

Optical Signal Distribution



DEV 7000 Series

Optical Transmission Equipment for Professional Applications

Features:

- /// Two different chassis carrying up to 16 modules:
- /// Optical transmitter modules with bias feeding & RF sensing
- /// Optical receiver modules with RF sensing, Manual Gain Control (MGC), Automatic Gain Control (AGC)
- /// Monitoring output of incoming/outgoing RF signal
- /// Monitoring of optical transmission in transmitter and receiver module
- /// Space requirement only 3 RU
- /// Redundancy switching can be integrated for transmission lines 1+1 and n+1

Application Areas:

- /// Cable head end stations with distant dish farms
- /// Redundant distributed dish sites
- /// Extended L-Band transmission over distances up to 60 km
- /// Satellite ground stations



DEV 7000 Series

Optical Transmission Equipment

The Problem

In cable head ends or satellite ground stations, RF signals are transported over long distances. With coaxial systems, the signal gets degraded because of frequency dependant losses. Equalisation and amplification does not really solve this problem.

DEV worked out a solution

DEV Systemtechnik has developed optical transmission equipment for professional use, which covers all requirements due to its flexibility in terms of configuration versatility. The chassis DEV 7103 and DEV 7123 are capable of holding up to 16 optical transmitter or optical receiver modules or a mixture of both. Via the built-in CPU with Ethernet, the DEV 7103 can be connected to an M&C system. Redundant systems 1+1 or n+1 can be integrated in the same housing.



Applications

The optical transmission equipment can be applied in stations and institutions, where RF signals are to be transported over a longer distance and therefore the signals are converted from electrical into optical signals and vice versa. Also in case that galvanic isolation is required, the optical link is the solution.

DEV 7000 Optical Transmission Equipment

Front View DEV 7103 (with 12x DEV 7313 Optical Receiver Modules)



Rear View DEV 7103 (with 12x 75 Ohm Outputs)



The Technical Concept

The DEV 7000 series is a modular system, which can be configured by the user for the individual application. Chassis and the different (extended) L-Band optical transmitter and receiver modules, for short range or long distance can be combined freely to match application requests. Optical redundancy systems with automatically switching capability in 1+1- and in n+1-configurations are possible as well. The chassis DEV 7103 and DEV 7123 are the base of the system with redundant and hot swappable power supplies and 12 slots on the front side and 4 slots at the rear side of the chassis for integrating the transmitter and receiver modules. On the rear side of the chassis the RF connections are configurable either in 50 Ohm with SMA-connectors (DEV 7781) or in 75 Ohm with F-connectors (DEV 7783). The chassis DEV 7103 additionally carries a CPU module which is used for remote surveillance and if redundancy is required. The optical transmitter modules DEV 7211 (L-Band) and DEV 7212 (extended L-Band) deliver bias current for driving an LNB via the input connector of the module. This can be switched on and off from the front side of the module, the web application and SNMP. The electrical output of the optical receiver modules DEV 7311 (L-Band, 20 km), DEV 7312 and DEV 7313 (both extended L-Band, 40 km and 60 km) are DC free and DC isolated. The optical splitter DEV 7512 and various redundancy kits DEV 771x complete the DEV 7000 portfolio.



DEV 7000 Series Chassis

DEV 7103 Chassis

The integrated CPU module of the DEV 7103 chassis provides surveillance and control capability of the optical transmission system via Web Interface or via an external M&C system. For all optical modules, the incoming or outgoing optical signals and RF signals are monitored; the RF signals are compared to user definable minimum thresholds. For all optical transmitters, the bias current can be monitored and compared to user definable lower and upper limits. Also, for the optical receivers DEV 7312 the MGC (Manual Gain Control) can be managed by the CPU module of the chassis. And finally for the optical receivers DEV 7313 the AGC (Automatic Gain Control) or MGC and the switching between AGC/MGC is provided by the remote control functionality of the chassis DEV 7103 as well.

The DEV 7103 chassis is needed, if optical redundancy kits are required.

