Optical Compact Nodes

for modern HFC networks

KATHREIN

Digital Systems GmbH

KATHREIN | Digital Systems GmbH

Who we are
and what we stand for

We ensure the best possible radio and TV reception

With decades of experience, Kathrein Digital Systems is an innovation and technology driver in the field of satellite reception. Our comprehensive portfolio ranges from antennas and components for signal processing to extensive installation accessories and high quality measuring instruments.

Thanks to extensive know-how in development and unsurpassed quality standards in production, our solutions and systems are absolutely top class. High-quality satellite reception systems in conjunction with sophisticated solutions for signal distribution, whether in single-family homes or in large building complexes, bring the signals to the receiving equipment in best HD quality.

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

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

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

Our awards in 2019:

Optical Compact Nodes

Major events cast a shadow ahead of them. The new DOCSIS 3.1 standard provides for significantly higher data transmission capacity in HFC networks. As well as efficient error correction and extended modulation profiles, the use of a wider frequency range up to 1.2 GHz also creates more bandwidth.

The new "1G2" optical compact nodes allow network operators to benefit in full from these advantages. They are designed for frequency ranges up to 1218 MHz in the forward path and up to 204 MHz in the return path, but can also be used without restriction in existing networks. The electronic frequency range changeover and particularly high output levels allow network upgrades to be implemented step-by-step without problems.

Like all other optical compact nodes, DOCSIS 3.1 operation can of course be implemented immediately in the available frequency ranges. Outstanding intermodulation parameters and the lowest noise levels in comparison with its competitors ensure the best possible system characteristics.

Optical Compact Nodes 2 × 2

ORA 9222-1G2

Scalable optical compact nodes with four outputs

Features

- One to four high-level outputs (trunk/distribution, two separate end stages)
- Full redundancy operation available in forwards and return path
- Segmentation available in the downstream and upstream
- One or two single or twin optical pluggable receiver modules (1–4 receivers)
- One or two plug-in return path transmitters for segmentation, coupling or redundancy, see OSR 9003, OSR 9003-P65-C1x
- Electronically settable matrix in the forwards path and return path
- Innovative operating concept: Electronic actuators, setting via a hand-held operating device or Web browser
- Automatic levelling in the forwards path
- Extremely low-noise receiver
- Internal optical interfaces and fibre management for unrestricted outdoor use (protection class: IP 67)
- Optional CWDM filters or splitters can be integrated
- Plug-in diplex filters 65/85 MHz, 85/105 MHz or 204/258 MHz
- "Plug-and-Play" by combination of two control loops
  - Two-pilot control for level and slope
  - Optical constant light control
- Monitoring by DOCSIS, FSK or HMS transponder
- Creates fibre identification code in the return path transmitters
- Output level up to 119 dBµV per output (for two outputs)

ADVANTAGES

- Higher accuracy over the entire level range
- Extended pilot range: 82.5 MHz–450 MHz for the lower pilot/ 420 MHz–998 MHz for the upper pilot
- Reads the remote feed voltage, the channel level of the forward signal path ("channel scan") via the monitoring
- Modular FttC fibre node with new flexible design
- Double receiver and single return path transmitter with constant light control permit full redundancy and segmentation
- Automatic switchover facility in the event of interruption
- Highly-efficient power factor correction (power factor close to 1)
- Second generation GaN technology end stages
- Electronic settings via Web browser with mobile devices by WiFi module

Features and Advantages

Power loss management
- Amplifier stages that are not required can be switched off
- Reduced power loss in stand-by mode

Second complete forwards path
- Trunk output (can optionally be used as a second distribution network output)
- Segmentation in the downstream

Return path
- Return path frequency range: 5–204 MHz
- Input level range: 65–90 dBµV for OMI = 5 %
- Electronically switchable return path matrix
- Redundant operating mode
- Return path segmentation
- Coupling of return paths
- Ingress control switch for each return path input

Return path transmitter modules
- Optical return path transmitter modules in DFB/CWDM technology available (C11 to C18)
- Control loops for optical output power and constant OMI

General
- Highly efficient switched-mode power supply for remote feeding: 28-90 VAC
- Remote feed current per output: 10 A - total: 20 A
- Die-cast housing with PG 11 connections
- LED mode indicator
- Ingress control switch at each return path input
- External ingress test sockets
- Many EMS functions
- Optical plug connectors: SC/APC, E-2000 or customized DLX
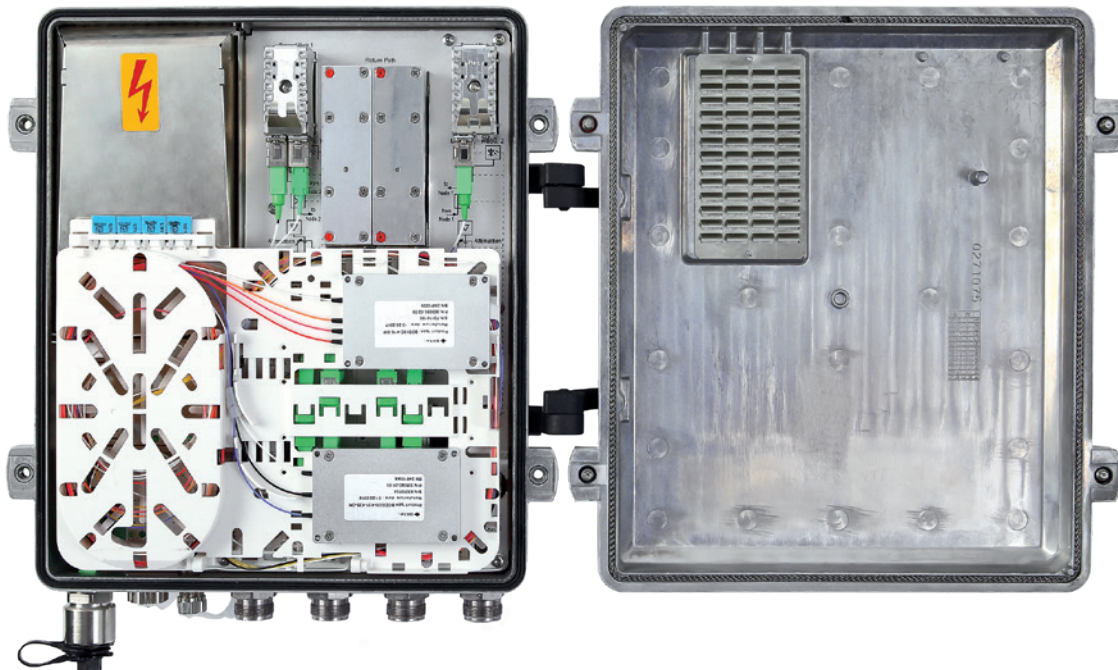
General description

The ORA 9222-1G2 is a highly-linear FttC fibre node with capacity for modular configuration, for use in HFC networks. The ORA 9222-1G2 has two independent downstream paths and two independent upstream paths (each of which can be segmented). When output taps are used, up to four outputs can be configured.

The modular concept of the ORA 9222-1G2 offers the facility for system-specific configuration of the fibre node. Both for the initial configuration and also in the event of any subsequent reconfiguration, the required modules can easily be exchanged and extended. In the most straightforward operating case the forwards path is equipped with a very low-noise receiver. The facility for path redundancy is obtained by adding a second optical receiver.

