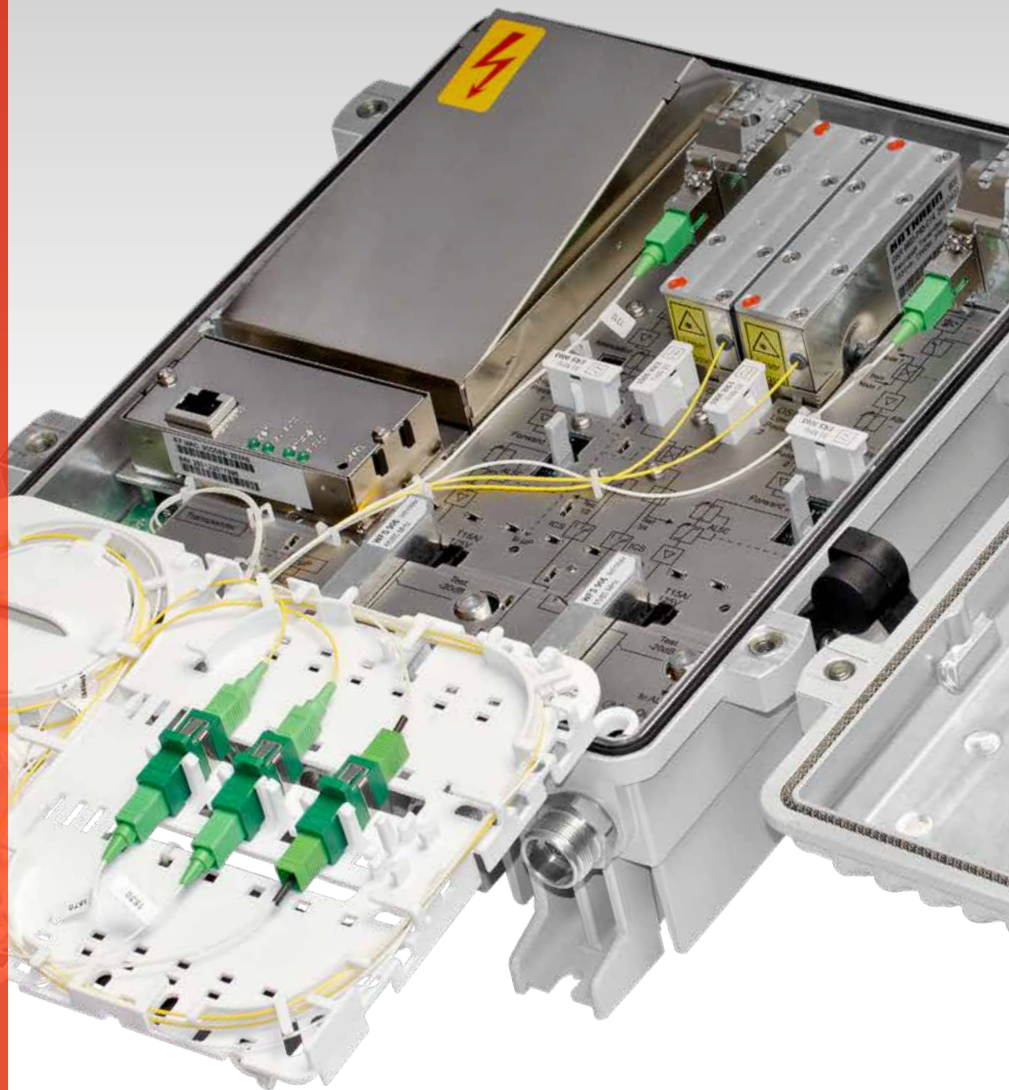


Optical Compact Nodes for modern HFC networks



Connecting of present and future

HUBER+SUHNER BKtel develops and produces active and passive components for modern FTTH and HFC broadband networks. A key focus lies on technological and high-performance solutions for the transition from existing HFC structures to modern fiber-optic access networks. With our products, the capacities of coax networks can be increased many times over and equipped for future data, telephony and TV services.