The configuration of a DEV 7103 chassis (e.g. with redundancy switching capability) can be completed by a DEV 14-0018 optical-to-Ethernet-converter, which enables the Ethernet connection to the distant chassis over fibre.

DEV 7123 Chassis

This chassis is used for applications which do not require surveillance capability, since it does not carry a CPU module. The chassis is prepared to carry up to 16 optical transmitter modules or optical receiver modules or a mixture of both.

Both chassis provide slots for three power supplies. By default, two supplies are delivered with the chassis, thus providing redundant power supply functionality for smaller optical transmission systems. Depending on the number and the type of installed optical modules, and also, whether power supply redundancy is required or not, a third power supply DEV 12-0011 can be ordered for the chassis. The easy installation of the third power supply permits the upgrade in the field.



DEV 7000 Series Optical Transmitter Modules

DEV 7211 Optical Transmitter Module L-Band

The optical transmitter module DEV 7211 was designed for the optical transmission of L-Band signals (950...2150 MHz) for distances up to 20 km.

DEV 7212 Optical Transmitter Module Extended L-Band

The optical transmitter module DEV 7212 is used for the optical transmission of extended L-Band signals (700...2300 MHz) for distances up to 40 km.

All optical transmitter modules are plug-in modules and can feed the LNB with bias. At the front side of the module an SMA monitor port and the bias switch is located, as well as three bi-coloured LEDs indicating the state of the bias monitoring, the RF-sensing and the low laser radiation detection.

As optical connector for all modules, choose E2000/HRL (Option 08) or SC/APC (Option 09).

Even though the DEV 721x optical transmitter modules were developed to match perfectly with the corresponding DEV 731x optical receiver module, they can be combined freely to obtain the desired functionality and performance.



DEV 7000 Series Optical Receiver Modules

DEV 7311 Optical Receiver Module L-Band

The optical receiver module DEV 7311 was designed for the optical reception of L-Band signals (950...2150 MHz) for distances up to 20 km.

DEV 7312 Optical Receiver Module Extended L-Band

The optical receiver module DEV 7312 is used for the optical reception of extended L-Band signals (700...2300 MHz) for distances ranging from 10 km up to 40 km.

If ordered with Option 37, the module can be used in applications with optical transmitters and receivers being less distant.

The output gain of the module can be adjusted via MGC.

DEV 7313 Optical Receiver Module Extended L-Band

The high-performance optical receiver module DEV 7313 will be installed on the receiver side in optical transmission applications of extended L-Band signals (700...2300 MHz) for distances from 10 km up to 60 km.

If ordered with Option 37, the module can be used in less distant applications.

The output gain of the module is either controlled automatically via AGC or can be adjusted via MGC.

All optical receiver modules are plug-in modules. At the front side of the module an SMA monitor port is located, as well as two bi-coloured LEDs indicating the state of the RF-sensing and the low laser reception detection.

As optical connector for all modules, choose E2000/HRL (Option 08) or SC/APC (Option 09).

Even though the DEV 731x optical receiver modules were developed to match perfectly with the corresponding DEV 721x optical transmitter module, they can be combined freely to obtain the desired functionality and performance.



DEV 7000 Series Cabling

DEV 7781 Cabling

The DEV 7781 is the RF-cabling required for one optical transmitter or one optical receiver in 50 Ohm with SMA connector.

DEV 7783 Cabling

The DEV 7783 is RF-cabling required for one optical transmitter or one optical receiver in 75 Ohm with F connector.

DEV 7711/50 and DEV 7711/75: L-Band Redundancy Kit 1+1

The DEV 7711 Redundancy Kit is the L-Band RF-cabling and the circuitry required for building up a 1+1 redundancy in combination with two optical transmitters or two optical receivers.

DEV 7712/50 and DEV 7712/75: L-Band Redundancy Kit 2+1

The DEV 7712 Redundancy Kit is the L-Band RF-cabling and the circuitry required for building up a 2+1 redundancy in combination with three optical transmitters or three optical receivers.

