BROADCAST

Smart Monitoring

Solutions for Monitoring Broadcast Antenna Systems

KATHREIN

KATHREIN

Information about KATHREIN Broadcast

As of 1st June 2019, KATHREIN SE's (formerly KATHREIN-Werke KG) business unit "BROADCAST" will be transferred to KATHREIN Broadcast GmbH (limited liability company).

From 1st June 2019, the new company data are:
KATHREIN Broadcast GmbH
Ing.-Anton-Kathrein-Str. 1, 3, 5, 7
83101 Rohrdorf, Germany
Tax Payer's ID No.: 156/117/31113
VAT Reg. No.: DE 323 189 785
Commercial Register Traunstein: HRB 27745

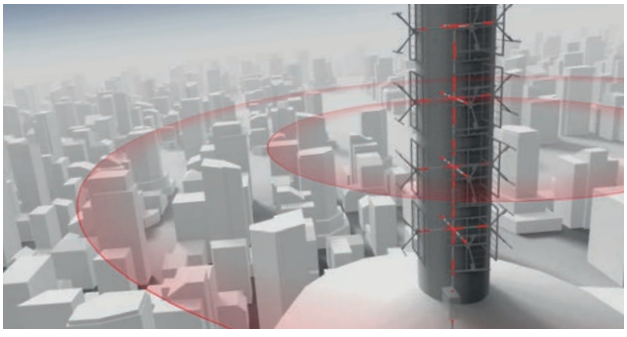
The antenna systems of new transmitting tower "Camlica" (Turkey) will be equipped with a Kathrein Smart Monitoring System

Kathrein Smart Monitoring is an innovative monitoring system for radio and TV transmitter stations. Using special sensors, the system, which Kathrein is developing 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

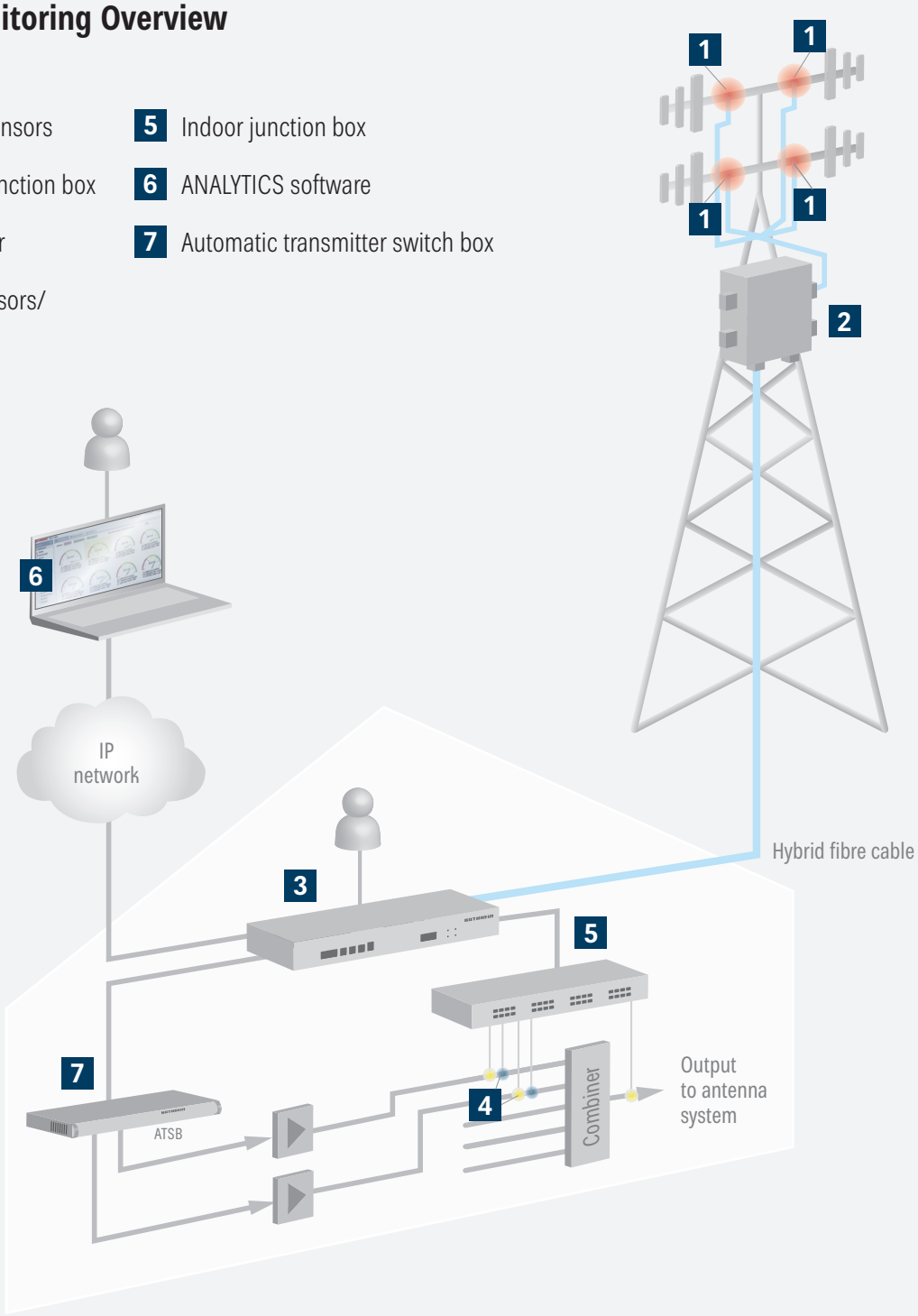
- Early recognition of critical operation status
- Exact localisation of degraded system components or sections
- Proof of SLA
- Scheduled proactive maintenance
- Optimised costs for regular maintenance