With more than 20 years of experience in research, development and production of communication technology, HUBER+SUHNER BKtel is the best partner to create flexible solutions to connect existing and new network structures.

Optical compact node ORA 9222-1G2-B

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Optical compact nodes Best DOCSIS 3.1 performance

DOCSIS 3.1 enables significantly higher data transmission capacity in HFC networks compared to preceding versions of the standard. The use of a wider frequency range up to 1.2 GHz as well as efficient error correction and extended modulation profiles leads to higher data throughput.

The current 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 systematically without problems.

Easy integration

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.



ORA 9222-1G2-B

Optical compact node 2 x 2

Performed to connect

Highly linear, modular configurable fiber node ORA 9222-1G2-B for use in HFC networks, with two independent downstream paths and two independent upstream paths (which can be used for segmentation). When output taps and splitters are used, up to four outputs can be configured.



Features

- 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 and the channel level of the forward signal path ("channel scan") via the monitoring
- Full redundancy in forward and return path
- Automatic switchover facility in the event of interruption
- Highly-effective power factor correction (power factor close to 1)
- Second generation GaN technology end stages
- Electronic settings via hand held module

Flexibel from the beginning

The modular concept of the ORA 9222-1G2 offers the facility for system-specific configuration of the fiber 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 fiber node power consumption. Constant output levels can be achieved by automatic gain and slope 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 fiber 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 fiber node can be measured at the test sockets.

DOCSIS ready and remote control

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 fiber node.

Notice

For operation, at least one receiver module ORD 9201-1G2 and one transmitter module OSR 900x 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 down-stream path. These modules are not included in the scope of supply.

ORA 9222-1G2-B

Optical compact nodes 2 x 2

The Fiber Node can be used in all network structures that use fiber nodes for the transition into existing HFC networks. Due to its compact and robust design it is suitable for outdoor applications or in street cabinets.

A major advantage of the ORA9222-1G2 is its remote monitoring capability. All device parameters or functions can be monitored and adjusted. The integral fiber management facility allows convenient and secure storage of the glass fibers 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 10 or HTE 20).

The basic advantages at a glance:

Eco-Power management

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

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

Remote monitoring capability

- Direct alarm reporting
- Remote configuration possible
- Ingress noise reduction by intelligent Ingress Control Switching (ICS)