DEV 7714/50 and DEV 7714/75: L-Band Redundancy Kit 4+1

The DEV 7714 Redundancy Kit is the L-Band RF-cabling and the circuitry required for building up a 4+1 redundancy in combination with five optical transmitters or five optical receivers.

DEV 7716/50 and DEV 7716/75: L-Band Redundancy Kit 6+1

The DEV 7716 Redundancy Kit is the L-Band RF-cabling and the circuitry required for building up a 6+1 redundancy in combination with seven optical transmitters or seven optical receivers.

DEV 7718/50 and DEV 7718/75: L-Band Redundancy Kit 8+1

The DEV 7718 Redundancy Kit is the L-Band RF-cabling and the circuitry required for building up an 8+1 redundancy in combination with nine optical transmitters or nine optical receivers.

The RF-cabling for the extended L-Band of the DEV 7000 series is offered separately, thus enabling the desired chassis to be equipped with the number of DEV 778x cabling required for the final stage of the optical transmission system. I.e. the number of DEV 778x cabling to be ordered has to be at least equal to the number of optical modules in each chassis DEV 71x3. On the other hand the number of DEV 778x cabling per chassis should not to exceed 16.

If redundancy of the optical transmission is required, the chassis DEV 7103 can be equipped with DEV 771x redundancy kit(s) instead of DEV 778x cabling. The DEV 7711 is a redundancy kit to build up an optical 1+1 redundancy, up to six times DEV 7711 can be installed in one chassis DEV 7103. All other redundancy kits DEV 771x are used to build up n+1 redundancies and can be installed once in one chassis DEV 7103. All redundancy kits are available as DEV 771x/50 with 50 Ohm impedance and with SMA connectors and as DEV 771x/75 with 75 Ohm impedance and with F connectors.

All DEV 7000 series cabling is not field-upgradeable, thus to be ordered for the final configuration with the purchase of the chassis.



DEV 7000 Series Optical Passive Devices

DEV 7512 Optical Splitter 1:2 1310 nm

The DEV 7512 is an optical splitter which divides an optical signal in two optical signals at a rate of 50%, thus the insertion loss of the splitter is 3 dB.



DEV 7000 Series Technical Data

Technical Data DEV 7000 Optical Link Specification:

Link Specifications:

Link gain with no optical cable:
Frequency response 950...2150 MHz:
Frequency response @ any 36 MHz interval:
Max. optical distance:
Noise figure of complete link:

Intermodulation distortion, two tones,
separation 10 MHz at -13 dBm:
Fibre:

Link Specifications:

Link gain with no optical cable:

Frequency response 950...2150 MHz:
700...2300 MHz:
Frequency response @ any 36 MHz interval:
Max. optical distance:
Noise figure of complete link:

Intermodulation distortion, two tones,
separation 10 MHz at -13 dBm:
Fibre:

DEV 7211 / DEV 7311

0±3 dB
±1 dB
±0,25 dB
20 km
22 dB @ 1 dB optical loss
27 dB @ 5 dB optical loss

>40 dBc
Single mode 9/125, Corning SMF28 or equivalent

DEV 7212 / DEV 7312

+3...+15 dB ±3 dB
(10...40 km, DEV 7312 standard)
-1...+11 dB ±3 dB
(short distance, DEV 7312 w/ Option 37)

±0,6 dB
±1 dB @ 6 dB link gain
±0,25 dB
40 km
22 dB @ 1 dB optical loss
27 dB @ 5 dB optical loss

>40 dBc
Single mode 9/125, Corning SMF28 or equivalent



DEV 7000 Series Technical Data (cont.)

