



CATALOGUE

Broadcast Solutions

Antenna Systems and Components – Monitoring and Measurement – Services



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 12/2021

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.



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.

> Band II FM Antenna Systems 87.5–108 MHz

FM Antenna Systems

> Band II FM Antennas 87.5–108 MHz

FM Antennas

> Band III VHF Antenna Systems 174–240 MHz

VHF Antenna Systems

> Band III VHF Antennas 174–240 MHz

VHF Antennas

> Band IV/V UHF Antenna Systems 470–862 MHz

UHF Antenna Systems

> Band IV/V UHF Antennas 470–862 MHz

UHF Antennas

> Power Splitters

Power Splitters

> Combiners and Filters for FM Broadcast

FM Combiners, Filters

> Components for Antenna Systems

Components

> Kathrein Smart Monitoring

Smart Monitoring

> Kathrein Signal Analyser

Signal Analyser

> Kathrein Broadcast Services

Broadcast Services

> Technical Annex

Technical Annex

Summary of Types

The articles are listed by type number in numerical order.

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Summary of Types

The articles are listed by type number in numerical order.

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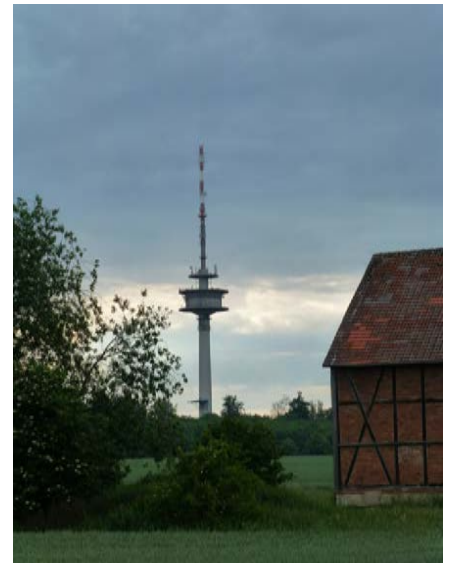
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Antenna Systems for FM Radio

87.5–108 MHz



Broadcast Station "Göttingen", Germany

FM Antenna System with very low wind load

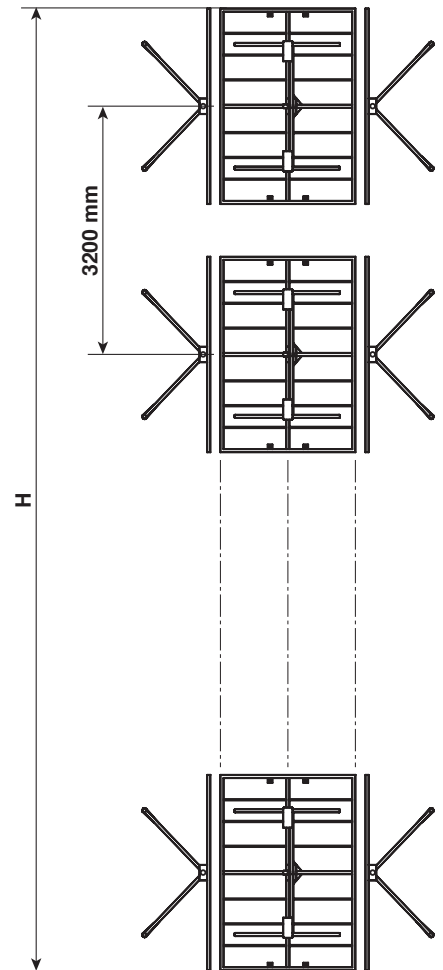
> FM Transmitting Antenna

- 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.

87.5–108 MHz

H

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



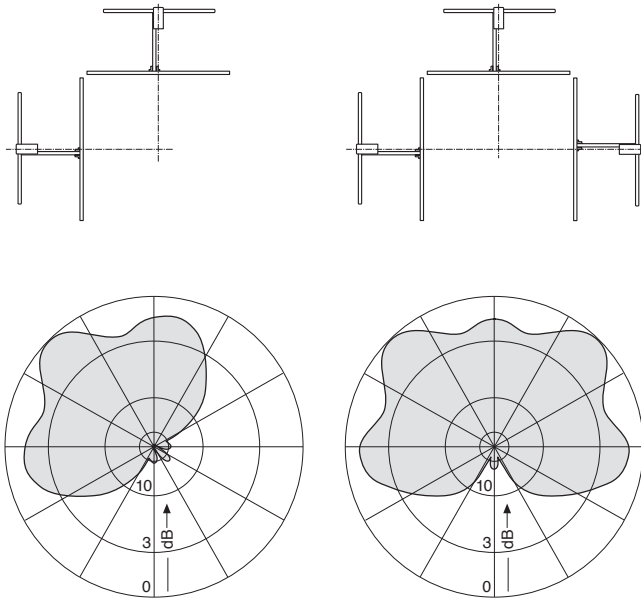
No. of bays	Panels per bay	Gain* (at mid-band)		Weight (without mounting hardware) kg	Antenna height H m	Windload (v = 160 km/h) kN
		dBd	times			
1	2	5.0	3.2	140	2.5	2.4
	3	3.5	2.2	210		3.9
	4	2.0	1.6	280		4.8
2	2	8.0	6.3	280	5.7	4.8
	3	6.5	4.5	420		7.8
	4	5.0	3.2	550		9.6
4	2	11.0	12.6	550	12.1	9.6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

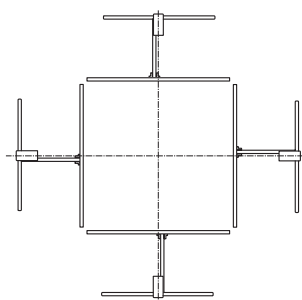
Horizontal Radiation Patterns

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

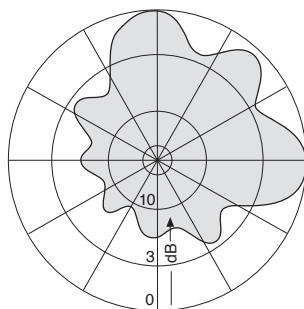
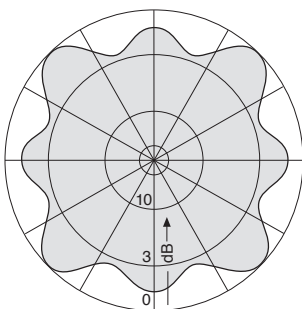
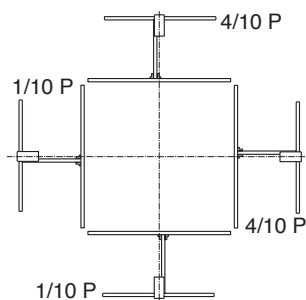
Equal power splitting



Equal power splitting



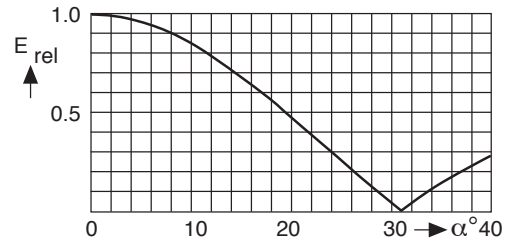
Different power splitting



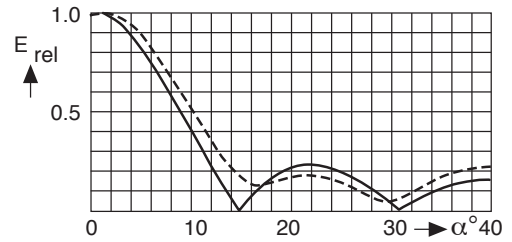
Vertical Radiation Patterns

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

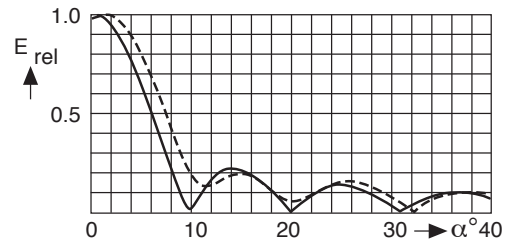
2 bays



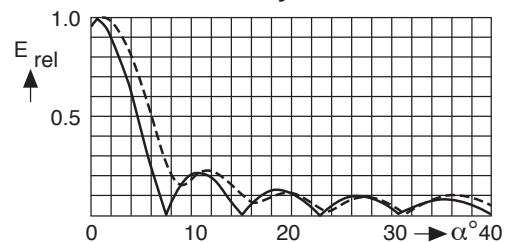
4 bays



6 bays



8 bays



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

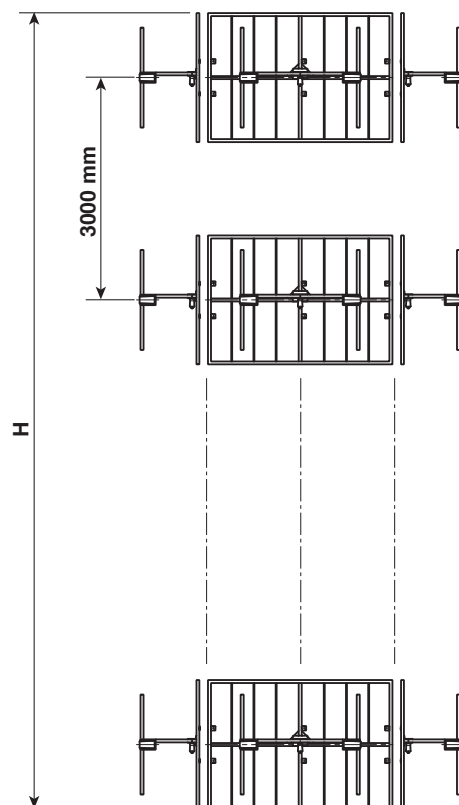
> FM Transmitting Antenna

- 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

87.5–108 MHz

V



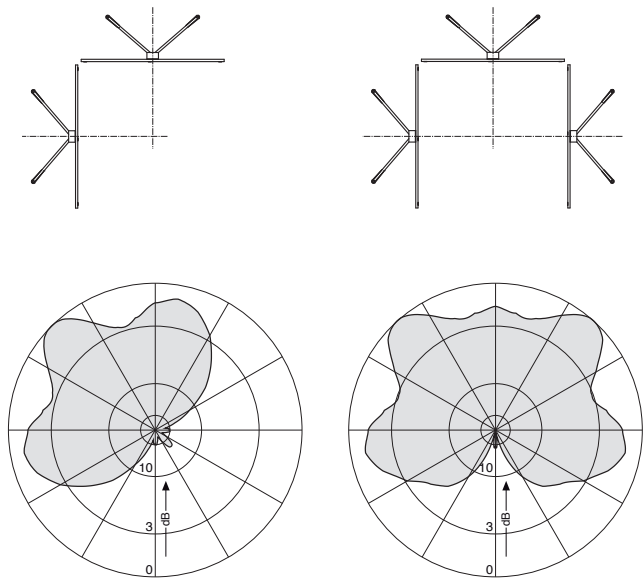
No. of bays	Panels per bay	Gain* (at mid-band)		Weight (without mounting hardware) kg	Antenna height H m	Windload (v = 160 km/h) kN
		dBd	times			
1	2	5.4	3.5	140	1.8	2.3
	3	3.7	2.3	210		3.8
	4	2.3	1.7	280		4.7
2	2	8.4	6.9	280	4.8	4.7
	3	6.7	4.7	420		7.7
	4	5.3	3.4	550		9.3
4	2	11.4	13.8	550	10.8	9.3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

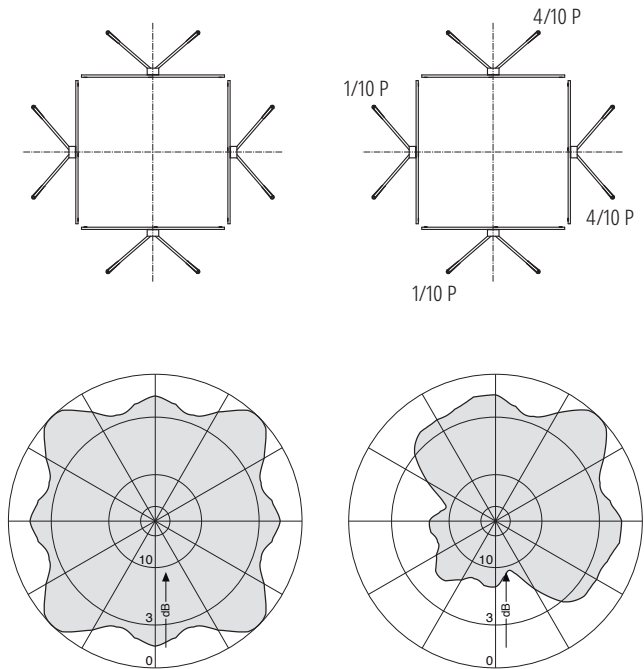
Examples of typical horizontal antenna arrays and their **horizontal** radiation patterns for optimal mast dimensions.

Equal power splitting



Equal power splitting

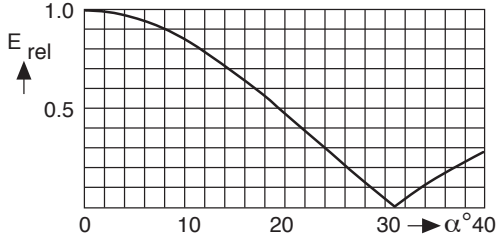
Different power splitting



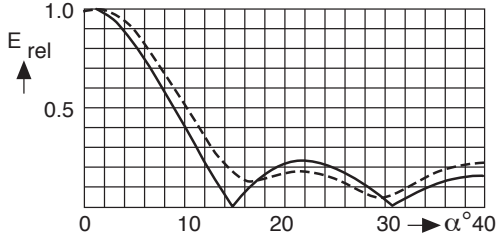
Vertical Radiation Patterns

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

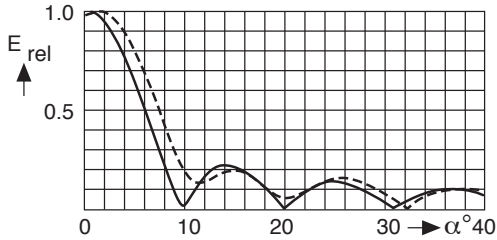
2 bays



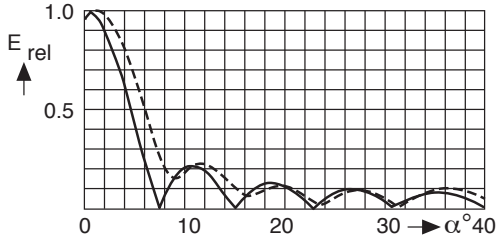
4 bays



6 bays



8 bays

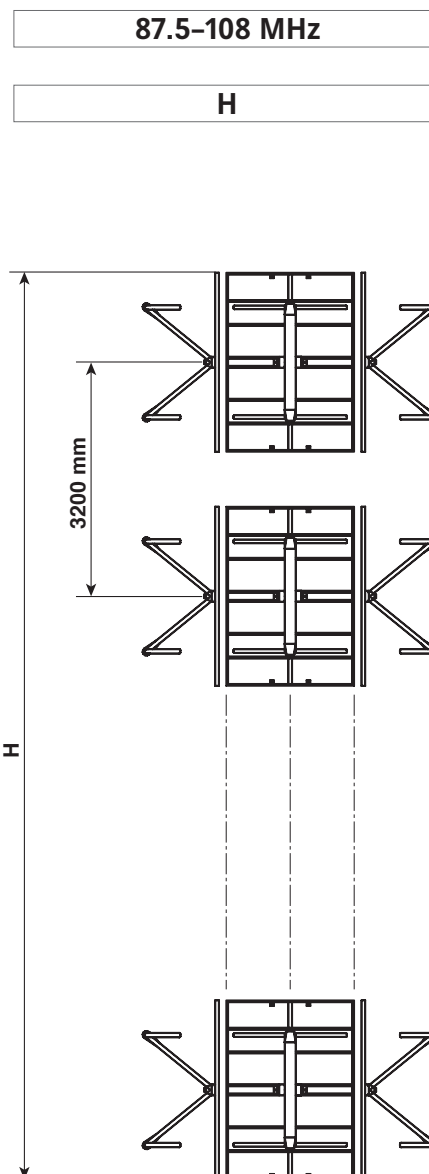


*) — without null fill
 - - - with null fill and beam tilt

> FM Transmitting Antenna

- 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 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



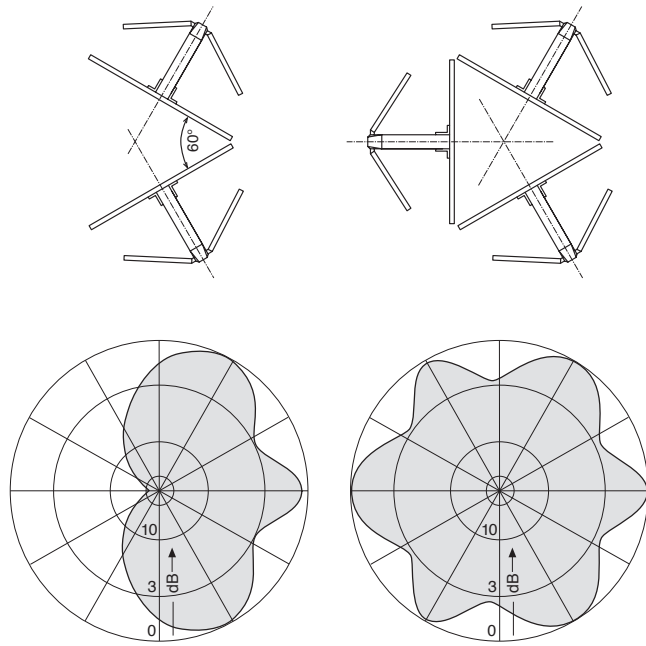
No. of bays	Panels per bay	Gain* (at mid-band)		Weight (without mounting hardware) kg	Antenna height H m	Windload (v = 160 km/h) kN
		dBd	times			
1	2	3.9	2.5	150	2.5	2.9
	3	1.7	1.5	220		4.4
2	2	6.9	4.9	290	5.7	5.9
	3	4.7	3.0	420		8.8
4	2	9.9	9.8	560	12.1	11.8
	3	7.7	5.9	850		17.5
6	2	11.7	14.8	850	18.5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

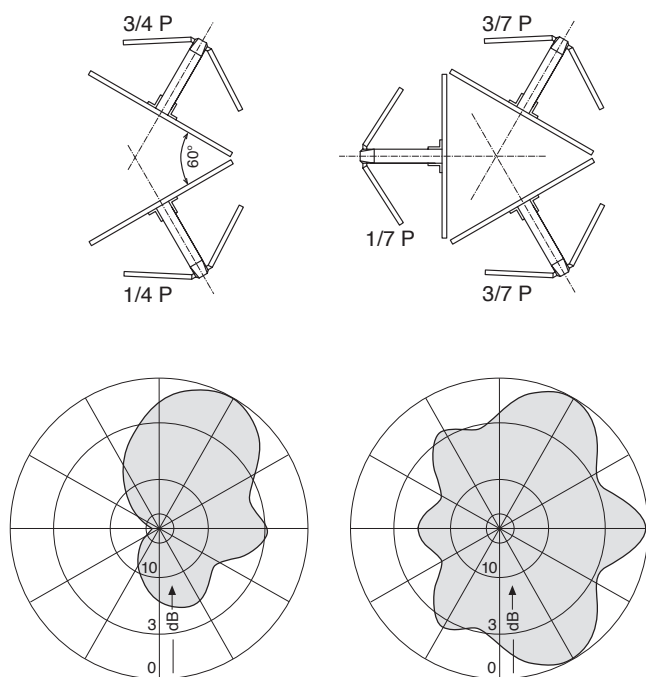
Horizontal Radiation Patterns

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

Equal power splitting



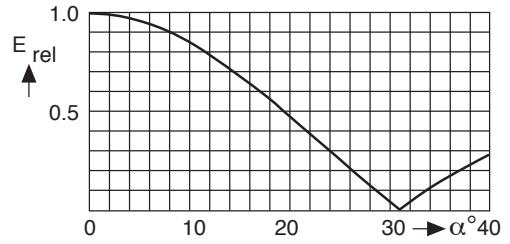
Different power splitting



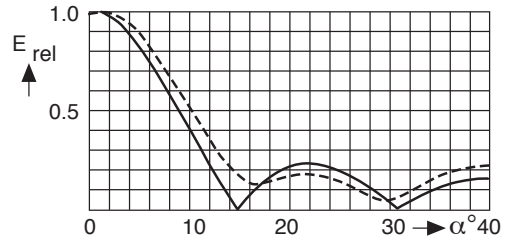
Vertical Radiation Patterns

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

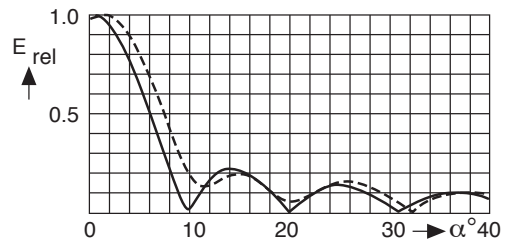
2 bays



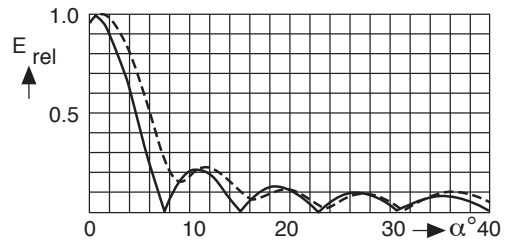
4 bays



6 bays



8 bays

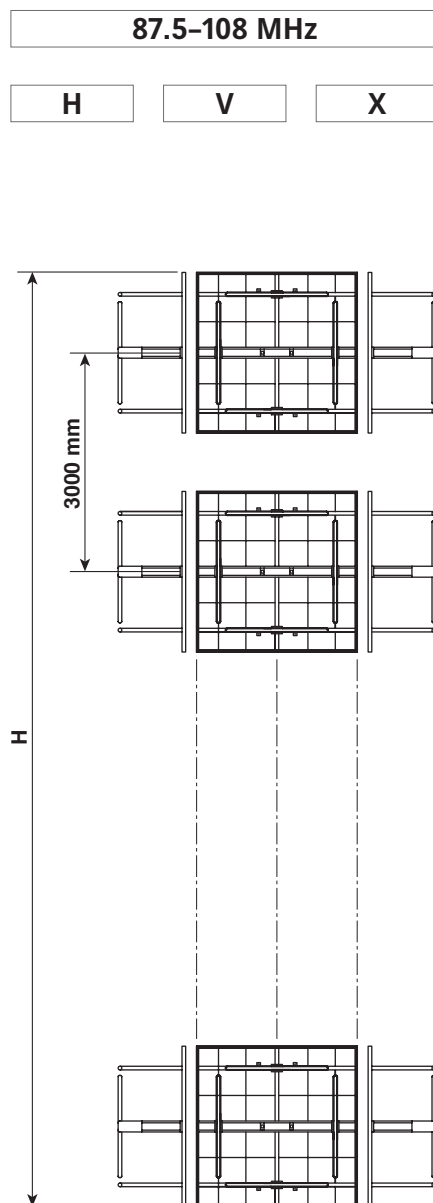


*) — without null fill
 - - - with null fill and beam tilt

> FM Transmitting Antenna

- 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



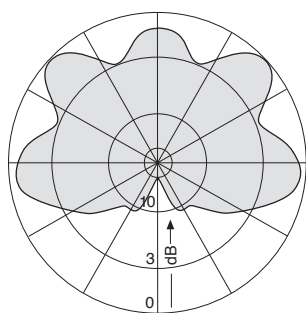
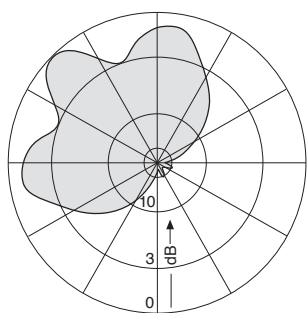
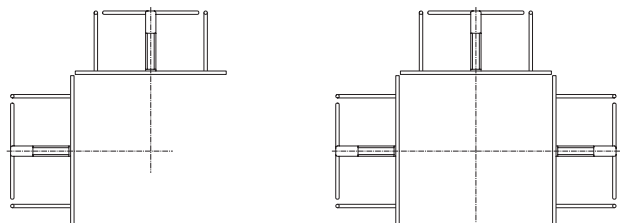
No. of bays	Panels per bay	Gain* (at mid-band)		Weight (without mounting hardware) kg	Antenna height H m	Windload (v = 160 km/h) kN
		dBd	times			
1	2	2.0	1.6	210	2.2	2.7
	3	0.5	1.1	320		4.3
	4	-1.0	0.8	420		5.4
2	2	5.0	3.2	420	5.2	5.4
	3	3.5	2.4	650		8.5
	4	2.0	1.6	850		10.8
4	2	8.0	6.3	850	11.2	10.8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

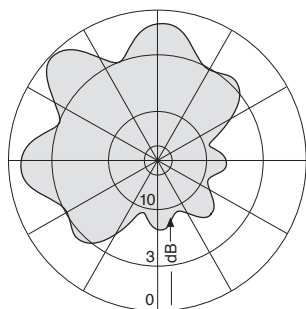
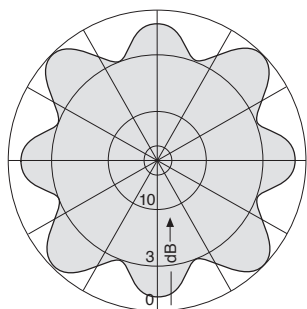
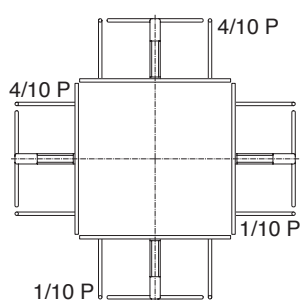
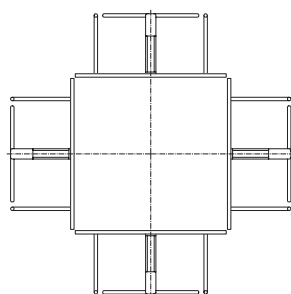
Examples of typical horizontal antenna arrays and their **horizontal** radiation patterns for optimal mast dimensions.

Equal power splitting



Equal power splitting

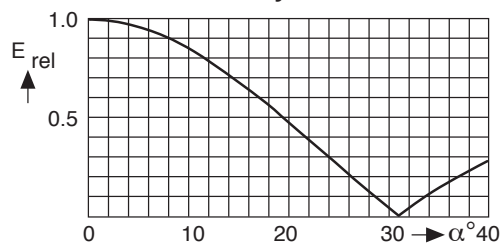
Different power splitting



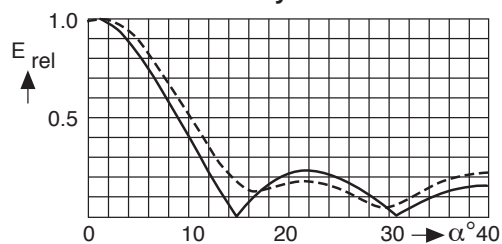
Vertical Radiation Patterns

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

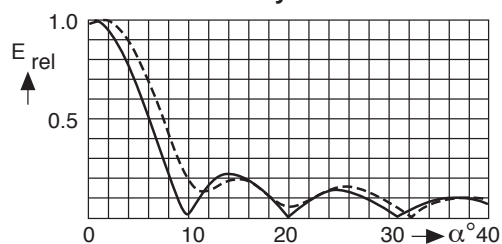
2 bays



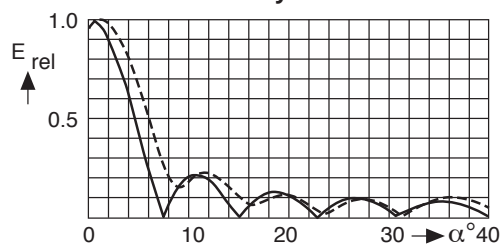
4 bays



6 bays



8 bays



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

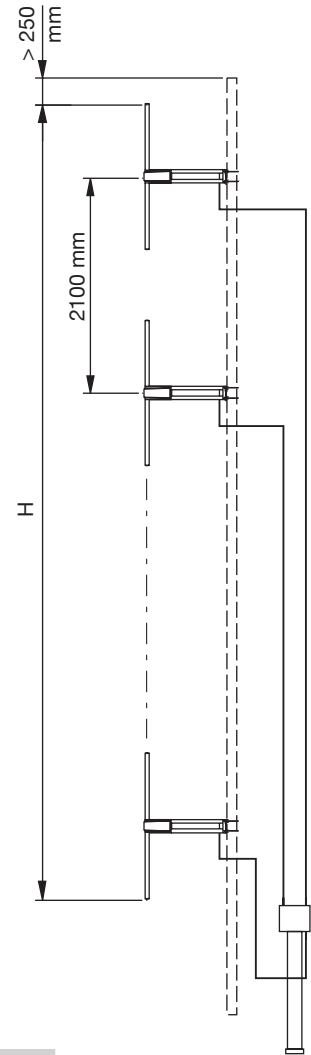
> FM Transmitting Antenna

- 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.