If only a single RF output is required, the second downstream segment can be switched off. This leads to a noticeable reduction in the fibre node power consumption. The constancy of the output level can be achieved by automatic control. It can be evaluated by either one or two pilot signals (from the specified frequency range). These can be present both as CW carriers and as PAL-modulated or QAM-modulated signals. To save time and avoid the use of additional meters, the levelling of the compact fibre node can be performed by "automatic levelling" of the RF output level. For this function the pilot level values are calibrated and saved in the factory. All that is necessary in the field is to input the required pilot level values, using the hand-held operating device. The devices then adjust themselves automatically. As an on-site check, the RF output signal of the fibre node can be accessed at the test sockets.

The ORA 9222-1G2 can be fitted with a monitoring transponder that conforms to HMS or DOCSIS. As economic alternative a FSK transponder is also available. When incorporated in a network management system, this allows monitoring of alarms at the fibre node. Furthermore, device parameters or functions can be monitored and set. The integral fibre management facility allows convenient and secure storage of the glass fibres and plugs. In addition it permits the attachment of any optical (de)multiplexers or splitters that may be installed. All local settings on the devices are performed in a user-friendly menu-driven way using the connectable hand-held operating device (HTE 20) or via the Web browser with mobile devices such as a tablet PC via the WiFi module.

NOTE

For operation, at least one receiver module ORD 9201-1G2/ORD 9202 -1G2 and one transmitter module OSR 9003, OSR 9003-P65-C1x together with a diplex filter WFS 9xx-1G2, a downstream system equaliser ERS 9xxx-1G2 and an upstream system equaliser ERR 9xxx are required. One plug-in card EBC 01E-1G2 is required in the output insert position for configuration with one output per downstream path. These modules are not included in the scope of supply.

⟩ Details
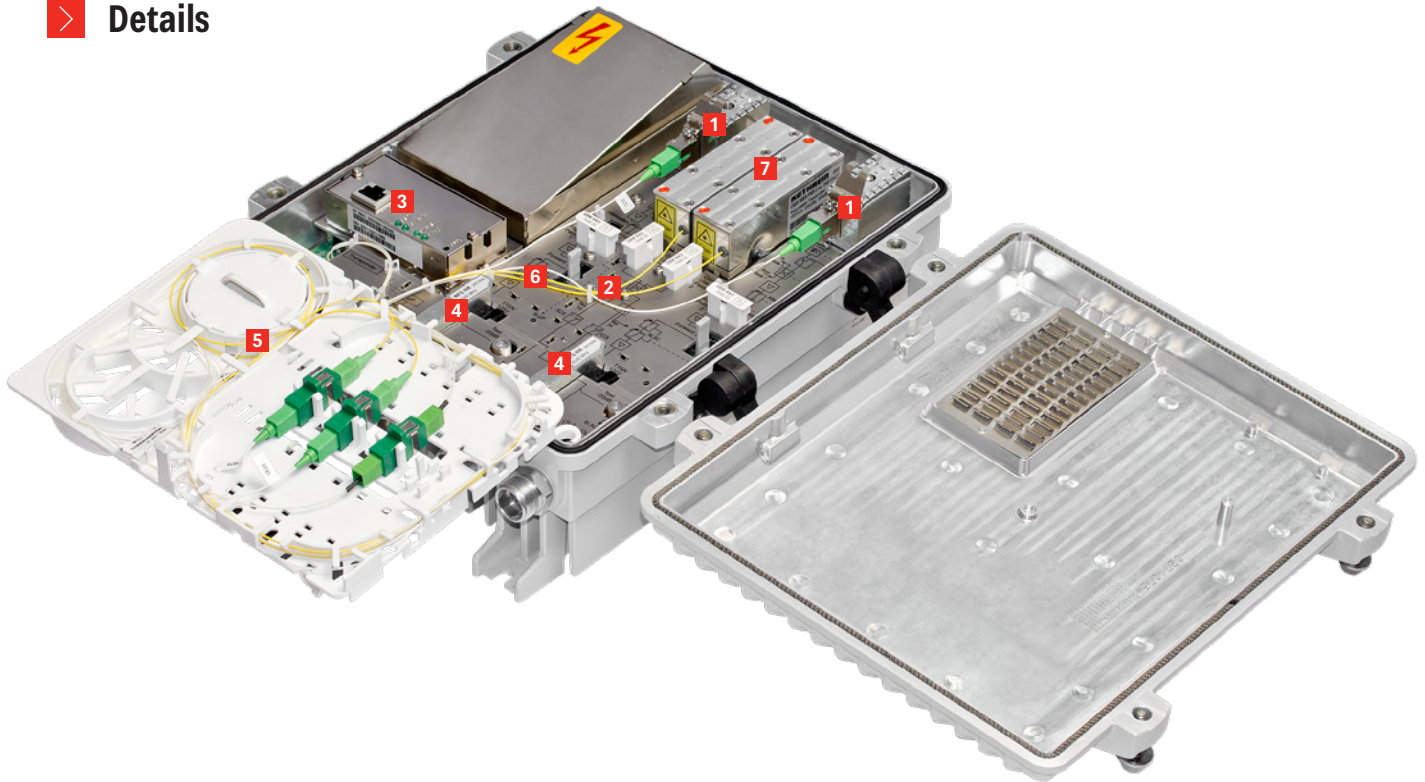
1 Segmentation/redundancy

Compact plug-in modules permit dual segmentation in the forward path and return path – even with full redundancy. The modules can be upgraded or exchanged easily during operation.

2 Electronically switchable matrix in the forwards path and return path

The single or double receiver and the two completely separate signal paths allow a wide variety of configurations regarding segmentation, paths, and device redundancy. The desired operating mode is selected simply by pressing a button.

3 Extended monitoring functions

These allow use of the new monitoring functions available under DOCSIS or HMS transponders. These include for instance reading the channel level in the forward path ("channel scan") or the existing remote feed values (voltage).

4 Return path frequency range up to 204 MHz

The entire frequency range defined in DOCSIS 3.1 can be covered in the return path by the use of pluggable diplex filters. This allows a step-by-step extension from 65 MHz. Return path system equalisers generate the best possible transmission characteristics.

5 Integrated fibre compartment

The integrated fibre compartment houses the fibres connected, optical connectors or splices. Optical multiplexers or splitters in tubular or compact form can simply be secured in the fibre compartment. A handy storage compartment for keeping small components such as protective caps, fuses and the like.

6 GaN technology

Amplifier stages in the latest Gallium Nitride technology offer the highest output level and superior dynamic data for all four outputs.

