

Passive components for

# DAS solutions

- **Tunnels**
- **Buildings**
- **Basements**
- **Parking garages**
- **Offshore platforms**



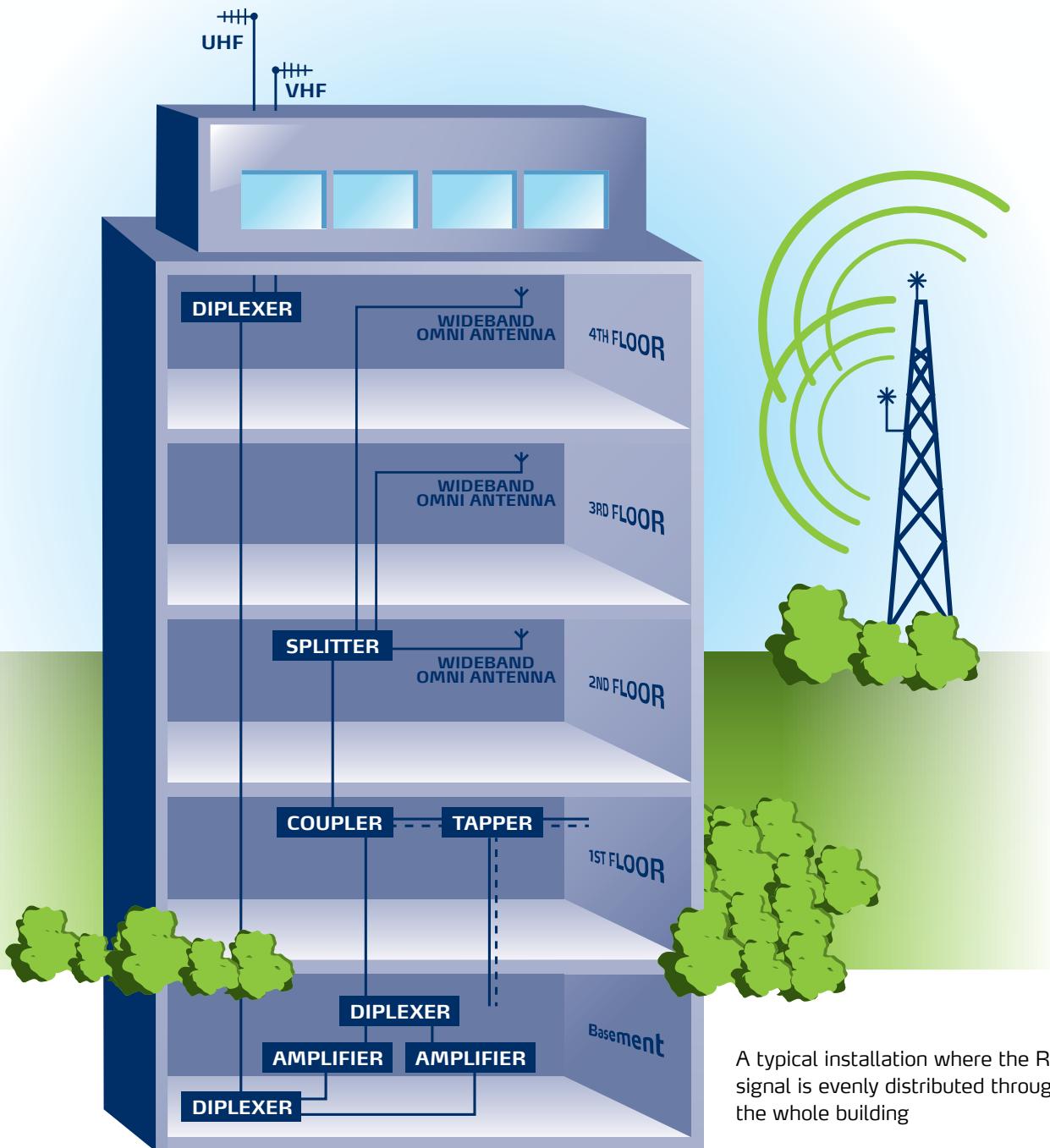
Antennas, filters and combiner equipment developed to cover professional indoor communication



"Improve quality of service"

# High quality components

Consistency in products and performance



High quality components suitable for DAS installation in buildings where confined areas require radio cover for single or multi services. Components

where the quality requirements are high due to reasons of environment, moisture or temperature or where component must be able to withstand PIM.

Procom R&D has test facilities and test procedures to ensure high quality and consistent performance.



