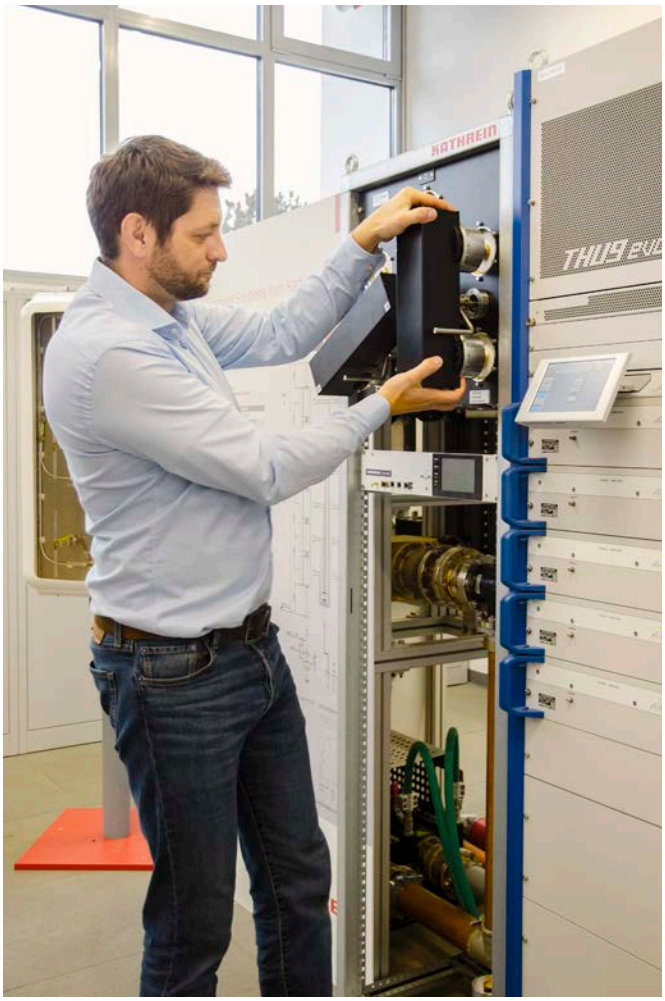
- Turnkey project management
- Hardware and accessories delivery
- Installation and commissioning
- Electrical and cooling systems works
- Integration in NMS

Antenna and Transmitter Operation and Maintenance, Repair and Spare Logistics

KATHREIN helps you to preserve your assets and ensures high system availability. Together with partners we are able to offer 24/7 readiness combined with short response time. We keep a stock of various antenna and combiner parts. Faulty products may be fixed on-site or in our own workshop and transmitter repair shop.

Operation and Maintenance

- On-site service, on demand or frame contracts
- Regular checks of RF components and mechanical structure
- Regular supervision and maintenance
- Operation parameter realtime monitoring
- Data logging and reports



Repair and Spare Logistics

- Emergency repair service
- Frame contracts for service incidents
- Troubleshooting and fault elimination
- Storing of consumable parts
- Spare part and RMA management

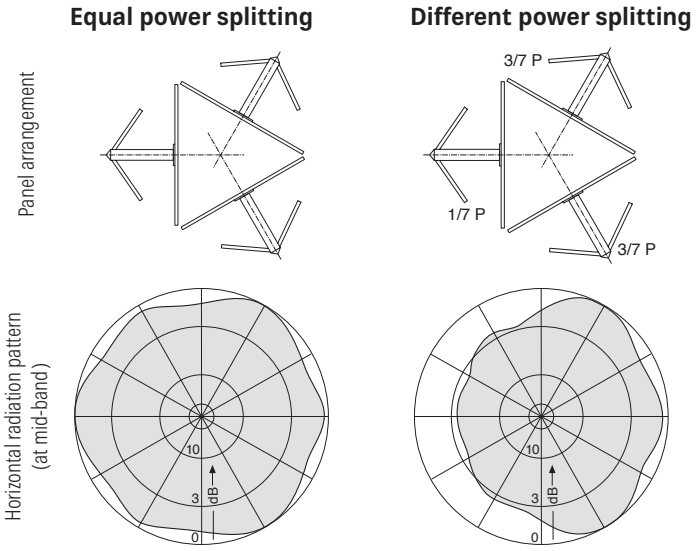
Technical Annex

Antenna System Configurations

Kathrein offers a wide variety of antenna systems, allowing the broadcaster to select the optimum configuration for each station. Following is an overview of various arrays and their typical characteristics and advantages.