Second complete forward path

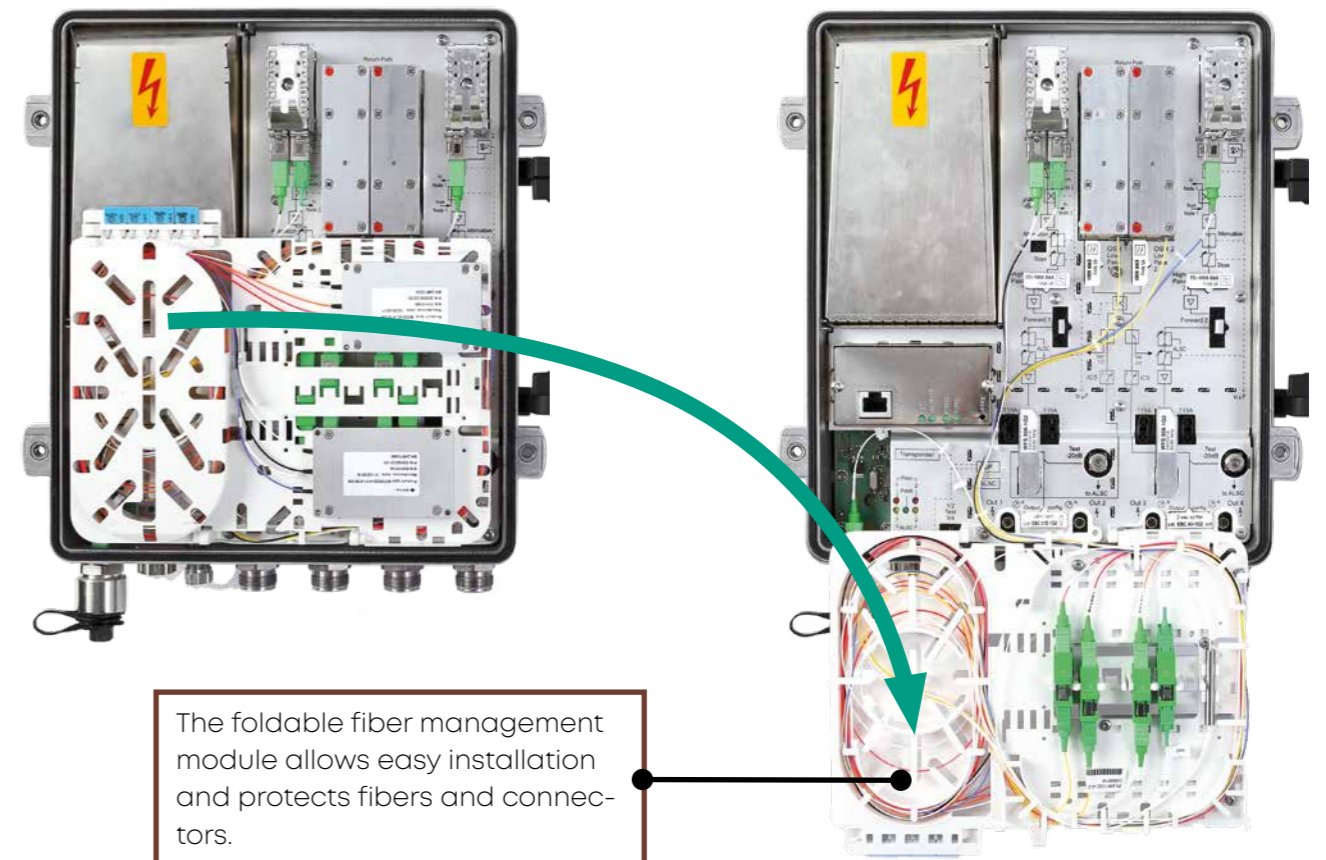
- Trunk output (can optionally be used as a second distribution network output)
- Segmentation in the downstream