# DAS

## Procoms Distributed Antenna System

Procom's system component program comprises couplers and power splitters, dummy loads & attenuators, isolators & circulators & power monitors. Procom's system components are designed by experienced engineers with a focus on the professional user. The products are of sturdy construction and use high-quality materials in conjunction with an extensive QA-system ensures the highest quality of both electrical specifications and mechanical parameters.

### **System components assist in coupling, filtering or attenuating the requested frequencies.**

At a time when Wireless Communications in Confined Areas, such as Tunnels, Underground Parking Garages, In-Buildings and last, but by no means least, on board Vessels, Trains and Oil platforms, are configured as Trunked Networks, the demand for DAS solutions and components increased, to provide RF coverage for

Public Cellular Systems, Mission Critical Communications Systems for Emergency Services/ First Responders.

Modern building construction methods often rely on using materials, which effectively shield radio waves, thus, the need arises to provide solutions that enable the RF signals being distributed throughout the inside.

In Buildings with public access there is often a demand for Emergency Services and First Responders to be able to communicate effectively, which requires the provision of a safe, secure and reliable distribution of the RF signals.

The solution is to use active and passive equipment especially developed for this task. Here Procom can provide new components that are tailor-made for DAS solutions. Everything from antennas and diplexer equipment to power splitters and tappers, which are available in various versions, ensuring the optimum solution.

# Inside buildings

Adequate coverage and bandwidth



**Procom's wide variety of products are well suited and contribute to an optimum solution for all applications**

The RF signal is often collected via a pick-up antenna and distributed to an active unit which amplifies the signal and sends it out in a distributed antenna system. The power is split through power splitters in a homogeneous

way so that an even distribution of the available signal is achieved.

Providing dedicated solutions for an optimal system design requires high precision. Performance data is needed for every single component when

the system loss has to be calculated.

There can be requirements for surveillance of the installations, measurement of loss and SWR. Procom has developed power monitor equipment to handle the system



**Sport Stadiums**



**Public transportation**



**Staircases**



**Warehouses**



**Inside buildings**

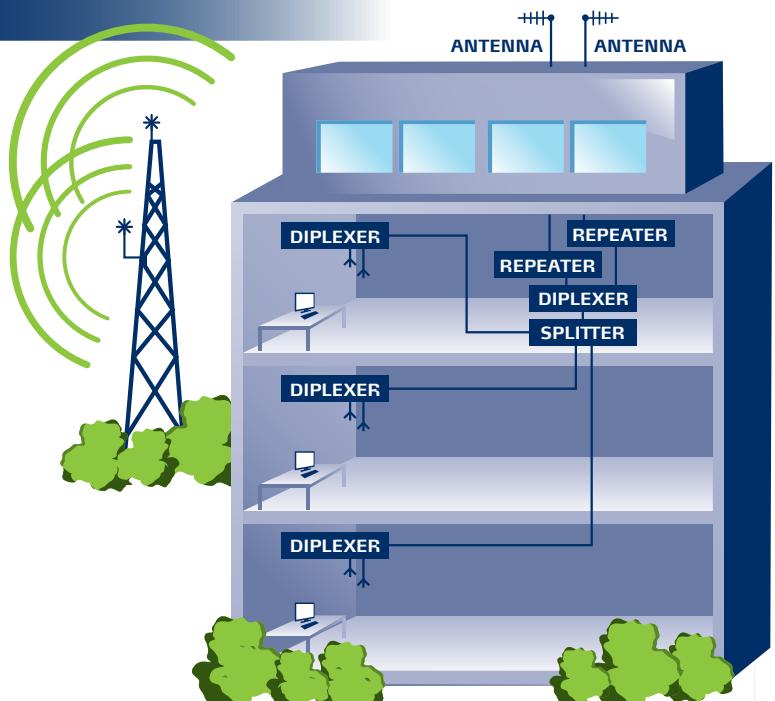


**Shopping centers**

## An optimum solution

**Procom's products are well suited and contribute to an optimum solution.**

- **The repeater** amplifies the RF signal outside-in and inside-out
- **The diplexer** combines the low and high RF spectrum into one single cable and vice versa from one cable to two antennas
- **The power splitter** splits the entire RF signal in 2, 3 or 4 ways



feedback in the case that the system has a defect. A distributed antenna system, or DAS, is a network with leaky feeder cables and antennas installed in a building or a tunnel in such a way that the RF signal gives a safe

radio cover. The system must be designed to avoid dead spots inside the building; here circular antennas are well suited. If a solution is to be based on antennas or leaky feeder cables depends on the physical characteristics and size of

the room. In tunnels it will most often be an advantage to use leaky feeder cables whereas it would be most advantageous to use antennas in large rooms. Irrespective of the choice of transmission.