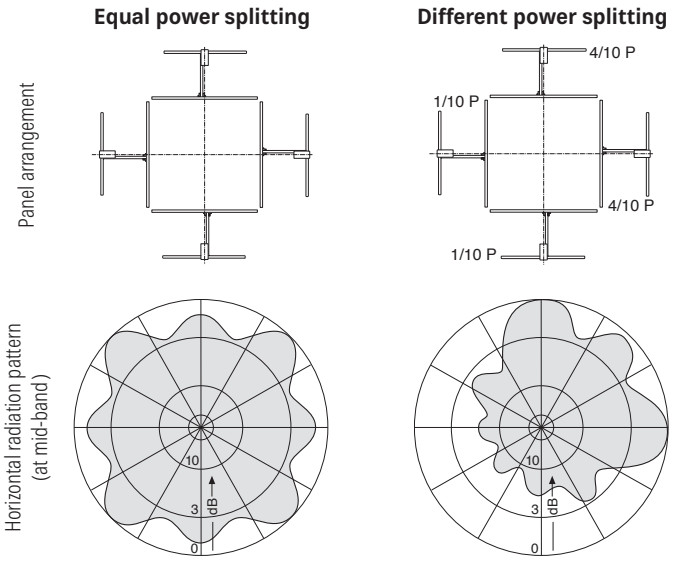
Three-sided Panel Array

The individual panels are designed to cover an azimuth sector of 120 degrees and three panels fed with equal power will result in an omni-directional pattern. Directional horizontal radiation patterns can be achieved by using a different panel arrangement and/or feeding the panels with unequal power levels.
This arrangement is especially suitable for triangular and round towers or masts.



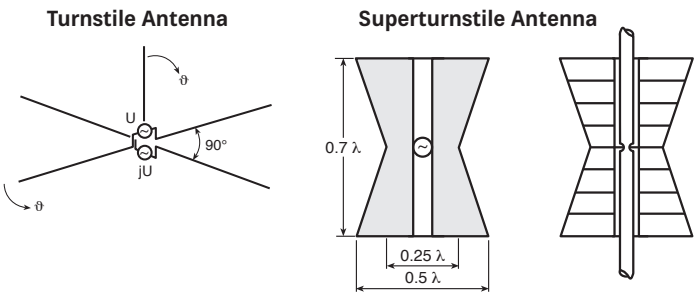
Four-sided Panel Array

The individual panels are designed to cover an azimuth sector of 90 degrees so that four panels fed with equal power will produce an omni-directional pattern. Again, directional horizontal radiation pattern can be produced with other panel arrangements and unequal power fed to various panels in the array.
This configuration is especially suitable for square towers or masts.
These broadband systems can be supplied for any polarization.



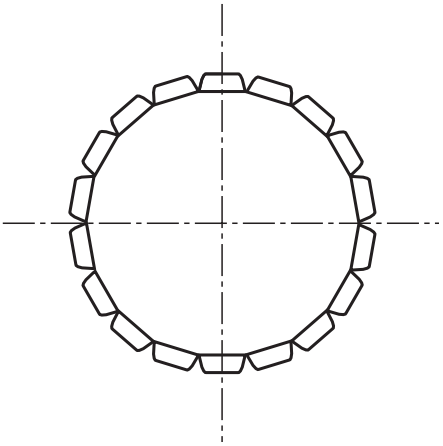
Turnstile and Superturnstile-Antennas

This type of antenna (also known as a “batwing”) produces an excellent horizontally polarized omni-directional pattern.
A metal mast can be placed in the center of a turnstile-antenna as long as the mast has a small diameter relative to the wave-length of the signal.



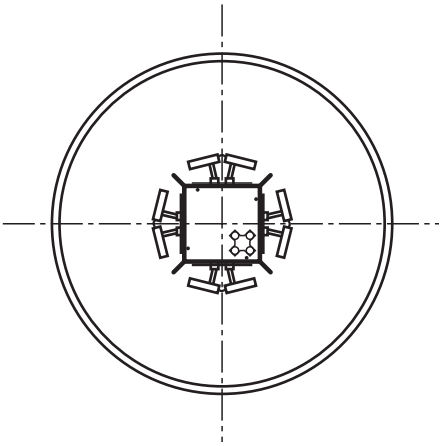
Multi-panel Array

If the cross section of the mast or tower is more than one wavelength it is impossible to obtain a satisfactory omni-directional horizontal radiation pattern using three or four panels per bay.
However, an omni pattern can be achieved by increasing the number of panels per bay.
The horizontal patterns of these "multi-panel" arrays will vary with frequency, but they can be designed for excellent omni performance over limited bandwidths.
Multi-panel arrays are available with horizontal or vertical polarization.



Special Antenna Systems Inside Self-supporting GRP Towers

A large-diameter GRP (Glass Reinforced Plastic) pipe can be utilized to substitute a metal support structure and enclose an antenna system.
The GRP pipe is transparent to RF energy and it allows the antenna engineer to use an optimized antenna design with a small cross-section at the center of the pipe. Antenna elements may be dipoles or turnstiles.
The GRP pipe also provides excellent protection against severe environmental conditions such as rain, ice, snow, wind and corrosive agents and it allows access for inspections and maintenance at any time.
Horizontally and vertically polarized systems can be supplied.