7 Return path transmitter modules

Highly linear optical return path transmitter modules are available with bandwidths in excess of 204 Mhz. The DFB / CWDM modules are equipped with two control loops one for constant optical output power and the other for constant OMI.
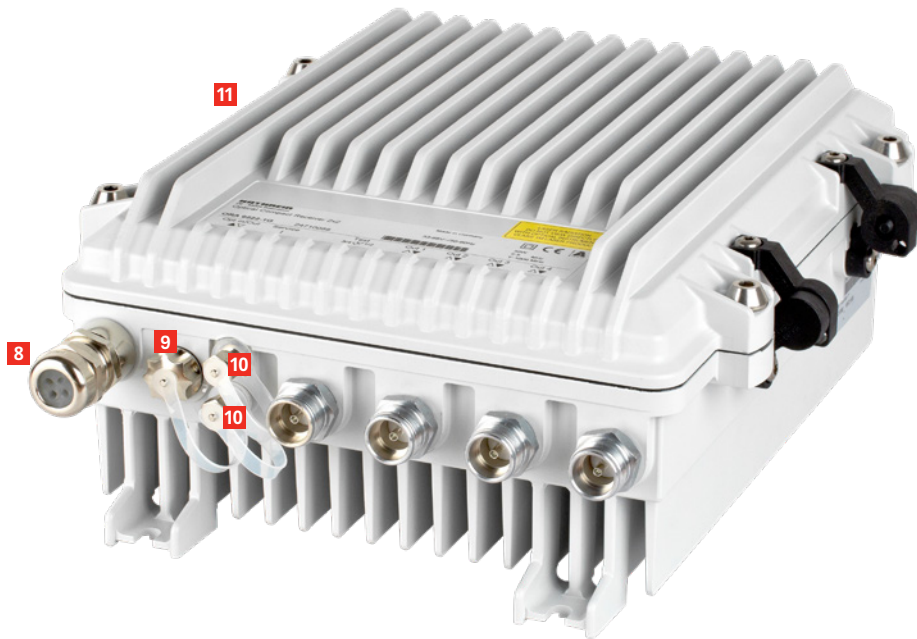
8 **Flexibly configurable optical interfaces**

Thanks to the flexible interface management, the ORA 9222-1G2 adapts straightforwardly to the required type of installation. Pigtails or pre-assembled optical break-out cables can be fed into the inside of the device using the optical gland ZGF 03.

9 **Electronic setting**

All settings of parameters and operating modes are made electronically using the well-proven hand-held operating device HTE 10. The connection is made via an external interface. Alternatively, the controls can be accessed using a Web browser with mobile devices such as a tablet PC or smartphone via the WiFi module WTE 10. Thus the casing can remain closed whilst the data are being checked or changed.

10 **External ingress test sockets**

The external ingress test sockets permit quick and realistic measurement to check for possible faults in the return path.

11 **AC local feeding clamb**

Accessible from the outside of the housing for AC local feeding. An RF connector can be used optional for connection.

⟩ Overview of Options

Fibre compartment open

1 **Optical receiver modules**
(two insert positions)
Available fittings:
ORD 9201-1G2, ORD 9202-1G2

2 **Optical return path transmitters**
(two insert positions)
Available fittings:
OSR 9003, OSR 9003-P65-C1x

3 **Upstream system equaliser**
(Low-pass)
Available fittings:
ERR 9065, ERR 9085, ERR 9204

4 **Downstream system equaliser**
(High-pass)
Available fittings:
ERS 9085-1G2, ERS 9105-1G2,
ERS 9258-1G2

5 **Monitoring transponder**
Available fittings:
TVM 850/H, TVM 1000, TVM 500

6 **Diplex filter**
Available fittings:
WFS 906-1G2, WFS 908-1G2,
WFS 920-1G2
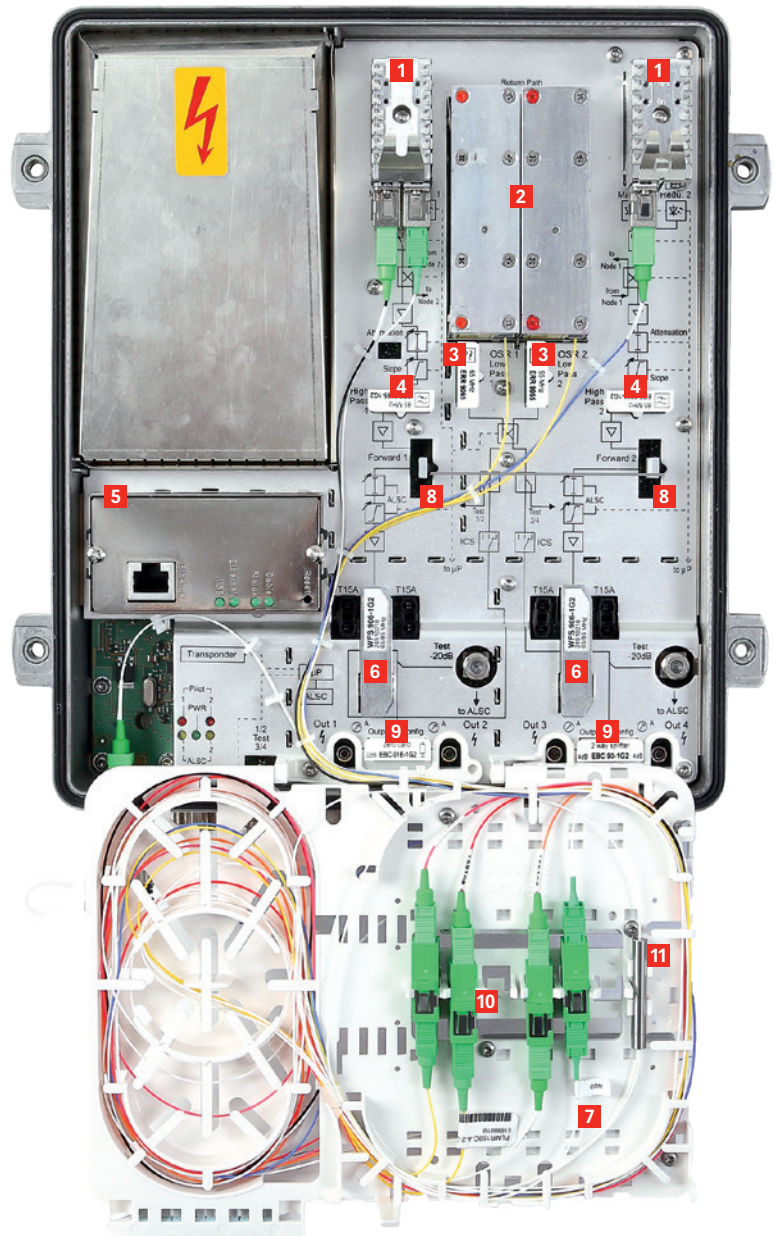
7 **Compartment for fibres, pigtails, patch cables**
Available patch cables for device-internal connections:
OFC 90/SC, OFC 90/SC-E

8 **Universal insert position (one insert position per forwards path)**
Available fittings:
System equaliser on request

9 **Output splitter field (two insert positions)**
Available fittings for operation with one or two outputs:
EBC 01E-1G2
Operation with three or four outputs:
EBC 90-1G2, EAC 90-1G2,
EAC 93-1G2, EAC 94-1G2

10 **Bracket for optical couplings**
Available fittings:
OKU 01/SC-E, OKU 01/SC, OKU 01/E