87.5–108 MHz

V

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, with 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

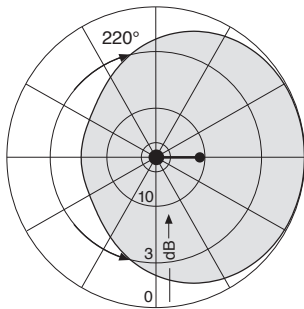


No. of bays	Gain* (at mid-band)		Weight (without mounting hardware) kg	Antenna height H m	Windload (v = 160 km/h)	
	dBd	times			frontal N	lateral N
2	5.0	3.2	40	3.48	230	440
4	8.0	6.3	80	7.68	460	880
6	9.7	9.3	120	11.88	690	1320
8	11.0	12.6	180	16.08	920	1760
10	11.8	15.1	220	20.28	1150	2200
12	12.7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

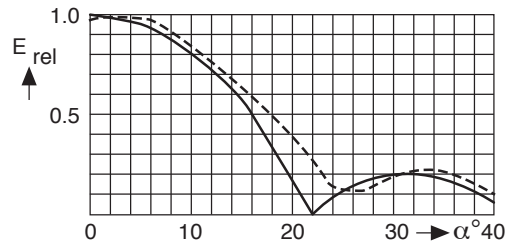
(Radiators mounted onto a slim steel tube, tower effects not considered)



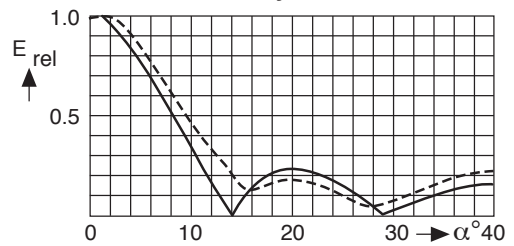
Vertical Radiation Patterns

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

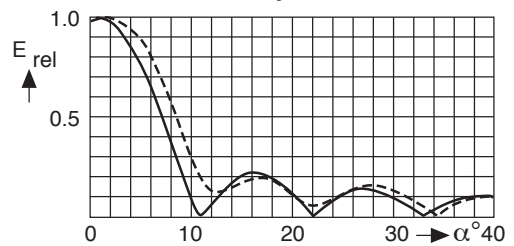
4 bays



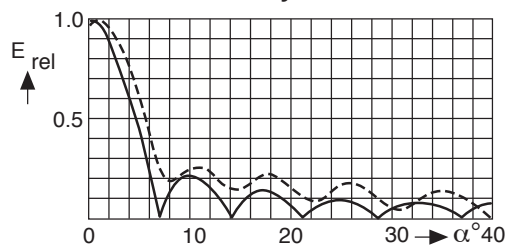
6 bays



8 bays



12 bays



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

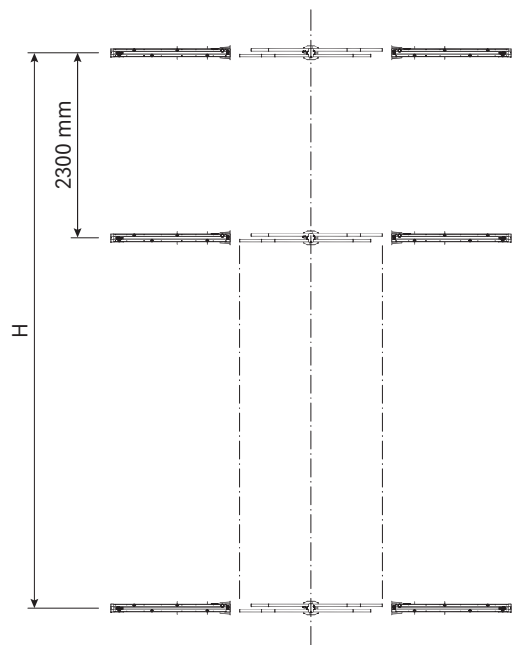
> FM Transmitting Antenna

- 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

87.5–108 MHz

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.

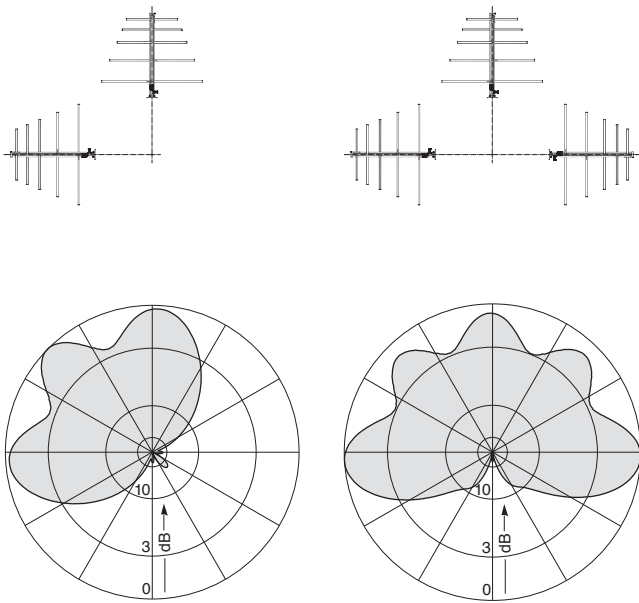
No. of bays	Log.Per. per bay	Gain** (at mid-band)		Weight (without mounting hardware) kg	Antenna height H m	Windload (v = 160 km/h) kN
		dBd	times			
2	2	7.0	5.0	160	2.5	1.3
	3	5.4	3.5	230		1.9
	4	4.2	2.6	300		2.5
4	2	10.0	10.0	300	7.1	2.5
	3	8.5	7.1	440		3.8
	4	7.2	5.3	680		5.0
8	2	13.1	20.4	680	16.3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

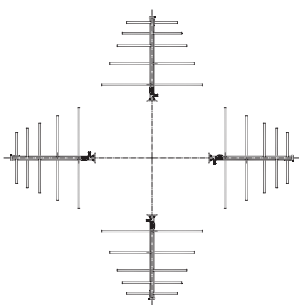
Horizontal Radiation Patterns

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

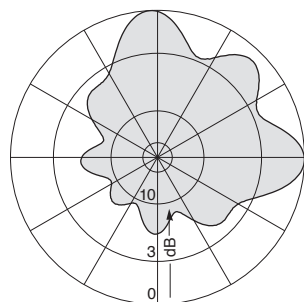
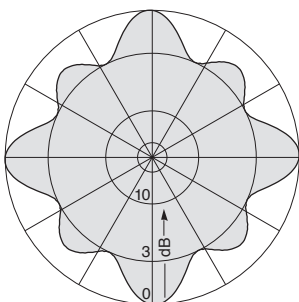
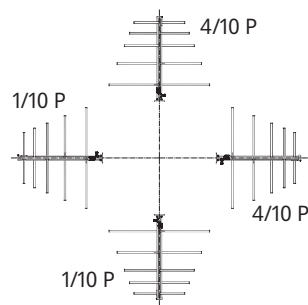
Equal power splitting



Equal power splitting



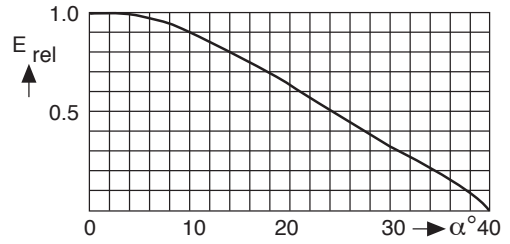
Different power splitting



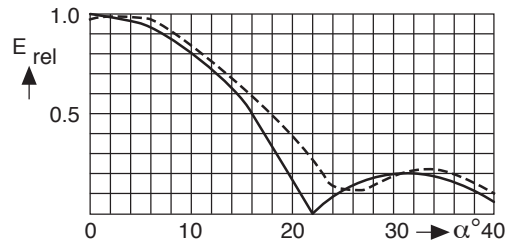
Vertical Radiation Patterns

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

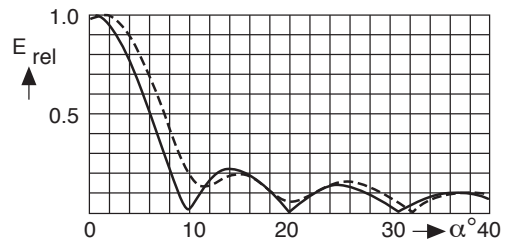
2 bays



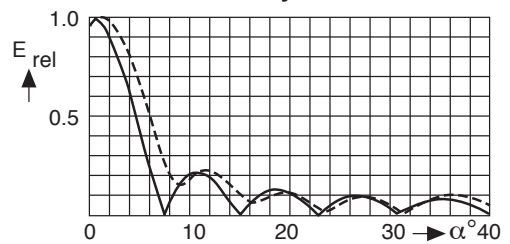
4 bays



8 bays



10 bays



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

Antennas for FM Radio

87.5–108 MHz

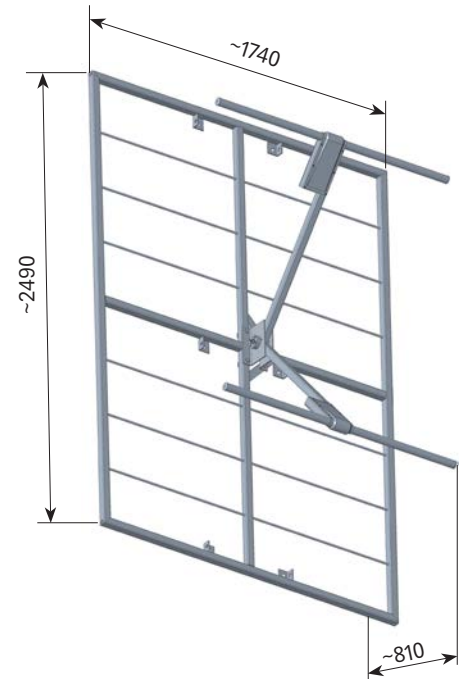
Panel Antenna

- 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		

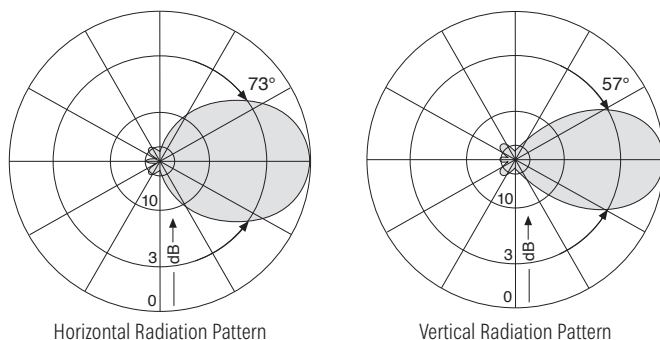
87.5–108 MHz

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.

Radiation Patterns (at mid-band)



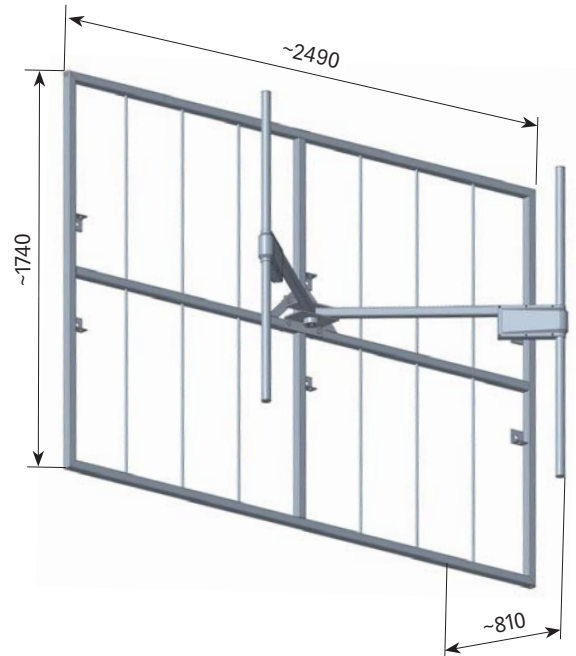
> Panel Antenna

- 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		

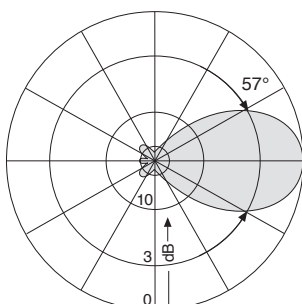
87.5–108 MHz

V

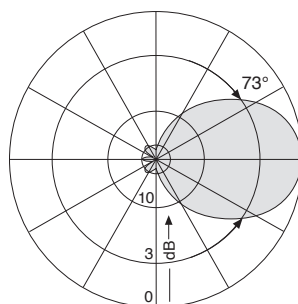


- Material:** Hot-dip galvanized steel.
Radome: Fiberglass.
- Mounting:** Mounting hardware and mounting dimensions upon request.
- Grounding:** Via mounting parts.
- Ice protection:** Even under severe icy conditions the antenna is still functional due to its heavy-duty construction and the fiberglass covers for the feeding points.
- Scope of supply:** Antenna without mounting clamps.
- Special features:** The antenna is shipped dismounted.

Radiation Patterns (at mid-band)



Horizontal Radiation Pattern



Vertical Radiation Pattern

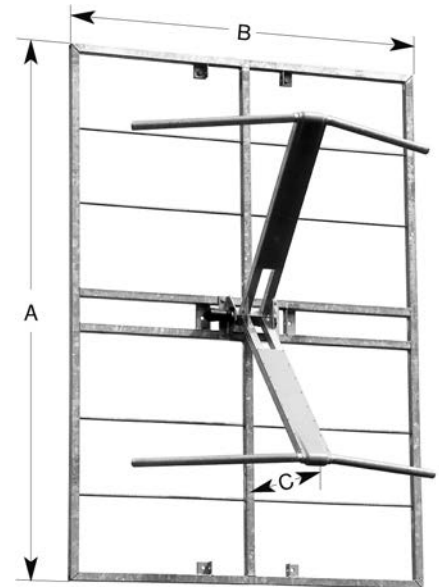
> Panel Antenna

Especially suitable for triangular and round masts.

87.5–108 MHz

H

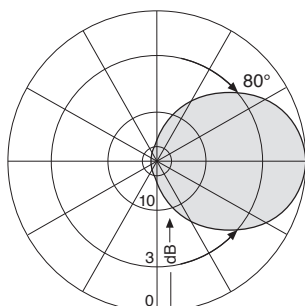
Order No.	601694 K523417	75010008	752183
Input	7-16 female	7/8" EIA flange	13-30 female
Max. power	3 kW	5 kW	7 kW
Frequency range	87.5–108 MHz		
VSWR	< 1.2		
Gain (at mid-band)	7 dBd		
Impedance	50 Ω		
Polarization	Horizontal		
Weight	66 kg		
Wind load (at 160 km/h)	Frontal: 1700 N, Lateral: 875 N		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



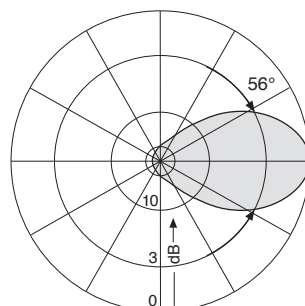
A: ~ 2490 mm
B: ~ 1740 mm
C: ~ 850 mm

- 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.

Radiation Patterns (at mid-band)



Horizontal Radiation Pattern



Vertical Radiation Pattern

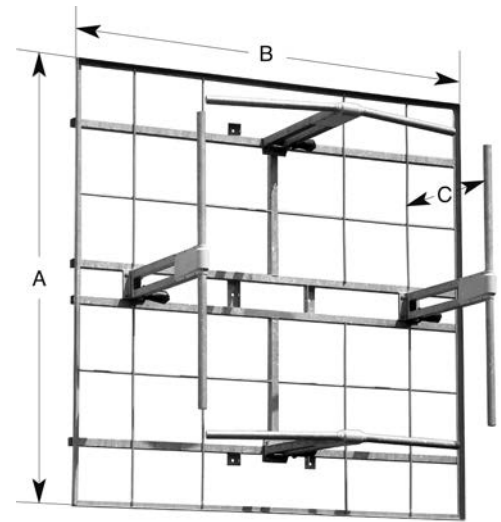
Panel Antenna

- 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	

87.5–108 MHz

H V X

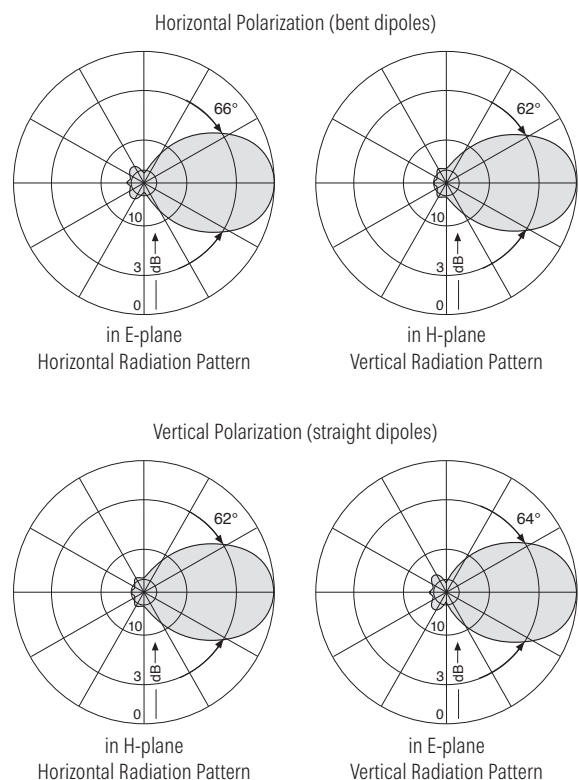


A = B: ~ 2200 mm
C: ~ 830 mm

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.

Radiation Patterns (at mid-band)



> Dipole Antenna

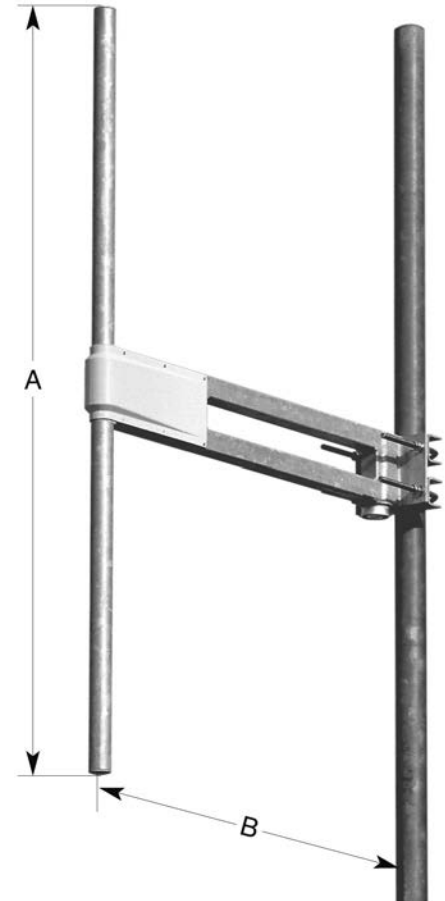
- Quasi-omnidirectional radiation pattern.
- For tubular masts.

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.

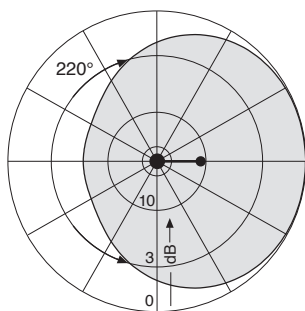
87.5–108 MHz

V

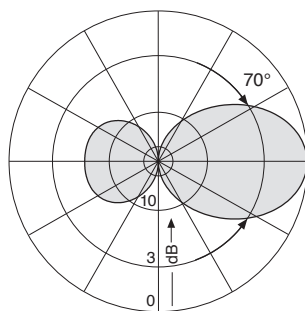


A: ~ 1380 mm
B: ~ 830 mm

Radiation Patterns (at mid-band)*



Horizontal Radiation Pattern



Vertical Radiation Pattern

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

> Yagi Antenna

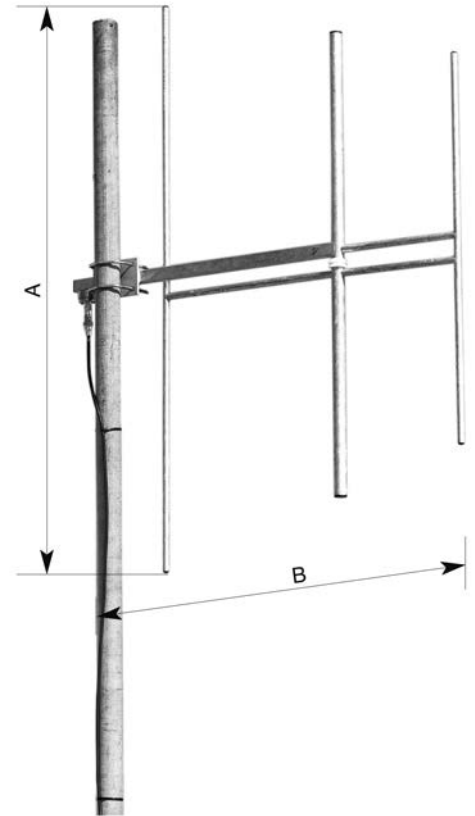
3 element broadband Yagi antenna.

87.5–108 MHz

V

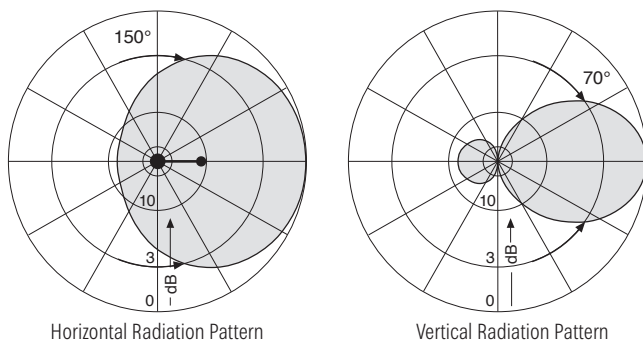
Order No.	770777	770776
Input	7-16 female	7/8" EIA flange
Max. power	3 kW	5 kW
Frequency range	87.5–108 MHz	
VSWR	< 1.3	
Gain (at mid-band)	4 dBd	
Impedance	50 Ω	
Polarization	Vertical	
Weight	13 kg	
Wind load (at 160 km/h) Frontal/Lateral	165 N/275 N	
Max. wind velocity	225 km/h	

- Material:** Hot-dip galvanized steel.
- Mounting:** To pipes of 60–125 mm Ø by means of 2 U-bolts, supplied.
- Grounding:** Via mounting parts.



A: ~ 1822 mm
B: ~ 1300 mm

Radiation Patterns (at mid-band)



> Yagi Antenna

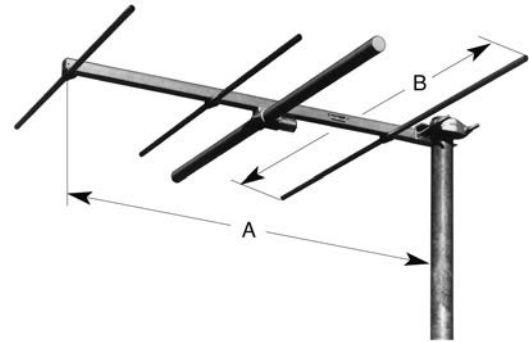
- 4 element broadband Yagi antenna.
- Component for low power transmitting antennas.

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	Frontal/lateral: 215 N/160 N
Vertically polarized	Frontal/lateral: 215 N/340 N
Max. wind velocity	225 km/h

87.5–108 MHz

H

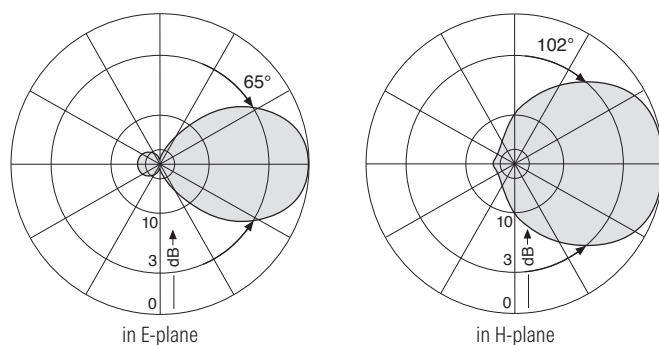
V



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.

Radiation Patterns (at mid-band)



Log.-Per. Antenna

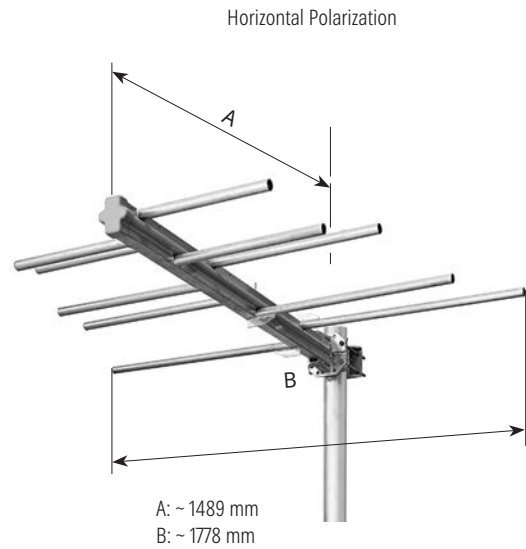
- Logarithmic-periodic broadband directional antenna.
- Suitable for sites with icing.

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	Frontal/lateral: 300 N/325 N		
Vertically polarized	Frontal/lateral: 300 N/475 N		
Max. wind velocity	225 km/h		

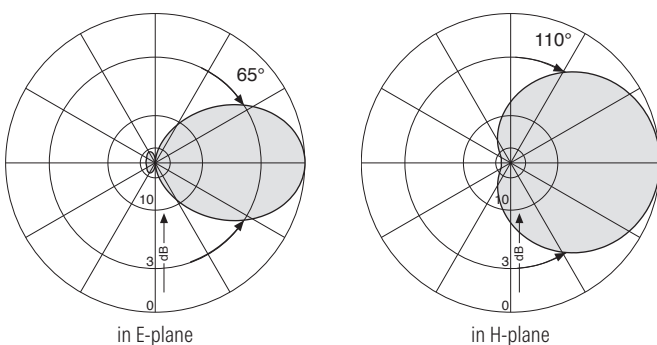
- Material:** Hot-dip galvanized steel.
- Mounting:** To pipes of 60–120 mm diameter by means of mounting clamps, supplied.
- Grounding:** Via mounting parts.

87.5–108 MHz

H V



Radiation Patterns (at mid-band)



Antenna Systems for VHF TV and DAB

174–240 MHz



Broadcast Station "Hochblauen", Germany

DAB Antenna System integrated in FM aperture

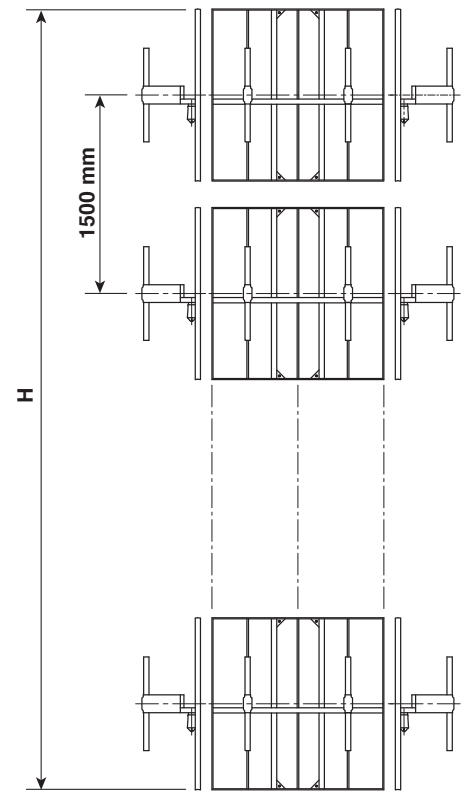
> VHF Transmitting Antenna

- Antenna array of dipole panels (page 38) 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	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

174–240 MHz

V



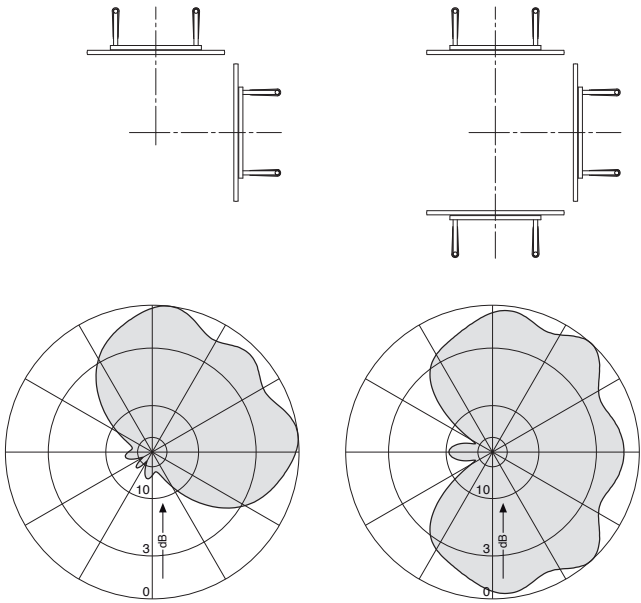
No. of bays	Panels per bay	Gain* (at mid-band)		Weight (without mounting hardware) kg	Antenna height H m	Windload (v = 160 km/h) kN
		dBd	times			
1	2	4.5	2.8	80	1.3	1.2
	3	2.7	1.9	120		1.9
	4	1.9	1.5	160		2.4
2	2	7.5	5.6	160	2.8	2.4
	3	5.7	3.7	240		3.8
	4	4.9	3.1	320		4.8
4	2	10.5	11.2	320	5.8	4.8
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