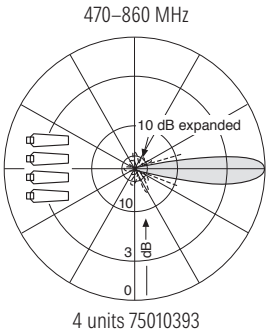


Relay Receiving Antennas

For professional receive applications such as transposer/translator inputs Kathrein offers antennas including yagis and logarithmic-periodic types.
UHF models are equipped with radomes to assure reliable operation in icing conditions and to protect the antennas against weather damage.

Arrays of these antennas are available to provide very high gain, extremely narrow main lobes, and high rejection of co-channel and other interfering signals coming into the rear and sides of the array. Receiving antennas and arrays are available with either horizontal or vertical polarization.

Example for Radiation Patterns



4 units 75010393

Glossary of Broadcast Antenna Terms

Antenna Gain
The gain of an array describes the increase of signal in the main radiation direction which is produced by reducing radiation in all other directions and concentrating it in the main beam. The gain of a broadcast antenna system is normally increased by using a larger number of vertical bays (increasing the vertical aperture) and thereby forming a more narrow vertical radiation pattern.
In the case of a directional antenna system the gain is increased by reducing or eliminating radiation toward azimuth segments and re-directing it toward the areas where coverage is desired.

When calculating the gain of an array the losses in the feeder cables and the power splitters must be taken into account.

Downtilt in Panel Arrays
When transmitting antennas are located on elevated sites it is often beneficial to tilt the main beam of the vertical radiation pattern downward to provide higher signal levels in the areas to be served. There are two ways to accomplish downtilt (also known as "beam tilt"). The panels can be mechanically tilted to direct the beam downward, or phase differences can be introduced into the array feeder system to achieve electrical tilt.

Impedance Tuning
While the VSWR of a well-designed antenna system can be optimized by the use of tuning devices it is not possible to achieve broad bandwidth by compensating for poor components with tuners.
The characteristics of a truly high quality antenna system are established in many ways, beginning with proper component design and manufacture followed by competent system design and installation.

Mast or Tower Dimensions for Panel Arrays
The radiation pattern of a panel array depends on the relative positions of the individual panels in space and the relative amplitude and phase of the RF energy fed to each panel. Therefore it is necessary to have exact dimensional information about the supporting tower or mast if one is to optimize an array design.
The cross section of the mast or tower should be less than one wavelength for a good omni pattern. As the cross section increases beyond one wavelength nulls in the horizontal radiation pattern will rapidly become deeper.

Measurement Links
When large-diameter coax lines are used in an antenna system it is not possible to easily connect measurement equipment without disassembly of the coax system. In these cases it is advisable to install measurement links in the coax feeders to allow convenient connection of test equipment to the antenna system.

Mismatch Compensation
In a broadcast panel array the impedance match of individual panels can be disturbed by mutual coupling, icing and the presence of nearby obstacles. For this reason it is necessary to design the feed system so as to cancel reflections within the array and thereby minimize the presence of reflected signal at the antenna system input. This technique is also known as impedance compensation.

Null Fill
Panel arrays with multiple vertical bays will exhibit deep nulls in the vertical radiation pattern if all bays are fed with equal phase and amplitude.
It is important to fill these nulls for proper signal coverage. For analog TV systems it is not sufficient to provide the minimum signal level, but it is necessary to make the direct signal bigger than any reflexion to avoid ghost pictures.

There are three methods of introducing null fill in a panel array:

- Mechanically tilting some panels downward
- Using a non-linear phase taper between bays
- Using an unequal power split between bays

Since some energy is taken from the main beam to fill the null, the maximum gain of the antenna system will be reduced, typically 0.5 to 1.5 dB, when null fill is introduced.

Polarization
The polarization is defined as the direction of the electrical vector, in practice the plane of the dipoles.
The electric field of an antenna system can be split into a horizontal and a vertical component.
If there is only one component, the polarization is pure horizontal or vertical (plane polarized).
If there are two components which are not in phase, the polarization is elliptical.
For slant polarization both must exist and they must be in phase.

When an antenna produces vertically and horizontally polarized fields with equal amplitude and with a phase difference of exactly 90 degrees, the resulting signal is circularly polarized.

Power Rating of Components

Generally, the power rating of components refers to the maximum CW power (or mean power) level that can be applied to the input.

The maximum mean power output of an analog TV transmitter occurs during transmission of a black picture and it is typically equal to 70% of the nominal peak sync power level.

For DTV and DAB the nominal transmitter power will occur as the effective mean power level, however, special attention has also to be paid to the voltage load of the system (voltage "crest-factor" due to OFDM modulation).

Split Antenna Systems

An antenna system can usually be divided into upper and lower halves which can be operated separately.

This arrangement allows the use of one half for broadcast operations while the other half is available for painting or maintenance or other work that must be performed in close proximity to the antenna.

The signal level will be reduced by 6 dB if one half of the antenna is fed with one half of the normal transmitter power. If the full transmitter power is available, the use of one half of the antenna will reduce the signal level by only 3 dB.