11 **Bracket for optical components in tubular design or splices**

1 **Bracket for optical multiplexers in compact form**

2 **Electronic setting**
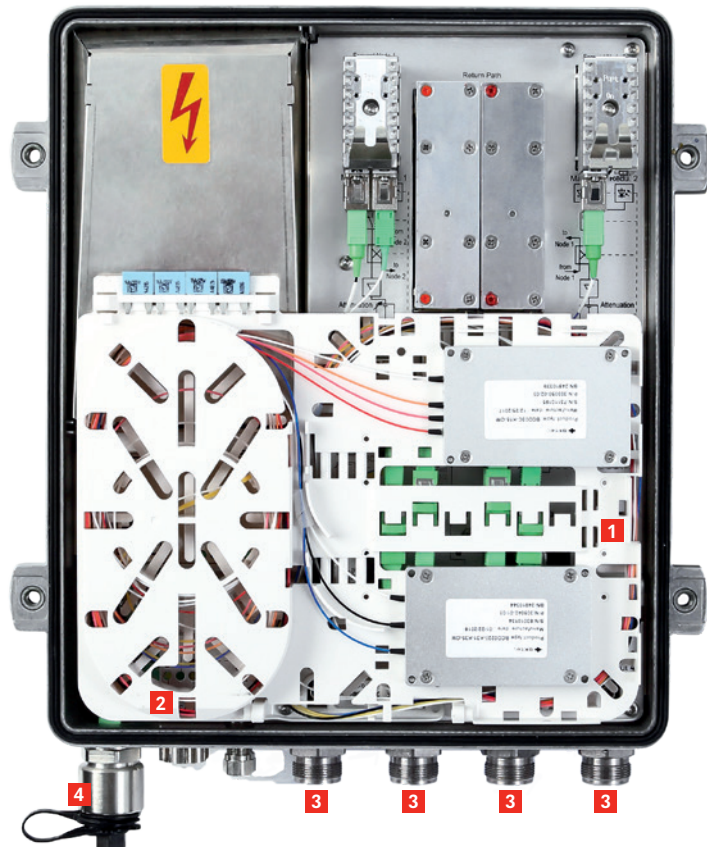Via hand-held operating device: HTE 20
Via Web browser with mobile devices by WiFi module: WTE 10

3 **RF interfaces**
Available fittings: PG-11 glands or cable fittings

4 **Fibre entry**
Available fittings: ZGF 03

Forward-looking Upgrade Option for Remote PHY Support

Inheriting all advantages of the outstanding analog fiber node ORA 9222-1G2 like segmentation, electronically switchable forward and return path matrix, electronic setting of parameters and operation modes, automatic levelling, extended monitoring functions, high RF output power and an integrated fibre compartment the ORA 9222-1G2 can easily be upgraded to a Remote PHY Node by simply exchanging the lid. The Remote PHY modules integrated into the new lid meet Cablelabs specifications and allow interoperability with CCAP cores of different vendors. Therefore the selection of the ORA 9222-1G2 fibre node represents a future proof choice for the best transition from legacy analog fibre architectures towards Distributed Access Architectures (DAA).

Supporting RF overlay modules together with Remote PHY the fiber node can be used also to transmit broadcast signals simultaneously with the Docsis 3.1 signals through the network.
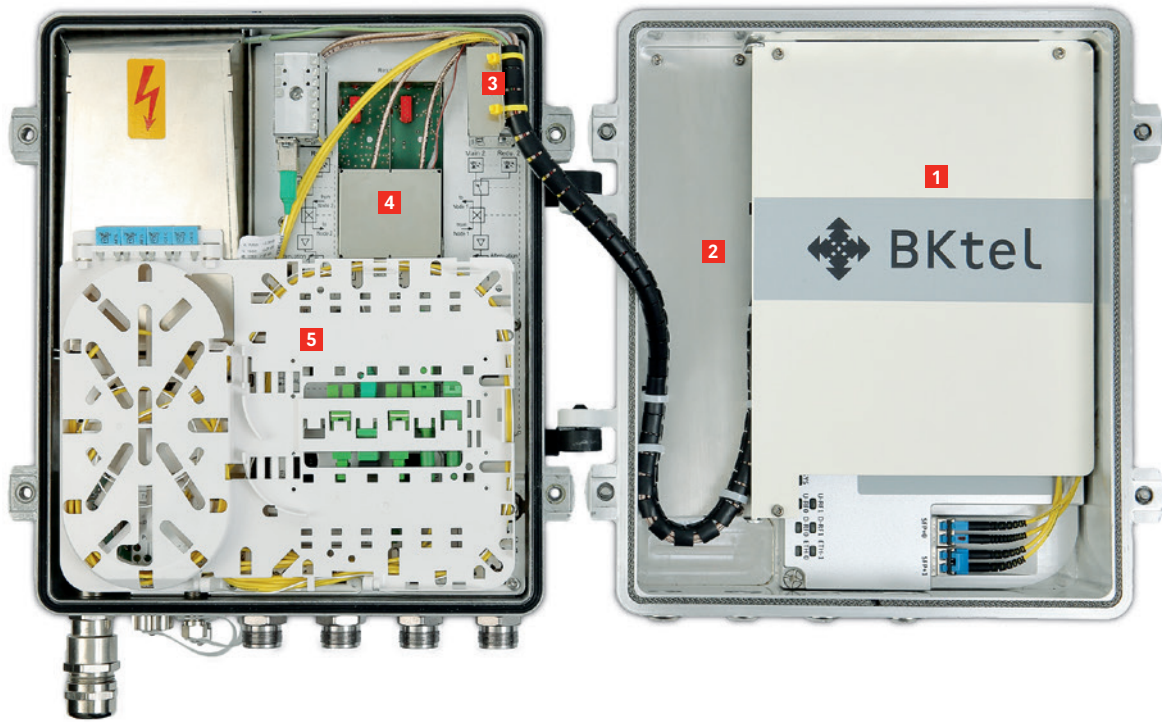
1   **Remote PHY module (Option)**
Remote PHY module in 1x1, 1x2 and 2x2 configuration to realize a Remote PHY Node for a Distributed Access Architecture.

2   **AC power supply for the Remote PHY module**
New designed high efficiency power supply for the Remote PHY module.

3   **Optical receiver modules for RF overlay**
The receiver modules provide an input for analog overlay and support 2x2 segmentation in the downstream

4   **Return path module**
The module supports 1 or 2 upstream segments.

5   **Fibre node with compartment for fibres and optical components**
Fibre node with all advantages of the ORA 9222-1G2 and 4 high level outputs.