Return path transmitter modules

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

Integrated special features

- 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



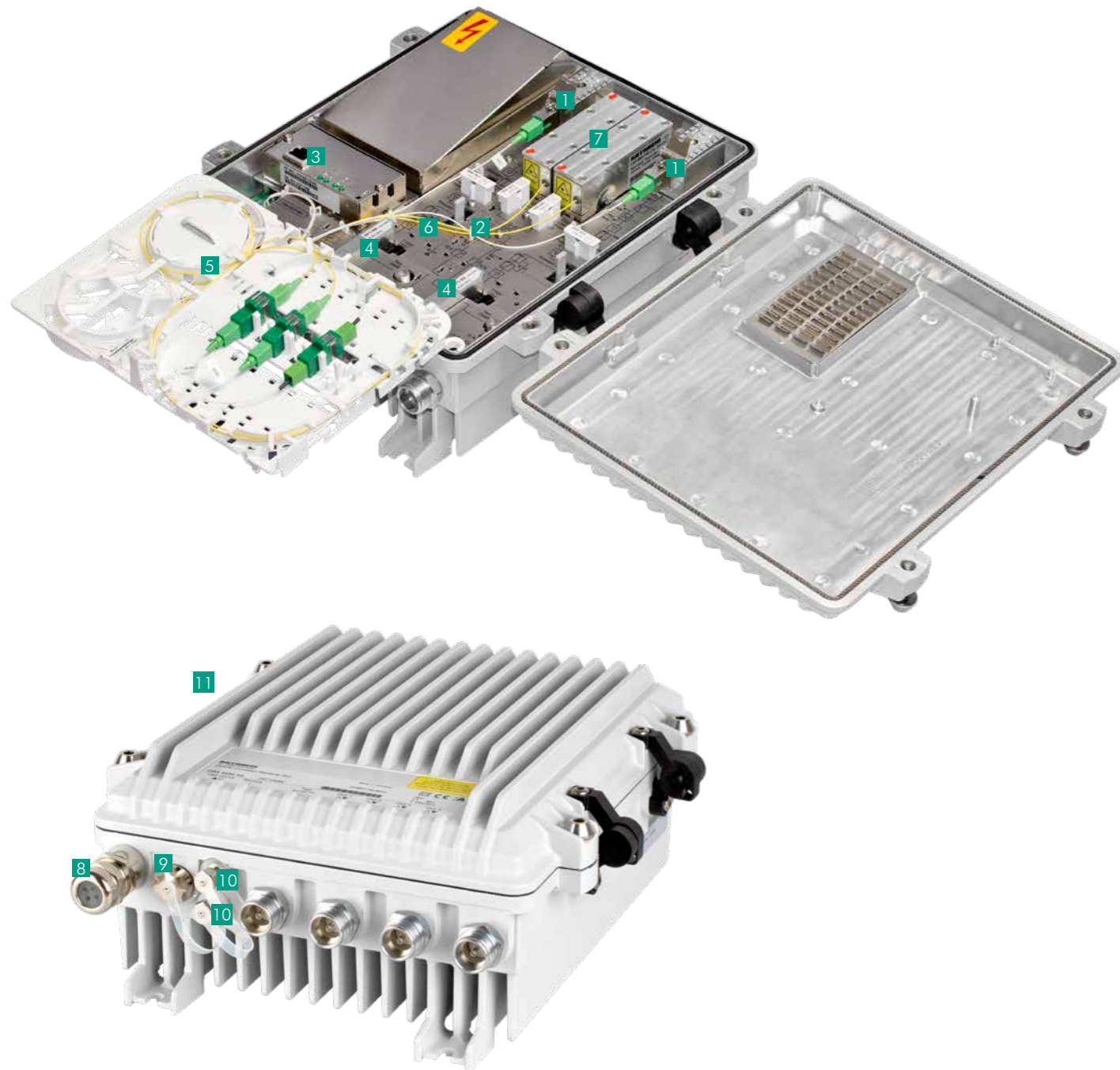
The foldable fiber management module allows easy installation and protects fibers and connectors.

Technical Features

- One to four high-level outputs (trunk/distribution, two separate output stages)
- Full redundancy operation available in forwards and return path
- Segmentation available in the downstream and upstream
- One or two optical pluggable receiver modules
- One or two plug-in return path transmitters for segmentation, coupling or redundancy, see OSR 900x
- Electronically settable matrix in the forwards path and return path
- Innovative operating concept: Electronic actuators, setting via a hand-held operating device
- Automatic levelling in the forwards path
- Extremely low-noise receiver
- Internal optical interfaces and fiber 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 fiber identification code in the return path transmitters
- Output level up to 119 dBμV per output (gain limit for two outputs)

ORA 9222-1G2-B

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. The modules can be upgraded or exchanged easily during operation.

2 Electronically switchable matrix in the forward 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 fiber compartment

The integrated fiber compartment houses the fibers connected, optical connectors or splices. Optical multiplexers or splitters in tubular or compact form can simply be secured in the fiber 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. Pigtailed or pre-assembled optical break-out cables can be fed into the inside of the device using the optical gland ZGF 03.

The new optical DLX gland ZGF 02 allows an SC/APC interface that is accessible from outside. This allows the device to be disconnected from the optical network quickly and easily. In all cases these glands are rated protection class IP 67 for unrestricted outdoors installation. An integral membrane is incorporated which prevents damaging condensed water penetrating inside the device.

9 Electronic setting

All settings of parameters and operating modes are made electronically using the well-proven hand-held operating device HTE 10 or HTE 20. The connection is made via an external interface. 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.