# Coverage in transport

## One system many services



### Demanding requirements

- Spurious from trains and installations
- Coverage inside all sorts of vehicles
- Many users, same location

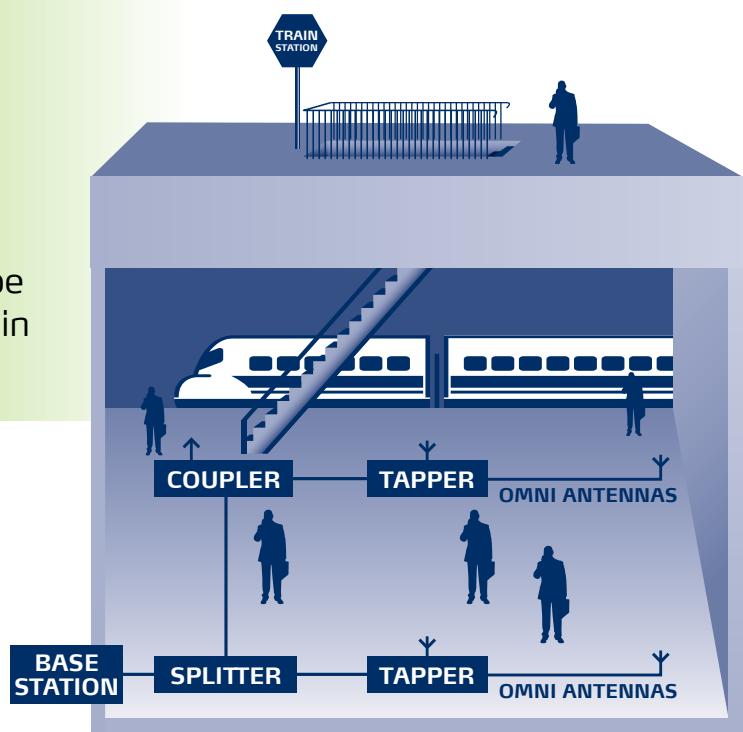
Systems enabling necessary services to be used together with public safety services in the same installation.



**PRO-DIPX**



**PRO-HPS**



# Coverage in tunnels

## Broadband services



### Many frequencies, few components

Broadband equipment which ensures multiband services in the solutions. Drivers must be alerted via FM broadcast services, mobile telephony must be available and public safety units must be able to communicate in case of incidents and emergencies.



**PRO-DIPX**



**PRO-ISO-PHY-TETRA**

# Coverage in hospitals

Many locations using same services



## Quality of service

Avoid disturbance to electronic medical equipment, resist radiation from other services and still ensure mission critical communication in selected or all areas. Control of signal path and coverage areas.



PRO-PMI



PRO-PHY

# Coverage on oil rigs

Rough environments - dedicated components



## Multiple services

Multi services must be distributable via DAS installations. On board communication, safety services must be able to work together with WiFi services. Coverage in critical areas such as shafts, pontoons and production areas. Installations with required performance and bandwidth and handheld units with multiple services to ensure an optimum solution.



**DC-BLK**



**PRO-TAP**

# DAS Components

Improve service by quality components

Procom has a wide range of passive components to support a DAS solution whether leaky feeder cables or antennas are used in the installation. The components are suitable for rough environments and can be

used in tunnels and even outdoors. Focus has been placed on encapsulation and immunity towards PIM. The products are individually tested prior to leaving the factory. Procom's DAS products are flexible and

can be supplied in many different versions with various connectors and for various frequencies dependent on needs. Equipment which is easy to install.

## Power Splitters

Power splitters are frequently used in distributed antenna systems in buildings or tunnels. The power splitter splits the signal evenly and with minimal loss and reflections. Application areas: Multiband antennas; radiating cables and distributed antenna systems.