Optical Compact Nodes 1 × 2

> **ORA 9022-1G**

Scalable optical compact nodes with three outputs

Features
- Frequency range 1006 MHz
- Modular FTTC fibre node
- Internal optical interfaces for unrestricted usage outdoors (protection class IP 54)
- Optical interfaces also optionally available on the device for external connections
- Innovative operating concept: Electronic actuators, setting via WiFi module WTE 10
- Electronically settable matrix in the return path:
  - Redundant operation
  - Return path segmentation
  - Automatic switching available in the event of an interruption
- Optional WDM coupler or splitter can be integrated
- Latest GaN-MMIC technology
- Single or twin optical pluggable receiver module
- Fully redundant operation available in the forward and return path
- One, two or three trunk/high-level outputs (two separate end stages)
- "Plug-and-Play" by combination of AGC and ALSC (two pilot signals)
- Automatic levelling in the forward path
- Extremely low-noise receiver (best in class)
- One or two plug-in return path transmitters for segmentation or redundancy, see OSR 9003, OSR 9003-P65-C1x
- Optical return path transmitter modules in DFB/CWDM technology available
- Permits easy exchange of modules
- Highly efficient switch-mode power supply with power factor correction
- Die-cast housing with PG 11 connections
- LED mode indicator
- Plug-in diplex filters 65/85 MHz, 85/105 MHz, 204/258 MHz
- Ingress control switch at each return path input
- Ingress test socket for each return path input (externally accessible), can optionally be used as a broadband input
- Many EMS functions
- Optical plug connectors: SC/APC or E-2000

ADVANTAGES
- Higher accuracy over the entire level range
- Extended pilot range: 82.5 MHz–450 MHz for the lower pilot/ 420 MHz–998 MHz for the upper pilot
- Read the remote feed voltage via the monitoring
- Electronic settings via Web browser with mobile devices by WiFi module (tablet PC, smartphones, notebooks etc.)
- Highly-efficient power factor correction (power factor close to 1)

❯ Features and Advantages

Top functionality

The optical compact nodes ORA 9022-1G combines previously unequalled functionality with excellent technical data at an excellent price-performance ratio.

An integrated, double-sided fibre compartment houses the fibres and optical connectors. Practical detail: There is also space for tubular or compact optical splitters or WDM couplers. They are then protected and a separate splice housing is unnecessary. This concept is also advantageous during installation: The optical receiver can be completely pre-assembled. During installation in the field it is only necessary to make the fibre connections.

Fully redundant operation

The device can be equipped electro-optically with plug-in modules for forward receivers or return path transmitters. Up to two modules in each case provide fully redundant operation. The modules are easy to exchange.

Various DFB types in 1310 nm and CWDM technology are available as return path transmitters. Thanks to the high output power of up to +6 dBm, very large distances can be covered. As a result it is possible to design optical fibre networks without intermediate hubs, saving fibre.

"Plug-and-Play" redefined

All device settings are made electronically using the hand-held operating device HTE 20 or via the WiFi module WTE 10 by Web browser using mobile devices such as a tablet PC, smartphone etc. This feature not only saves plug-in cards, but also simplifies setup. During automatic levelling the operator only needs to define the required output level and slope. At the press of a button the device then automatically sets optimal dynamic data. The copy function can copy all settings and transfer them to other devices: setup could hardly be quicker. The integrated constant 2-pilot and constant light controls ensure a frequency-agile output level.

Variable return path management

The electronically switchable return path matrix is of particular interest for step-by-step network expansion. The two return path inputs are independent due to the use of separate diplex filters, and their connections to the two return path transmitters can vary from each other. For instance, both return paths can initially be coupled to a common transmitter. As data traffic increases, a second return path transmitter can be fitted and each of the two return paths connected to its own dedicated transmitter.

An externally accessible ingress test socket is available for each of the return paths, so measurements can be performed quickly. The signal flow direction on these test sockets can be switched from "measure" to "inject" so that signals can be injected into the return paths. This function can also be used for broadband return path inputs up to 204 MHz.

The optical compact node ORA 9022-1G is suitable for all cable network operators with HFC networks. Due to the step-by-step segmentation features, the plug-in modules and the integrated fibre compartment, it provides the flexibility for optimally adapting HFC networks to the specific requirements.

› **Details**

Integrated fibre compartment
The integrated fibre compartment houses the fibres connected, optical connectors and splices.

Redundancy
Compact plug-in modules provide redundancy in the forward and return path. The modules can be upgraded or exchanged easily during operation.

Optical splitters or multiplexers
Tubular or compact accessories can be straightforwardly fastened to the fibre compartment.

Two active end stages
Two separate end stages and a total of three outputs allow high-level or trunk outputs to be flexibly configured. Due to the excellent dynamic data, demanding amplifier cascades can also be connected downstream. In case of operation with one output, the unused end stage can be simply switched off to reduce the power consumption.
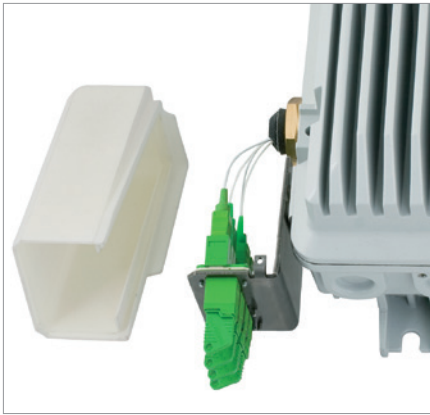
Optical interfaces optionally internal or external

Thanks to the flexible interface manage-ment, the ORA 9022-1G adapts straightforwardly to the required type of connection. Pigtails or pre-assembled optical break-out cables can be laid inside the device. As a result the optical connectors are housed with complete protection. Mounting outdoors to protection class IP 54 is then possible. Using the opticalcoupling bracket, the plug connectors can also be attached to the exterior. Quick connection with pigtails is then possible.

AC feeding clamp

Clamp accessible from the outside of the housing for local AC feeding.

Electronic setting

All parameters and operating data settings are made electronically using the hand-held operating device HTE 20 or via the WiFi module WTE 10 by Web browser using mobile devices such as a tablet PC, smartphone etc. This feature makes possible automatic levelling in the forward path and pre-setting in the return path. The values set can be copied at the press of a button and transferred to another device.

The connector for HTE 20 is external therefore all settings and measurements can be done with the housing lid in closed position.

Externally accessible test sockets and broadband return path inputs

Each return path route has its own test socket as well as an ingress control switch (ICS). The test sockets can be switched. This allows both the incoming return path signal to be checked and also signals to be injected. This can be used for separate return path injection as a broadband return path input even up to 204 MHz.

Optical Receiver Modules

ORD 9202-1G2

⟩ **ORD 9201-1G2, ORD 9202-1G2**

The optical receiver modules ORD 9201-1G2 and ORD 9202-1G2 are intended for use in the optical fibre node ORA 9222-1G2. The ORD 9201-1G2 is a single receiver module and provides one optical receiver for each RF path. The ORD 9202-1G2 is a twin module and for redundancy purposes provides two optical receivers for each RF path.

Features
- Optical receiver modules
- Optical reception of CATV frequency multiplex signals from a single monomode glass fibre
- Extremely low-noise receiver (best in class)
- Optical plug connectors: SC/APC
- For operation with ORA 9222-1G2

ADVANTAGES

For operation of the ORA 9222-1G2 at least one ORD 9201-1G2 or ORD 9202-1G2 plug-in module is necessary

Optical Interfaces

⟩ **Version SC/APC**

1 **Optical receiver module ORD 9201-1G2/9202-1G2:**
Device interface SC/APC, pigtail or cable can be plugged in directly

2 **Optical return path transmitters:**
Pigtail device interface with SC/APC, connection of the pigtail or cable using optical coupling OKU 01/SC