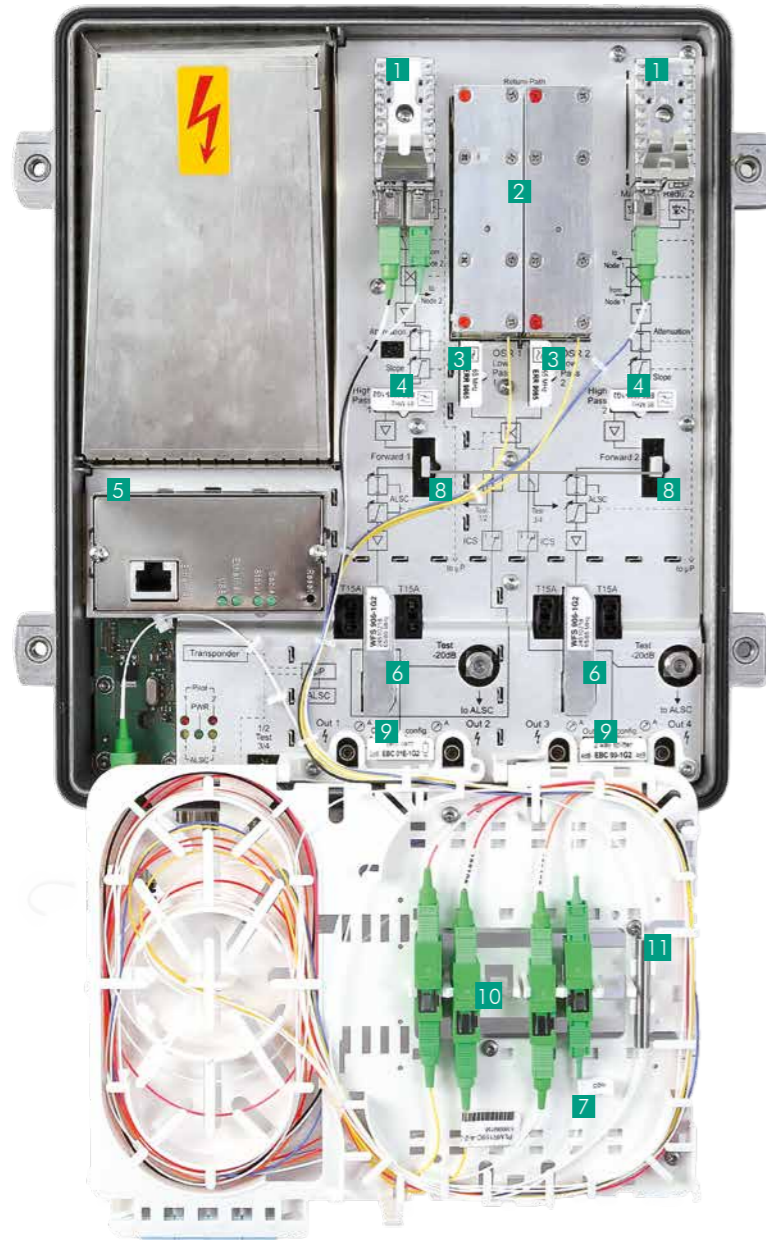
11 AC local feeding clamb

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

ORA 9222-1G2-B

Overview of options

Fiber compartment open



- 1 Optical receiver modules (two insert positions)**
Available fittings:
ORD 9201-1G2
- 2 Optical return path transmitters (two insert positions)**
Available fittings:
OSR 9003, OSR 9003-P65-Cxx
- 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 fibers, 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**

Fiber compartment closed



- 1 Bracket for optical multiplexers in compact form**
- 2 Electronic setting**
Via hand-held operating device: HTE 10
- 3 RF interfaces**
Available fittings: PG-11 glands or cable fittings
- 4 Fiber entry**
Available fittings: ZGF 03, ZGF 02

Special Equipment

Optical receiver modules: ORD 9201-1G2

The optical receiver module ORD 9201-1G2 is intended for use in the optical fiber node ORA 9222-1G2. The ORD 9201-1G2 is a single receiver module and provides one optical receiver for each RF path.