- > **Model: PRO-HPS... 70-470 or 380-2700**
- > **Frequency range 70-470 or 380-2700 MHz**
- > **Max. input power 500 W**
- > **2, 3 & 4 way high power splitter covering the 380-2700 MHz band**
- > **Excellent PIM performance**
- > **Low insertion loss and good impedance match**
- > **Divider output (dB): 3/5/6**
- > **Low SWR 1 : 1,25**
- > **Standard connector: N-female or 7-16 DIN-female**



## Couplers

Procom's compact power divider programme comprises equal and unequal power dividers, directional couplers, broad-banded power hybrids, cascaded Wilkinson-hybrids and power splitters. Procom's compact power dividers offer high isolation and excellent amplitude and phase balance. Detailed product specifications are available on [www.procom.dk](http://www.procom.dk). The product line comprises 18 different products with the following main features:

- > **Model: PRO-PHY... & PRO-DIR...**
- > **Frequency range 80-2700 MHz**
- > **Input power 200 W**
- > **Divider output 3 to 30 dB**
- > **Low SWR typ. 1 : 1,2**
- > **Standard connector: N-female or 7-16 DIN-female**



## Power Tappers

A tapper is a device that taps off a portion of the signal while allowing the rest of the signal to pass through with a minimum of loss. For correct function and low SWR on the main line input and output ports the coupled tapper port must be terminated in  $50\ \Omega$ .

Power tappers are frequently used in distributed antenna systems in buildings or tunnels. Tappers operate similarly to directional couplers but without the directivity (no isolation between output port and coupled port) and have relatively broad bandwidths.

- > **Model: PRO-TAP 150-2700-...** 4,8 dB/6 dB/8 dB/10 dB/15 dB/20 dB
- > **Frequency:** 150-1550 MHz & 1650-2700 MHz
- > **500 W power tapper with 4.8 to 20 dB coupling**
- > **Max. input power:** 500 W
- > **Very low insertion loss over the entire frequency range**
- > **Standard connector:** N-female or 7-16 DIN-female



## Diplexers . Used for splitting and combining the signal...

...if a feeder cable carries multiband frequencies which have to be split to specific antennas for high performance. Diplexers are passive devices that combine two ports into a single common port. They prevent intermodulation and keep reflected SWR to a minimum for each of the input transmitters. A typical example would be the simultaneous operation of two different band radio transceivers on a common antenna.

- > **Model: PRO-DIPX series**
- > **Low- and high-frequency ranges**
- > **Max. input power (watts): 10 to 200**
- > **Divider output (dB): 6/8/10/20**
- > **Low SWR over the entire frequency band**
- > **Standard connector: N-female or 7-16 DIN-female**



## Mobile TETRA Combiners

To ensure the highest possible isolation between several TETRA- radios, Procom has developed new combiners. The two-, three-, four-, six- and eight-station TETRA-combiners give a trouble-free connection of two or three or four or six TETRA stations into an arbitrary TETRA-running antenna. The unique isolation of 60 dB between the stations is higher than or equal to what the ETSI-standard is demanding.

ETSI compliant connection from two to six radios.

- > **The PRO-ISO-PHY-TETRA-4 combiner provides the possibility of connecting up to four TETRA radios into one common antenna**
- > **Models for connecting two, three, four, six and eight TETRA radios**
- > **The smallest and most compact design on the market**
- > **Suitable for both stationary and mobile use**



# State-of-the-art Antennas

## omnidirectional, directional, and patch antennas

Procom produces many types of antennas, omnidirectional, directional or patch antennas to be used as pick-up antennas. Antennas designed to withstand lightning. Mechanical parame-

ters are essential for equipment with heavy demands for operation time. Antennas with gain and tilt as required. Frequencies from 60 MHz to 6.0 GHz can be covered.

Inside buildings antennas can be used especially in larger rooms. Circular polarized antennas improve indoor coverage compared to simular linear polarized antennas.

### CXL Antennas

Procom's CXL antennas cover frequency ranges from 66 MHz to 5900 MHz. All the CXL antennas are coaxial - and omnidirectional antennas. Procom has CXL antennas with the following bracket types:

**SL: Slim line** - price competitive for high gain antennas / **LW: Lightweight** - modern style base station antenna, most commonly used / **C: Similar to LW for larger size antennas**

**HD: Heavy Duty** - high gain and high power antenna, used for the rough weather conditions

- > Frequency ranges: 66 to 5900 MHz
- > Max. input power: 250 W
- > Low SWR over the entire frequency band
- > Standard connector: N-female or 7-16 DIN-female