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 Automatic transmitter switch box



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

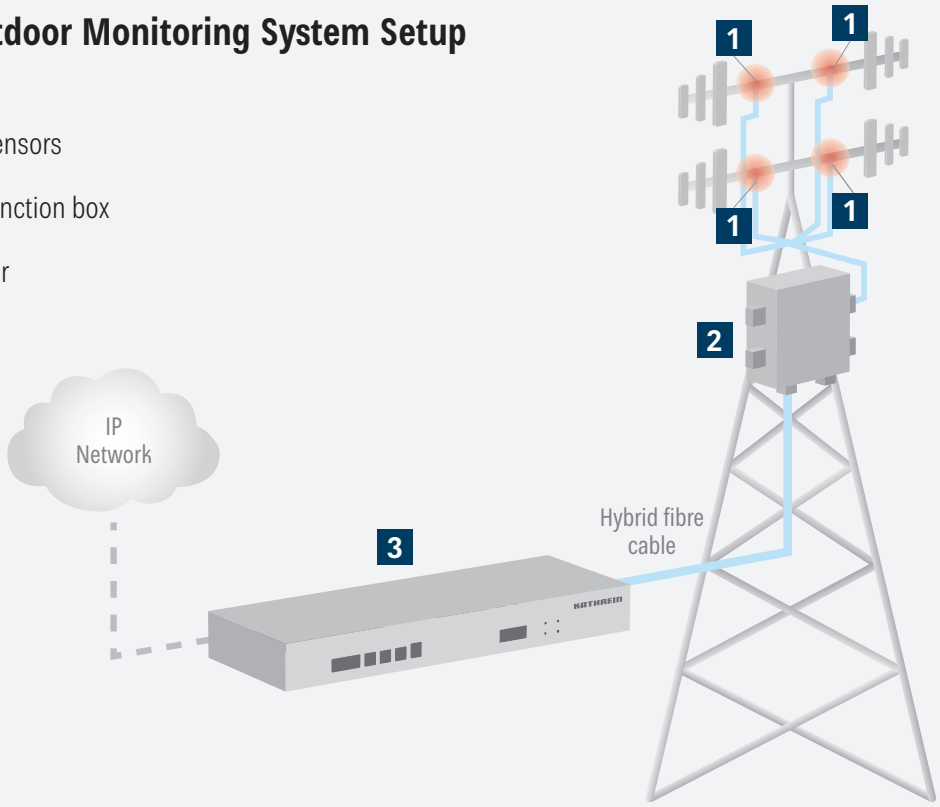
Outdoor Monitoring

Typical Outdoor Monitoring System Setup

1 Outdoor sensors

2 Outdoor junction box

3 Data logger



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, ⅞" EIA, 13-30, 1 ⅝" EIA, 3 ⅛" EIA, 4 ½" EIA, 6 ⅛" EIA.