Features

- Optical receiver modules
- Optical reception of CATV frequency multiplex signals from a single monomode glass fiber
- Extremely low-noise receiver (best in class)
- Optical plug connectors: SC/APC
- For operation with ORA 9222-1G2 or ORA 9022-1G2



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

Optical return path transmitters: OSR 9003 modules

- Plug-in modules for operation with an input or output
- Optical return path transmitter modules for use in the ORA 9222-1G2 and ORA 9022-1G2
- 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 690037-03
OSR 9003 P65-C11	+3/+6 dBm 1471 nm 690037-11
OSR 9003 P65-C12	+3/+6 dBm 1491 nm 690037-12
OSR 9003 P65-C13	+3/+6 dBm 1511 nm 690037-13
OSR 9003 P65-C14	+3/+6 dBm 1531 nm 690037-14
OSR 9003 P65-C15	+3/+6 dBm 1551 nm 690037-15
OSR 9003 P65-C16	+3/+6 dBm 1571 nm 690037-16
OSR 9003 P65-C17	+3/+6 dBm 1591 nm 690037-17
OSR 9003 P65-C18	+3/+6 dBm 1611 nm 690037-18

Version SC/APC

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

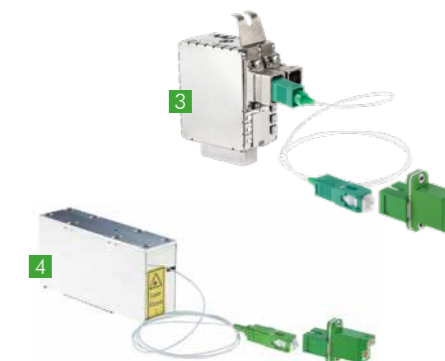
2 Optical return path transmitters
OSR 900x: Pigtail device interface with SC/APC, connection of the pigtail or cable using optical coupling OKU 01/SC



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 OSR 900x
Device interface pigtail with SC/APC, transition to E-2000 with optical coupling OKU 01 SC-E



Components

Handheld module: HTE 20

The handheld module HTE 20 permits direct access to fiber nodes and amplifiers in order to configure them. The handheld module HTE 20 is attached to the controlling device; it is started by Plug & Play and is supplied with power by the controlling device.

Features

- Controlling all device settings with a few button presses
- Display of all device settings
- Ambient conditions:
 - Operating temperature: -10°C to +40°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 amplifiers and fiber nodes
- 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 fiber nodes
- 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 / 85...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
- 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 9105-1G2, 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)

Components

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 (for ORA 9222-1G2)

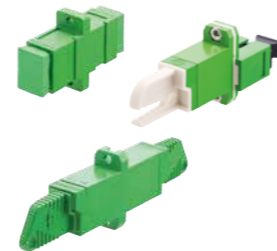


Taps/splitters: EAC 90-1G2, EAC 93-1G2, EAC 94-1G2, EBC 90-1G2



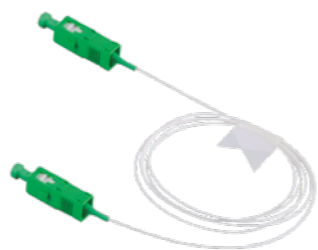
Optical couplings: OKU 01/SC, OKU 01/SC-E, OKU 01/E

- 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



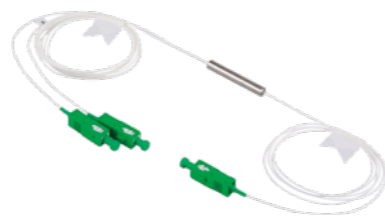
Optical patch cables: OFC 90/SC, OFC 90/SC-E

- 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 multiplexer/ demultiplexer, tubular design: BWMR 1310/1550, BWMR 1310

- Optical multiplexer/demultiplexer:
 - Wavelengths: 1310/1550 nm, 1310/CWDM C05 C18
 - Application: for instance separation of forwards/return path
- High reliability
- High isolation
- Low insertion loss
- Optical connections: 900 µm fibers, plug connectors SC/APC



Optical glands: ZGF 02, 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. The gland ZGF 02 contains an SC/APC coupling and permits connection of a single-fiber WDM system. ZGF 02 and 03 are suitable for ORA 9222-1G2.