It will be necessary to climb the mast or tower to perform antenna switching unless a coax patch panel is installed at the transmitter output with two main feeders up to the antenna inputs.

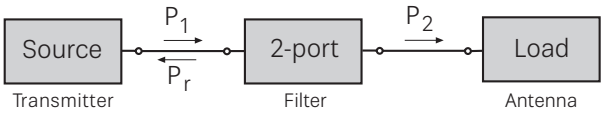
Glossary of Broadcast Combiners and Filters

Introduction

Filters and combiners are essential components of many broadcasting antenna systems. They are used for selecting frequencies, suppressing disturbing emissions and noise sidebands. Several channels can be combined into one common antenna by using combiners. In certain cases, separate antenna diagrams for individual channels can also be generated.

Selection of parameters

According to their use as elements of a system, filters are constructed as two-port networks and are matched to the impedance of the other system elements (e.g. transmitter, receiver, antenna or connecting cables) at both the input and the output.



$$P_2 = P_1 - P_r - P_v$$

P_1 = Input power
P_r = Reflected power
P_v = Power loss through filter
P_2 = Power transmitted

Fig. 1: Filter as element of a system.

Frequency response

The attenuation usually depends on the frequency used. This relationship is illustrated in diagram 1, showing a typical attenuation curve for a filter.
A plot of the attenuation vs frequency shows the typical filter curve. The attenuation **a** (1.1) is the logarithmic ratio between input power and transmitted power.

Matching

As a measurement of how a filter is matched the return loss, which is the logarithmic relationship between the input and reflected power $\mathbf{a}_r$ (1.2), is displayed in diagram 2. The return loss $\mathbf{a}_r$, reflection coefficient **r** and VSWR factor **s** (1.3 and 1.4) are all related according to the formulas.

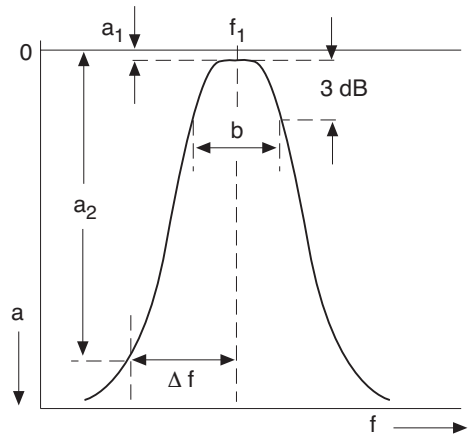


Diagram 1: Frequency response of a filter tuned to frequency f_1 with insertion loss a_1, stop band attenuation a_2 at the frequency of $f_1 - \Delta f$ and with bandwidth b at 3 dB.

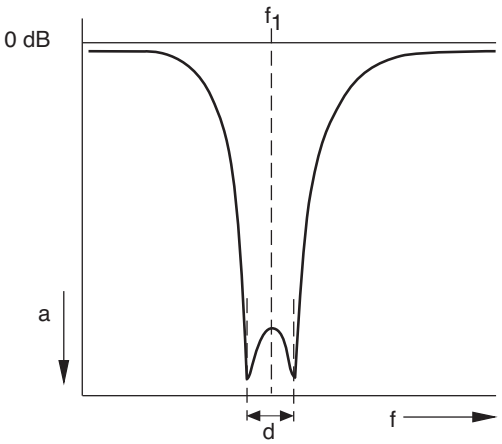


Diagram 2: Return loss of a 2-cavity band-pass filter, tuned to the frequency f**1** and with pass-band bandwidth d.

$$a\,/\,\mathrm{dB} = 10 \log \frac{P_1}{P_2} \qquad (1.1)$$

$$a_r\,/\,\mathrm{dB} = 10 \log \frac{P_1}{P_r} \qquad (1.2)$$

$$a_r = -20 \log |r| \qquad s = \frac{1 + |r|}{1 - |r|} \qquad (1.3)\ (1.4)$$

Filters

Where used in broadcasting systems, filters are normally set up as a combination of several λ/4 resonators. The Q factor of the resonators is very important with regard to the electrical data and is influenced by the shape and volume of the filter as well as by the conductivity of the material used.

The selectivity of the filters used for combiners has a decisive influence on the minimum spacing required between the transmitters to be connected onto one common antenna. If the frequency spacing is narrow then the filters must similarly be tuned in a very narrow way. But this will cause an increase in the insertion loss resulting in the filters becoming hot (diagram 3). This problem can be avoided if filters of greater volume are used which have a relatively lower insertion loss.

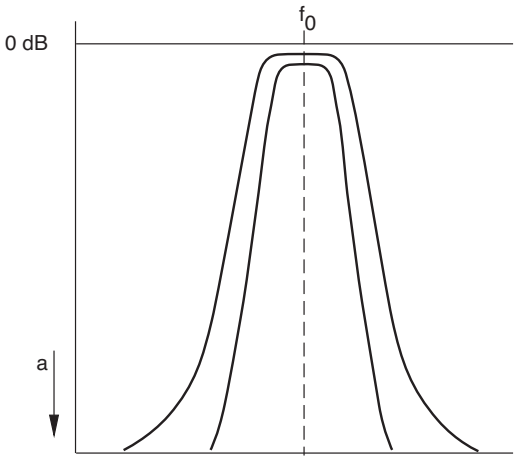


Diagram 3: Examples of two different tuning possibilities for a band-pass filter. Narrower tuning will result in higher insertion loss and steeper slopes.