⟩ **Version E-2000**

3 **Optical receiver module ORD 9201-1G2/9202-1G2:**
Device interface SC/APC, transition to E-2000 with patch cable OFC 90/SC and optical coupling OKU 01 SC-E (or OFC 90/SC-E and OKU 01 E)
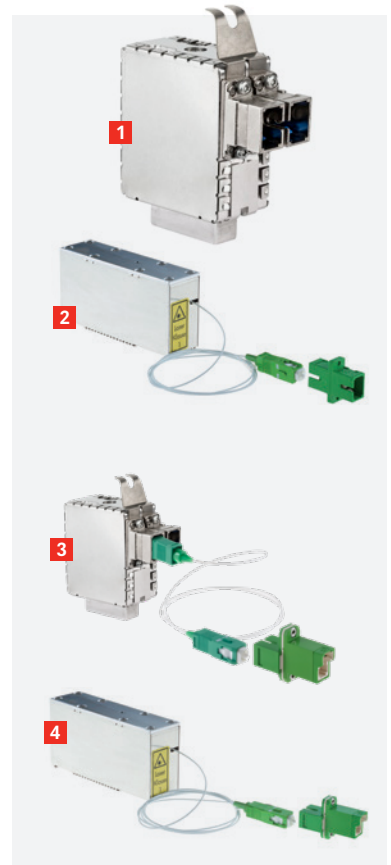
4 **Optical return path transmitters:**
Device interface pigtail with SC/APC, transition to E-2000 with optical coupling OKU 01 SC-E

Components

> Overview

Description	Type	Order no.	ORA 9222-1G2	ORA 9022-1G
Zero card for operation with one output 1.2 GHz	EBC 00-1G2	24510217	✓	✓
Splitter (two symmetrical outputs) 1.2 GHz	EBC 90-1G2	24510214	✓	✓
Tap (3/6 dB) 1.2 GHz	EAC 93-1G2	24510216	✓	✓
Tap (1.5/10 dB) 1.2 GHz	EAC 90-1G2	24510215	✓	✓
Tap (0.8/20 dB) 1.2 GHz	EAC 94-1G2	24510220	✓	✓
HMS monitoring transponder (5–42 MHz), frequency-agile	TVM 850/H	26210077	✓	✓
DOCSIS monitoring transponder	TVM 1000	26210086	✓	✓
FSK moitoring transponder	TVM 500	26210846	✓	✓
WiFi module for wireless manual operation via a Web browser	WTE 10	25010086	✓	✓
Adapter PG 11 to 3.5/12 socket	EMP 53	208500002	✓	✓
PG 11 to F socket (female)	EMP 35	275300	✓	✓
Optical gland	ZGF03	25510003	✓	

> Plug-in Diplex Filters (Device Assignment Overview)

Type	Order no.	ORA 9222-1G2
WFS 906-1G2	24510218	2
WFS 908-1G2	208500007	2
WFS 920-1G2	24510209	2
ERR 9065	24510156	2
ERR 9085	208500005	2
ERR 9204	24510211	2
ERS 9085-1G2	24510219	2
ERS 9105-1G2	208500212	2
ERS 9258-1G2	24510210	2

The table shows the number of plug-in modules for full configuration of each device.

› WiFi Module
WTE 10

The WiFi module WTE 10 permits direct access from a PC, tablet or smartphone to the connected amplifiers and fibre nodes in order to configure them. To view the configuration, only a Web browser supporting Javascript is required. The WiFi module WTE 10 is then attached to the controlling device, it is started by Plug & Play and is

Features
- WiFi standard to IEEE 802.11 b/g/n
- Display of all device settings via a Web interface
- Ambient conditions:
  - Operating temperature: -20°C to +50°C
  - Suitable for outdoor use
  - Housing protection class: IP 54
- Language: English
- Copy function for saving the device settings
- No additional power supply necessary
- Can be updated in order to support new devices and functions

› Monitoring Transponder HMS
TVM 850/H

- Monitoring transponder for compact and house connection amplifiers and also optical compact receivers (see table on page 31)
- Monitoring of various parameters such as voltage, current consumption, internal temperature, etc.
- Control of the ingress control switch in devices that are equipped with this facility
- Transmission by the HMS protocol
- Frequency-agile in the range 5–42 MHz

⟩ Monitoring Transponder
DOCSIS/EuroDOCSIS 2.0, Frequency-agile
TVM 1000

- Monitoring transponder for amplifiers and optical compact receivers
- Monitoring of various parameters such as voltage, current consumption, internal temperature, etc.
- Transmission within DOCSIS or EuroDOCSIS protocol
- 10/100 BaseT service interface
- Frequency-agile in the range 5–65/90–862 MHz
- Additional monitoring functions

⟩ FSK Multi-band Transponder Module
TVM 500

- FSK transponder for compact and house connection amplifiers and also optical compact receivers (see page 31)
- Control of the ingress control switch in devices that are equipped with this facility
- Interference-free FSK subrack
- Frequency-agile in selected frequency ranges

⟩ Plug-in Diplex Filters
WFS 906-1G2, ERS 9085-1G2, ERR 9065
WFS 908-1G2, ERS 9105-1G, ERR 9085
WFS 920-1G2, ERS 9258-1G2, ERR 9204

Diplex filters and return path system equalisers for improving the return path band limits.

Components for frequency range 65/85 MHz
- WFS 906-1G2: Input and output diplex filter 65/85 MHz
- ERS 9085-1G2: Interstage downstream equaliser (downstream from 85 MHz)
- ERR 9065 Return path system equaliser (upstream up to 65 MHz)

Components for frequency range 85/105 MHz
- WFS 908-1G2: Input and output diplex filter 85/105MHz
- ERS 9105-1G2: Interstage downstream equaliser (downstream from 105 MHz)
- ERR 9085: Return path system equaliser (upstream up to 85 MHz)

Components for frequency range 204/258 MHz
- WFS 920-1G2: Input and output diplex filter 204/258MHz
- ERS 9258-1G2: Interstage downstream equaliser (downstream from 258 MHz)
- ERR 9204: Return path system equaliser (upstream up to 204 MHz)

❯ Zero Cards
EBC 01E-1G2, EBC 00-1G2

- Plug-in modules for operation with an input or output
- EBC 01E-1G2: For operation in the output insert positions (for ORA 9222-1G2)
- EBC 00-1G2: For operation in the output insert position

❯ Taps/splitters
EAC 90-1G2, EAC 93-1G2, EAC 94-1G2, EBC 90-1G2

❯ Optical Return Path Transmitters
OSR 9003, OSR 9003-P65-C1x modules

- Optical return path transmitter modules for use in the ORA 9222-1G2 and ORA 9022-1G
- Electro-optical conversion of the return path signals
- DFB laser with optical isolator
- Optical output power: +6 dBm or +3 dBm
- Choice of eight different CWDM wavelengths, others on request
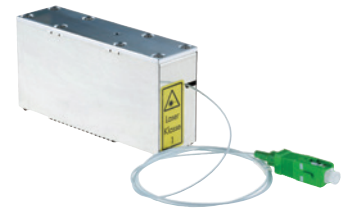
Available types:

OSR 9003	+3/+6 dBm | 1310 nm | 24610201
OSR 9003 P65-C11	+3/+6 dBm | 1471 nm | 24610424
OSR 9003 P65-C12	+3/+6 dBm | 1491 nm | 24610425
OSR 9003 P65-C13	+3/+6 dBm | 1511 nm | 24610426
OSR 9003 P65-C14	+3/+6 dBm | 1531 nm | 24610427
OSR 9003 P65-C15	+3/+6 dBm | 1551 nm | 24610385
OSR 9003 P65-C16	+3/+6 dBm | 1571 nm | 24610428
OSR 9003 P65-C17	+3/+6 dBm | 1591 nm | 24610429
OSR 9003 P65-C18	+3/+6 dBm | 1611 nm | 24610430