ZGF 02

- 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
- The gland ZGF 02 contains an SC/APC coupling and permits connection of a single-fiber WDM system
- Installation is performed at a free cable opening (PG 11) in the amplifier casing
- Degree of protection when correctly installed: IP 67 (ZGF 02/03)

Overview

Description	Type	Order no.	ORA9222-1G2
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 monitoring transponder	TVM 500	26210846	✓
Handheld module	HTE 20	690091	✓
Adapter ring PG 11 to 5/8"	EMU 29	273243	✓
Adapter PG 11 to 3.5/12 socket	EMP 53	25010011	✓
PG 11 to IEC connector (f) with M14 male thread	EMP 34	275289	✓
PG 11 to F socket (female)	EMP 35	275300	✓
DLX adapter (1xSC/APC)	ZGF02	25510002	✓
Optical gland	ZGF03	25510003	✓

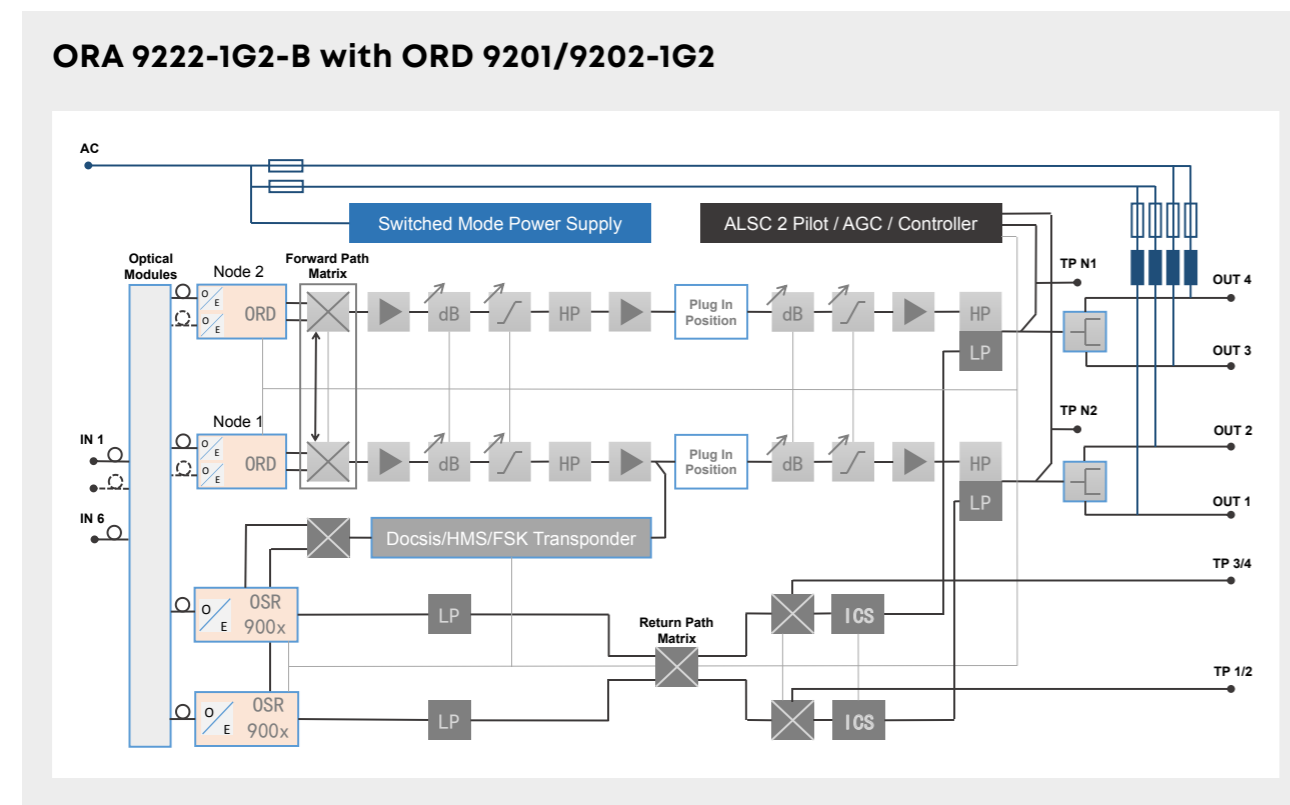
Components

Plug-in diplex filters (device assignment overview)

Type	Order no.	ORA 9222-1G2
WFS 906-1G2	24510218	2
WFS 908-1G2	24510222	2
WFS 920-1G2	24510209	2
ERR 9065	24510156	2
ERR 9085	24510158	2
ERR 9204	24510211	2
ERS 9085-1G2	24510219	2
ERS 9105-1G2	24510223	2
ERS 9258-1G2	24510210	2

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

Block diagram



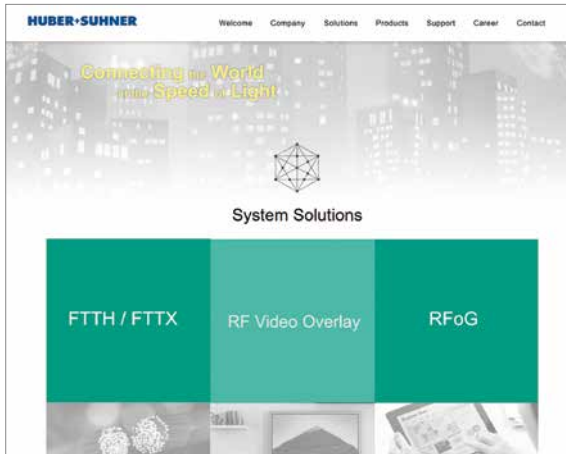
Order number overview

Type	Order no.	Type	Order no.
B		ORD 9201-1G2	690052-01