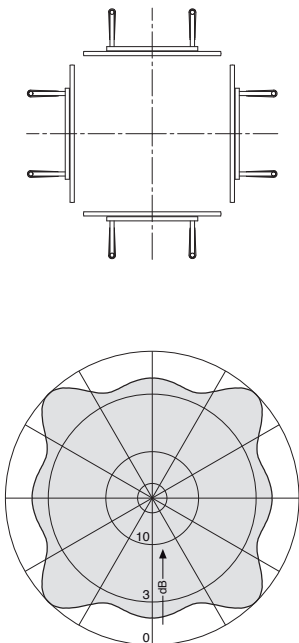
Horizontal Radiation Patterns

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

Equal power splitting



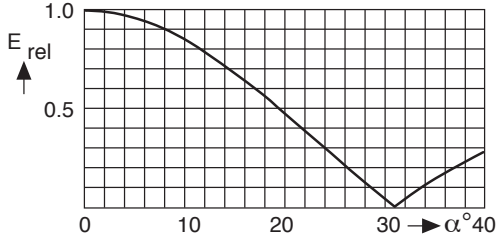
Equal power splitting



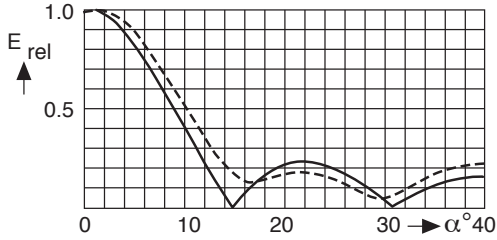
Vertical Radiation Patterns

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

2 bays



4 bays



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

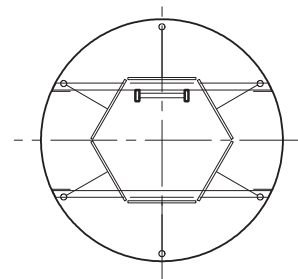
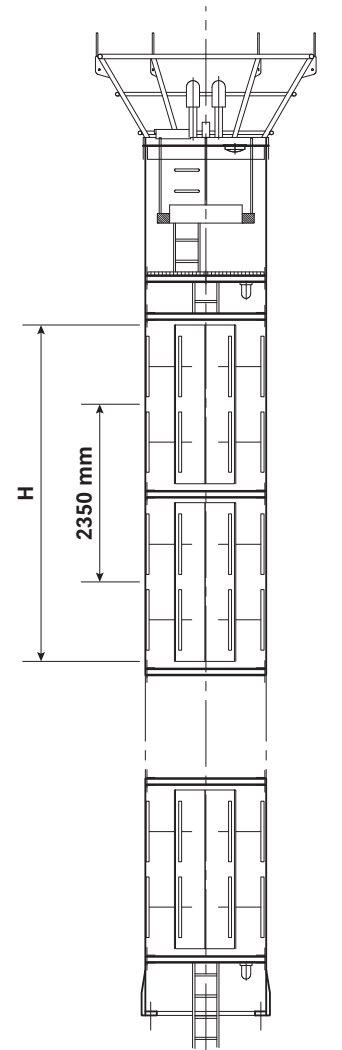
> VHF Transmitting Antenna

174–230 MHz

V

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

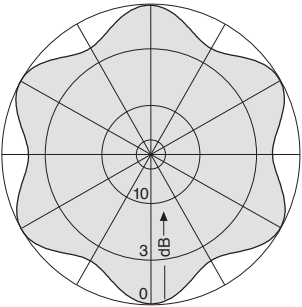
Input	Connectors according to IEC, EIA or DIN.
Max. power	According to customer's requirements.
Frequency	174–230 MHz
VSWR, typically	< 1.2 in the whole range.
Impedance	50 Ω
Polarization	Vertical
Vertical radiation pattern	Null fill and beam tilt upon request.
Horizontal radiation pattern	Omnidirectional
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 Ø) kg	Antenna height H m	Windload** (v = 160 km/h) with cylinder 1.6 m Ø 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

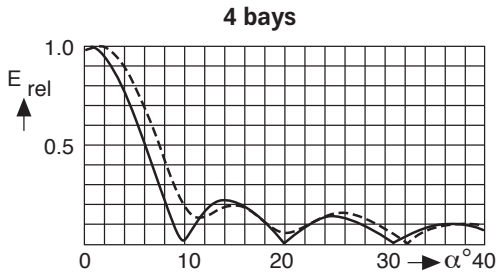
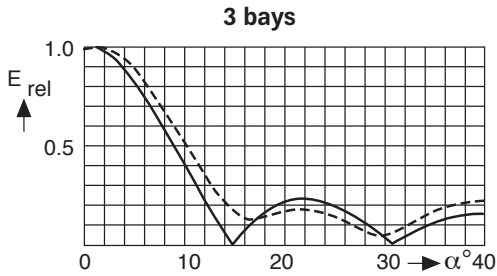
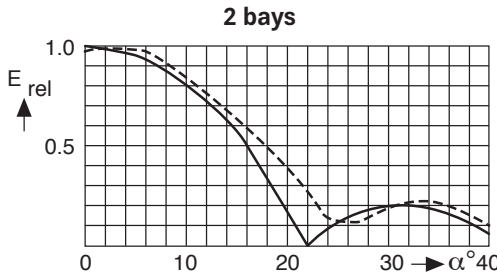
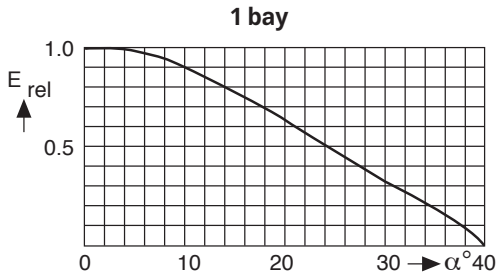
* Attenuation of the internal cabling and the gain-decrease in case of null fill in the vertical radiation pattern are not considered.
 Approximate values for gain decrease:
 cable attenuation: 0.2–0.4 dB
 null fill: 0.3–1.0 dB
 Gain figures are valid for the direction of maximum radiation (see diagrams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



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

➤ Omnidirectional Antenna

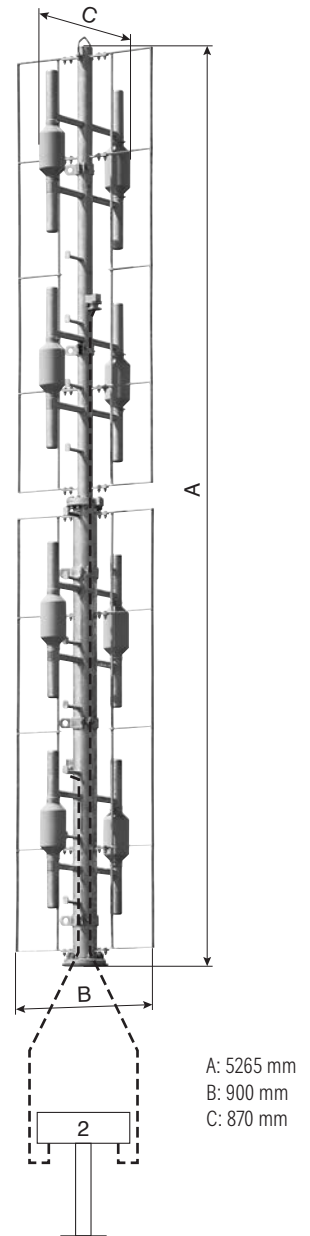
- Especially suitable for mounting at the top of masts.
- Consists of types 16911184 (lower half) and 75010365/368 (upper half), power splitter and cabling.

Splitter input	1 $\frac{5}{8}$ " EIA flange	3 $\frac{1}{8}$ " 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	

- 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.

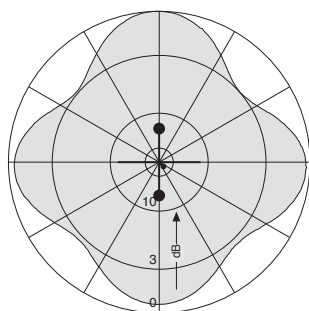
174–240 MHz

V

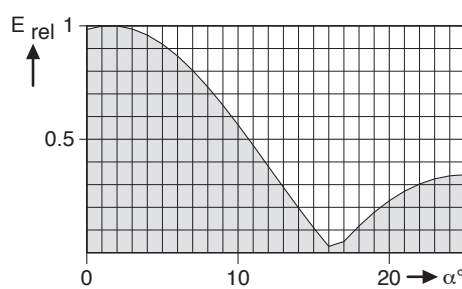


A: 5265 mm
B: 900 mm
C: 870 mm

Radiation Patterns (at mid-band)



Horizontal Radiation Pattern



Typical Vertical Radiation Pattern, Electrical Downtilt: 1.5°

Antennas for VHF TV and DAB

174–240 MHz

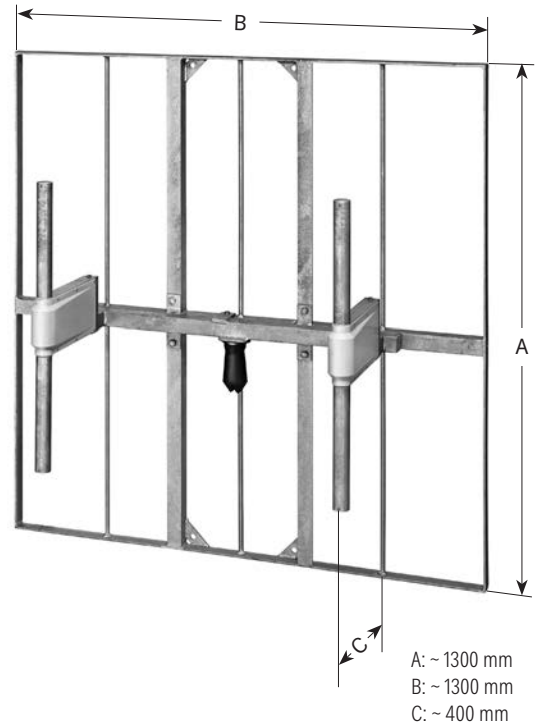
> Panel Antenna

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		

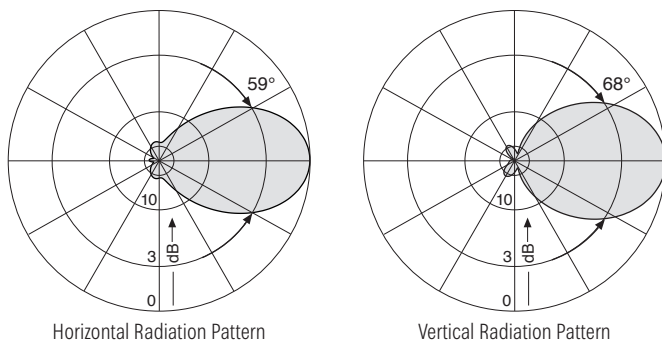
174–240 MHz

V



- 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.

Radiation Patterns (at mid-band)



Panel Antenna

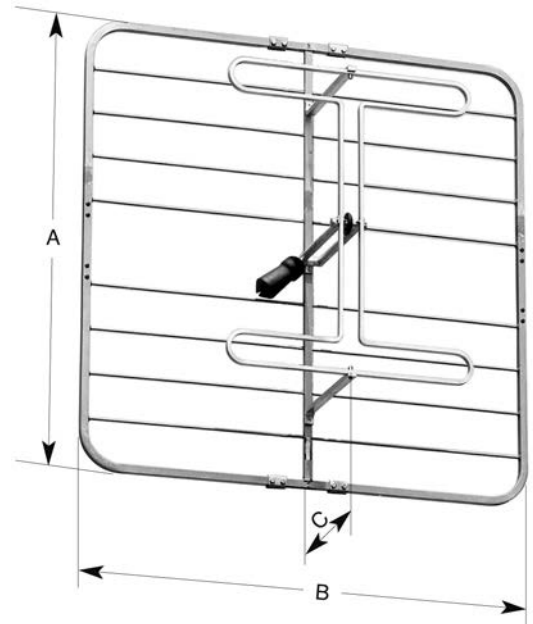
Light weight panel of weather-resistant aluminum.

174–230 MHz

H

V

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:	Frontal/lateral: 440 N/250 N
Vertical:	Frontal/lateral: 440 N/350 N
Max. wind velocity	
Horizontal:	225 km/h
Vertical:	200 km/h

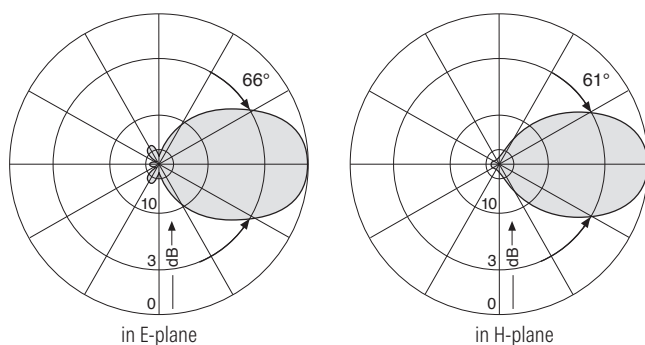


A: ~ 1200 mm
B: ~ 1200 mm
C: ~ 360 mm

VHF Antennas

- Material:** Weather-resistant aluminum.
- Mounting:** To pipes of 60–115 mm \varnothing by means of mounting clamps, supplied.
- Grounding:** Via mounting parts.
- Special features:** The antenna will be shipped dismantled.

Radiation Patterns (at mid-band)



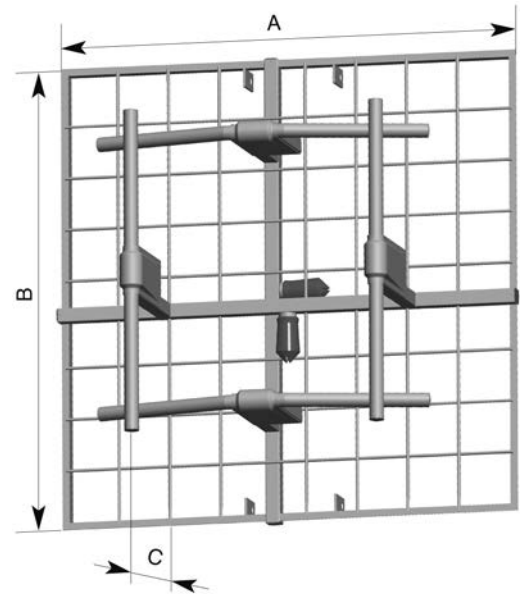
Panel Antenna

- 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

174–240 MHz

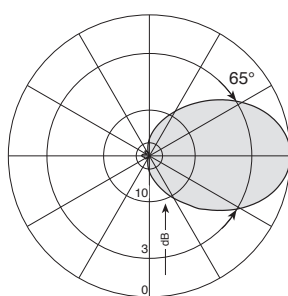
H V X



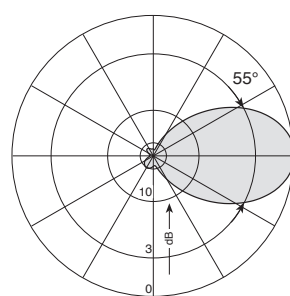
A: ~ 1300 mm
B: ~ 1300 mm
C: ~ 465 mm

- 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)

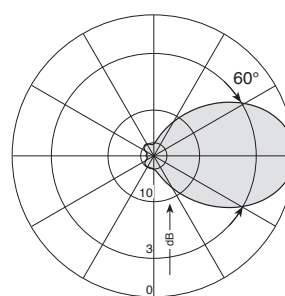


Horizontal Radiation Pattern
E-plane

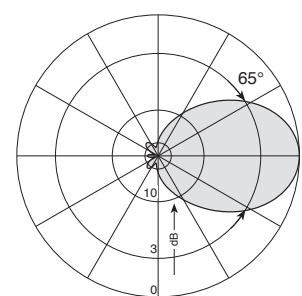


Vertical Radiation Pattern
H-plane

Radiation Patterns for vertical polarization (at mid-band)



Horizontal Radiation Pattern
H-plane



Vertical Radiation Pattern
E-plane

> Log.-Per. Antenna

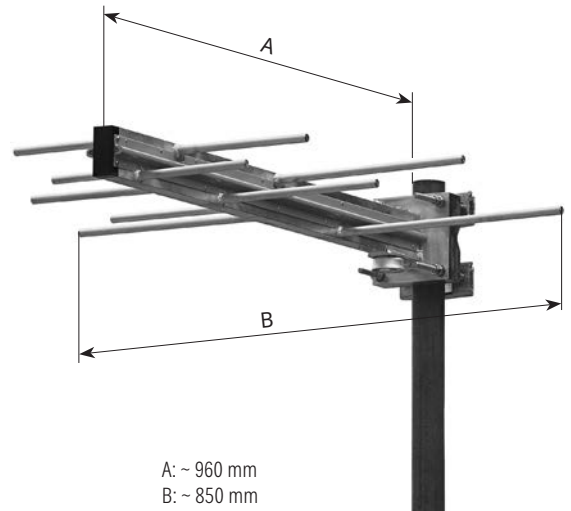
174-240 MHz

H

V

Logarithmic-periodic broadband directional antenna.

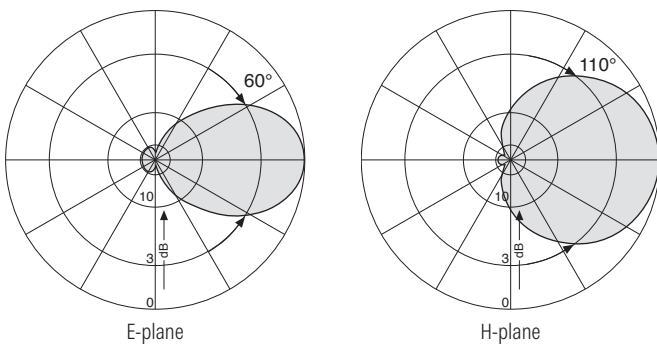
Order No.	75010242
Input	7-16 female
Max. power	2 kW
Frequency range	174-240 MHz
VSWR	174-230 MHz: ≤ 1.25 230-240 MHz: ≤ 1.3
Gain (at mid-band)	5 dBd
Impedance	50 Ω
Polarization	Horizontal or vertical
Weight	10 kg
Wind load (at 160 km/h)	Frontal/lateral: 100 N/190 N
Max. wind velocity	225 km/h



VHF Antennas

- Material:** Hot-dip galvanized steel.
- Mounting:** To pipes of 40-95 mm diameter by means of mounting clamps, supplied.
- Grounding:** Via mounting parts.

Radiation Patterns (at mid-band)



> Dipole Antenna

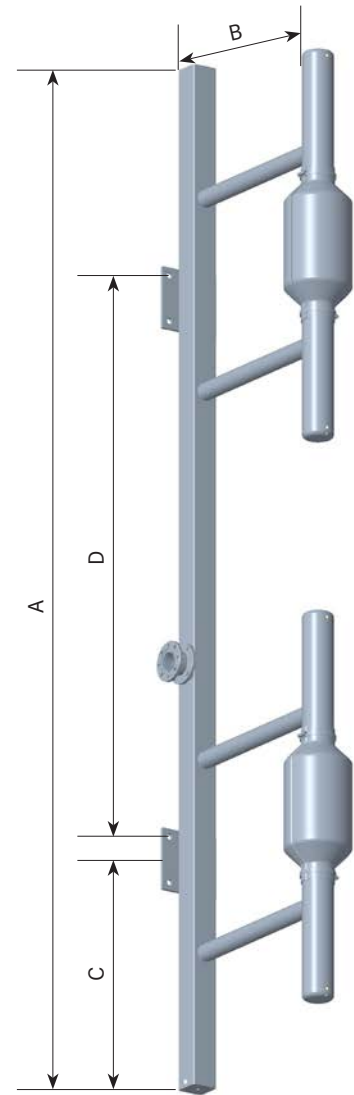
- Hot-dip galvanized steel.
- For side-mounting to masts.

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.

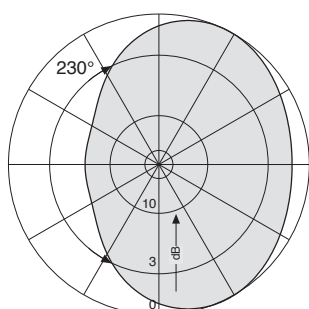
174–240 MHz

V

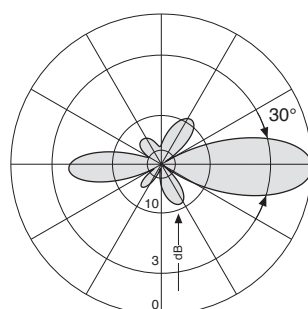


A: ~ 2326 mm
B: ~ 460 mm
C: ~ 520 mm
D: ~ 1280 mm

Radiation Patterns (at mid-band)*



Horizontal Radiation Pattern



Vertical Radiation Pattern
1.5° electrical downtilt

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

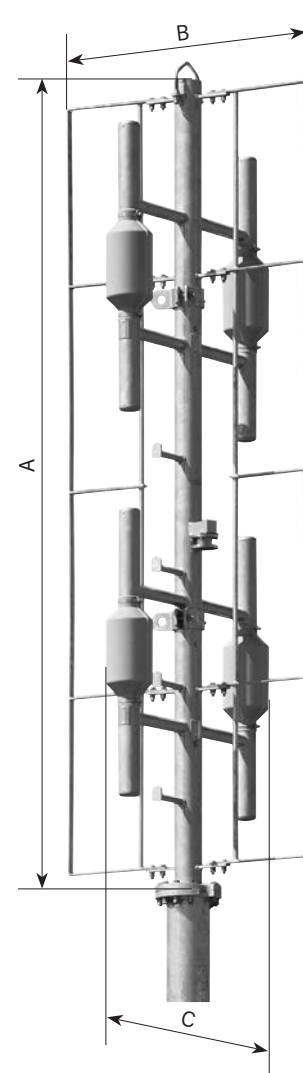
> Omnidirectional Antenna

174–240 MHz

V

Omnidirectional antenna for top mounting.

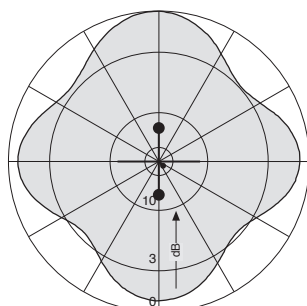
Order No.	75010365	75010366	75010367	75010368
Input	7-16 female	7/8" EIA flange	13-30 female	1 5/8" EIA flange
Max. power	2 kW	3 kW	5 kW	8 kW
Frequency range	174–240 MHz			
VSWR	< 1.2			
Gain (at mid-band)	4.5 dBd			
Impedance	50 Ω			
Polarization	Vertical			
Weight	80 kg			
Wind load (at 160 km/h)	1080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



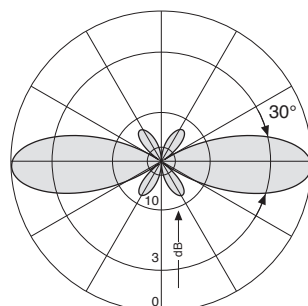
A: ~ 2625 mm
 B: ~ 900 mm
 C: ~ 870 mm

- 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!

Radiation Patterns (at mid-band)



Horizontal Radiation Pattern



Vertical Radiation Pattern
 2° electrical downtilt

Antenna Systems for UHF DTV and Next Generation Broadcasting

470–862 MHz



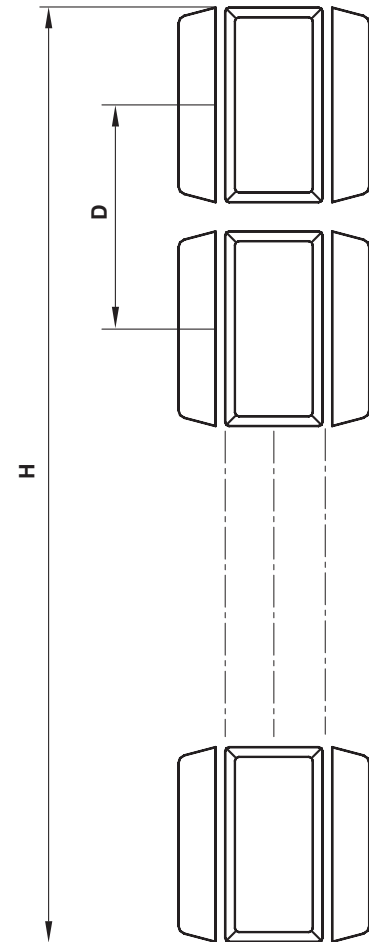
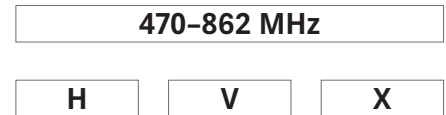
Broadcast Station "Leonberg", Germany

UHF Antenna System for 5G Broadcasting repeater

> UHF Transmitting Antenna

- 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 Ø c) Panels mounted inside self-supporting fiberglass cylinder (1.6 m Ø)
Grounding	Via mounting parts.
Max. wind velocity	As required.



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

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 Ø	without cylinder **	behind radome 1.2 m Ø ***	GRP cylinder 1.6 m Ø ***
4	2	15.0	31.6	120	4.45	4.3	5.2	4.5	6.0
	3	13.6	22.9	160			6.4		
	4	11.8	15.1	210			6.2		
6	2	16.8	47.9	170	6.75	6.5	7.8	7.0	9.0
	3	15.4	34.7	240			9.6		
	4	13.6	22.9	330			9.3		
8	2	18.0	63.1	240	9.05	8.7	10.4	9.0	12.0
	3	16.6	45.7	320			12.8		
	4	14.8	30.2	420			12.4		
12	2	19.8	95.5	350	13.65	13.1	15.6	14.0	18.0
	3	18.4	69.2	490			19.2		
	4	16.6	45.7	670			18.6		
16	2	21.0	125.9	450	18.25	17.5	20.8	20.0	24.0
	3	19.6	91.2	690			25.6		
	4	17.8	60.3	890			24.8		

* 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).

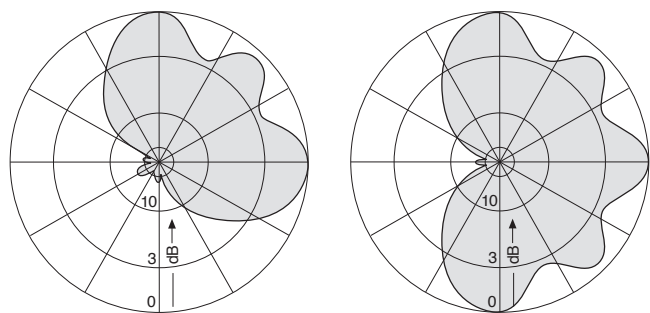
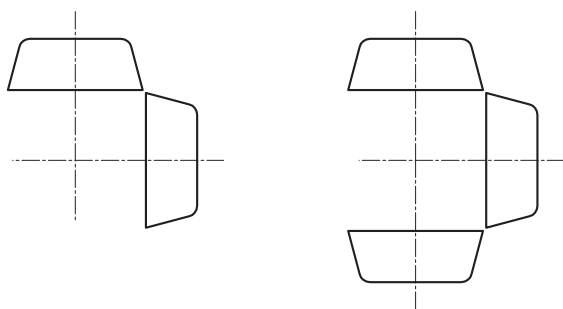
** Average values, depending on design and arrangement.

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

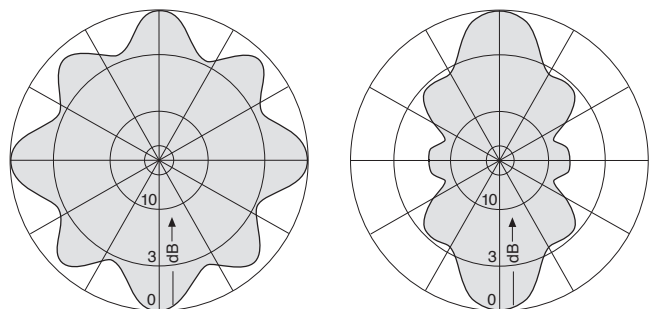
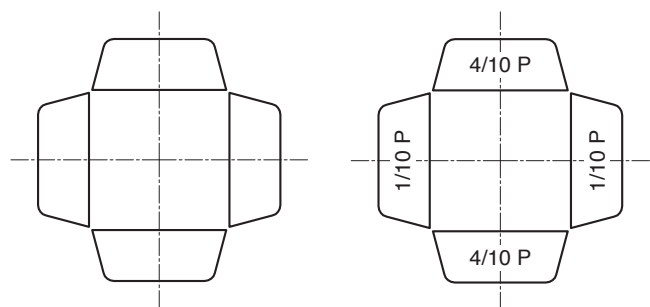
Horizontal Radiation Patterns

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

Equal power splitting



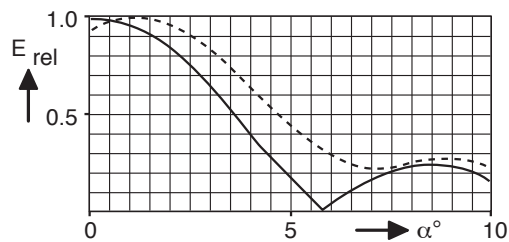
Equal power splitting Different power splitting



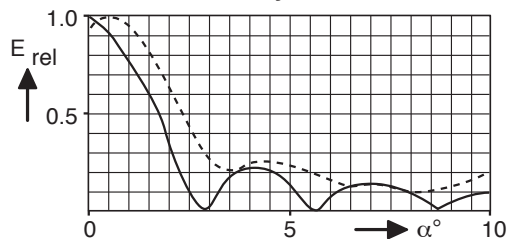
Vertical Radiation Patterns

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

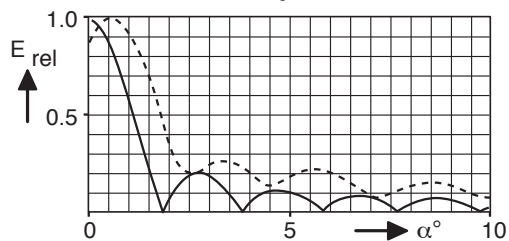
4 bays



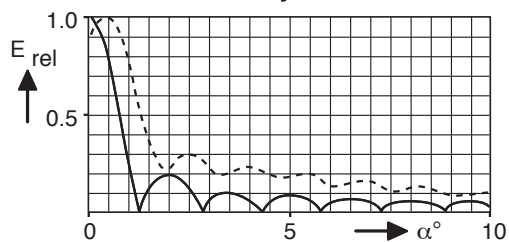
8 bays



12 bays



16 bays



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

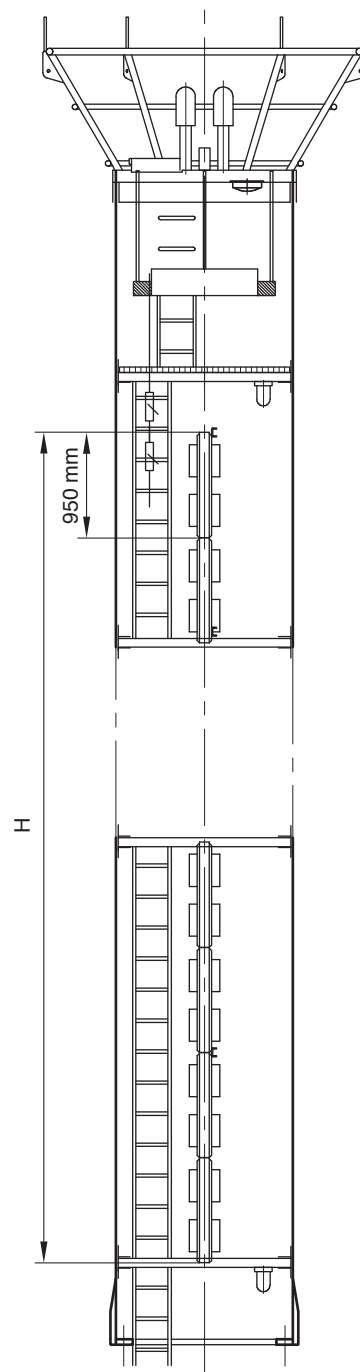
UHF Transmitting Antenna

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

470–862 MHz

H

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.