Directional couplers

A directional coupler is a reciprocal four-port construction, whereby two of the ports are isolated from each other.

For example, the power fed in at port 1 is split up to ports 2 and 3, whereas port 4 is isolated. The power fed into the other ports is similarly split.

If the coupling range of a transmission-line coupler is λ/4 at the center frequency fm then the coupling attenuation over a frequency range of $f_1 / f_2 = 2$ is almost independent of the frequency (fig. 3).

For example, with a 3-dB directional coupler there is a divergence of ± 0.4 dB and phase difference of 90° occurs between the signals at ports 2 and 3, which is also almost independent of the frequency (fig. 2).

If every port is terminated with a reflection-free load, then the formulas for coupling attenuation and directivity apply.

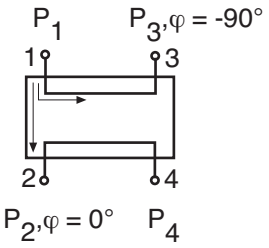


Fig. 2: Directional coupler.

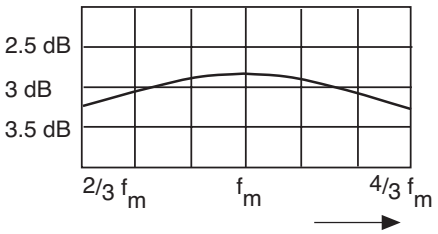


Fig. 3: Coupling attenuation for 3-dB transmission-line coupler of λ/4 length.

Coupling attenuation

$$a_k = 10 \log \frac{P_1}{P_2}$$

Directivity

$$a_d = 10 \log \frac{P_2}{P_4}$$

Combiners

Combiners are a combination of frequency-selecting components (e.g. filters, stretchlines) with nodes and connecting elements (e.g. directional couplers, starpoints).
In high quality combiners bandpass filters are used in preference to stop band filters.

Starpoint combiners

Starpoint combiners for n channels consist of n band-pass filters with outputs that are connected to a common starpoint. The individual band-pass filters are tuned to the respective frequencies. Since the band-pass filters are mismatched outside their pass-bands (with inductive coupling the impedance approaches a short-circuit) the impedance can be transformed up to very high levels by selecting the appropriate length for the link between the filters and the starpoint.
This means that for every input the transformed impedances of all the other inputs are very high at the starpoint which produces a very low parallel load at the antenna output.

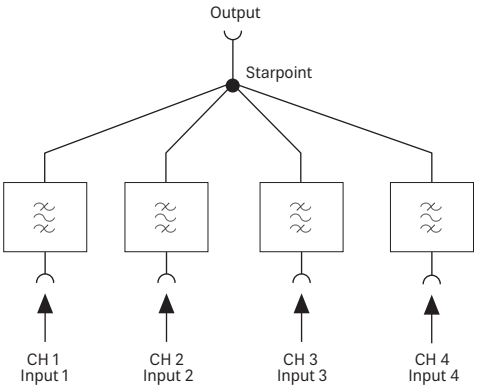


Fig. 4: Starpoint combiner for 4 channels

Directional filter combiner

Directional filter combiners are a combination of filters and 3-dB couplers. One module consists of two band-pass filters, two 3-dB couplers and a balancing load.
One input is narrowband, corresponding to the band-pass curve of the band-pass filter. The other input is broadband, corresponding to the operating range of the 3-dB coupler.
Compared to other types of combiners that can be produced at less expense, directional filters offer a number of useful advantages:

- Simple set-up of multiple combiners through cascading of modules
- Very high isolation between the inputs
- Broadband matching at all inputs
- Easy extension of existing combiners by adding new modules.

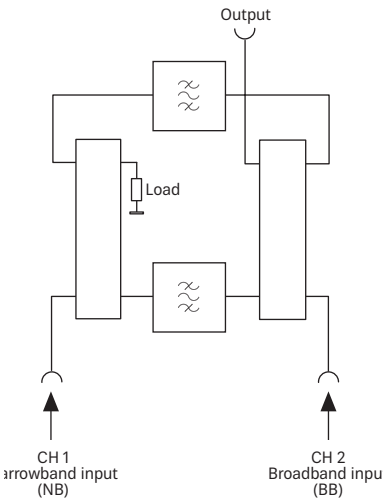


Fig. 5: Directional filter combiner

Function of module

The signal fed into the narrowband input is split into two halves by the 3-dB coupler. Both of these pass through one of the band-pass filters to the second 3-dB coupler where they are then added in equal phase at its output due to the 3-dB couplers function.
At the broadband input the two partial signals are anti-phase and therefore practically no signal appears at this port. The broadband input is isolated from the narrow-band input by the directional coupler. However the isolation depends on the band-pass filters being identically tuned.