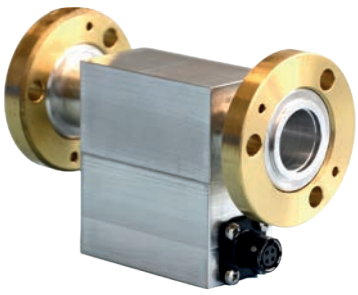
Outdoor monitoring implemented at FM transmitting antenna system "Langenburg", Germany

Antenna Monitoring Sensor 1.5G

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

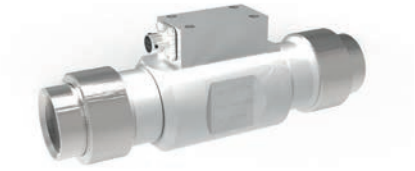
Order No.	75210183		75210184	
RF connector	7-16 female/male		7⁄8" EIA flange	
Signal connector	1 x MIL-Circular 4-pin socket IP 66 – Amphenol			
Impedance	50 Ω			
Frequency range	50–860 MHz			
Return loss	> 37 dB (FM) > 35 (VHF and UHF)			
Accuracy measured return loss	Range RL 10 to 20 dB: ±1 dB Range 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 AlSi1MgMn			
Surface	SurTec® 650 (RoHS compliance)			
Dimensions	115 x 56 mm		110 x 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 UHF 665–860 MHz	2–1800 W 2–1300 W	30 dB 30 dB	3–3000 W 3–2200 W	30 dB 30 dB

75210183

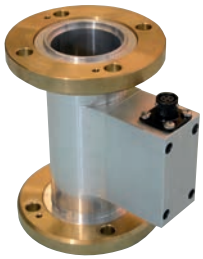


75210184

Order No.	**75210186**		**75210185**	
RF connector	13-30 female/male		1⅝" EIA flange	
Signal connector	1 x 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 x 85 mm		121 x 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 **665–860 MHz**	5.4 kW 4 kW	30 dB 30 dB	7 kW 6 kW	30 dB 30 dB



75210186



75210185

Order No.	7520000005		7520000006		7520000007	
RF connector	3⅛" EIA flange		4½" EIA flange		6⅛" EIA flange	
Signal connector	1 x 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 x W x L)	152 x 128 x 220 mm		192 x 180 x 220 mm		215 x 205 x 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 UHF 665–860 MHz	24 kW 20 kW	30 dB 30 dB	37 kW 28 kW	30 dB 30 dB	73 kW 54 kW	30 dB 30 dB

7520000007,
752000005 and 752000006 are similar

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 x H x W)	160 x 100 x 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

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 x MIL-Circular 4-pin Socket IP 66 – Amphenol			
Signal connector JB	1 x 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

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 x HAN BRID® F.O. 2 power contact + 2 HP fibre contacts metal housing – Harting	1 x 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 x 1.5 mm^2 – Low smoke, fire retardant, zero halogen – UV-resistant – Leoni

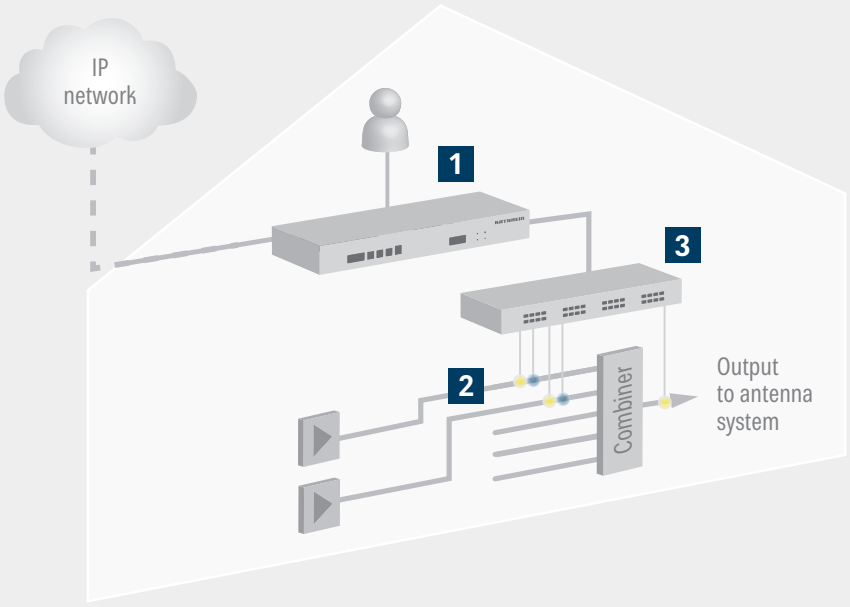
Order No.	75210208	75210209	75210211
Accessories	Stripping tool	Crimp tool for HAN BRID® electrical contacts	Fibre optic connector mounting tool