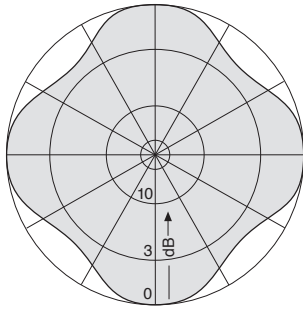


No. of bays	Gain* (at mid-band)		Weight** kg	Antenna height H m	Windload** (v = 160 km/h) kN
	dBd	times			
2	7.7	5.9	350	1.9	2.5
4	10.7	11.8	700	3.8	5.0
8	13.7	23.4	1400	7.6	10.0
12	15.5	35.5	2200	11.4	15.0
16	16.7	46.8	3050	15.2	20.0

* 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.

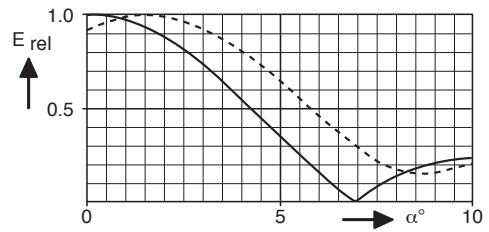
Typical Horizontal Radiation Pattern (at mid-band)



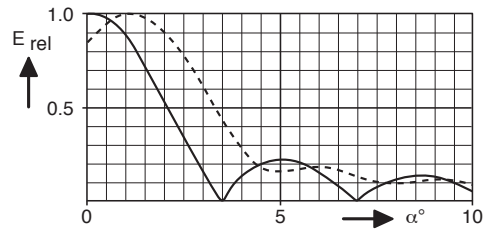
Vertical Radiation Patterns

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

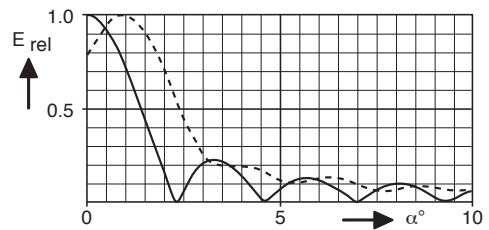
4 bays



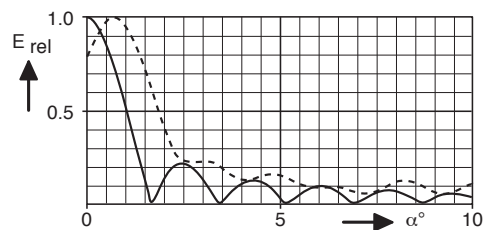
8 bays



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

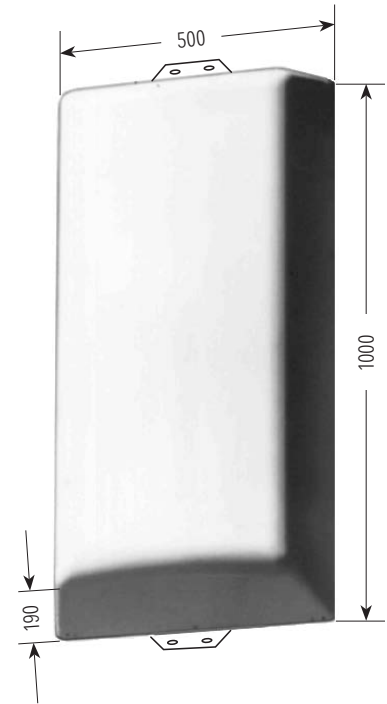
> UHF Panel

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

470–862 MHz

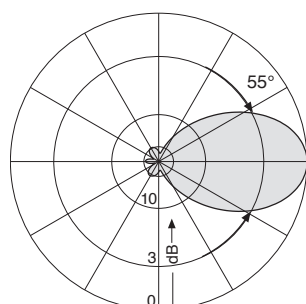
H



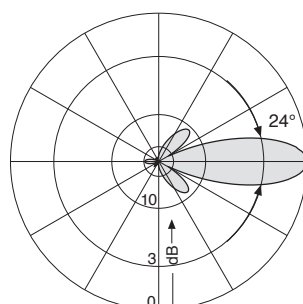
Horizontal polarization

- 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.

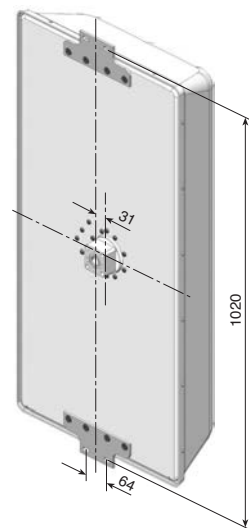
Radiation Patterns (at mid-band)



Horizontal Radiation Pattern



Vertical Radiation Pattern



All dimensions in mm

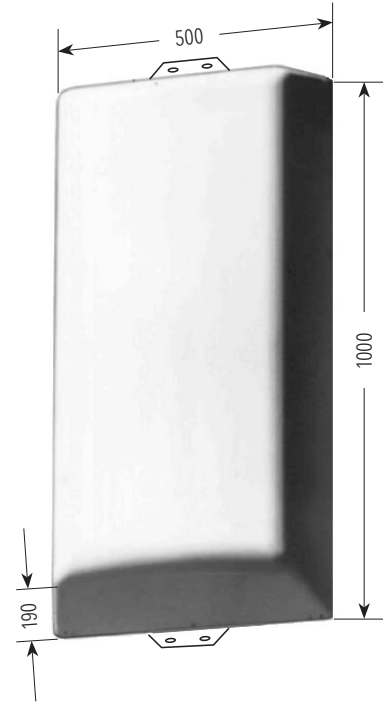
> UHF Panel

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

470–862 MHz

V



Vertical polarization

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

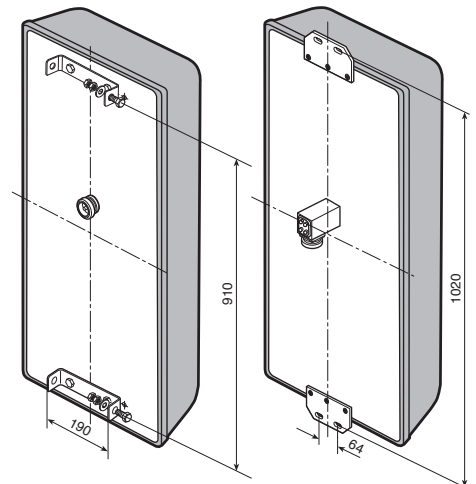
Radome color: RAL 9016 (traffic white), other radome colors on request.

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.

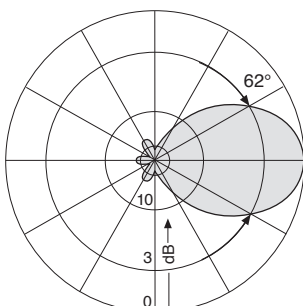
Ice protection: The dipoles remain fully functioning even in icy conditions as the fiberglass cover protects the whole antenna.

Examples with different connectors and attachments:

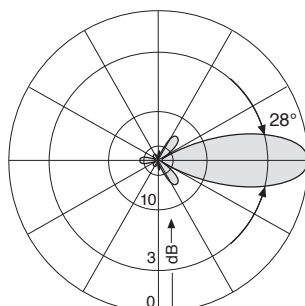


All dimensions in mm

Radiation Patterns (at mid-band)



Horizontal Radiation Pattern



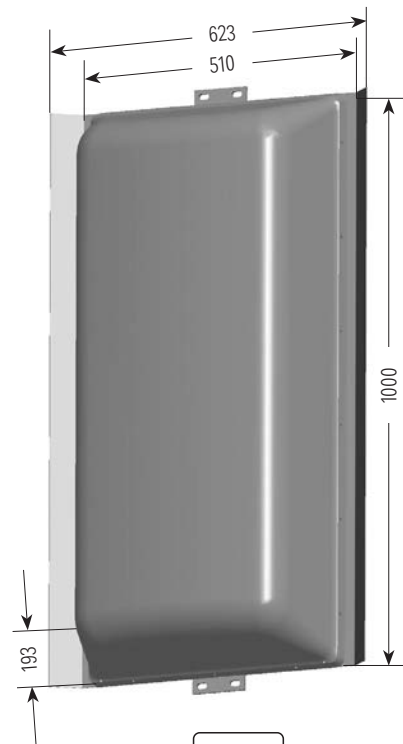
Vertical Radiation Pattern

> UHF Panel

470-694 MHz
X

Directional antenna for elliptical polarizations.

Order No.	750000044	750000049
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	

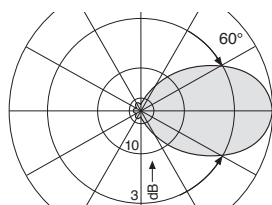


Elliptical polarization

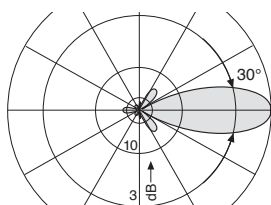
- Material:** Reflector screen, dipoles: Weather-resistant aluminum, tin-plated brass. Protective cover: Fiberglass. Attachment plate: Hot-dip galvanized steel.
- Radome color:** RAL 9016 (traffic white), other radome colors on request.
- Mounting:** Using M 8 × 35 screws (supplied) to suitable attachment 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.

Radiation Patterns (at mid-band)

Horizontal Polarization

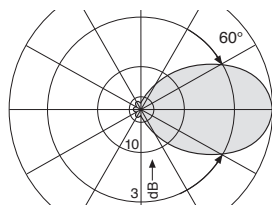


Horizontal Radiation Pattern

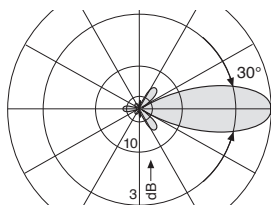


Vertical Radiation Pattern

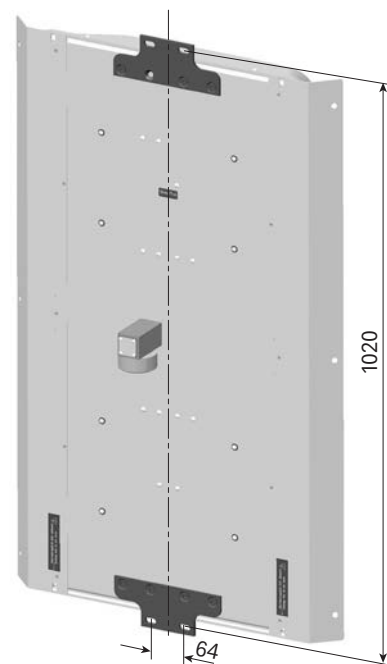
Vertical Polarization



Horizontal Radiation Pattern



Vertical Radiation Pattern



All dimensions in mm

> UHF Panel

Directional antenna for various polarizations.

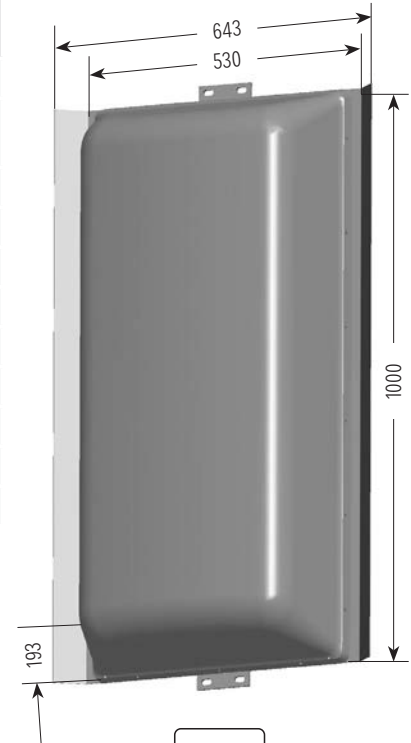
470–694 MHz

H

V

X

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 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	

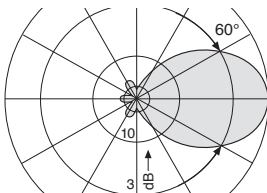


Hor./ver./elliptical polarization

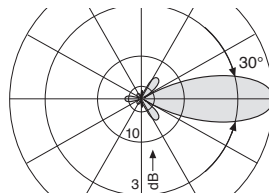
- Material:** Reflector screen and dipoles: Weather-resistant aluminum, tin-plated brass. Protective cover: Fiberglass. Attachment plate: Hot-dip galvanized steel.
- Radome color:** RAL 9016 (traffic white), other radome colors on request.
- Mounting:** Using M 8 × 35 screws (supplied) to suitable attachment 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.

Radiation Patterns (at mid-band)

Horizontal Polarization

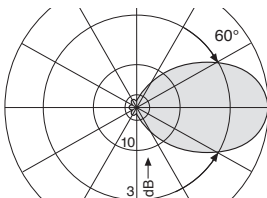


Horizontal Radiation Pattern

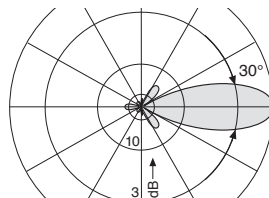


Vertical Radiation Pattern

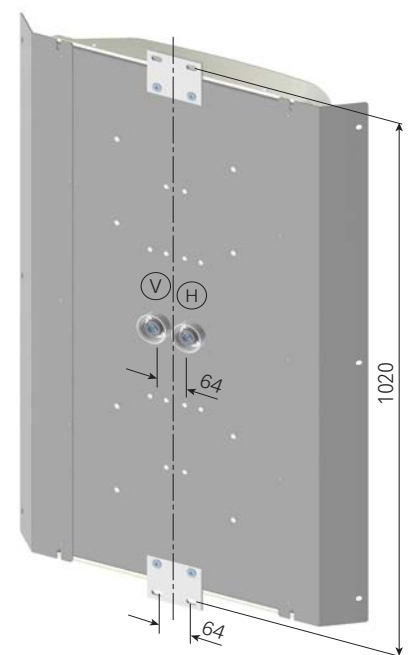
Vertical Polarization



Horizontal Radiation Pattern



Vertical Radiation Pattern



All dimensions in mm

> Cardioid Antenna

- Broadband slot antenna.
- Elliptically polarized.
- Wide cardioid pattern.
- Low windload.

470–694 MHz

X

Order No.	7500100007	7500100020
Input	1 ½" EIA flange	3 ½" EIA flange
Max. power (at 40 °C ambient temperature)	5 kW	15 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.

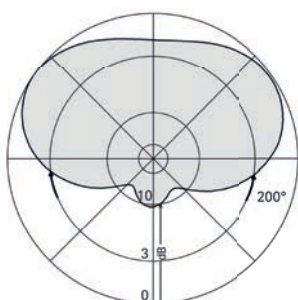
Radome color: Light grey (RAL 7035).

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

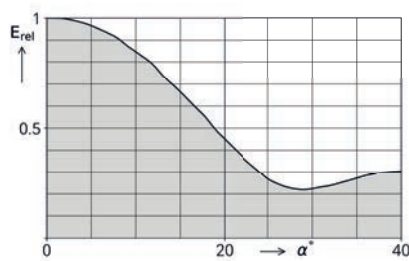
Mounting 7500100020: Side mount, by means of accessories (please order separately).

Grounding: Via mounting parts.

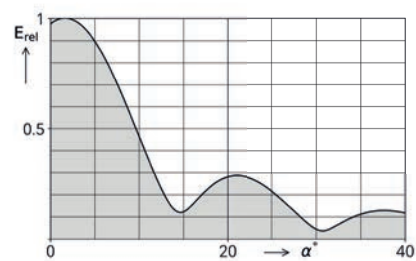
Radiation Patterns (at mid-band)



Horizontal Radiation Pattern



Vertical Radiation Pattern 7500100007



Vertical Radiation Pattern 7500100020

> Omnidirectional Antenna

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

470–654 MHz

H

V

X

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	
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

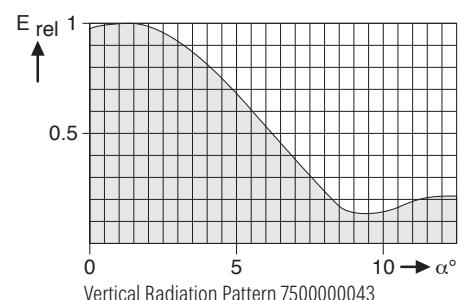
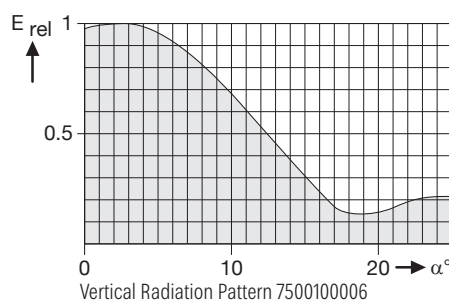
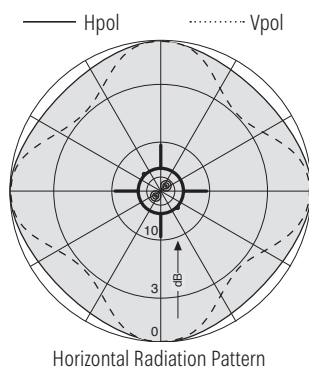
Material: Omnidirectional antenna in protective fiberglass radome with a diameter of 330 mm. Radome color: Light grey or customized. Flange: Hot-dip galvanized steel.

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

Radiation Patterns (at mid-band)



> UHF Omni

470–862 MHz

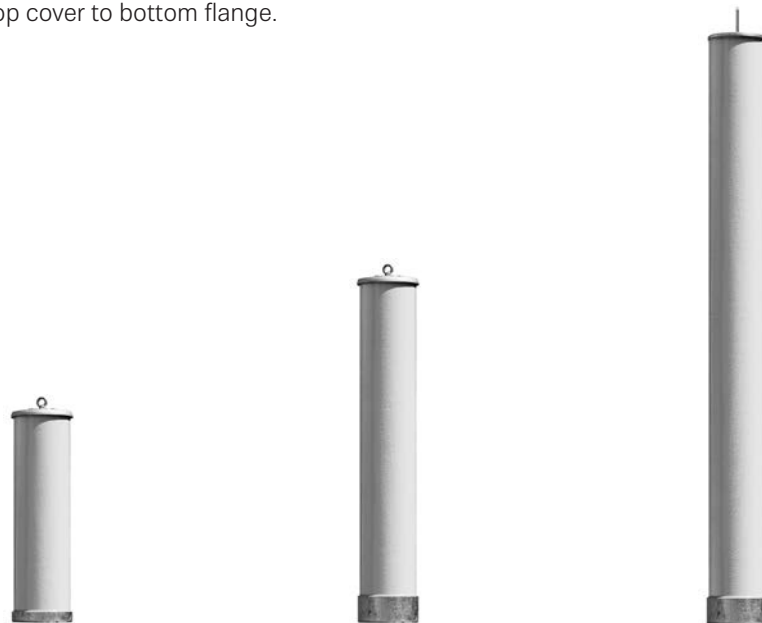
H

- 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.

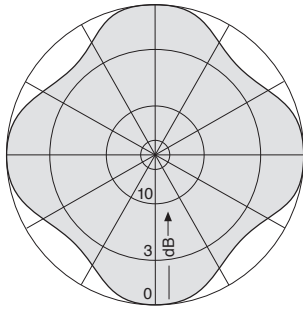


Order No.	75010270	75010271	75010272
Input connector	7-16 female	7-16 female	7-16 female
Max. power*	600 W	1 kW	1 kW
Frequency range	470–862 MHz	470–862 MHz	470–862 MHz
VSWR	≤ 1.2	≤ 1.2	≤ 1.15
Gain (at mid-band)	2.0 dBd	4.5 dBd	7.5 dBd
Impedance	50 Ω	50 Ω	50 Ω
Radome diameter	230 mm	230 mm	230 mm
Height (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

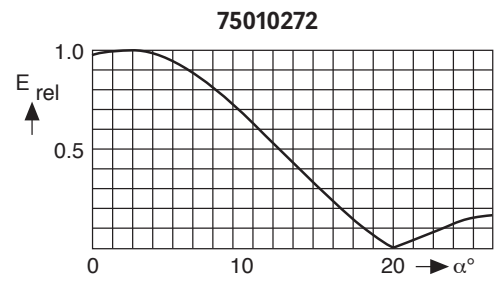
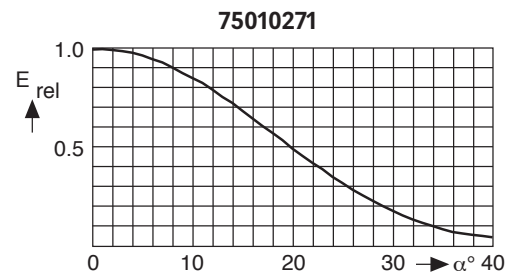
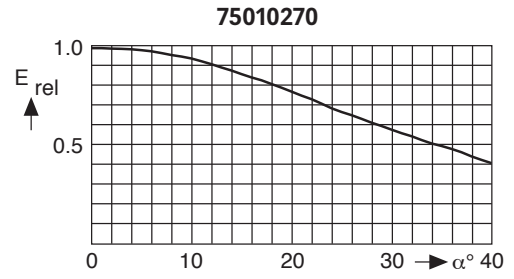
* at 40 °C ambient temperature

Horizontal Radiation Pattern (at mid-band)

Vertical Radiation Patterns (at mid-band)



Typical Horizontal Radiation Pattern



> UHF Omni

470–862 MHz

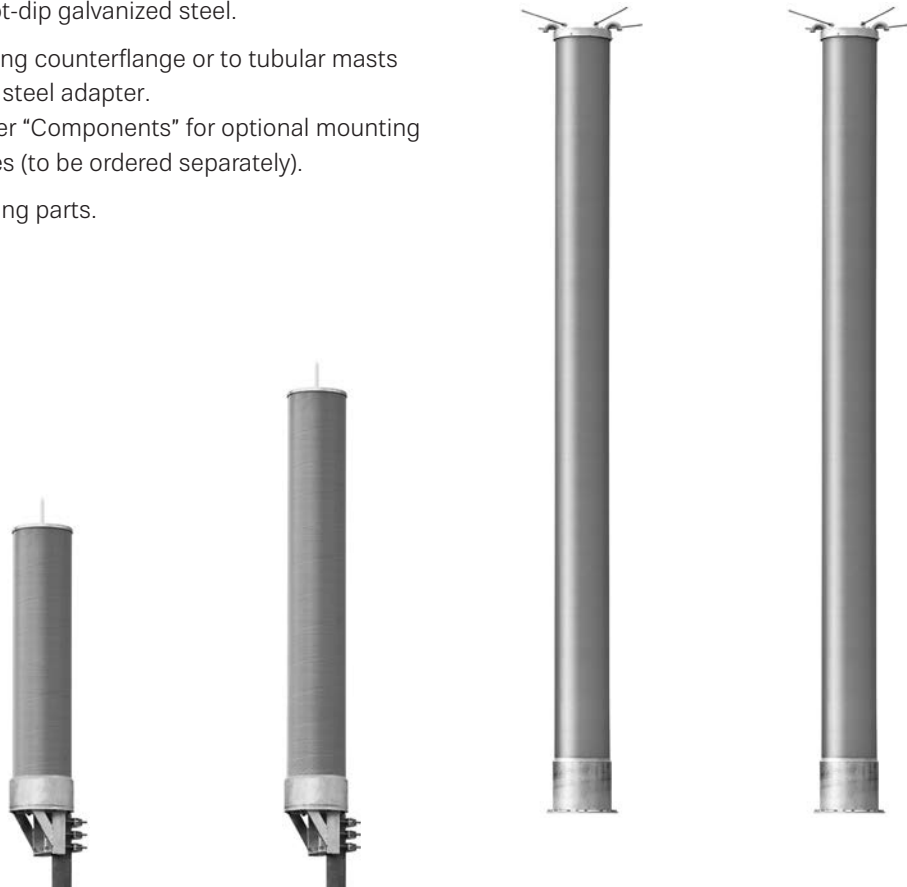
H

- 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.

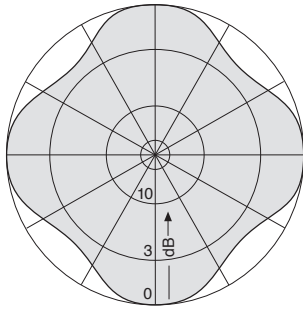


Order No.	75010066	75010067	75010068	75010069
Input connector	1 5/8" EIA flange	1 5/8" EIA flange	1 5/8" EIA flange	3 1/8" EIA flange
Max. power*	2.5 kW	5 kW	5 kW	7.5 kW
Frequency range	470–862 MHz	470–862 MHz	470–862 MHz	470–862 MHz
VSWR	≤ 1.1	≤ 1.1	≤ 1.1	≤ 1.1
Gain (at mid-band)	5.0 dBd	8.0 dBd	11.0 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

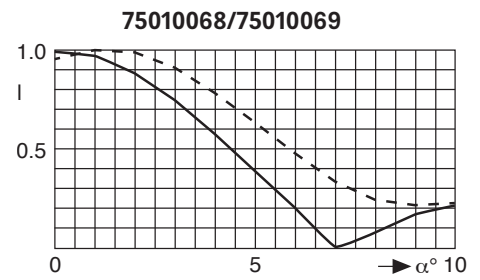
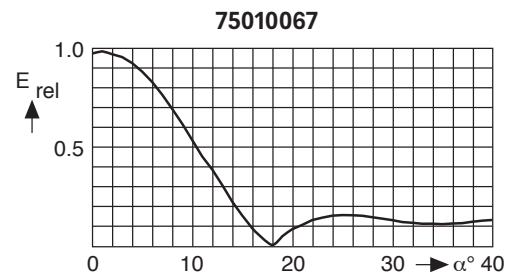
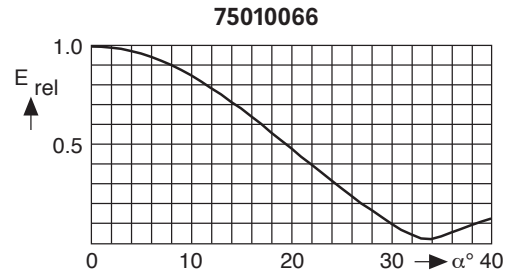
Horizontal Radiation Pattern (at mid-band)



Typical Horizontal Radiation Pattern

Vertical Radiation Patterns (at mid-band)

Examples of typical vertical radiation patterns*)



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

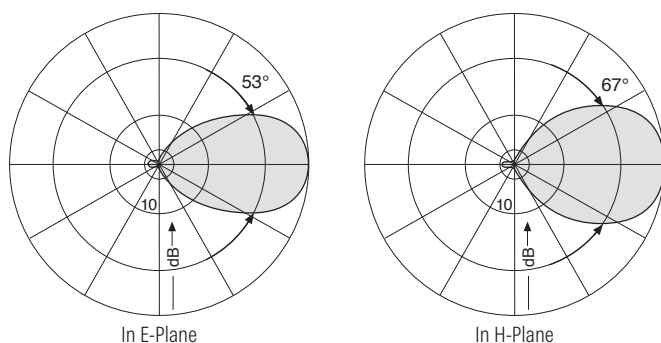
> Log.-Per.Antenna

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.:	Frontal/lateral: 63/100 N
For vertical pol.:	Frontal/lateral: 63/500 N
Max. wind velocity	For horizontal pol.: 240 km/h For vertical pol.: 180 km/h

- 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.