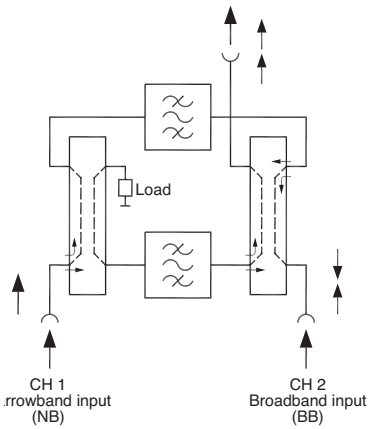


Fig. 6: Functioning of module

The frequency of a signal fed into the broadband input lies within the stop band of the band-pass filters. The signal is split into two halves by the 3-dB coupler and reflected completely by the band-pass filters and proceeds to the output after co-phase addition. The narrowband input is isolated from the broadband input by the directional coupler, as described above, but there is additional isolation due to the stop band attenuation of the band-pass filters.

Cascading of modules

Multiple combiners are easly set up by using several modules with the output of each module feeding the broadband input of the next module.
The number of channels possible in a given frequency band is limited only by the minimum spacing between the signals. However limitation can also arise because the insertion loss for each additional module increases by 0.05 up to 0.2 dB and can assume intolerable values. The power rating of the 3-dB coupler at the output also can limit the number of channels in practice.

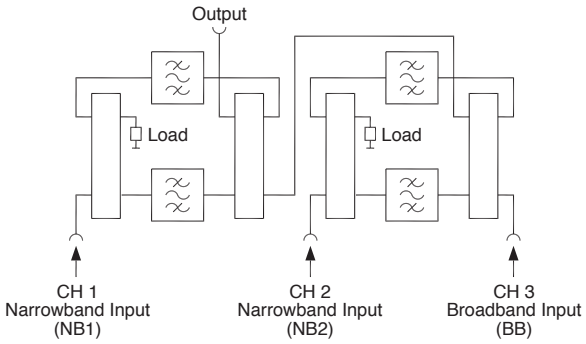


Fig. 7: Directional filter combiner with 2 modules

Multiplexer

Multiplexers consist of one or more directional filter modules and a starpoint combiner. The output of the starpoint combiner is connected to the broadband input of the directional fiter combiner.
It is advantageous to feed the channels with the largest possible frequency spacing into the starpoint combiner since this produces the optimal isolation.
The isolation between the narrowband input to the starpoint combiners' inputs is determined by the directional couplers and additionally by the stop-band attenuation of the band-pass filters.