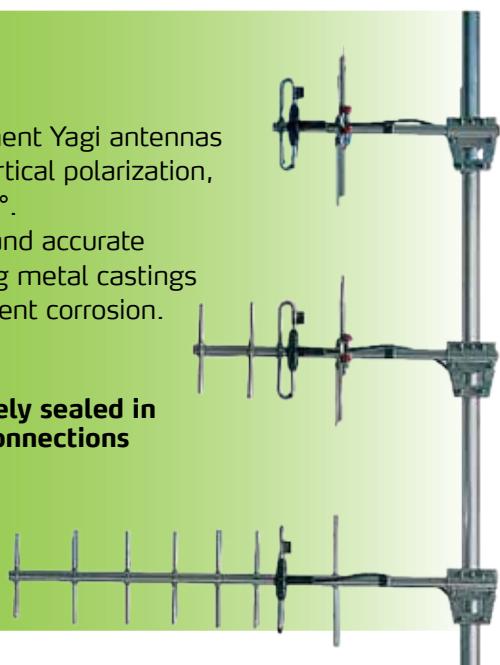


### Directional Antennas

**S.2Y, S.4Y and S.8Y** These antennas are 2-, 4- and 8-element Yagi antennas with 3, 7, and 10 dBD gain, respectively. When mounted for vertical polarization, the horizontal coverage is S.2Y: 150°, S.4Y: 90° and S.8Y: 58°.

These Yagis incorporate baluns optimized for wide bandwidth and accurate matching. Radiating elements, supporting booms and adjoining metal castings have been constructed in high-quality aluminium alloys to prevent corrosion. All metal parts are DC-grounded.

- > The entire balun unit and feeder cable inlet are completely sealed in a polythene moulding ensuring permanent waterproof connections
- > Supplied with a 3 m "tail" of RG 213 terminated with an N-female connector
- > Designed for back mounting



## Indoor Circular Polarized Antennas

**PCPI WIFI and PCPI DCS/UMTS** are Right Hand Circular Polarized patch antennas for indoor use. Circular polarized antenna is chosen to avoid out-of-phase signals. Specially designed for closed rooms.



- > Low profile antennas for the 2400 - 2500 or 1710 - 2200 MHz band
- > PCPI DCS/UMTS covers the DCS and the UMTS frequency range 1710 - 2200 MHz with a radiation gain of 5 dBi

**PCPI GPS Extend** is used where GPS-signals are missing. It is a Low profile antenna for reradiating the GPS signal. Outdoor GPS antenna is necessary.



- > Covers the GPS frequency 1575 MHz with a radiation gain of 5 dBi
- > Full size  $2\lambda$  circular patch antenna
- > Internal 25 dB selective amplifier
- > 5V DC output on N-connector for feeding outside GPS antenna with built-in amplifier

## Low-profile Ultra Wideband Omnidirectional DAS Antennas

**UWB-I 380-6000** is an Ultra Wideband Omnidirectional Antenna capable of supporting TETRA, GSM, PCS, UMTS, WIFI 2.4 and 5.X GHz, 4G LTE and WiMax.

- > Covers 380 - 6000 MHz frequencies with a radiation gain of approx. 0 dBi
- > Omnidirectional coverage
- > No need for external ground plane
- > Vertical polarization
- > Max. power 50 W

Provided with external coaxial cable with N-female connector.



Size: 107x 325 mm

## Indoor or Outdoor Linear or Circular Polarized Patch Antennas

**LPO TETRA/380-470** is an Indoor Linear Polarized low profile Antenna for mounting on ceiling.

**PCPO xH/TETRA/...** is a Left or Right Hand Circular Polarized patch antenna for outdoor use. The antennas are carefully sealed with a discrete cover.

- > Low-profile antennas for the 380 - 470 MHz band
- > LPO TETRA/380-470 for ceiling mount
- > Bandwidth 90 MHz
- > PCPO xH/TETRA/... for wall or mast mount
- > Bandwidth 50 MHz with a radiation gain of 7 dBi



Size: 231 mm x 81 mm

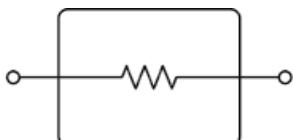


Size: 345 x 345 x 60 mm

# DAS Components at Procom

# Product overview

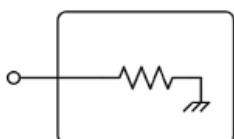
## Attenuators



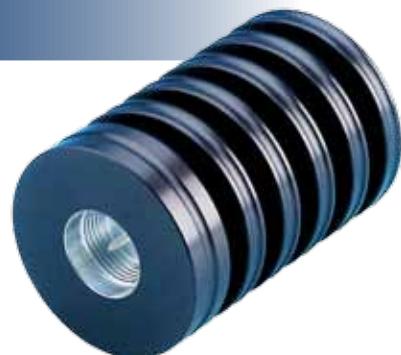
- 3 dB, 6 dB, 10 dB, 20 dB and 30 dB attenuators.
- Very low SWR - attenuation flatness suitable for:
- Coaxial Transmission Lines
- Power Monitors
- Watt Meters