❯ Optical Couplings
OKU 01/SC, OKU 01/SC-E, OKU 01/E

Optical couplings for universal use

Available types:
- OKU 01/SC: Double-sided SC/APC
- OKU 01/SC-E: Optical adapter couplings from SC/APC to E-2000
- OKU 01/E: Double-sided E-2000
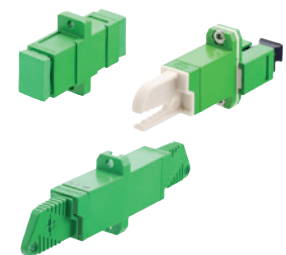
⟩ Optical Patch Cables
OFC 90/SC, OFC 90/SC-E

Optical patch cables for universal use

Available types:
- OFC 90/SC: Double-sided SC/APC 8°
- OFC 90/SC-E: One plug SC/APC 8°, one plug E-2000 8°
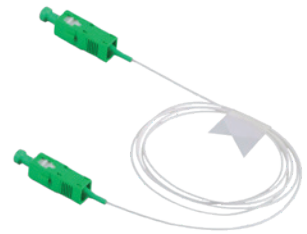
⟩ Optical Glands
ZGF 03

The purpose of the gland ZGF 03 is to allow optical cables (pigtails) to pass through into the inside of the amplifier point casing. ZGF 03 is suitable for ORA 9222-1G2.

- The purpose of the gland ZGF 03 is to allow optical cables (pigtails) to pass through into the inside of the amplifier point casing
- Up to four optical cables with a diameter of max. 4 mm each can be fed through
- Installation is performed at a free cable opening (PG 11) in the amplifier casing
- Degree of protection when correctly installed: IP 67
- Low insertion loss
- Optical connections: 900 µm fibres, plug connectors SC/APC

Technical Data

❯ Optical Compact Receivers

Type	ORA 9222-1G2
Order no.	24710118
Operation with a receiver module	ORD 9201-1G2 / ORD 9202-1G2
Forward path	
Optical wavelengths [nm]	1271-1611
Sensitivity of the photodiode [A/W] (at 1310/1550 nm)	0.85/0.95
Optical return loss [dB]	> 45
Optical input level range, 1310 nm, nominal [dBm] (with ORD 920x)	-7 to +2
Optical input level range, 1550 nm, nominal [dBm] (with ORD 920x)	-8 to +1
Maximum optical input power (continuous) [dBm]	+3
Nominal optical modulation index (OMI) [%]	3.7
Equivalent noise current density at input [pA/√Hz]	< 2.5
Frequency range [MHz]	85–1218
Number of outputs (internally pluggable)	1 to 4
Impedance [Ω]	75
Output level, per output (in practical operation) 1218	1000 MHz, 2 outputs, trunk/distribution [dBµV]	1 × 95–119/1 × 95–119
Output level, per output (in practical operation) 1218	1000 MHz, 3 outputs, trunk/distribution [dBµV]	1 × 95–119/2 × 95–115
Output level, per output (in practical operation) 1218	1000 MHz, 3 outputs, trunk/distribution [dBµV]	2 × 95–115/2 × 95–115
Output pre-emphasis 85–1218	1000 MHz [dB]	-2–20
Frequency response (total) [dB]	± 0.5
Setting range, lower pilot frequency [MHz]	82.5–450
Setting range, upper pilot frequency [MHz]	420–998
Pilot output level [dBµV]	85–116
Maximum output level to CENELEC, 1 output per active path	
CSO = 60 dB, CENELEC, 9 dB slope, with EBC 01E-1G2 [dBµV]	122
CTB = 60 dB, CENELEC, 9 dB slope, with EBC 01E-1G2 [dBµV]	116
Max. output level for full digital load [dBµV] [3]	112
Test socket (output) [dB]	-20

Type	ORA 9222-1G2
Return loss (at 85 MHz) [dB]	> 18 -1.0 / oct., min. 16 dB
Hum modulation ratio at 7 A per RF connection [dB]	70
Return path (general): see also data OSR 9003, OSR 9003-P65-C1x	
Frequency range (dependent on the diplex filter used) [MHz]	5–204
Impedance [Ω]	75
Return loss [dB]	20
Frequency response (total) [dB]	± 0.5
Input level for OMI control loops [dBμV]	66–85
Ingress control switch [dB]	0/6/46
Hum modulation ratio at 7 A per RF connection (8–15/15–204 MHz) [dB]	65/70
Power supply	
Input voltage range [V AC]	28–90
Mains frequency range [Hz]	47–63
Power consumption, fully configured, 1/2 active outputs, at 50 V AC [W] [1]	30/51
Remote feed current at the outputs, per output [A]	< 10
Feed in remote feed current (power passing) [A]	< 20
Temperature range [°C]	-20–+55
General data	
Radiated interference power 5–30 MHz [dBpW]	< 27–20
Radiated interference power 30–862 MHz [dBpW]	< 20
RF interfaces (external)	4 × PG 11
Ingress test ports (external) / test sockets (internal)	F sockets
Dimensions (W × H × D) [mm] [2]	282 × 305 × 132
Weight [kg]	6.5
Casing material	Aluminium die-casting, painted
Type of protection to DIN EN 60529	IP 67
Overvoltage protection	Impulse 6 kV; 1.2/50 μs
Network management (optional)	
Monitorable/settable parameters	Operating voltage, current, temperature, electronic actuators, optical input power, pilot setting and alarms, automatic levelling, ICS switch, remote inventory data, frequency range for forwards path, display of plugged-in diplex filters

[1] With TVM 1000
[3] 282 mm incl. hinges
[4] Full digital load 110 channels, 256 QAM, 258–1218 MHz

Type	ORA 9022-1G
Order no.	24710083
Operation with receiver module	ORD 120-1G
Forward path	
Frequency range [MHz]	85–1006
Optical wavelengths [nm]	1271–1611
Optical return loss [dB]	> 40
Optical input level range, 1310 nm, nominal [dBm]	-7–+2
Optical input level range, 1550 nm, nominal [dBm]	-8–+1
Maximum optical input power (continuous) [dBm]	+3
Nominal optical modulation index (OMI) [%]	3.7
Equivalent noise current density at input [pA/√Hz]	< 2.5
Impedance [Ω]	75
Number of outputs (internally pluggable)	1, 2 or 3
Maximum output level per output (depending on channel load) 1006 MHz [dBμV]	121
Output pre-emphasis 85–1006 MHz [dB]	0–20
Frequency response [dB]	± 0.75
Setting range, lower pilot frequency [MHz]	120–450
Setting range, upper pilot frequency [MHz]	420–998
Maximum output level @ 862 MHz to CENELEC	
CSO > 60 dB, 10 dB pre-emphasis [dBμV]	112
CTB > 60 dB, 10 dB pre-emphasis [dBμV]	110
Max. output level for full digital band [dBμV]	112
Return loss (at 85 MHz) [dB]	> 19-1.5/oct.
Hum modulation ratio at 7 A [dB]	> 70
Return path (general): see also data OSR 9003, OSR 9003-P65-C1x	
Frequency range [MHz]	5–65
Frequency range (via broadband inputs) [MHz]	5–450
Impedance [Ω]	75
Return loss [dB]	18
Frequency response (total) [dB]	± 1.5
Input level for OMI 5 % (per channel) [dBμV]	62–85