Radiation Patterns (at mid-band)



470–862 MHz

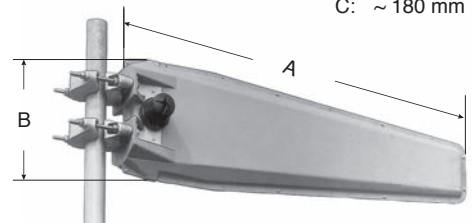
H

V

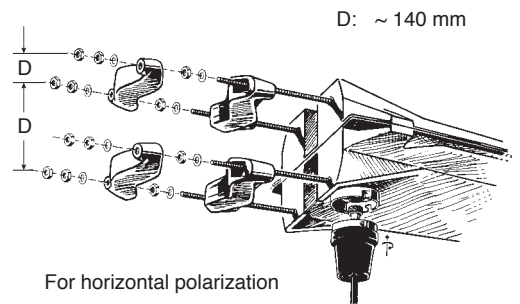


For horizontal polarization

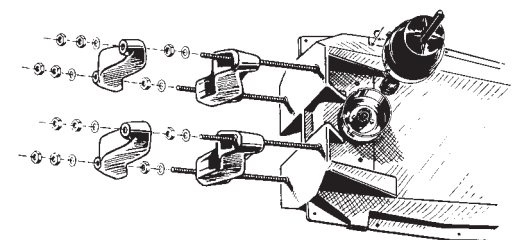
A: ~ 1153 mm
B: ~ 353 mm
C: ~ 180 mm



For vertical polarization



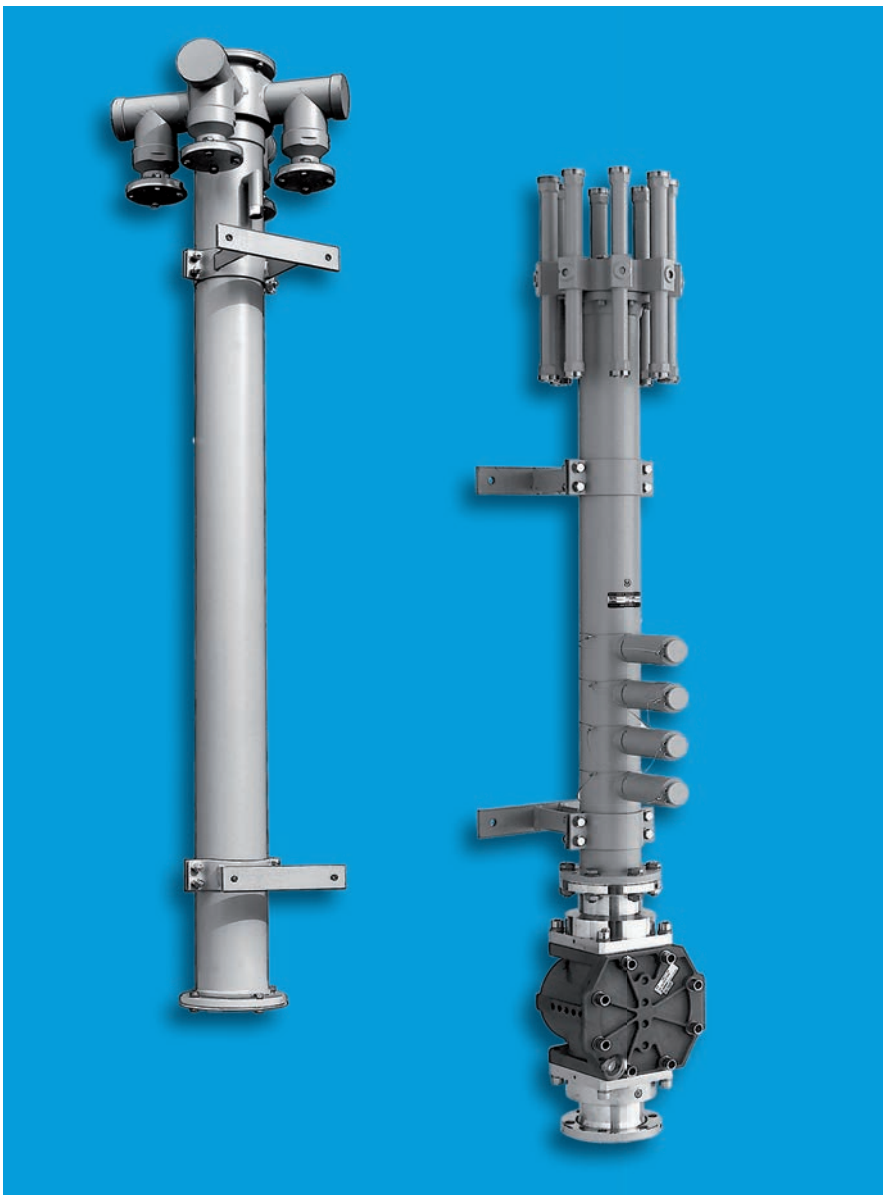
For horizontal polarization



For vertical polarization

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, 7/8", 1 5/8", 3 1/8", 4 1/2", 6 1/8" 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.		

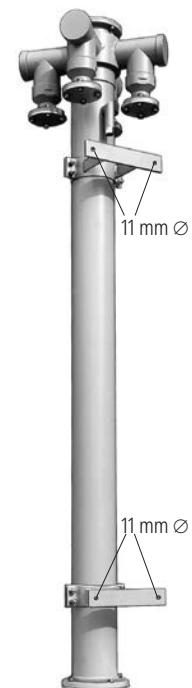
Material: Outer conductor: Brass with protective grey paint. Inner conductor: Brass or aluminum.

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 ventilation tube for pressurized operation)
IP 53 (opened ventilation tube for non-pressurized operation)



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

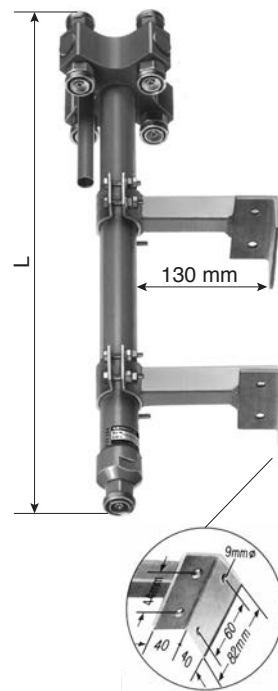


Example: 4-way splitter with standard-attachment

> 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.		



759044



- 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).
- 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 ventilation tube for pressurized operation)
 IP 53 (opened ventilation tube for non-pressurized 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
753000010	2 clamps	Mast diameter: 45–125 mm



Combiners and Filters for FM Broadcast



> Band-pass Filter

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.

87.5 ... 108 MHz

3 kW

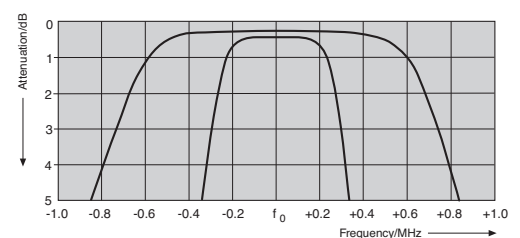
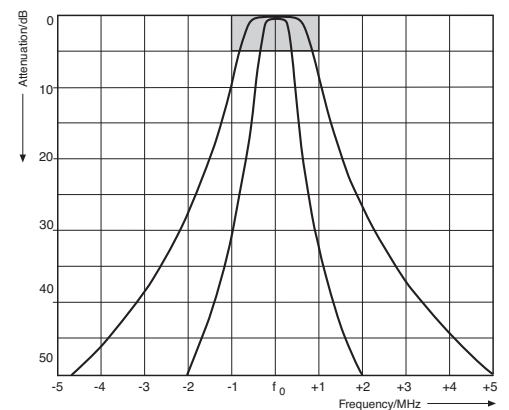


728726 FM Band-pass filter, 3 kW

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

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.

87.5 ... 108 MHz

5 kW

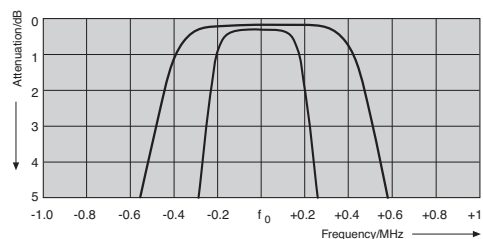
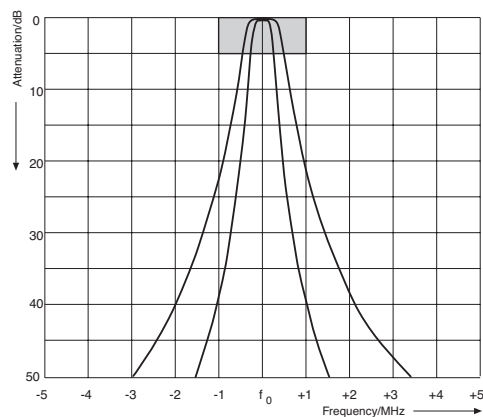


730150 FM Band-pass filter, 5 kW

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	1½" 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.

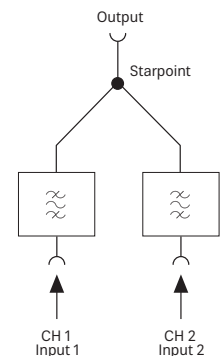
The band-pass filters must be tuned to the operating channel. Tuning may be done at our factory or can be carried out on site. Clear tuning instructions and also any special tools necessary are supplied along with the combiner.



728868 FM Starpoint combiner, 2 × 3 kW

Technical Data

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



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.

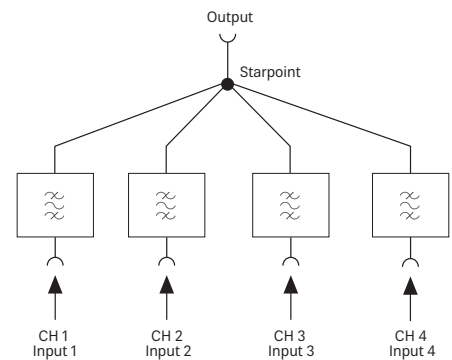
The starpoint combiners may be extended by adding further band-pass filters and by exchanging the starpoint.

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.	Inputs	Insertion loss ¹⁾	Connectors Input/Output	Weight	Dimensions (l × w × h) [mm]	Packing size [mm]
790717	2	< 0.4 dB	1 5/8" EIA/1 5/8" EIA	220 kg	975 × 695 × 1275	1080 × 890 × 1500
790718	3	< 0.5 dB	1 5/8" EIA/3 1/8" EIA	335 kg	2185 × 695 × 1260	2 × 1080 × 890 × 1500 1 × 1080 × 470 × 1500
790719	4	< 0.6 dB	1 5/8" EIA/3 1/8" EIA	450 kg	2185 × 695 × 1260	2 × 1080 × 890 × 1500
Frequency range	87.5 ... 108 MHz					
Channel spacing	> 1.5 MHz					
Isolation	> 35 dB					
VSWR	< 1.1 (at pass band)					
Impedance	50 Ω					
Input power	max. 5 kW (per input)					
Temperature range	-20 °C ... +50 °C					
Material	Aluminum (outer conductor) Brass, silver-plated (inner conductor)					
Colour	RAL 7032 (grey)					

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.

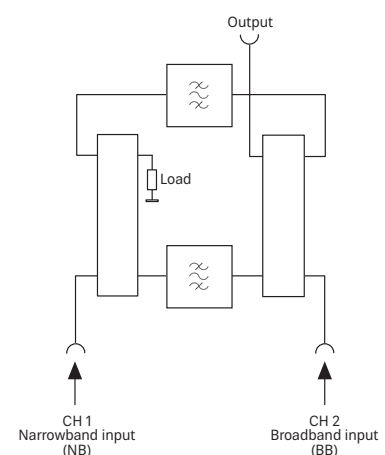
Clear tuning instructions and also any special tools necessary are supplied along with the combiner.



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.

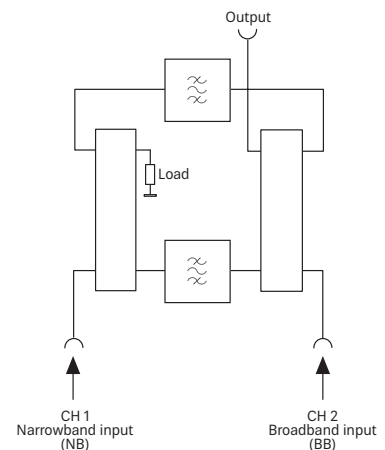


790573 FM Directional filter combiner, 10 kW
(mirror version of 728393)

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 5/8" EIA flange (NB-input) 3 1/8" 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.



> 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

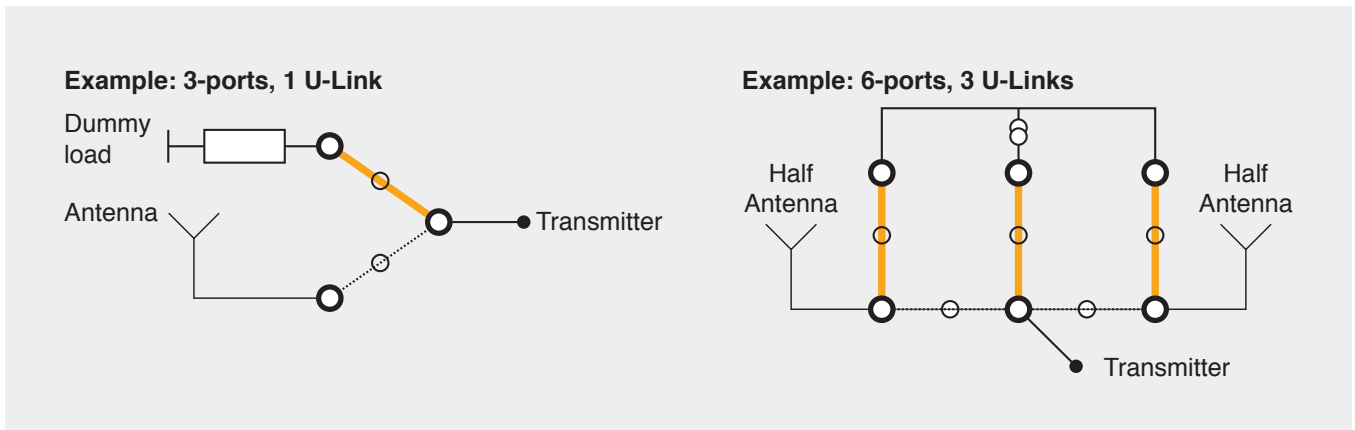
Mounting Hardware

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



FM switching unit with power measurement unit, Sira

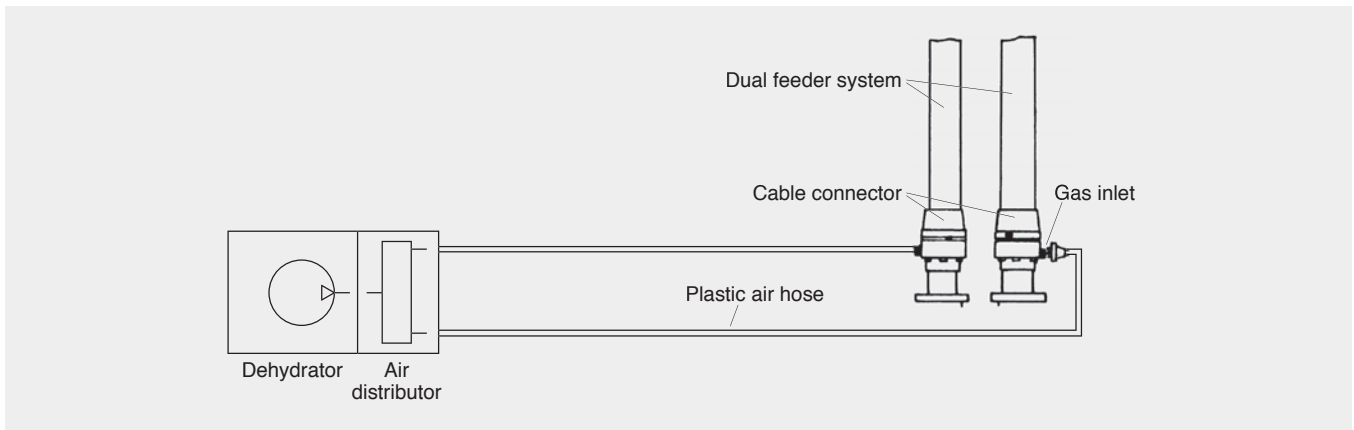


UHF switching unit, Sira

> Dehydrators

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

Typical pressurization system

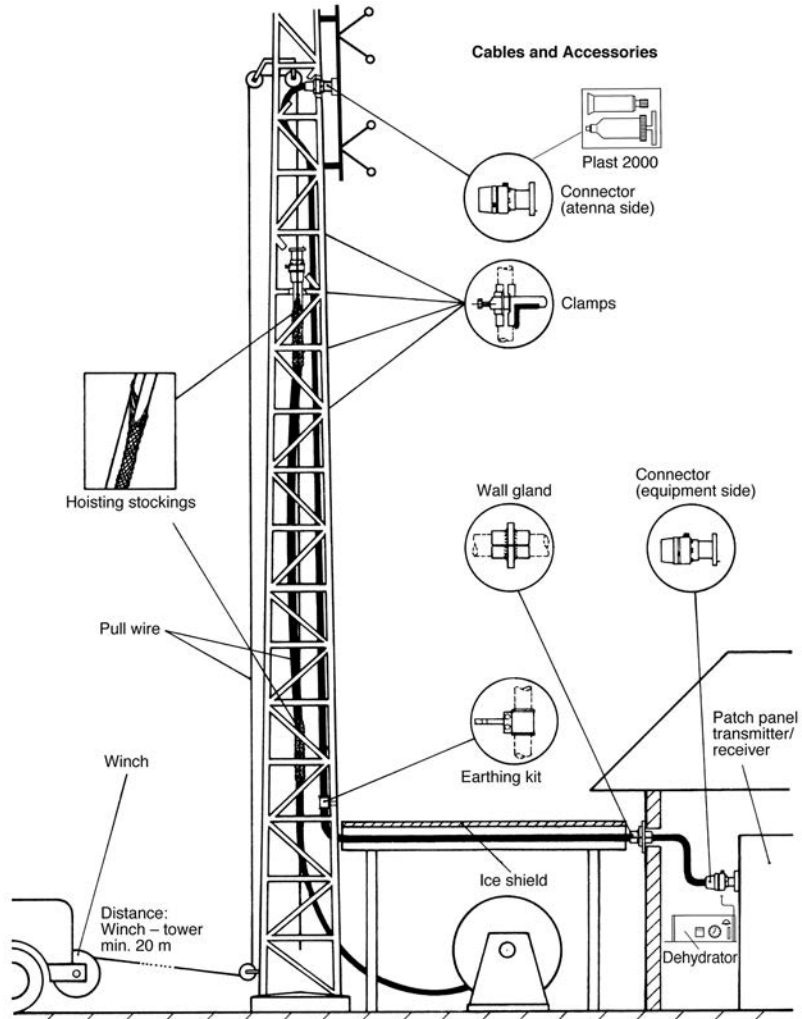


> Coaxial Cables and Accessories

- KATHREIN supplies products of high quality brands.
- Branch cables completely configured, phase-adjusted and fully tested.
- Feeder cables incl. accessories up to 6 1/8".
- Fire retardant jacket available.
- Air or foam dielectric cables.



Photos: RFS

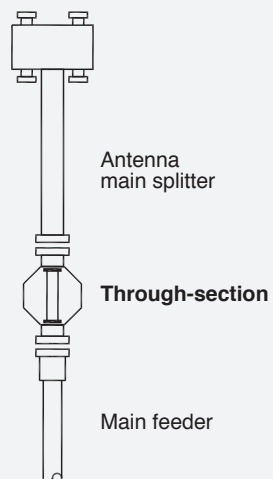


> Direct Access Units

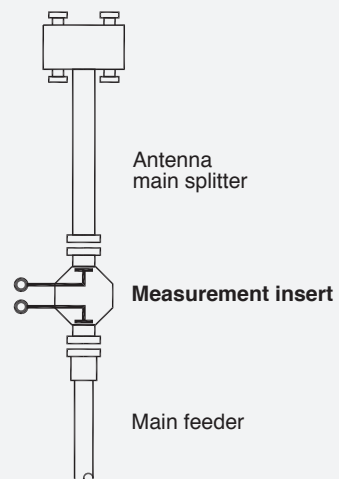
- KATHREIN supplies products of high quality brands.
- Quick and direct access to feeder cables.
- Accurate measurements of VSWR and electrical length.
- Antenna testing and tuning without dismantling the connected feeders.
- For outdoor application.
- Suitable for all broadcast standards.



Normal operation



Measurement operation

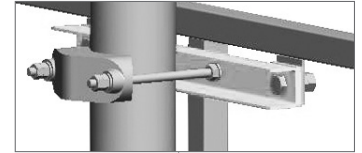


> Mounting Hardware for FM Panels

- 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 \varnothing	Weight kg
7530000007	7500100022	60–115	12
	7500100023		
	7500100024		
7530000008	601768	115–245	28
	601979		
	601694		
	75010008		
	752183		



Set of clamps
7530000007



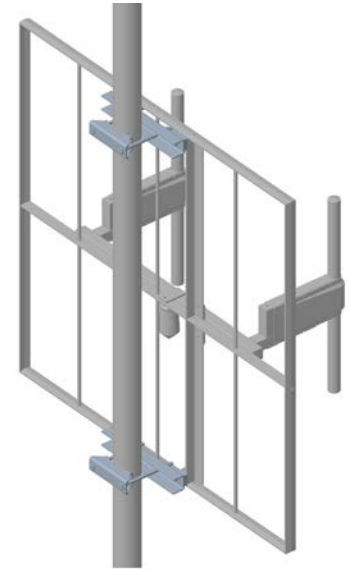
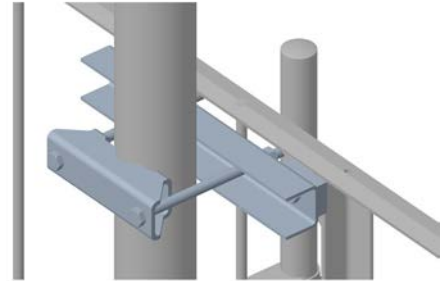
Set of clamps
7530000008

> Mounting Hardware for VHF Antennas

Components for mounting VHF antennas to tube masts.

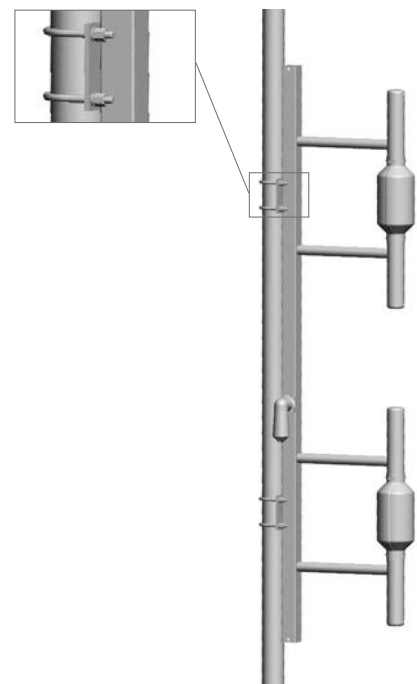
Pair of clamps for one VHF panel

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



Two pairs of clamps for one VHF dipole

Order No.	Suitable for VHF dipole	Suitable for tube mast of mm \varnothing	Weight kg
75310386	75010295 75010296 75010297	88.9	1.5



> 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.

Set of clamps for one UHF panel

Order No.	Old type number*	Suitable for tube mast of mm \varnothing	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!

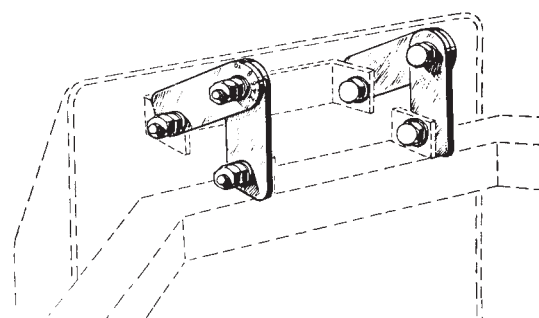


Pair of clamps 75310413

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 \varnothing	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 \varnothing	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 \varnothing	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.

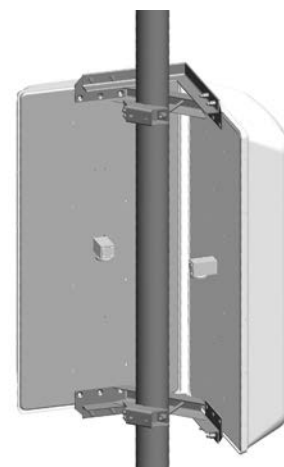
Pair of clamps for one UHF panel with attachment plate

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

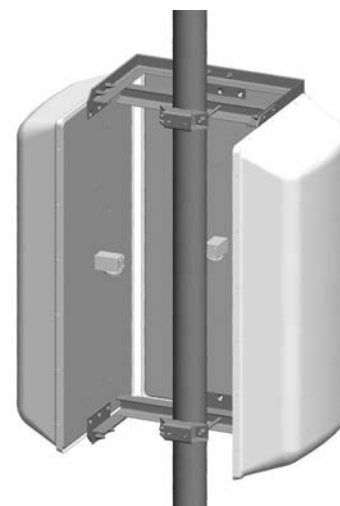


Remark:

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 \varnothing	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	60–125	9,9	550
	75010211			
	75010212			
	75010213			
7530000028	776165	125–245	11,3	
	776202			
	776167			
	7500100018			
	7500100031			
	7500000044			
	7500000049			

Material:

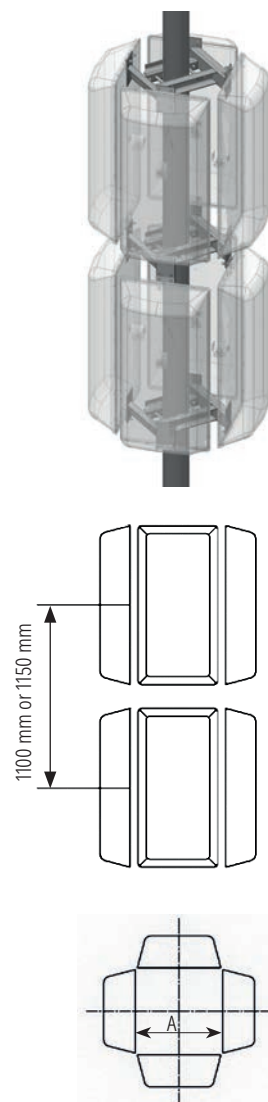
Hot-dip galvanized steel.
Stainless steel bolts and nuts are supplied.

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 \varnothing	Weight kg
759044	30–340	0.65

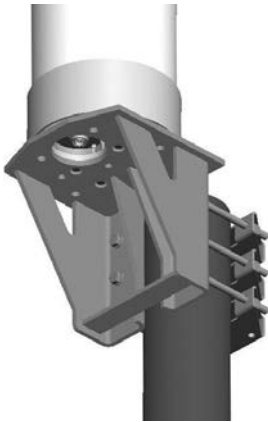


> Mounting Hardware for UHF Omnidirectional Antennas

Notes:

The selection of proper tube mast is under responsibility of the customer. It is necessary to carry out a static 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

> Electrical Adapters

Adapters for straight connector to elbow connector

Examples:



7-16 female



7/8" EIA flange

Adapter for 7-16 connector to N-connector



Order No.	Type	Remark
092930	7-16 m/f	EIA elbows do not include coupling element (bullet) – please order separately.
75210216	7/8" EIA f/f	
0921100	13-30 m/f	
0921262	1 5/8" EIA f/f	

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.

Kathrein Smart Monitoring

Solutions for Monitoring Broadcast Antenna Systems





Keeping Control with Smart Monitoring

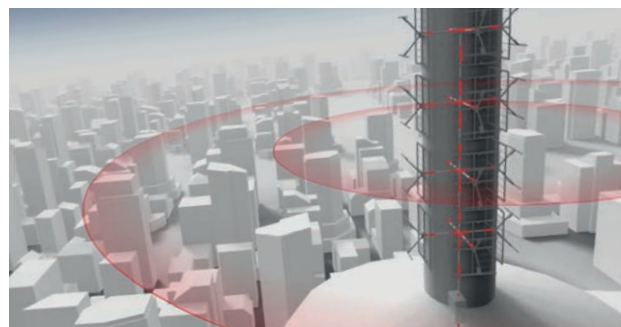
The antenna systems of new transmitting tower "Camlica" (Turkey) are equipped with a Kathrein Smart Monitoring System

Kathrein Smart Monitoring is an innovative monitoring system for radio and TV transmitter stations. Using special sensors, the system, which Kathrein has developed together with the Swiss company "DAC System SA", 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 Kathrein Smart Monitoring system can be integrated into new antenna systems as well as be retrofitted into an existing system.