75210206 75210207

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.

Combiner

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

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 x 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 x W x D)	1 HU 43.7 x 483 x 300 mm
Weight (total)	2 kg
Working temperature	0 to +45 °C
Safety	EN 60950-1
Max. power consumption	< 5 W

7520000011

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 x W x L)	80 x 42 x 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 x W x L)	20 x 20 x 24 mm

7520000010

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 x 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 x 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

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 –

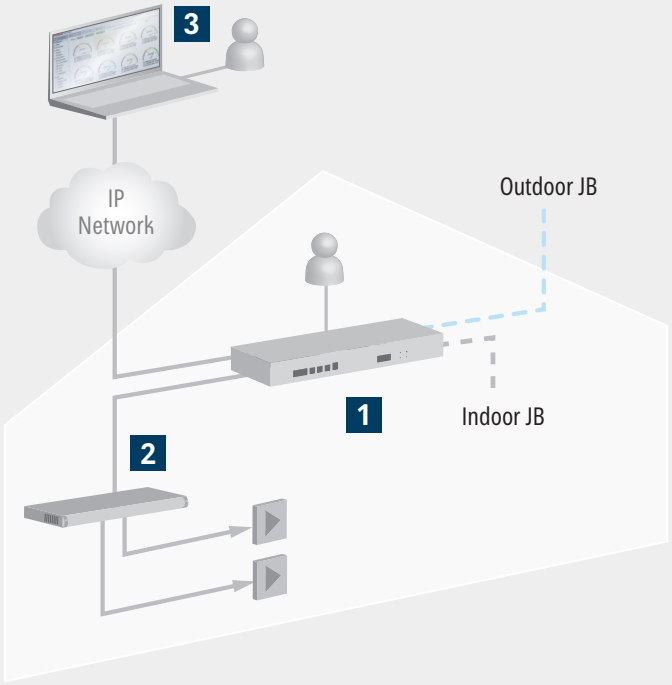
Data Processing, Analysis Software and TX Control

Typical Data Processing and TX Control System Setup

1 Data logger

2 Automatic transmitter switch box

3 ANALYTICS software



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:

- 75210195 – one time data logger SW licence fee, w/o. SNMP, per each sensor
- 75210196 – 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:

- 75210197 – one time ANALYTICS SW licence fee, initial 20 sensors
- 7520000008 – one time ANALYTICS SW licence fee, additional 50 sensors

Outdoor monitoring and ANALYTICS Software in use at transmitting station "Augsburg-Hotelturm", 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 x 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 x W x D)	1 HU: 43.7 x 483 x 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

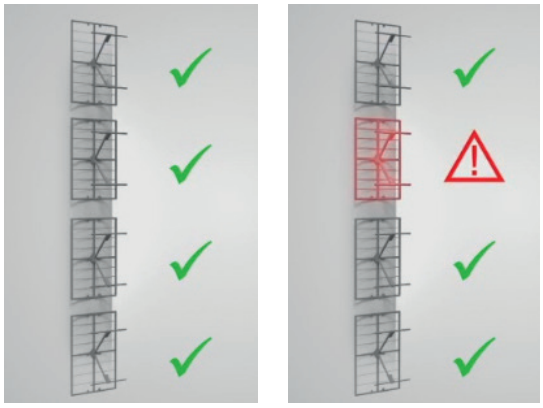
ANALYTICS is a powerful software tool, optimised to store, process and visualise antenna operation data generated by antenna monitoring. It can manage various data loggers of a large-sized network. SNMP alarm traps can be generated to trigger an NMC. Further, ANALYTICS provides comfortable configuration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