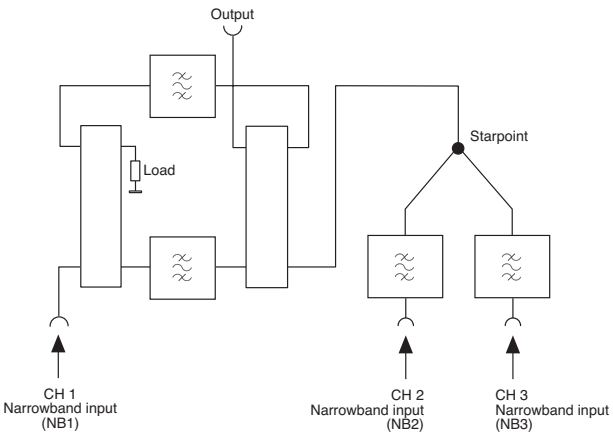


Fig. 8: Multiplexer for three channels

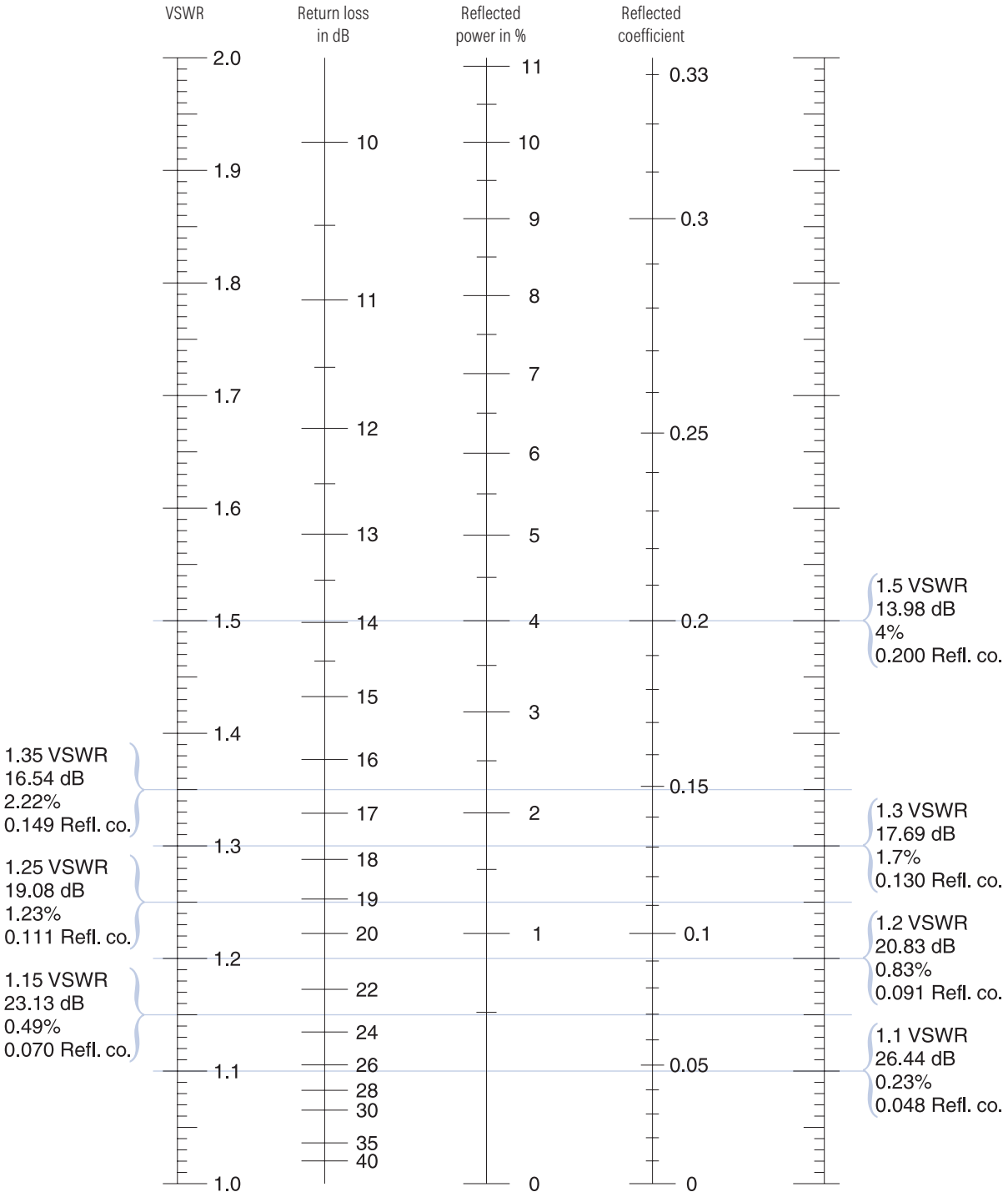
Comparison

Starpoint combiners/directional filter combiners/multiplexers

Type	Starpoint combiner	Directional filter combiner	Multiplexer
Set-up	Band-pass filters + starpoint	Band-pass filters + 3-dB coupler	Directional filter + starpoint combiner
Spacing **FM: 30 W–1 kW** **FM: 3 kW–20 kW**	2.5 MHz 1.5 MHz–2 MHz	2 MHz 0.8 MHz–1 MHz	2 MHz 1 MHz
Matching (VSWR)	All inputs matched in pass-band range	All inputs broadband matched	Starpoint inputs: pass-band matched Directional filter inputs: broadband matched;
Frequency response	All inputs are narrow-band according to frequency response of the band-pass filters	Narrowband input: according to frequency response of the band-pass filters Broadband input: not selective	All inputs are narrowband according to frequency response of the band-pass filters
Isolation	According to stop-band attenuation of the band-pass filters	NB – BB: attenuation through 3-dB coupler BB – NB/NB – NB: Attenuation through 3-dB coupler + stop-band attenuation of band-pass filters	Between starpoint inputs: like starpoint combiner Directional filter inputs: attenuation through 3-dB coupler + stop band attenuation of band-pass filters
Extensions	With additional band-pass filter; new starpoint cabling necessary	Very simply by adding up a directional filter module; no altering of existing cabling	Simple by adding new directional filter module between starpoint and directional filter; altering of existing cabling necessary
Costs	Economical solution for wide frequency spacing	Sophisticated solution with several technical advantages	Costs between starpoint and directional filter combiner; smaller frequency spacing possible than with starpoint

VSWR, Return Loss, Reflected Power, Reflection Coefficient

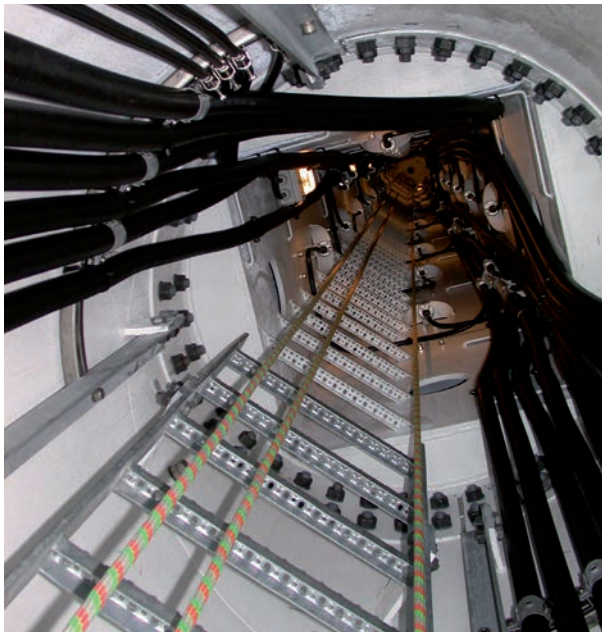
Locate the known value on the appropriate scale, then read across horizontally to find the equivalent values as shown in the examples above.