Main features

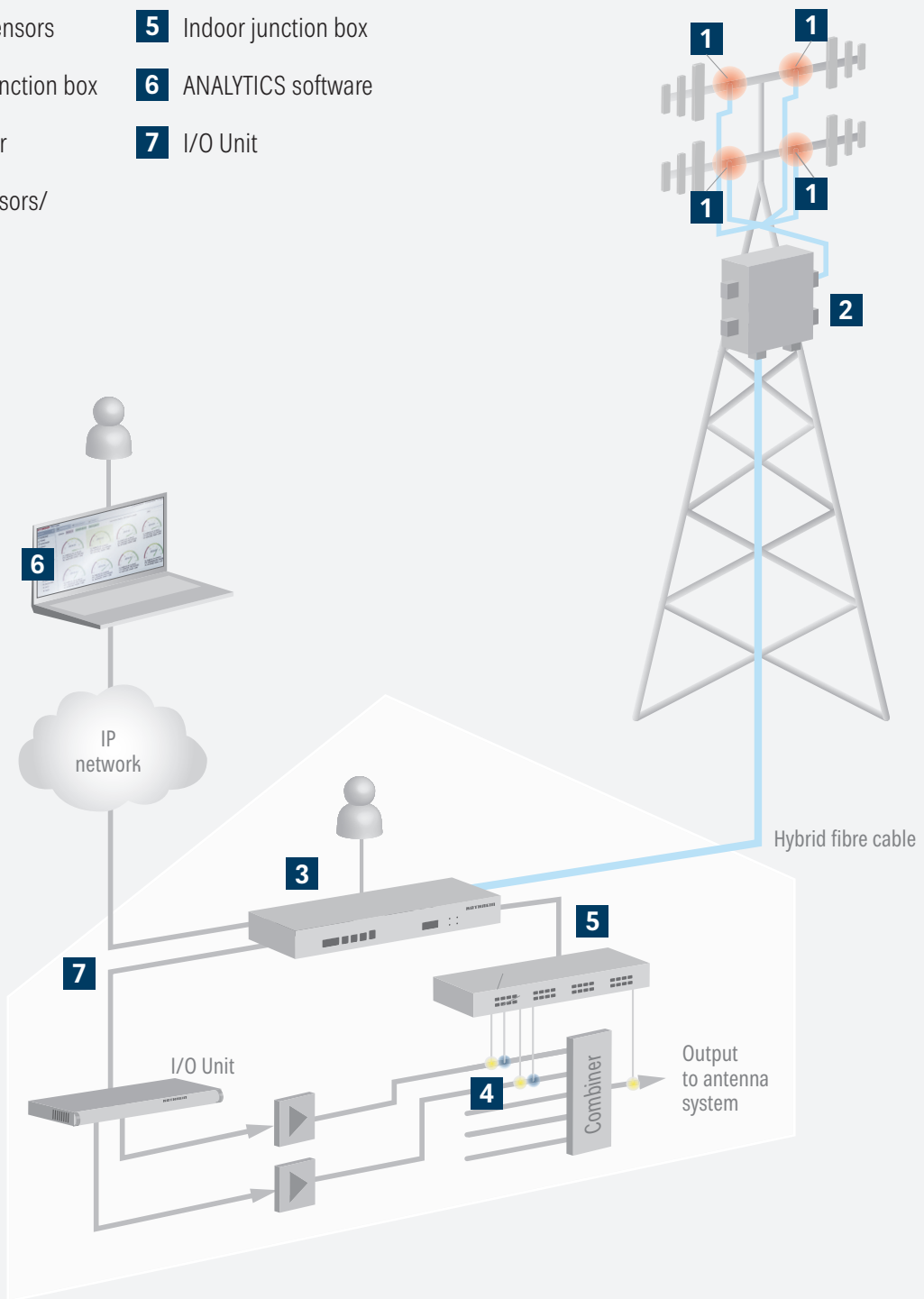
- Early recognition of critical operation status
- Exact localisation of degraded system components or sections
- Proof of SLA
- Scheduled proactive maintenance
- Optimised costs for regular maintenance



Malfunctions are detected directly in the tower

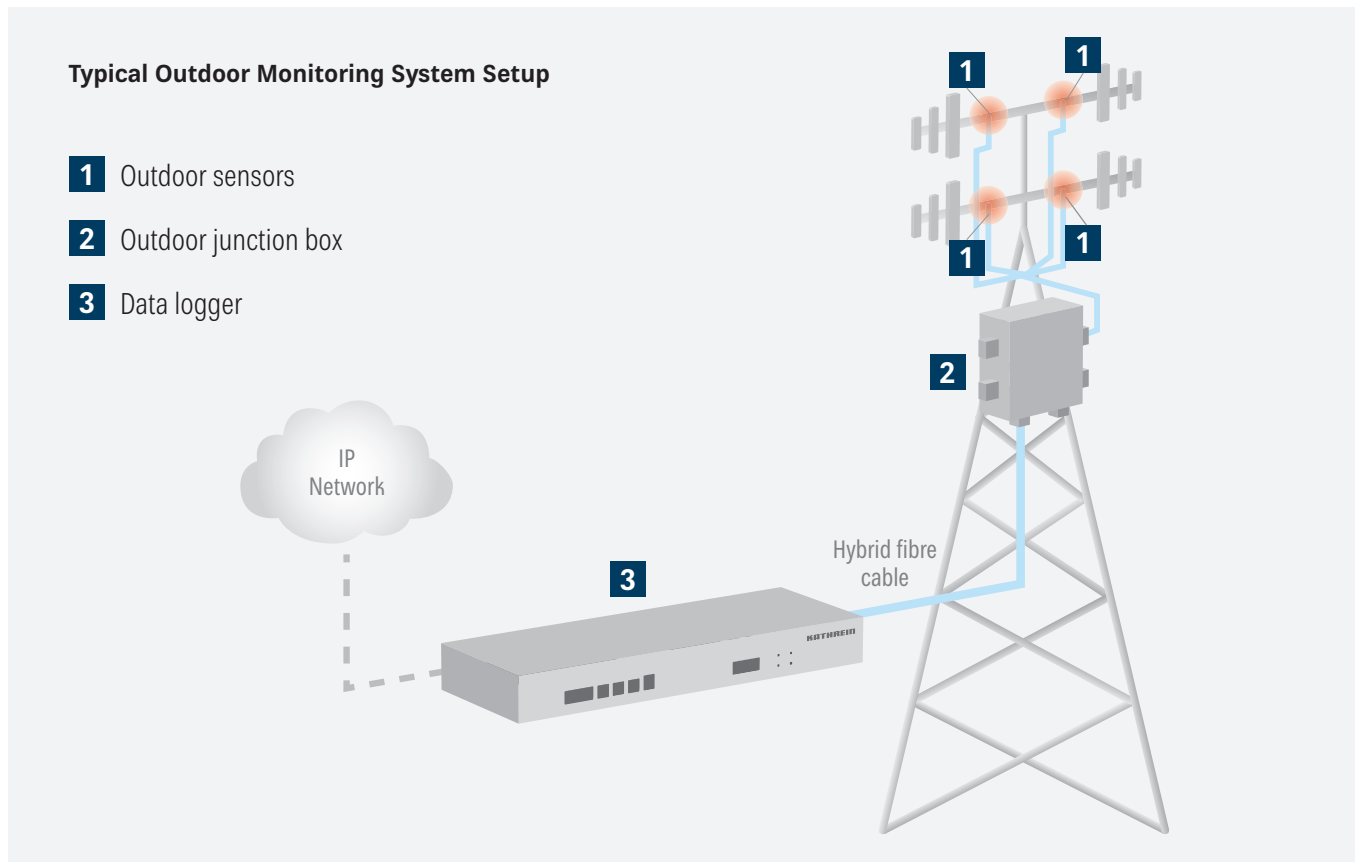
> Smart Monitoring Overview

- 1** Outdoor sensors
- 2** Outdoor junction box
- 3** Data logger
- 4** Indoor sensors/ detectors
- 5** Indoor junction box
- 6** ANALYTICS software
- 7** I/O Unit



Please ask your Kathrein contact for further information about the product, trials or installation details.

Outdoor Monitoring



Kathrein Smart Monitoring allows evaluating the return loss of antenna system outdoor components such as antenna radiators, power splitters and connecting cables.

The RF sensors connected to the distribution system allow sensitive detection directly at the component.

Outdoor sensors are available in all common line sizes such as 7-16, 7/8" EIA, 13-30, 1 5/8" EIA, 3 1/8" EIA, 4 1/2" EIA, 6 1/8" EIA.

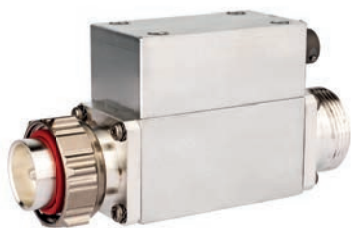


Outdoor monitoring implemented at FM transmitting antenna system "Langenburg", Germany

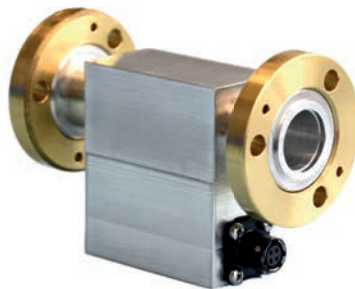
> Outdoor Antenna Monitoring Sensor 1.5G

- For measuring the forward and reflected power.
- For outdoor use.

Order No.	75210183		75210184	
RF connector	7-16 female/male		7/8" EIA flange	
Signal connector	1 × MIL-Circular 4-pin socket IP 66 – Amphenol			
Impedance	50 Ω			
Frequency range	50–860 MHz			
Return loss	> 37 dB (FM) > 35 (VHF and UHF)			
Accuracy measured return loss	Range RL 10 to 20 dB: ±1 dB Range RL 20 to 25 dB: ±1.5 dB Range RL 25 to 30 dB: ±2 dB			
Insertion loss	≤ 0.02 dB			
Power consumption	< 250 mW			
Material	EN AW-6082 T651, EN AW AISi1MgMn			
Surface	SurTec® 650 (RoHS compliance)			
Dimensions	115 × 56 mm		110 × 70 mm	
Weight (approx.)	500 g		550 g	
Working temperature	–45 to +55 °C			
Protection class	IP 66 (mated)			
DC isolation	≥ 6 kV			
	Power range	Directivity	Power range	Directivity
FM	2–4000 W	35 dB	5–7500 W	35 dB
VHF	2–3000 W	30 dB	3–5000 W	30 dB
UHF 470–665 MHz	2–1800 W	30 dB	3–3000 W	30 dB
UHF 665–860 MHz	2–1300 W	30 dB	3–2200 W	30 dB



75210183



75210184

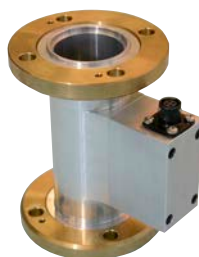
> Outdoor Antenna Monitoring Sensor 1.5G

- For measuring the forward and reflected power.
- For outdoor use.

Order No.	75210186		75210185	
RF connector	13-30 female/male		1½" EIA flange	
Signal connector	1 × MIL-Circular 4-pin socket IP 66 – Amphenol			
Impedance	50 Ω			
Frequency range	50–860 MHz			
Return loss	> 37 dB (FM) > 35 (VHF and UHF)		> 37 dB (FM and VHF) > 35 (UHF)	
Accuracy measured return loss	Range RL 10 to 20 dB: ±1 dB Range RL 20 to 25 dB: ±1.5 dB Range RL 25 to 30 dB: ±2 dB			
Insertion loss	≤ 0.02 dB			
Power consumption	< 250 mW			
Material	EN AW-6082 T651 · EN AW-ALSi1MgMn			
Surface	SurTec® 650 (RoHS compliance)			
Dimensions	119 × 85 mm		121 × 89 mm	
Weight (approx.)	960 g		980 g	
Working temperature	–45 to +55 °C			
Protection class	IP 66 (mated)			
DC isolation	≥ 6 kV		≥ 8 kV	
	Max. power	Directivity	Max. power	Directivity
FM	12 kW	35 dB	20 kW	35 dB
VHF	7.5 kW	31 dB	13 kW	32 dB
UHF 470–665 MHz	5.4 kW	30 dB	7 kW	30 dB
665–860 MHz	4 kW	30 dB	6 kW	30 dB



75210186



75210185

> Outdoor Antenna Monitoring Sensor 1.5G

- For measuring the forward and reflected power.
- For outdoor use.

Order No.	7520000005		7520000006		7520000007	
RF connector	3 1/8" EIA flange		4 1/2" EIA flange		6 1/8" EIA flange	
Signal connector	1 × MIL-Circular 4-pin socket – Amphenol					
Impedance	50 Ω					
Frequency range	50–860 MHz					
Return loss	> 37 dB (FM, VHF) > 35 dB (UHF)					
Accuracy measured return loss	Range RL 10 to 20 dB: ±1 dB Range RL 20 to 25 dB: ±1.5 dB Range RL 25 to 30 dB: ±2 dB					
Insertion loss	≤ 0.02 dB					
Power consumption	< 250 mW					
Material	Rigid line: copper; Sensor housing: brass					
Dimensions (H × W × L)	152 × 128 × 220 mm		192 × 180 × 220 mm		215 × 205 × 220 mm	
Weight (approx.)	2900 g		4900 g		5100 g	
Working temperature	–45 to +55 °C					
Protection class	IP 66 (mated)					
Surge protection	≥ 15 kV		≥ 18 kV		≥ 18 kV	
	Max. power	Directivity	Max. power	Directivity	Max. power	Directivity
FM	56 kW	35 dB	85 kW	35 dB	173 kW	35 dB
VHF	30 kW	32 dB	50 kW	32 dB	90 kW	32 dB
UHF 470–665 MHz	24 kW	30 dB	37 kW	30 dB	73 kW	30 dB
UHF 665–860 MHz	20 kW	30 dB	28 kW	30 dB	54 kW	30 dB



7520000007,
7520000005 and 7520000006 are similar

> Outdoor Antenna Monitoring Junction Box – v3.x

- Collects the signals of the outdoor sensors.
- Located in the tower, close to the antennas.

Order No.	75210187	75210188
Sensor input interface		
Signal connector	Rectangular connector HAN 3HPR + Q12-F-QL 12 contacts socket – Harting	
Input voltage	0–12 V	
Input protection	IEC 61000/±8 kV contact discharge	
Resolution	15 bit	
Number of sensors	8	16
Sampling interval per sensor	Polling cycle	
Junction box interface		
Signal connector	HAN BRID® – IP 66 2 copper contacts + 2 HP fibre connectors – Harting	
Power supply	48 V	
Input-/Output signal	200/230 µm PCF fibre – HP crimp contacts	
Optical output power fibre coupled 0.5 m	> -17.3 dBm	
Optical wavelength	650 nm (635–662)	
Optical receiver sensitivity	< -21.5 dBm	
Distance to data logger	Fibre attenuation: < 12 dB/km – max. 500 m	
Polling value	Arithmetic average over burst sampling	
Polling cycle all sensors	4 to 3600 sec. Recommended polling: 1 to 2 times per minute	
Housing		
Material	AL-powder coated, RAL 7032 silky grey	
Dimensions (L × H × W)	160 × 100 × 160 mm	
Weight (total)	2000 g	
Mounting	4x M12 screws to fixation structure (mounting kit included)	
Working temperature	-45 to +55 °C	
Environmental	Sealed enclosure IP 66/EN 60529	



75210188, 75210187 is similar

> Outdoor Antenna Monitoring Cable – Sensor to Junction Box

- For connecting the sensor to the junction box.
- Fully shielded and weather-proof.

Order No.	75210191	75210192	75210193	75210194
Signal connector sensor	4 × MIL-Circular 4-pin Socket IP 66 – Amphenol			
Signal connector JB	1 × rectangular Han – 3HPR-Q 12/0 – 12 contacts male IP 66 – Harting			
Signal cable	LIHCH CH 4X4X0.22 VZN SW – Low smoke, fire retardant, zero halogen – UV-resistant – Leoni, Protection tube self-extinguishing UL94-Vo fire retardant, zero halogen, outer diameter: 10 mm			
Length available	3 m	5 m	7 m	10 m



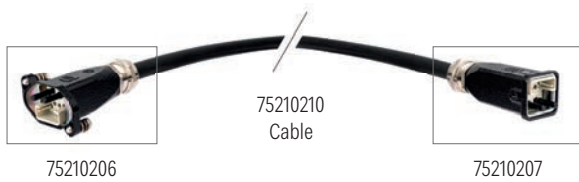
Picture shows 75210191, others are similar

> Outdoor Antenna Monitoring Cable – Junction Box to Data Logger

- For connecting the junction box (JB) to the data logger (DL).
- Hybrid cable, 2 fibre + 2 wire.

Order No.	75210207	75210206	75210210
Description	Hybrid connector DL side	Hybrid connector JB side	Hybrid cable
General technical information	1 × HAN BRID® F.O. 2 power contact + 2 HP fibre contacts metal housing – Harting	1 × HAN BRID® F.O. 2 power contact + 2 HP fibre contacts metal housing IP 65 – Harting	AT-V(ZN)H(ZN)H(C)2YFR 2K200/230 + 2 × 1.5 mm ² – Low smoke, fire retardant, zero halogen – UV-resistant – Leoni

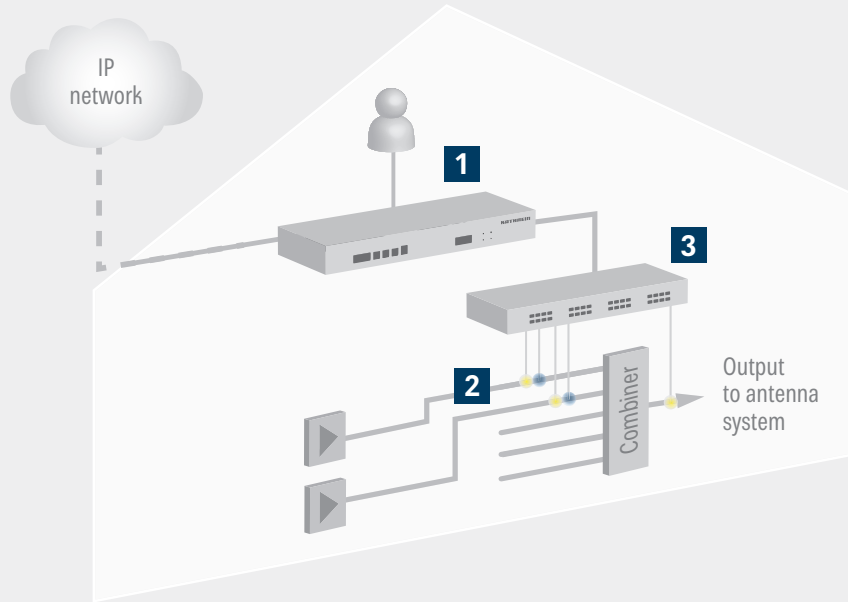
Order No.	75210208	75210209	75210211
Accessories	Stripping tool	Crimp tool for HAN BRID® electrical contacts	Fibre optic connector mounting tool



Indoor Monitoring

Typical Indoor Monitoring System Setup

- 1** Data logger
- 2** Indoor sensors/detectors
- 3** Indoor junction box



In order to supervise RF lines, combiners and switching devices in the transmitter building, a wide variety of indoor monitoring products is available for the Kathrein Smart Monitoring System.

RF detectors may be connected onto line couplers, for example at combiner inputs or switching panel connections. Alternatively, temperature detectors may be used to detect overheating in components early.



Indoor and outdoor monitoring implemented at FM transmitting antenna system "Stuttgart", Germany

> Indoor Antenna Monitoring Junction Box – v4.x

- Collects the signals of the indoor sensors.
- Located in the transmitter room.

Order No.	7520000011
Monitoring input interface	
Available monitoring points	Sensor, RF detector, temperature detector
Signal connector	RJ 45 socket
Input protection	IEC 61000/±8 kV contact discharge
Resolution	16 bit
Number of sensors	16
Junction box interface (Daisy chain possible)	
Signal	2 × D-SUB 9-pin connector (male – data logger; female to next junction box 4.x)
Power supply	48 V
Input/output signal	RS 485
Distance to data logger	100 m
Polling cycle all sensors	4 to 3,600 sec. Recommended polling: 1 to 2 times per minute
Housing	
Material	AL, anodised, RoHS
Dimensions (H × W × D)	1 HU 43.7 × 483 × 300 mm
Weight (total)	2 kg
Working temperature	0 to +45 °C
Safety	EN 60950-1
Max. power consumption	< 5 W



7520000011

> Indoor Antenna Monitoring Detectors

RF Detector

- RF probe for directional couplers.
- For indoor use.

Order No.	7520000009
RF connector	N male
Signal connector	RJ 45 female 8-pin – shielded
Impedance	50 Ω
Frequency range	50–860 MHz
Return loss	> 30 dB
Power consumption	150 mW
Dynamic range	60 dB (–40 dBm/+20 dBm)
Material	Aluminium
Dimensions (H × W × L)	80 × 42 × 30 mm
Weight (approx.)	85 g
Working temperature	–10 to +40 °C
Protection class	IP 50



7520000009

Temperature Detector

For indoor use

Order No.	7520000010
Signal connector	USB type A
Accuracy	± 1 °C
Temperature measurement range	2–110 °C
Dimensions (H × W × L)	20 × 20 × 24 mm



7520000010

> Indoor Antenna Monitoring Cables

Cable – RF Detector to Junction Box 4.x

- For connecting the RF detector to the junction box 4.x.
- For indoor use.

Order No.	7520000012
Signal connector	RJ 45 plug 8-pin acc. IEC 60603-7
Signal cable	4 × 2 AWG 26/7 SF/UTP CAT.5e PUR
Length	5 m



7520000012

Cable – Temperature Detector to Junction Box 4.x

- For connecting the temperature detector to the junction box 4.x.
- For indoor use.

Order No.	7520000014
Signal connector temperature detector	USB type A
Signal connector JB 4.x	RJ 45 plug 8-pin acc. IEC 60603-7
Signal cable	8-wire – AWG 26-30 – shielded – PVC jacket
Length	5 m



7520000014

Cable – Sensor to Junction Box 4.x

- For connecting the sensor to the junction box 4.x.
- For indoor use.

Order No.	7520000013
Signal connector sensor	1 × MIL-Circular 4-pin Socket IP 66 – Amphenol
Signal connector JB 4.x	RJ 45 plug 8-pin acc. IEC 60603-7
Signal cable	8-wire – AWG 26-30 – shielded – PVC jacket
Length	5 m



7520000013

> Indoor Antenna Monitoring Cable – Junction Box 4.x to Data Logger 2.1

- For connecting the junction box 4.x (JB 4.x) to the data logger (DL).
- For indoor use.

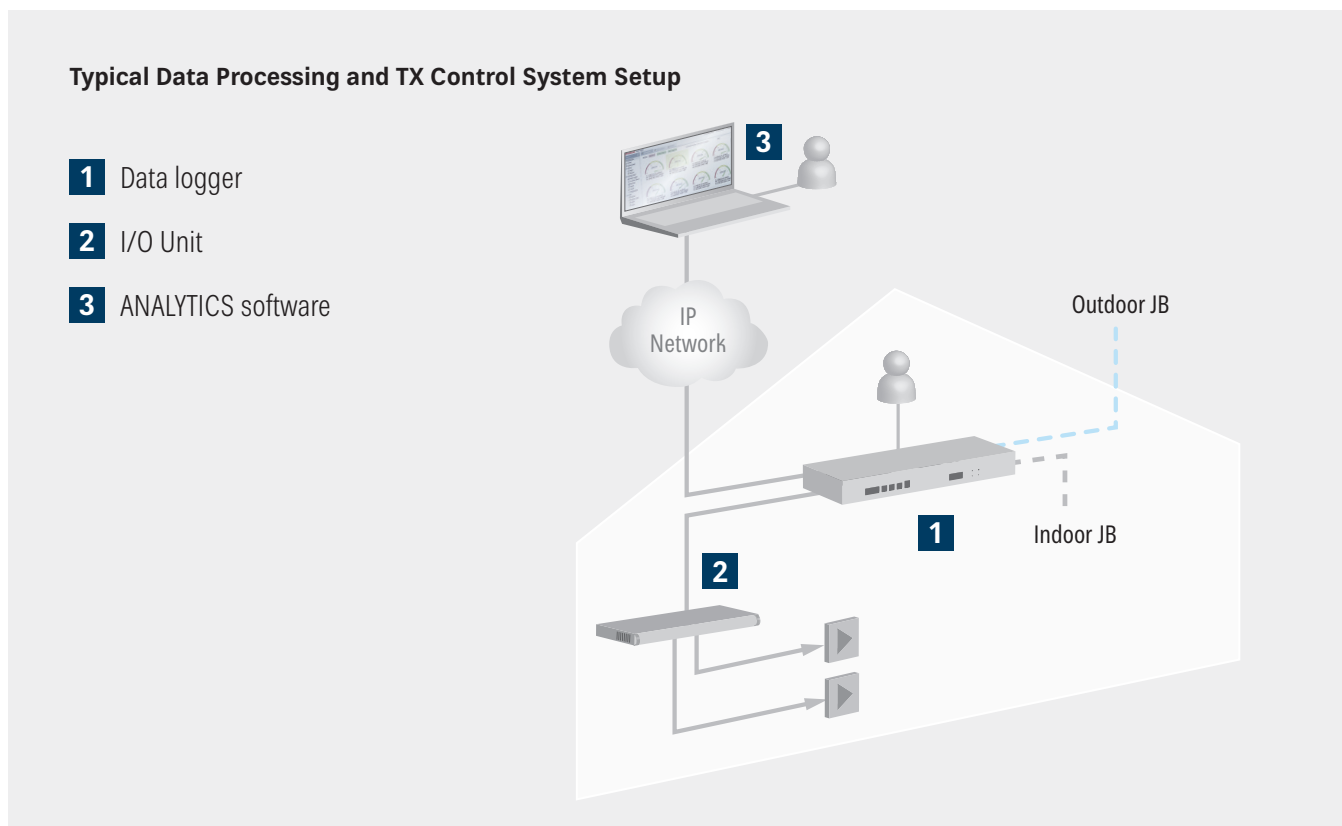
Order No.	7520000015
Signal connector	D-sub male – female 9-pin Plastic hood with shielding 4-40 UNC screw
Signal cable	9-wire – AWG 26-30 – shielded – PVC jacket
Length	12 m



7520000015

Pin out connection JB site	Pin out connection DL site	Description
5, 9	5, 9	+
2, 4	2, 4	-
8	8	RS 485 +
7	7	RS 485 -

Data Processing, Analysis Software and TX Control



Powerful tools are available for the Kathrein Smart Monitoring System in order to evaluate antenna data and handle alarms:

Data logger software:

Provides access to stored data in the data logger, with simple analysis functions. SNMP functionality is available as an option. Data logger SW licence fee applies per monitoring point. Order numbers:

- 7620100018/19 – one time data logger SW licence fee, w/o. SNMP, per each sensor
- 7620100024/25 – one time data logger SW licence fee, incl. SNMP, per each sensor

ANALYTICS software:

Provides storage and visualisation of antenna data, as well as powerful analysis functions. Manages various data loggers. Generation of SNMP alarm traps is included. Order numbers:

- 7620100020/21 – one time ANALYTICS SW licence fee, initial 20 sensors
- 7620100022/23 – one time ANALYTICS SW licence fee, additional 50 sensors



Outdoor monitoring and ANALYTICS Software in use at transmitting station "Augsburg-Hotelturnm", Germany

> Antenna Monitoring Data Logger – v2.1

- For processing the data from the junction box.
- Indoor unit.



75210189, 75210190 is similar

Order No.	75210189	75210190
Junction box interface		
Signal connector optical	HAN BRID® connector 2 copper contacts + 2 HP fibre connectors	
Signal connector electrical	Sub D9 (f) connector	
Power supply	2 × AC 90–264 V, 47–63 Hz – IEC	
Input/output signal	200/230 μm PCF fibre – HP crimp contacts	
Electrical outputs	±48 V, ground	
Optical output power fibre coupled 0.5 m	-12.5 dBm	
Optical wavelength	650 nm	
Optical receiver sensitivity	-25 dBm	
Distance to junction box	Fibre attenuation: 12 dB/km – max. 500 m*	
Number of junction boxes supported	16	
Polling cycle	4 to 3600 sec. Recommended polling: 1 to 2 times per minute	
Local	PC/laptop interface/Ethernet	
LAN	Ethernet/IP interface	
GSM module	–	Huawei MU609
RF connector GSM antenna	SMA	
Indication LED	Operation: Green – System is powered Alarm: Red – System alarm indication F1: Yellow – blinking – Indication that junction box communication works F2: Yellow – blinking – Indication that DACS ANALYTICS communication works	
I/O interface	Sub D9 (f) connector: 2 outputs: A (P2), B (P3), 12 V – 100 mA 2 inputs: A (P4), B (P5), ground connection 5 mA will trigger input; Ground: P6-P9/ +12 V: P1	
Housing		
Material	AL, anodised, RoHS	
Dimensions (H × W × D)	1 HU: 43.7 × 483 × 220	
Weight	2350 g	
Working temperature	0 to +45 °C	
Safety	EN 60950-1	
Max. power consumption	55 W (depending on the number of junction boxes added)	

* Worst case, warranted over the full temperature range –45 to +55 °C

> ANALYTICS Software

ANALYTICS is a powerful software tool, optimised to store, process and visualize antenna operation data generated by antenna monitoring. It can manage various data loggers of a large-sized network. SNMP alarm traps can be generated to trigger an NMC. Further, ANALYTICS provides comfortable configuration tools for the antenna monitoring systems.

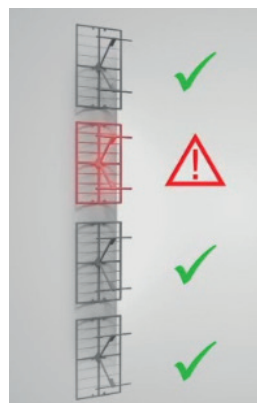


Powerful cockpit

- Power and return loss trend curves for preventive maintenance
- Analysis of antenna performance in relation to weather conditions
- Proof of service levels
- Map navigation
- Reports

Real-time precision

- Real-time detection of performance degradation
- Information of the distribution/radiation of the transmission power



Immediate failure detection and exact localisation

1 Dashboard to visualize operation status



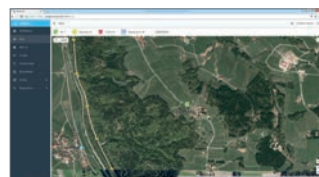
2 Trend curves to analyse operation data



3 Document manager to provide ready station information

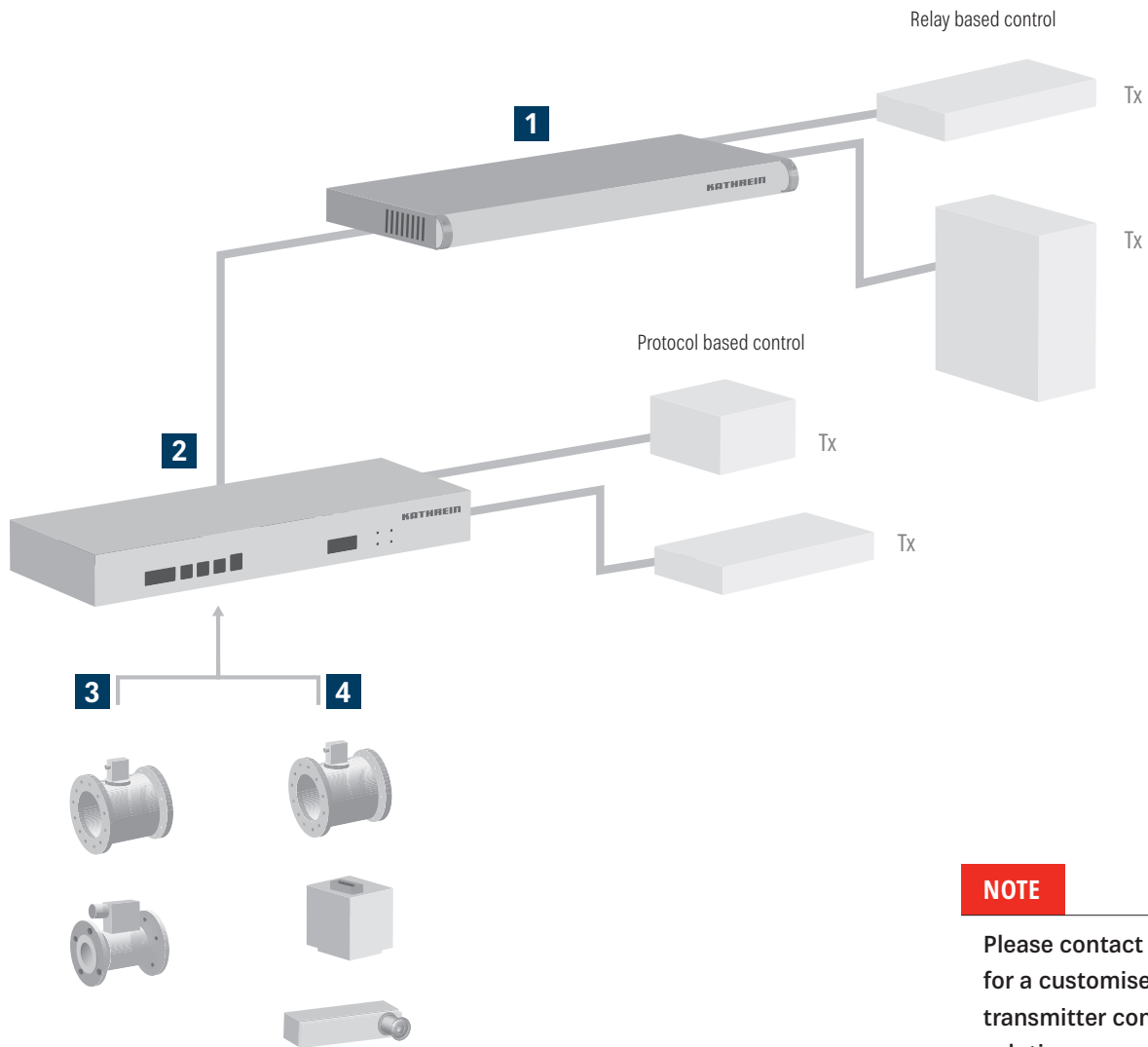


4 Site information map to optimise service logistics



> Antenna Monitoring Transmitter Control

- 1** I/O Unit
- 2** Data logger
- 3** Kathrein outdoor monitoring sensors
- 4** Kathrein indoor monitoring sensors

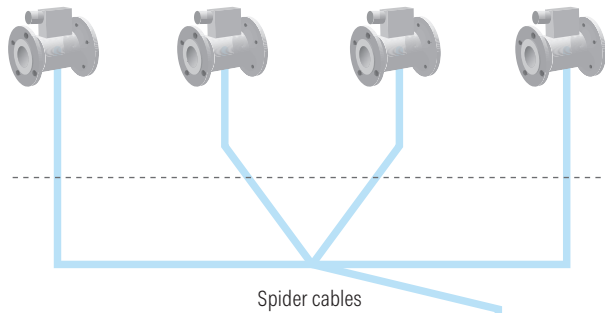


NOTE

Please contact Kathrein for a customised transmitter control solution

Planning Guide

> Monitoring Hardware Planning Guide

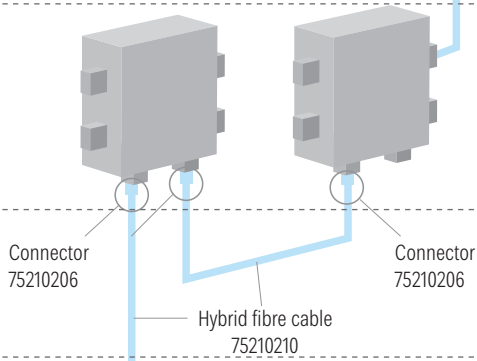


Outdoor sensors 1.5G

Sensors shall be placed symmetrically in an antenna system, i.e. either one sensor per each radiator incl. jumper cable, or one sensor per each bay incl. bay feeder. Ideally the sensors are placed directly on each output connector of a splitter. It is recommended to monitor max. 4 radiators together via one splitter. Outdoor sensor products: 75210183, 75210184, 75210186, 75210187, 7520000005, 7520000006, 7520000007

Outdoor spider cables

To connect max. 4 sensors per each spider cable to one JB input. Lengths of 3, 5, 7 and 10 m spider cables are available. Different cables may be used on one JB (no phase relation must be observed). Unused connections may be left unterminated, but protected against dirt and humidity. Spider cable products: 75210191, 75210192, 75210193, 75210194

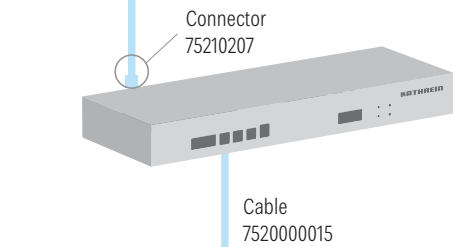


Outdoor junction box (outdoor JB) v3.x

The outdoor JB should be placed approximately at the centre height of the antenna section to be monitored, close to the power splitters. Max. 16 sensors per JB can be connected. Up to 16 JB may be set up in a daisy-chain configuration. Sensors from different antenna systems (FM/VHF/UHF) can be connected to one JB. Outdoor JB products: 75210187, 75210188

Hybrid fibre cable

For connecting the JB to data logger, or JB to JB. Maximum total length of hybrid fibre cable is ca. 500 m. The cable can be delivered with connectors attached, or to be fitted with connectors on-site (special tools required).