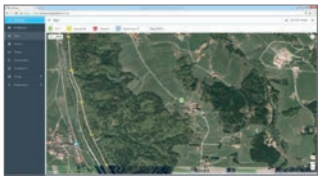
Immediate failure detection and exact localisation

1 Dashboard to visualise operation status

2 Trend curves to analyse operation data

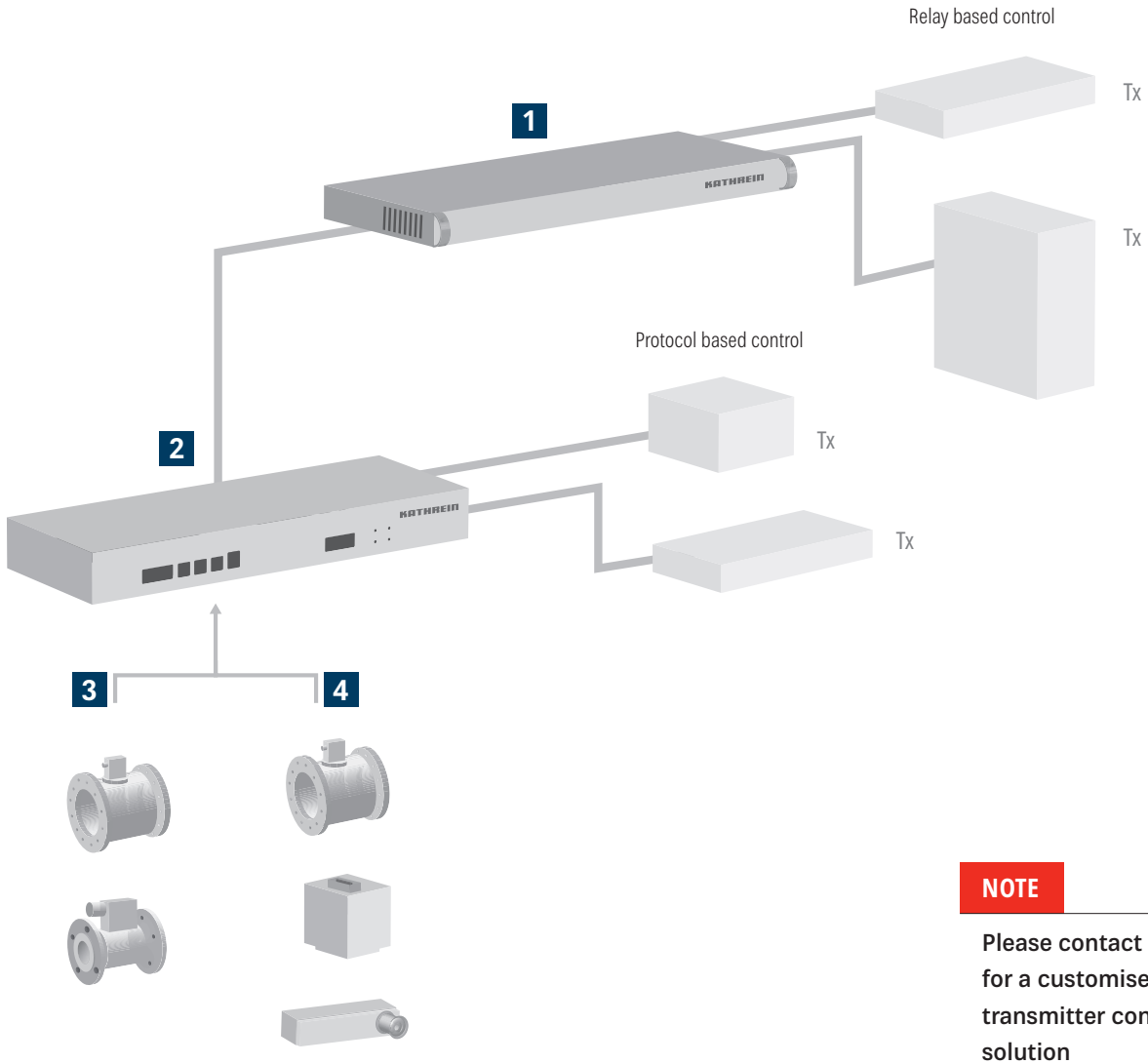
3 Document manager to provide ready station information