BWMR 1310	24810197	OSR 9003 P65-Cxx	690037-xx
BWMR 1310/1550	24810098	T	
E		TVM 1000	26210086
EAC 90-1G2	24510215	TVM 850/H	26210077
EAC 93-1G2	24510216	TVM 500	26210846
EAC 94-1G2	24510220	W	
EBC 00-1G2	24510217	WFS 906-1G2	24510218
EBC 01E-1G2	24510230	WFS 908-1G2	24510222
EBC 90-1G2	24510214	WFS 920-1G2	24510209
EMU 29	273243	Z	
EMP 53	25010011	ZGF 02	25510002
EMP 34	275289	ZGF 03	25510003
EMP 35	275300	H	
ERR 9065	24510156	HTE	690091
ERR 9085	24510158	O	
ERR 9204	24510211	OFC 90/SC	24810101
ERS 9085-1G2	24510219	OFC 90/SC-E	24810102
ERS 9105-1G2	24510223	OKU 01/SC	24810031
ERS 9258-1G2	24510210	OKU 01/SC-E	24810099
H		OKU 01/E	24810100
HTE	690091	ORA 110D-RFoG	24710071
O		ORA 118D-RFoG	24710072
OFC 90/SC	24810101	ORA 119D-RFoG	24710073
OFC 90/SC-E	24810102	ORA 9022-1G2-B	690085-xx
OKU 01/SC	24810031	ORA 9222-1G2-B	690062-xx
OKU 01/SC-E	24810099		
OKU 01/E	24810100		

You have questions?

Visit our website. You will find a lot of information about FTTH, Video Overlay and other network solutions as well as an overview of our product range:

Network solution:



Futureproof with Fiber-to-the-home:

<https://www.bktel.com/systems-solutions.htm>



Our product range:

<https://www.bktel.com/products.htm>

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