Data logger (DL) v2.1

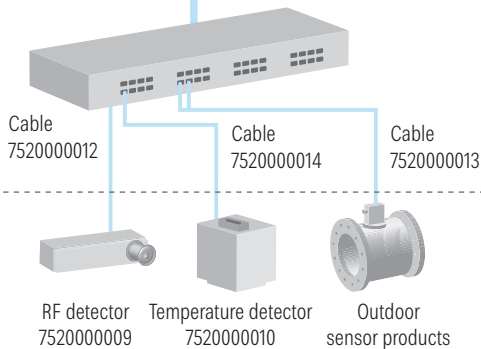
One data logger can handle up to 160 monitoring points from 16 junction boxes (JB). Antenna data is stored in the DL for over more than 1 year before overwritten. Data logger products: 75210189, 75210190

Access to antenna data can be via

- Local connection to laptop
- Internet/intranet and by using the ANALYTICS Software
- DynDNS Tunnel

Alarms may be signalled by

- SNMP protocol via Internet/intranet
- SMS via mobile network



Indoor junction box (indoor JB) v4.x

The indoor JB shall be placed in the transmitter room, distance to DL max. 10 m. It can handle up to 16 monitoring points from RF detectors, temperature detectors or RF sensors. For reflection monitoring by RF detector or RF sensor, two inputs of the indoor JB are occupied per test point. Indoor JB product: 7520000011

Indoor detectors

An indoor RF detector and an indoor temperature detector are available. For reflection monitoring, two RF detectors and a suitable double-directional coupler with N-female connector is required per test point. Outdoor RF sensors 1.5G may also be used for indoor monitoring.




> Antenna Monitoring Planning Guide – Data Management

 **Service technician:**
configuration, alarms, dashboard



 **Technical control centre engineer:**
full functionality

 **NMC operator:**
values, alarm traps




USE CASE 1	Network operator wants to outsource complete antenna monitoring service. KATHREIN provides software as a service.	
Product	SW licence fee, data logger	Order No. 7620100018/19
	SW licence fee, ANALYTICS SaaS	RFQ
	DACS ANALYTICS, SNMP alarm traps interface	included

Data logger at station	SNMP	ANALYTICS SaaS	ANALYTICS inhouse	SNMP	NMC SNMP	Application
				yes		Outsourcing of services for operation of various antennas. Preventive maintenance and proof of SLA.


USE CASE 2	Network operator uses third party NMC and service. Antenna monitoring has to be integrated into existing NMC structure via SNMP.	
Product	SW licence fee, data logger with SNMP functionality	Order No. 7620100024/25

Data logger at station	SNMP	ANALYTICS SaaS	ANALYTICS inhouse	SNMP	NMC SNMP	Application
	yes		intranet required			Supervision of medium-sized networks or single stations. Handling of emergency cases.

USE CASE 3	Network operator wants to run antenna monitoring fully independently. ANALYTICS software runs in network operator's facilities and generates alarm traps for NMC.	
Product	SW licence fee, data logger	Order No. 7620100018/19
	SW licence fee, ANALYTICS – inhouse installation, 20 sensors	Order No. 7620100020/21
	ANALYTICS, SNMP alarm traps interface	included

Data logger at station	SNMP	ANALYTICS SaaS	ANALYTICS inhouse	SNMP	NMC SNMP	Application
				yes		Operation of various antennas or large-sized networks. Preventive maintenance and proof of SLA.

USE CASE 4	Station operator only needs local or remote access via tunnel to read stored data in data logger. Alarms via SMS possible.	
Product	SW licence fee, data logger	Order No. 7620100018/19
	Tunnel service (DynDNS)	free

Data logger at station	SNMP	ANALYTICS SaaS	ANALYTICS inhouse	SNMP	NMC SNMP	Application
						Supervision of small-sized networks or single stations. Handling of emergency cases.

> Antenna Monitoring Power Meter with 5" Display

The Power Meter is a universal device which can be used in various configurations, for all kinds of antenna monitoring tasks:

- As an economic standalone monitoring solution to indicate forward/ reflected power at the main feeder inputs
- As data processing unit for outdoor and indoor monitoring systems (see pages 93–111), with full data logger functionalities
- As data processing unit for RFHawkeye™ TDR monitoring systems, see pages 114–115



- Includes analog interfaces and sensor interfaces.
- Dashboard with real time return loss and power value indication.
- Trend curves for power and return loss with alarm threshold barriers allow preventive maintenance.
- SNMP interface for alarms and values available.
- Fully extendable to Kathrein Smart Indoor and Outdoor Antenna Monitoring as well as transmitter control (I/O Unit).

Order No.	7520000160
Analog interface 50–860 MHz	6 (3 × VSWR/RL)
Sensor/T-Det. interface	1/2
Connectivity	PC/Laptop interface (local), Ethernet (LAN), Wi-Fi
Power supply	2 × AC 90...264 V, 47...63 Hz – IEC
Analog interfaces	Analog ports (FWD + RFL) – SMA F-Connector
Sensor interfaces	Connection of outdoor sensors 1.5 G
Option	Mobile data interface
Display	5" touch screen for user interaction
Possible enhancements	Additional indoor and outdoor junction box can be added, to connect: <ul style="list-style-type: none"> ▪ Outdoor sensors ▪ Temperature selectors ▪ RF-Detectors
Analog RF–interfaces (VSWR/RL)	
RF connector	SMA female
Impedance	50 Ω
Frequency range	50–860 MHz
Return loss	> 30 dB
Dynamic range	60 dB (–40 dbm/+20 dbm)

Sensor interface	
Available monitoring points	Outdoor sensor by cable 7520000013; temperature detectors by cable 7520000014
Signal connector	RJ 45 socket
Input protection	IEC 61000/±8 kV contact discharge
System parameters	
Polling cycle	4 to 3600 sec. recommended polling: 1–2 times per minute
Resolution	15 bit
Local	PC/Laptop interface/Ethernet
LAN	Ethernet/IP interface/WLAN-Wi-Fi
GSM-Module, optional	Huawei MV 609
RF connector GSM	SMA female
Indication LED	Operation: Green – System is powered Alarm: Red – System alarm indication F1: Yellow – blinking – Indication that junction box communication works, F2: Yellow – DL operating system (OS) is up and running
I/O interface	Sub D9 (f) connector: 2 Output: A (P2), B (P3), 12 V – 100 mA 2 Input: A (P4), (P5), ground connection 5 mA will trigger input; ground: P6-P9; +12 V: P1
Mechanical data	
Display	5" display with touch screen for user interaction
Dimensions	2 HU / H 87.4 mm x W 483 x D 220 mm
Weight	2800 g
Working temperature	0...45 °C
Safety	EN60950-1
Max. power consumption	10 W (without junction boxes connected)
Junction box interfaces (JB)	
Junction box interface	for extensions with JB 3.x (outdoor) or JB 4.x (indoor)
Signal connector optical (outdoor)	HAN BRID® connector 2 copper contacts +2 HP fibre connectors
Signal connector electrical (indoor)	Sub D9 (f) connector
Power supply	2 × AC 90...264 V, 47...63 Hz – IEC
Input-/Output – Signal	200/230 µm PCF fibre – HP crimp contacts
Electrical outputs	±48 V, ground
Optical output power fibre coupled 0.5m	> -12.5 dBm
Optical wavelength	650 nm
Optical receiver sensitivity	< -25 dBm
Distance data logger (outdoor) to first JB 3.x	Fibre attenuation: 12 dB/km* – max. 500 m*
Distance data logger (indoor) to first JB 4.x	max. 100 m
Number of junction boxes supported	15

* Worst case, warranted over the full temperature range -45...+55 °C

> Antenna Monitoring In-Service Time Domain Reflectometer RFHawkeye™

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.

RFHawkeye is registered trademark of DAC System SA, Switzerland

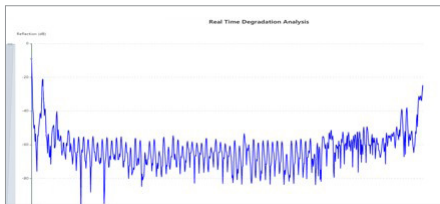
Depending on the Tx power and complexity of the antenna and feeder system, there are two different RFHawkeye™ versions available, i.e. **RFHawkeye™ Compact** and **RFHawkeye™ Standard**.

RFHawkeye™ Compact

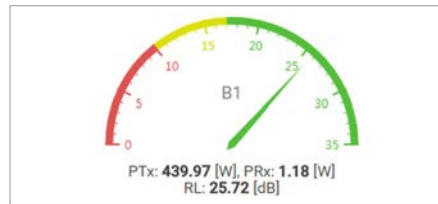
for low/medium power applications, is an economic solution for single feeder systems, and allows monitoring of VSWR degradation. In addition, the system provides the real time RF Power Meter. Product versions for FM (max. Tx power 7 kW) and UHF (max. power 5 kW) are available.



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: 7/8", 1 5/8", 3 1/8".

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

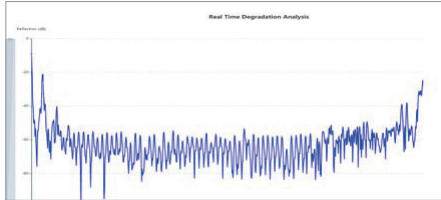


RFHawkeye™ Standard

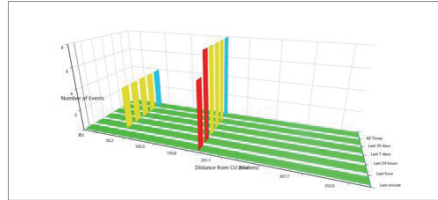
for medium/high power applications, features indication of VSWR degradation, and arc detection. It is expandable for multiple feeder systems and may be integrated in other smart monitoring applications. Product versions for FM (max. Tx power 70 kW) and UHF (max. power 50 kW) are available.



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: 7/8", 1 5/8", 3 1/8", 4 1/2", 6 1/8".



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 112/113)

is the controller of the system, provides the UI, keeps the database and history, analyzes the data and triggers the alarms.



Integrated in a Kathrein Smart Monitoring System, RFHawkeye™ provides all advantages of a sophisticated antenna monitoring, such as configurable alarm thresholds, dashboard with real-time values, trend curves, SNMP interface.

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

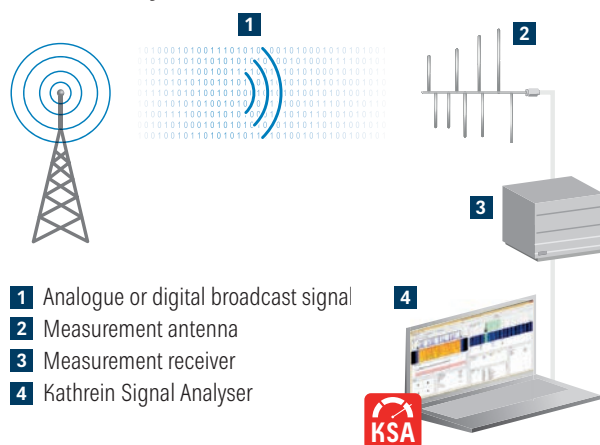
Kathrein Signal Analyser strictly follows the concept of SDR (Software Defined Radio). The input with high quality

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



- 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. 7620100008/09

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.

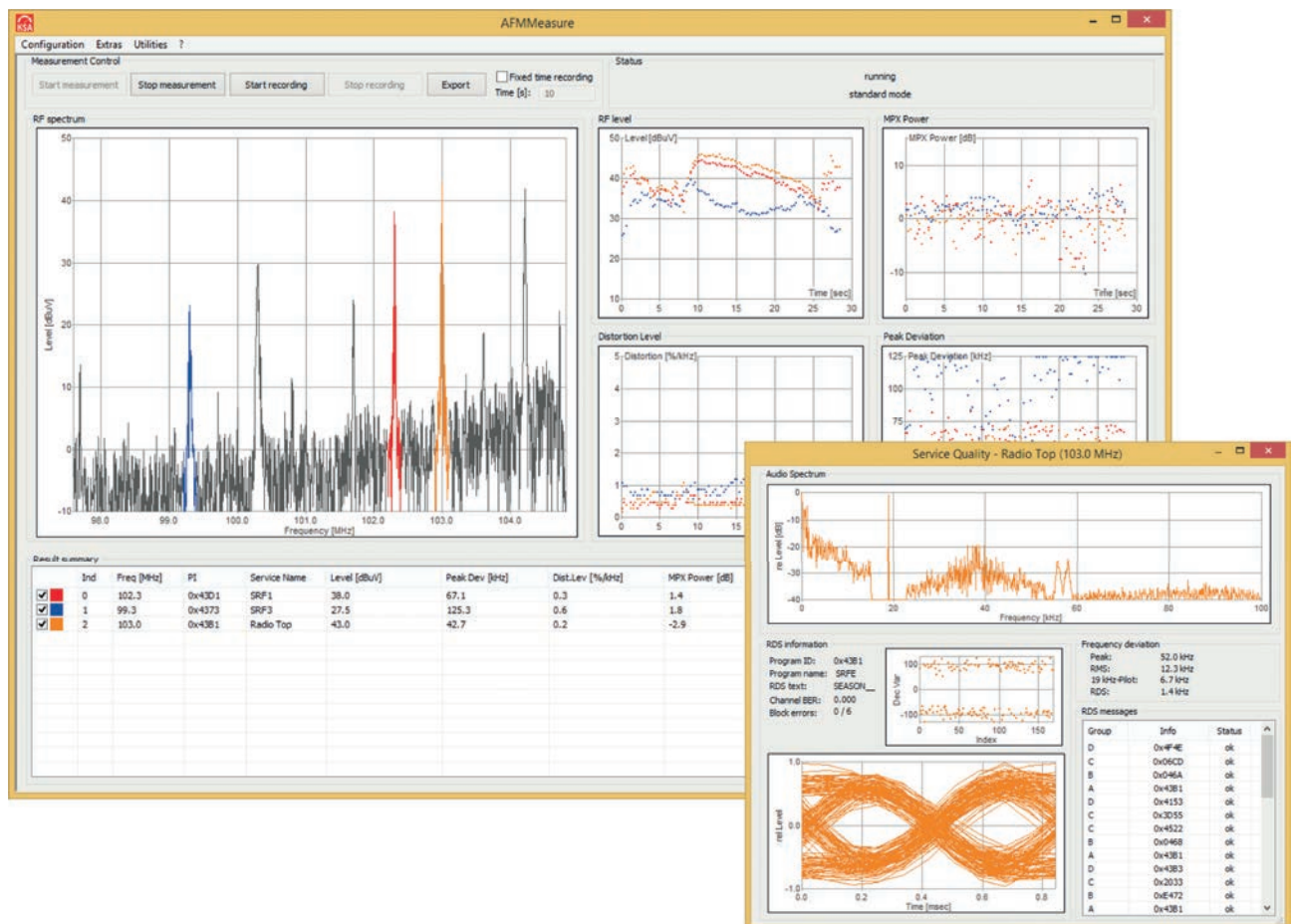
➤ KATHREIN Signal Analyser Measure FM



Software for measuring and analysing FM signals.
Order No. 7620100004/05

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+



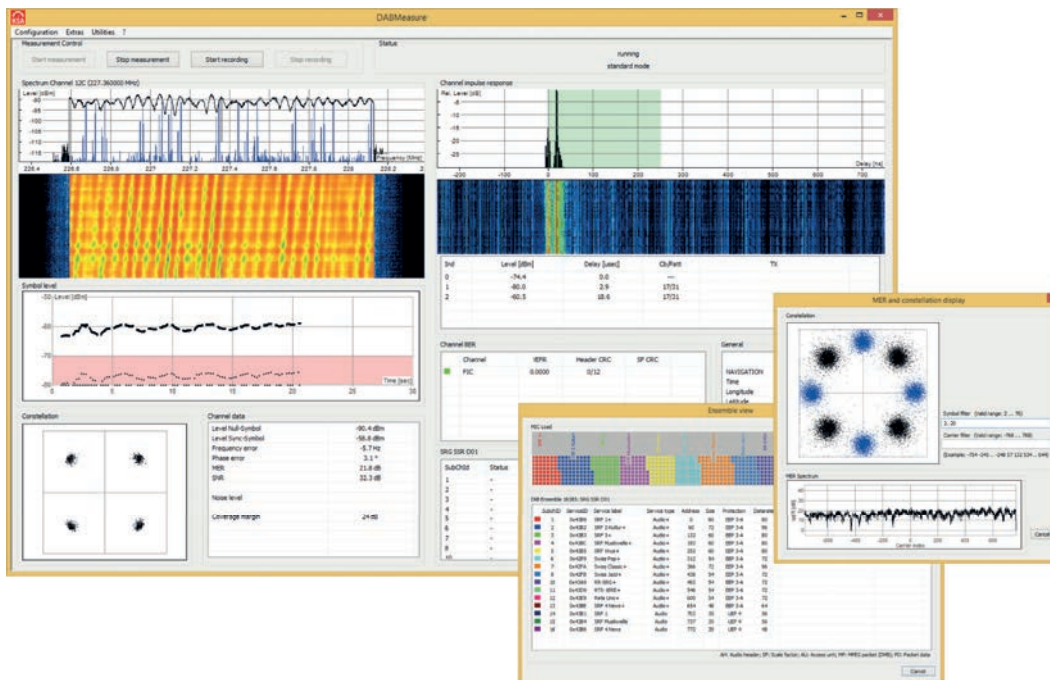
Software for measuring and analysing DAB/DAB+ signals.
Order No. 7620100006/07

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. 7520100002/03

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

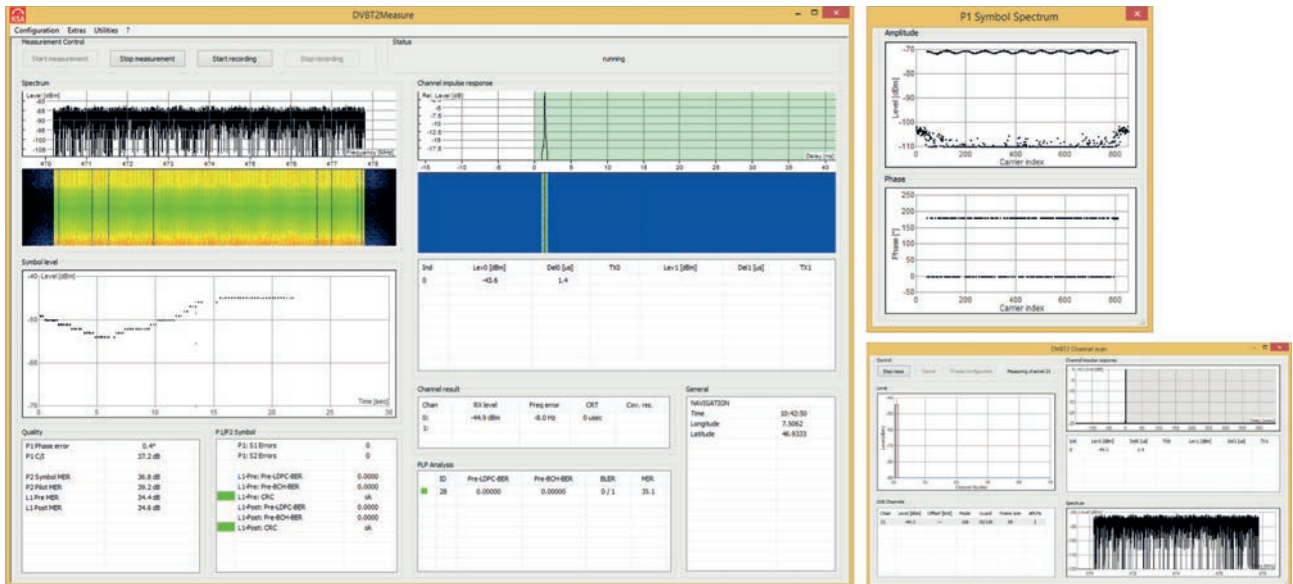
Software for measuring and analysing DVB-T2 signals.
Order No. 7620100010/11

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 signalling 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

- Transmitting 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

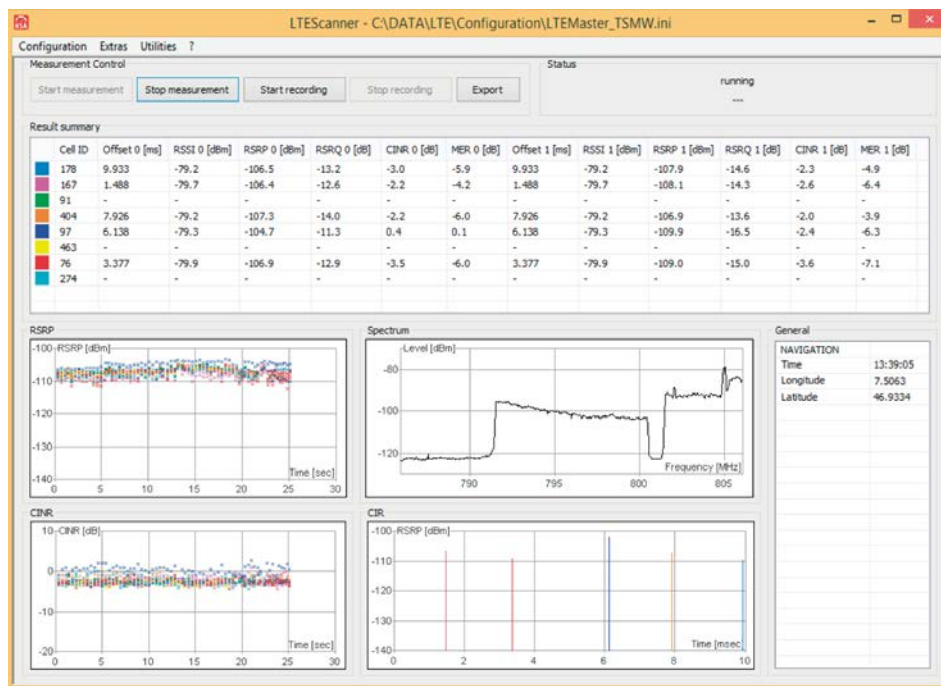
Software for measuring and analysing FeMBMS signals.
Order No. 7620100016/17

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

FeMBMS Parameters and Graphs

- MBSFN symbol
- MER
- Constellation

- Channel impulse response
- SFN ID
- Channel BER/BLER: PBCH, PCFICH, PDCCH, PDSCH, PMCCH, PMTCH

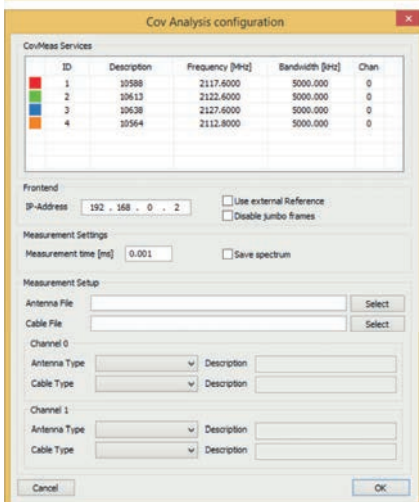
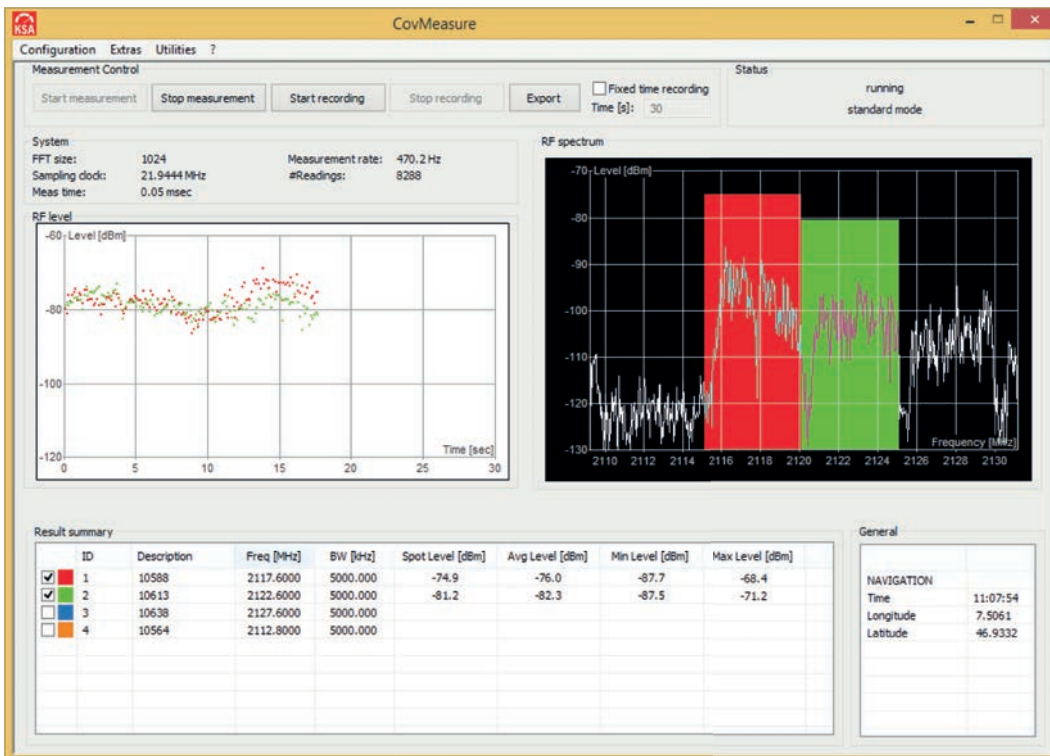
KATHREIN Signal Analyser Coverage Measure



The software is able to measure a number of channels with a certain bandwidth within the acquisition bandwidth of the receiver (eg. 24MHz).
Order No. 7620100014/15

Key Features

- Very high speed channel measurement
- Free definable number of channels
- Free definable bandwidth 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.