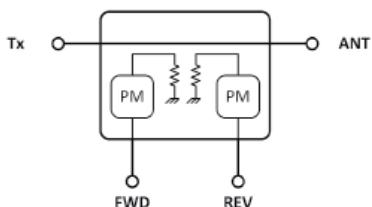
## Loads



- Coaxial loads with very low SWR - especially suitable for:
- Power Hybrids
- Isolators
- Coaxial Transmission Lines
- Power Monitors and Watt meters
- Receiver Multicouplers



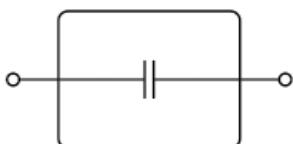
## Power monitors



- Directional and bi-directional power monitors
- Spectrum related from 66 to 960 MHz
- Input power up to 250W
- Very low insertion loss <0,1dB
- Impedance 50Ω



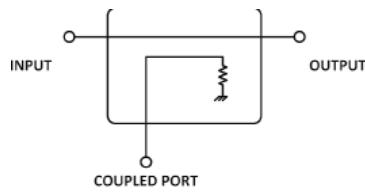
## DC-blocks



- Models covering from 50 to 2.500MHz
- DC-blocking of both conductor and ground for galvanic separation
- High RF power rating
- High DC voltage rating
- Large frequency range
- Available with N- or 7/16 DIN-connectors
- IP65



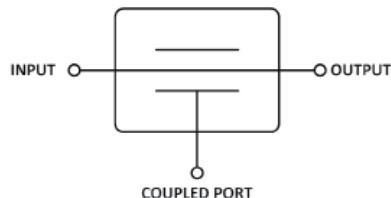
## Couplers



- Directional Couplers covering from 80 to 2.700MHz
- Small coupling values and isolation between outputs
- Low SWR on all ports
- Directivity
- Isolation between outputs
- High Power
- IP64



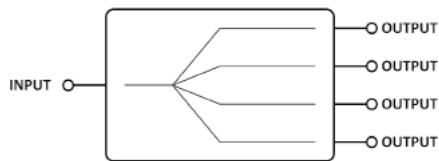
## Power Tappers



- Multi band power tappers
- Low SWR on Input/Output ports
- No directivity
- Wide bandwidth 150 to 2.700MHz
- High Power
- Accurate coupling values
- IP68 (7/16), IP65 (N)



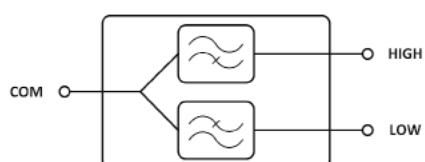
## Power Splitters



- Very Low Insertion Loss
- No directivity
- Wide bandwidth 380 to 2.700MHz
- Equal splitting between multiple output ports
- High Power performance
- IP66



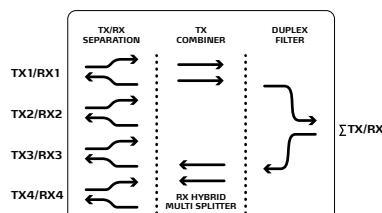
## Diplexers



- Combine or split two frequency bands
- IP67 rated for both indoor and outdoor use
- Chebychev filter design ensures very high isolation
- Very low insertion loss
- Wide temperature range
- N or 7/16 DIN-female connectors on all ports
- IP67 rated for both indoor and outdoor use



## Mobile TETRA Combiners



- Easy way to combine mobile units used as repeaters
- High isolation between ports >60dB
- Passive unit
- Very small
- 19" rack tray on request
- IP62



## About PROCOM A/S

PROCOM A/S is one of the leading suppliers of antenna systems for wireless 2-way radio communication for professional users. In Denmark we produce a wide range of products, which apart from antennas also comprises combiners, filters and measuring equipment.

Procom has four subsidiaries and a network of dealers covering the whole world. Procom is in close co-operation with a number of large international customers within the industry and within the public emergency forces such as Ministries of Defence, police forces, fire-fighting brigades and civil defences.

An essential part of our success in developing products for wireless 2-way radio communication is the fact that our products have the ability to tolerate an extreme load. Our organization

is always ready to develop and manufacture custom-made solutions.

Procom is a privately owned company founded in 1980. Our company is located in Frederikssund north of Copenhagen.



*RF is our competence!*

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