Type	ORA 9022-1G
ICS loss [dB]	0/6/40
Power supply	
Input voltage range [V AC]	30–90
Mains frequency range [Hz]	47–63
Power consumption incl. an ORD 120, 1/2 active outputs [W]	26/37
Power consumption fully equipped, 1/2 active outputs [W] [1]	32/43
Remote feed current at the outputs [A]	10
Feed in remote feed current (power passing) [A]	20
General data	
Radiated interference power 5–30 MHz [dBpW]	< 27–20
Radiated interference power 30–862 MHz [dBpW]	< 20
RF interfaces (external)	PG 11
Ingress test sockets/broadband inputs (external)	F sockets
Dimensions (W × H × D) [mm]	280 [3] × 244 × 143
Weight [kg]	4.6
Casing material	Aluminium die-casting, painted
Type of protection to DIN EN 60529	IP 54
Temperature range (in operation) [°C]	-20 to +55
Network management (optional)	
Monitorable/settable parameters	Operating voltage, current, temperature, electronic actuators, optical input power, pilot setting and alarms, automatic levelling, ICS switches, remote inventory data, frequency range for forward path, display of plugged-in diplex filters

[1] With TVM 850/H; with TVM 1000 the value is approx. 2 W higher

> Components

Type	WTE 10
Order no.	25010086
WiFi standard	IEE 802.11 b/g/n
Frequency range [GHz]	2.4
Encryption	WPA-PSK (AES), WPA2-PSK (AES)
Maximum transmission power [dBm]	+18
Ambient temperature range [°C]	-20 to +50
Housing protection class (to EN 60529)	IP 54

Type	TVM 1000	TVM 850/H	TVM 500
Order no.	26210086	26210077	26210846
Input frequency range [MHz]	90–862	75–90.5	300–320; 425–450; 863–870; 902–928
Input level range [dBµV]	48–78	50–95	48–95
Output frequency range [MHz]	5–65	5–42	–
Max. output level [dBµV]	113–118	105	–
Power consumption [W]	3.5	1	0,4
Transmission protocol	DOCSIS/EuroDOCSIS 2.0	HMS	2 FSK
For device types	VGO 939-1G, VGF 939-1G, VOS 952-1G, VOS 953-1G, ORA 9222-1G2, ORA 9022-1G, VGP 9143 D-1G2		ORA 9222-1G2; ORA 9022-1G; VGP 9143D-1G2; VGF 939D-1G

Type	EBC 01E-1G2	EBC 00-1G2
Order no.	24510230	24510217
Frequency range [MHz]	5–1218	5–1218
Through loss [dB]	< 0.5	

Type	EAC 90-1G2	EAC 93-1G2	EAC 94-1G2	EBC 90-1G2
Order no.	24510215	24510216	24510220	24510214
Frequency range [MHz]	5–1218			
Through loss 5–15 MHz [dB] [1]	< 1.5	< 2.2	< 0.3	< 3.4
Through loss 15–65 MHz [dB] [1]	< 1.3	< 2.0	< 0.3	< 3.4
Through loss 65–862 MHz [dB] [1]	< 1.3	< 2.7	< 0.6	< 3.5
Through loss 862–1006 MHz [dB] [1]	< 1.5	< 3.1	< 0.7	< 3.7
Through loss 1006–1218 MHz [dB] [1]	< 1.6	< 3.1	< 0.9	< 3.9
Tap loss [dB]	10	6	20	As for through loss
Decoupling/directional attenuation [dB]	28			26
Impedance [Ω]	75			

[1] The through loss is the attenuation of the signal between the signal output of the device and output 1 if used in the output insert position or between the input and tap input if used in the input insert position (loop-through input splitter field)

Type	OSR 9003 P65-C11 / OSR 9003 P65-C12 / OSR 9003 P65-C13 / OSR 9003 P65-C14 / OSR 9003 P65-C15 / OSR 9003 P65-C16 / OSR 9003 P65-C17 / OSR 9003 P65-C18
Order no.	see page 37
Optical wavelength(s) [nm]	1471/1491/1511/1531/1551/1571/1591/1611
Optical output power [dBm]	+3 (+6) [1]
Frequency range [MHz]	5–204
Relative intensity noise (RIN) [dB/Hz]	- 155
Impedance [Ω]	75
Return loss (5 MHz) [dB]	> 18
Second pilot tone [MHz]	65
OMI second pilot tone [%]	2 ± 0.5
Network management (optional)	
Monitorable/settable parameters	

[1] Switchable when used in the ORA 9022-1G or ORA 9222-1G2

Type	OFC 90/SC	OFC 90/SC-E
Order no.	24810101	24810102
Length [cm]	90	
Diameter of the patch cord [mm]	0.9	
Attenuation of the optical plug connectors [dB]	0.3	

Order Number Overview

Type	Order no.
E	
EAC 90-1G2	24510215
EAC 93-1G2	24510216
EAC 94-1G2	24510220
EBC 00-1G2	24510217
EBC 01E-1G2	24510230
EBC 90-1G2	24510214
EMP 53	208500002
EMP 35	275300
ERR 9065	24510156
ERR 9085	208500005
ERR 9204	24510211
ERS 9085-1G2	24510219
ERS 9105-1G2	208500212
ERS 9258-1G2	24510210
O	
OFC 90/SC	24810101
OFC 90/SC-E	24810102
OKU 01/SC	24810031
OKU 01/SC-E	24810099
OKU 01/E	24810100
ORA 9022-1G	24710083
ORA 9222-1G	24710083
ORD 120-1G	24810177
ORD 9201-1G2	24810347
ORD 9202-1G2	24810348
OSR 9003-P65-C11	24610424
OSR 9003-P65-C12	24610425
OSR 9003-P65-C13	24610426
OSR 9003-P65-C14	24610427
OSR 9003-P65-C15	24610385
OSR 9003-P65-C16	24610428
OSR 9003-P65-C17	24610429
OSR 9003-P65-C18	24610430

Type	Order no.
T	
TVM 1000	26210086
TVM 850/H	26210077
TVM 500	26210846
W	
WFS 906-1G2	24510218
WFS 908-1G2	208500007
WFS 920-1G2	24510209
WTE 10	25010086
Z	
ZGF 03	25510003

Notes

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Sales Germany

KATHREIN Digital Systems GmbH
Eiselauer Weg 13
89081 Ulm, Germany
order@kathrein-ds.com

Technical advice for specialist suppliers

KATHREIN Digital Systems GmbH
Eiselauer Weg 13
89081 Ulm, Germany
Phone +49 731 270 909 70
Fax +49 731 92767-22
support@kathrein-ds.com

KATHREIN Digital Systems GmbH
Anton-Kathrein-Straße 1–3
83022 Rosenheim, Germany
www.kathrein-ds.com | info@kathrein-ds.com

KATHREIN

Digital Systems GmbH