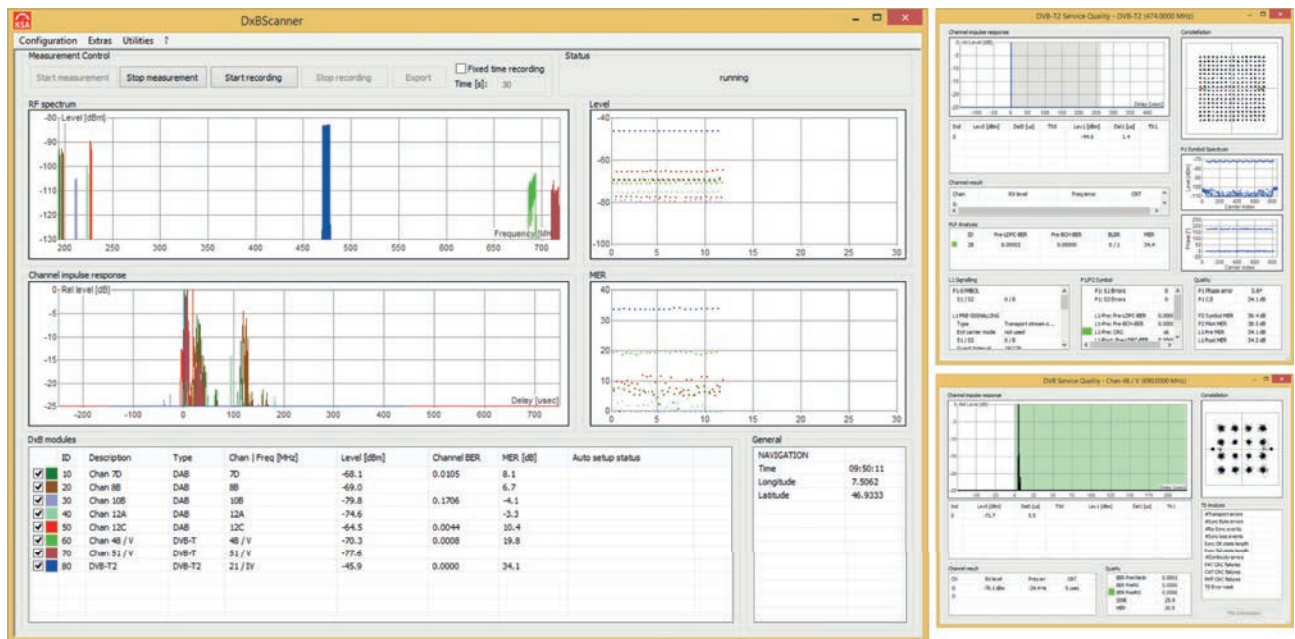
Order No. 7620100012/13

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 post: 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

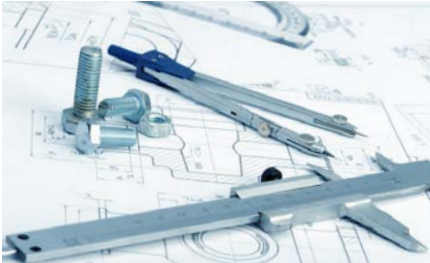
DVB-T

- 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

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.

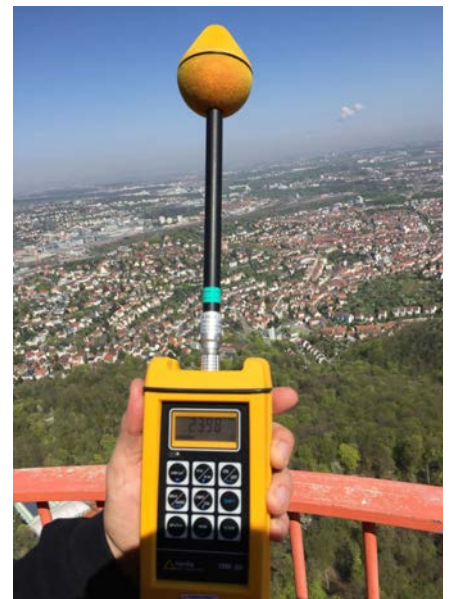
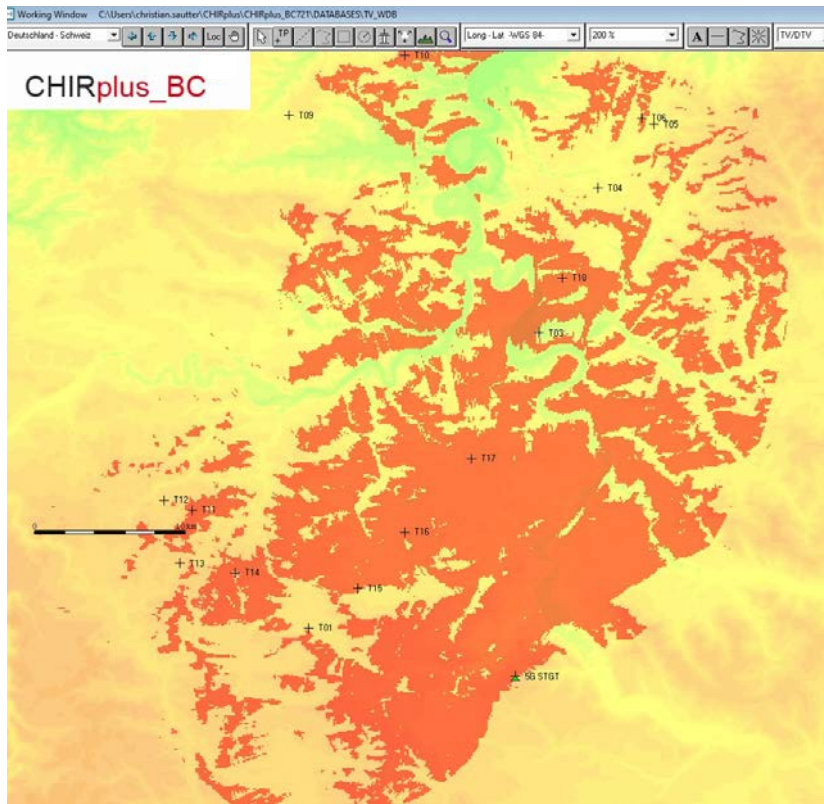
- Basics and technology trainings
- Service and measurement training
- Product handling and installation training
- Webinars
- Antenna archive from 1967 until today: technical documentations, design drawings of antennas and systems, KATHREIN and other German manufacturers



> 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 engineers 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

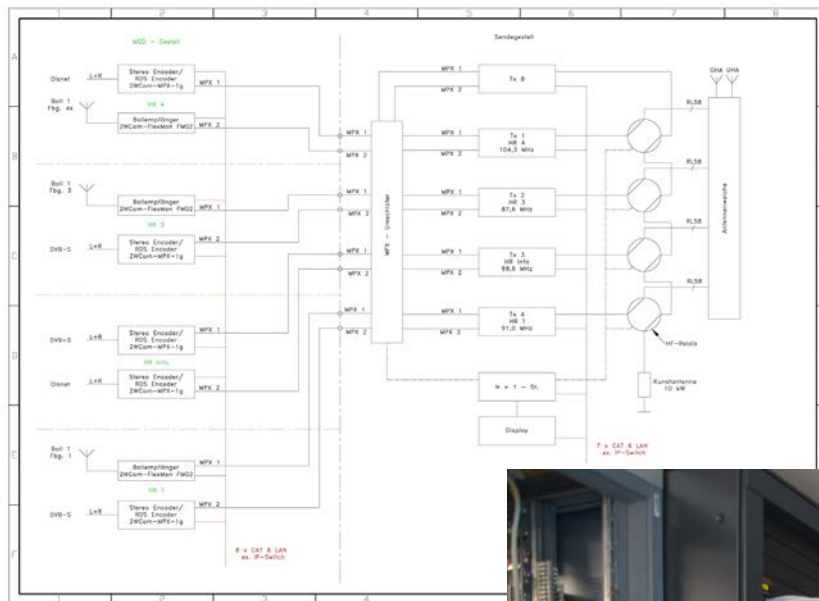


➤ Transmitter Project Planning and Transmitter Installation

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

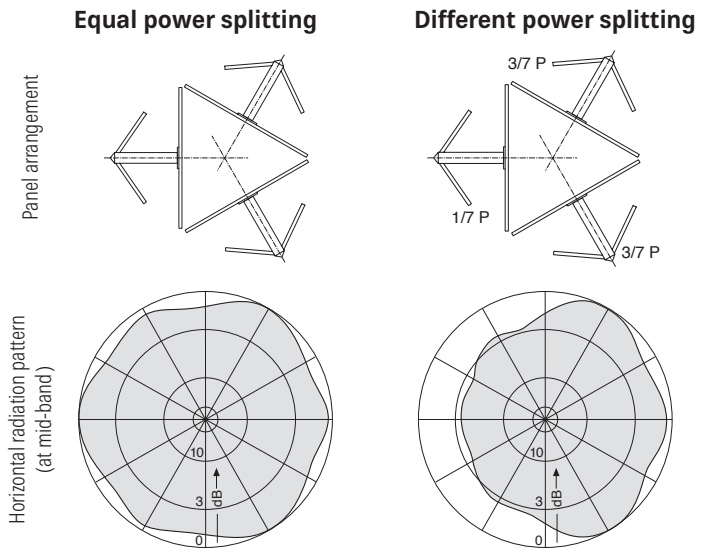
➤ Antenna System Configurations

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.

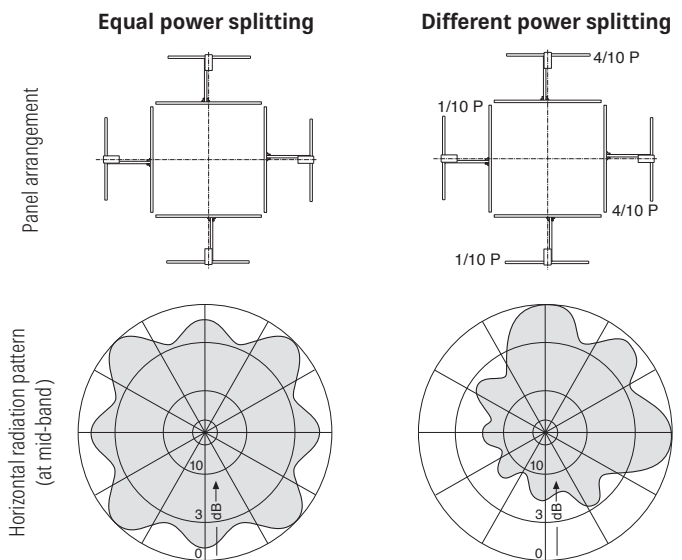


Four-sided Panel Array

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 patterns 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.

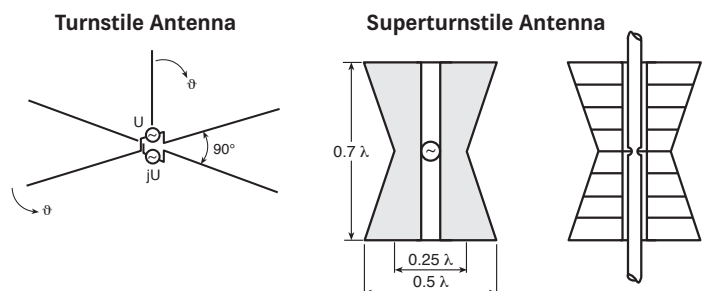
These broadband systems can be supplied for any polarization.



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.



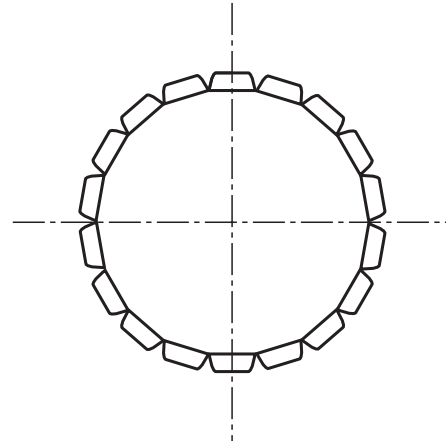
Multi-panel Array

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

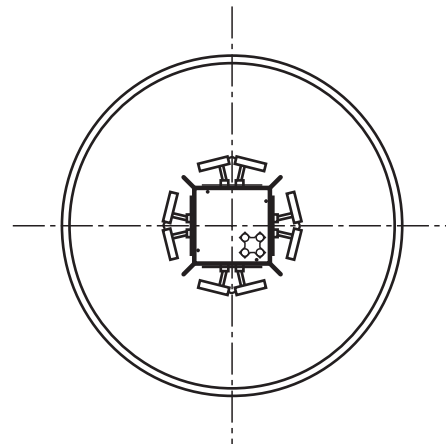
Self-supporting GRP Towers

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.



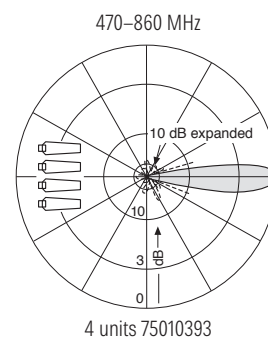
Relay Receiving Antennas

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



> 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.

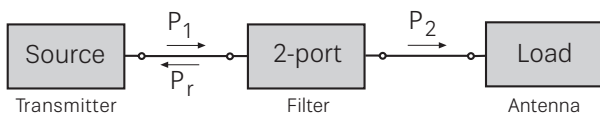
> Glossary of Broadcast Combiners and Filters

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 a_r (1.2), is displayed in diagram 2. The return loss a_r , reflection coefficient r and VSWR factor s (1.3 and 1.4) are all related according to the formulas.

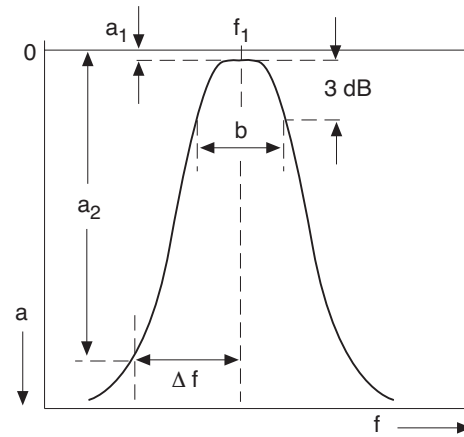


Diagram 1: Frequency response of a filter tuned to frequency f_1 with insertion loss a_1 , stop band attenuation a_2 at the frequency of $f_1 - \Delta f$ and with bandwidth b at 3 dB.

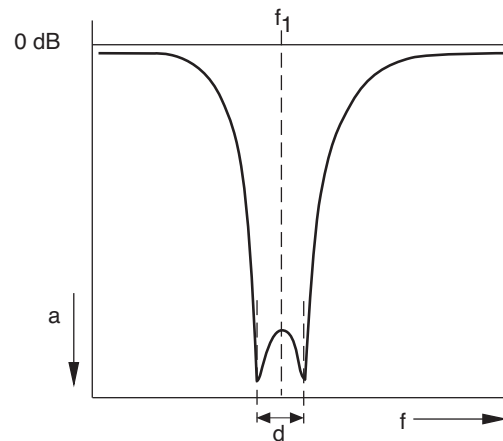


Diagram 2: Return loss of a 2-cavity band-pass filter, tuned to the frequency f_1 and with pass-band bandwidth d .

$$a / \text{dB} = 10 \log \frac{P_1}{P_2} \quad (1.1)$$

$$a_r / \text{dB} = 10 \log \frac{P_1}{P_r} \quad (1.2)$$

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

$$(1.4)$$

Filters

Where used in broadcasting systems, filters are normally set up as a combination of several $\lambda/4$ 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.

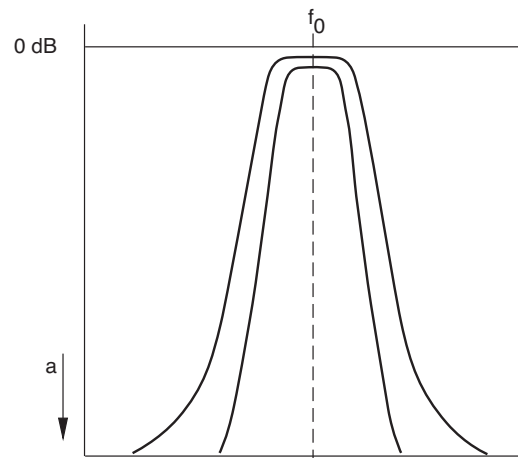


Diagram 3: Examples of two different tuning possibilities for a band-pass filter. Narrower tuning will result in higher insertion loss and steeper slopes.

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 $\lambda/4$ at the center frequency f_m 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.

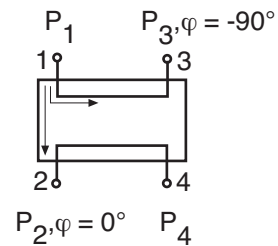


Fig. 2: Directional coupler.

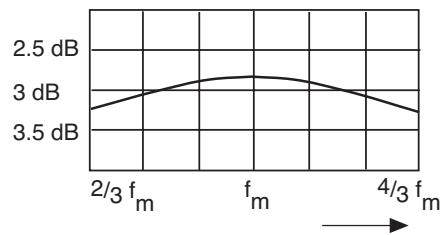


Fig. 3: Coupling attenuation for 3-dB transmission-line coupler of $\lambda/4$ length.

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.

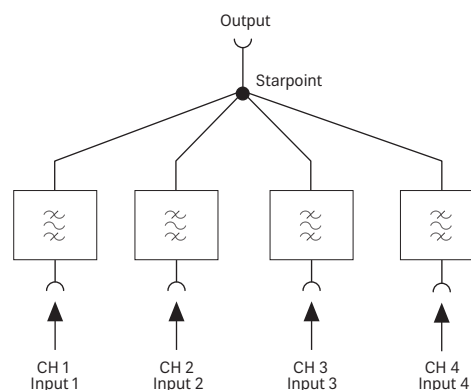


Fig. 4: Starpoint combiner for 4 channels

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.

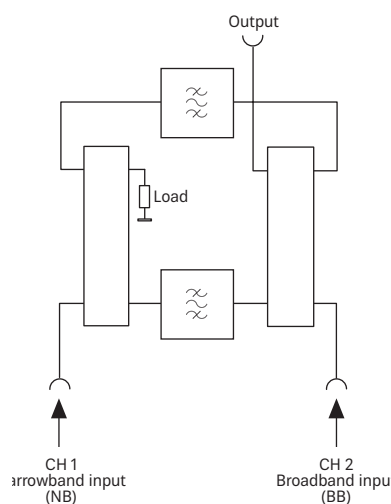


Fig. 5: Directional filter combiner

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 narrowband input by the directional coupler. However the isolation depends on the band-pass filters being identically tuned.

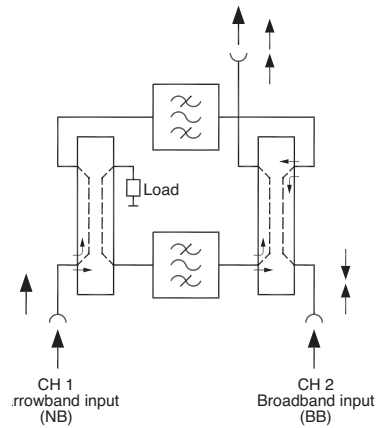


Fig. 6: Functioning of module

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 easily 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.

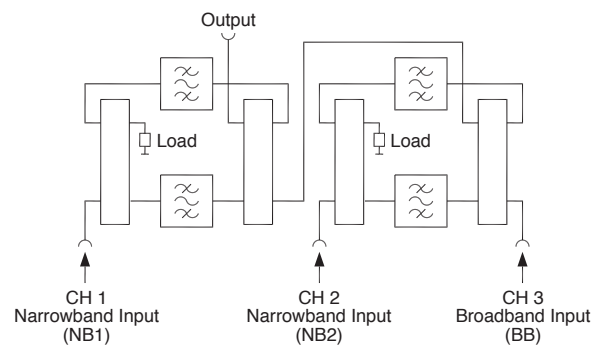


Fig. 7: Directional filter combiner with 2 modules

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 filter 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.

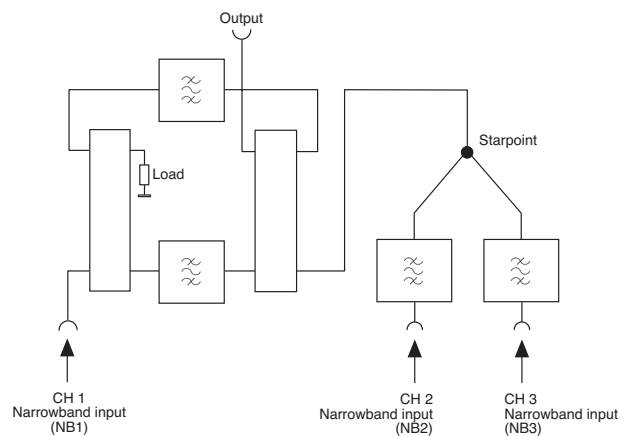


Fig. 8: Multiplexer for three channels

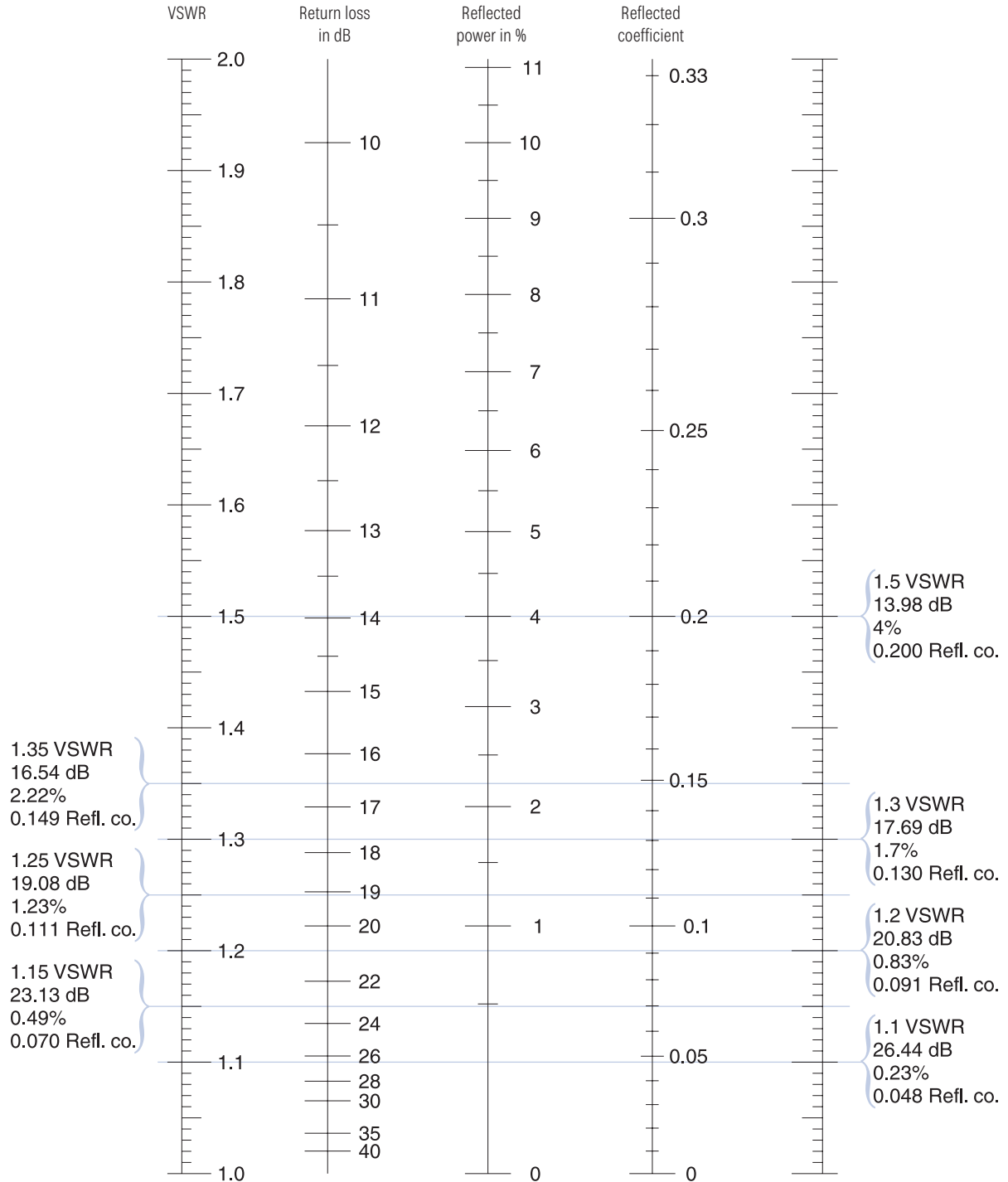
Comparison

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

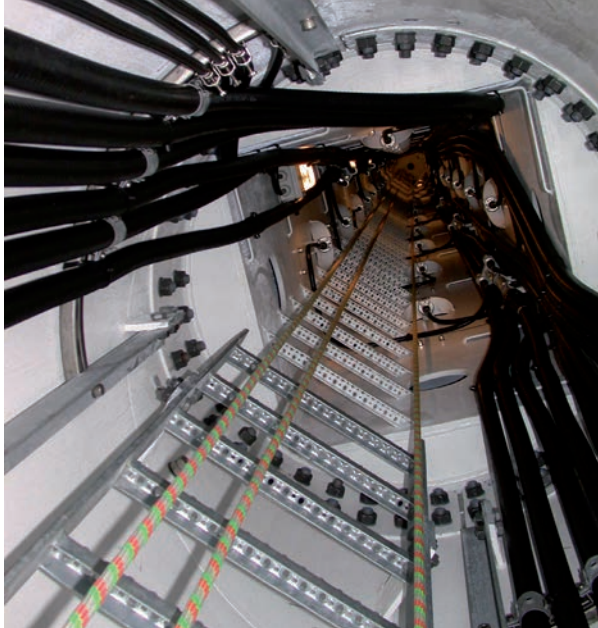
Locate the known value on the appropriate scale, then read across horizontally to find the equivalent values as shown in the examples above.



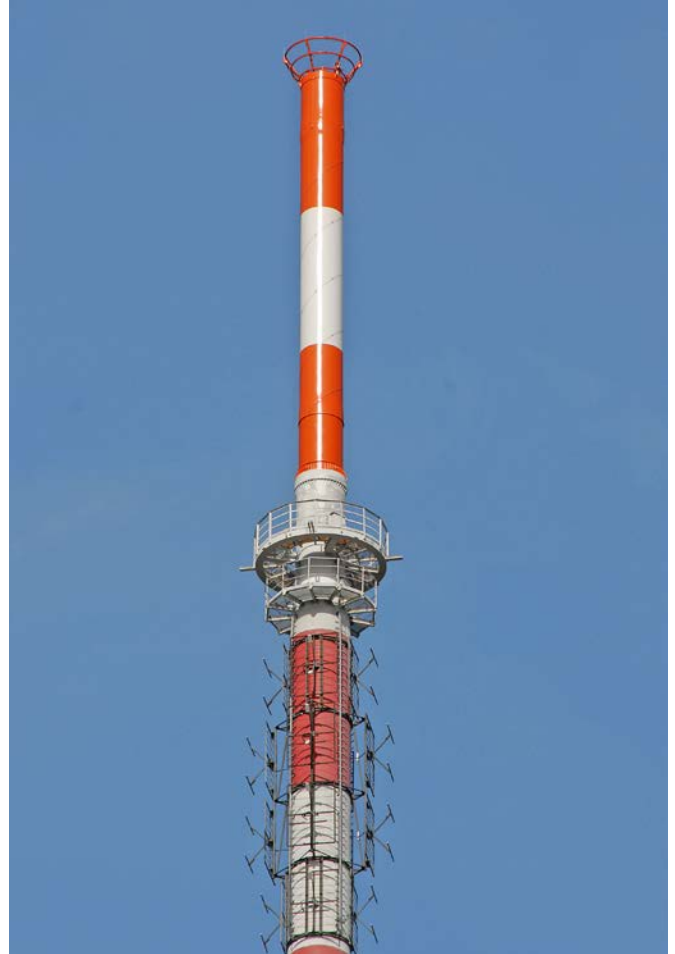
> Configuration Examples

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.

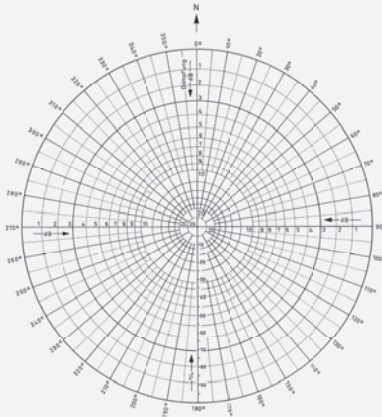
UHF Antenna mounted on square steel spine



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 <input type="checkbox"/>	Vertical <input type="checkbox"/>	Slant <input type="checkbox"/>	Circular <input type="checkbox"/>	Elliptical <input type="checkbox"/>
Frequency (MHz) or channels:					
Transmitter power (kW):					
Min. power rating for system (kW):	Analog <input type="checkbox"/>		Digital <input type="checkbox"/>		
Antenna gain:	Number of bays:		ERP:		
Combiner:	Yes <input type="checkbox"/> No <input type="checkbox"/>	Direct Access Unit:	Yes <input type="checkbox"/> No <input type="checkbox"/>	Patch panel:	Yes <input type="checkbox"/> No <input type="checkbox"/>
Half antenna mode	Yes <input type="checkbox"/> No <input type="checkbox"/>	Half power <input type="checkbox"/>	Full power <input type="checkbox"/>	1 Feeder <input type="checkbox"/>	2 Feeders <input type="checkbox"/>
Horizontal Radiation Pattern:					
Omnidirectional or directional (if directional specify requirements)					
					
Vertical Radiation Pattern:					
Beam tilt (in degrees):					
Null-fill (in %):					
Tower/Mast:					
Square <input type="checkbox"/>	Triangular <input type="checkbox"/>	Round <input type="checkbox"/>	Pipe mast <input type="checkbox"/>		
Azimuth direction of tower face:					
Side length or diameter:					
Vertical antenna aperture:					
Feeder cable:					
Air <input type="checkbox"/> Foam <input type="checkbox"/>					
Size:		Connectors:			
Length (m):		Dehydrator:		Yes <input type="checkbox"/> No <input type="checkbox"/>	
Remarks:					
e.g. special climatic conditions					

Please contact: KATHREIN Broadcast GmbH | Ing.-Anton-Kathrein-Straße 2 | 83101 Rohrdorf | Germany
www.kathrein-bca.com | support@kathrein-bca.com

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.

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

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