Configuration Examples

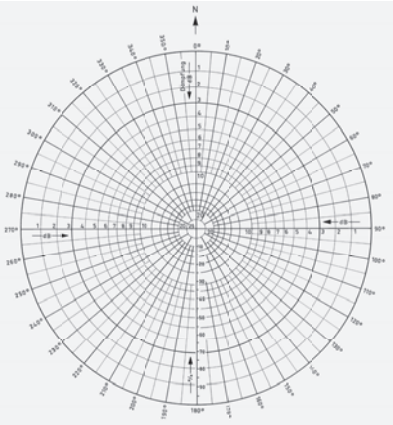
KATHREIN has designed special solutions to combine maximum climbing space and safety with optimum horizontal pattern performance. Although very stringent technical specifications of some broadcasters require larger climbing areas, KATHREIN demonstrated that safe climbing and rescue is possible and was able to get approval for its solutions.

UHF Antenna mounted on square steel spine



UHF Antenna mounted in self supporting GRP cylinder

The following information is required to design an optimum antenna system for you:

Company information:								
Company name:								
Contact person:								
Address:								
Phone:								
Fax:								
E-mail:								
Station information:								
Station name:								
Coordinates:								
Station height (m):		Antenna height (m):						
Project information:								
Polarization:	Horizontal ☐	Vertical ☐		Slant ☐		Circular ☐		Elliptical ☐
Frequency (MHz) or channels:								
Transmitter power (kW):								
Min. power rating for system (kW):		Analog ☐				Digital ☐		
Antenna gain:		Number of bays:				ERP:		
Combiner:	Yes ☐ No ☐	Direct Access Unit:	Yes ☐ No ☐			Patch panel:	Yes ☐ No ☐	
Half antenna mode	Yes ☐ No ☐	Half power ☐		Full power ☐		1 Feeder ☐	2 Feeders ☐	
Horizontal Radiation Pattern:								
Omnidirectional or directional (if directional specify requirements)								
Vertical Radiation Pattern:								
Beam tilt (in degrees):								
Null-fill (in %):								
Tower/Mast:								
Square ☐	Triangular ☐	Round ☐		Pipe mast ☐				
Azimuth direction of tower face:								
Side length or diameter:								
Vertical antenna aperture:								
Feeder cable:								
Air ☐ Foam ☐								
Size:				Connectors:				
Length (m):				Dehydrator:	Yes ☐ No ☐			
Remarks:								
e.g. special climatic conditions								

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Please note

As a result of more stringent legal regulations and judgements regarding product liability, we are obliged to point out certain risks that may arise when products are used under extraordinary operating conditions.

The mechanical design is based on the environmental conditions as stipulated in ETS 300 019-1-4.

The antennas may be used at locations where the anticipated peak wind velocity or gust wind speed lies within the maximum wind speed listed in the datasheet. We guarantee the mechanical safety and electrical functionality under such conditions. The wind speeds are defined in accordance with the DIN, EN or TIA standards. This guarantee makes allowance for the partial safety factors specified in those standards.

Extraordinary operating conditions, such as heavy icing or exceptional dynamic stress (e.g. strain caused by oscillating support structures), may result in the breakage of an antenna or even cause it to fall to the ground. Cylindrical bodies can show crosswind response, which can cause the supporting structure to oscillate and to be damaged. Prismatic bodies, even with non-circular cross-section can show crosswind response, which can cause the supporting structure to oscillate (see EN 1991-1-4 or EN 1993-3-1). Fatigue calculations are required for structures having cylindrical parts. So a fatigue analysis must be carried out by a stress engineer for the supporting structure (mast) with the antenna.

These facts must be considered during the site planning process.

The installation team must be properly qualified and also be familiar with the relevant national safety regulations.

The details given in our data sheets have to be followed carefully when installing the antennas and accessories.

The limits for the coupling torque of RF-connectors, recommended by the connector manufacturers must be obeyed.

Our quality assurance system applies to the entire company and is certified according to EN ISO 9001.

Product photos show typical installation arrangements. Mast sections, antenna fixations and accessories such as weather protection caps are not included in the scope of supply and must be ordered separately.

We reserve the right to make alterations in accordance with the requirements of our customers, please also check: **www.kathrein-bca.com**

9980100015/500/0823/JW | Subject to change.

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