4 Site information map to optimise service logistics



Antenna Monitoring Transmitter Control

1. Automatic transmitter switch box (ATSB)
2. Data logger
3. Kathrein outdoor monitoring sensors
4. Kathrein indoor monitoring sensors

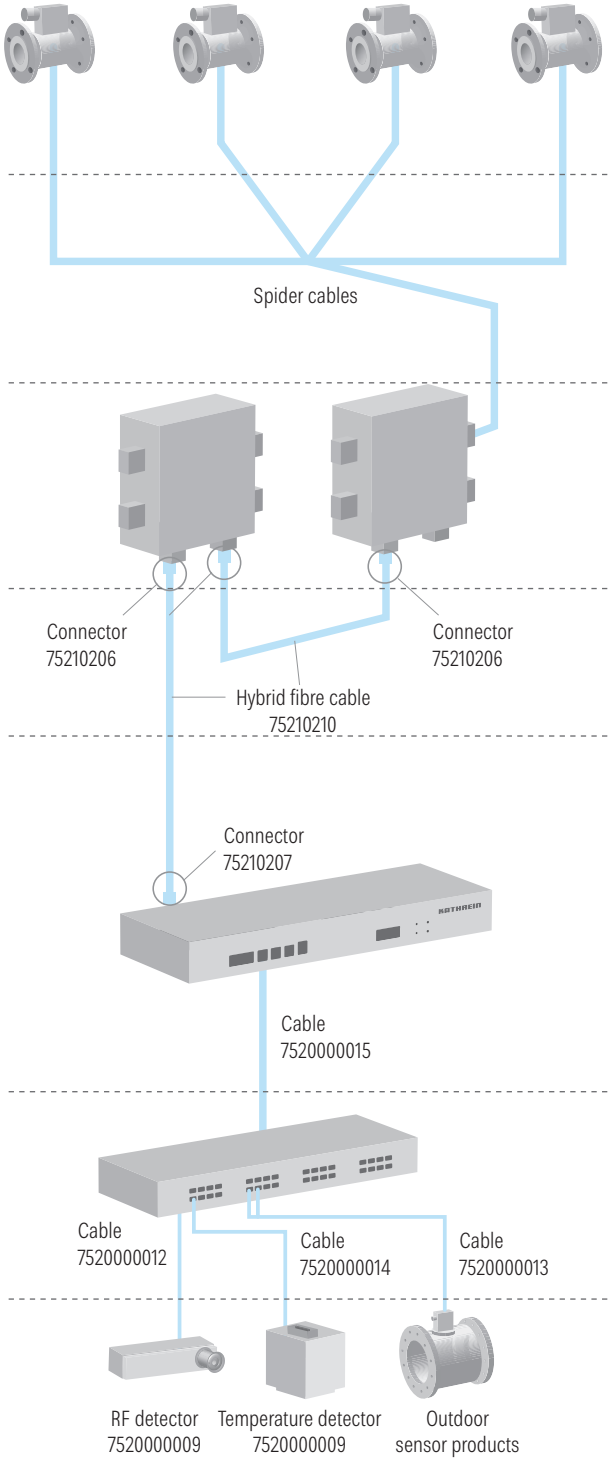


NOTE

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

Hybid 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 signalised 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: 75210190

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. 75210195
	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. 75210196

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. 75210195
	SW licence fee, ANALYTICS – inhouse installation, 20 sensors	Order No. 75210197
	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. 75210195
	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.

9980000097/0,4/0818/MMG/PF | Subject to change. Title: stock.adobe.com | adiruch na chiangmai

KATHREIN Broadcast GmbH
Ing.-Anton-Kathrein-Str. 1, 3, 5, 7
83101 Rohrdorf, Germany
www.kathrein-bca.com
broadcast@kathrein.de

KATHREIN