Technical Data DEV 7000 Optical Chassis:

Specifications:

Remote Communication:

Interface (connector):
Remote control & surveillance:

Alarms:

Module alarm handling:

Specifications:

Common Specifications:

Capacity:

No of slots:

Alarms:

Two stage alarm signalisation
for power line failure:

Alarm connector:

Contact load:

B-Alarm:

A-Alarm:

Bias:

Bias:

Redundant Power Supply:

Redundant power supplies:

No. of power supply slots:

No. of installed power supply modules:

Power consumption:

General Specifications:

Housing:

Weight:

Environmental conditions:

MTBF:

Specifications:

Optical Input/Output:

No. of channels:

Wavelength:

Fibre:

Connectors:

Max. optical distance:

Twisted Pair Input/Output:

Interface (connector):

General Specifications:

Housing:

Weight:

DEV 7103 Chassis

Ethernet (RJ-45)
via Web Interface and/or
via SNMP protocol

Alarms of all plug-in modules are communicated
directly to the built-in CPU module.

DEV 7123 Chassis

(please refer to common specifications)

16, i.e. 12 slots @ front side, 4 slots @ rear side

Potential free contacts

Sub-D 9 (m)

60 V; 0,3 A

One power supply unit does not deliver any
secondary power.

All power supply units do not deliver any secondary
power.

max. 2,2 A total per chassis

100...260V AC out of two different phases

3

2*

150 VA max.

19", 3 RU (133 mm), 430 mm depth

~5 kg (empty chassis)

ETS 300019 Part 1-3 Class 3.1

50.000h @ 20° C

DEV 14-0018

Optical to Ethernet Converter Module

2 (Tx / Rx)

1310 nm

Single mode 9/125, Corning SMF28 or equivalent

SC/PC

20 km

Ethernet (RJ-45)

3 RU (129 mm), 8 HP (40 mm)

~0,3 kg



DEV 7000 Series Technical Data (cont.)

Technical Data DEV 7000 Optical Transmitter:

Specifications:	DEV 7211 Optical Transmitter
Input:	
Frequency range:	950...2150 MHz
Specifications:	DEV 7212 Optical Transmitter
Input:	
Frequency range:	700...2300 MHz
Common Specifications:	
Input:	
Damage level:	+10 dBm
Max. input level:	-10 dBm
Output:	
Laser type:	DFB
Laser class (according to IEC 60 825-1):	Class 1M (low risk to eyes, no risk to skin)
Wavelength:	1310±20 nm
Optical power:	<7 dBm
Connector:	E2000 HRL (Option 08) SC/APC (Option 09)
Monitoring Port:	
Amplitude frequency response:	<±1 dB w/ respect to input signal
Return loss:	>16 dB
Connector:	SMA (f)
Bias & Bias Current Alarm:	
Bias:	max. 0,5 A; 15 V +3 V per module
Adjustable alarm level setting:	
• Upper alarm level:	max. 400 mA (DEV factory setting: 350 mA)
• Lower alarm level:	min. 50 mA (DEV factory setting: 100 mA)
Alarm indication:	Via LED
Separate alarm output:	Via microcontroller**
RF Sensing:	
Adjustable threshold level (THL) for RF sensing:	-10 dBm > THL > -55 dBm
DEV factory setting:	-30 dBm
Alarm indication:	Via LED
Separate alarm output:	Via microcontroller**
Low Laser Radiation Alarm:	
Alarm indication:	Via LED
Separate alarm output:	Via microcontroller**
General Specifications:	
Power consumption:	16 V; 0,15 A
Housing:	3 RU (129 mm), 5 HP (25 mm)
Weight:	~0,5 kg
Environmental conditions:	ETS 300019 Part 1-3 Class 3.1



DEV 7000 Series Technical Data (cont.)

Technical Data DEV 7000 Optical Receiver:

Specifications:	DEV 7311 Optical Receiver
Output:	
Frequency range:	950...2150 MHz
Specifications:	DEV 7312 Optical Receiver
Output:	
Frequency range:	700...2300 MHz
Manual Gain Control (MGC):	
Manual gain control:	Via buttons on the front panel and/or via microcontroller**
Specifications:	DEV 7313 Optical Receiver
Output:	
Frequency range:	700...2300 MHz
Manual/Automatic Gain Control:	
Manual gain control / set point control:	Via buttons on the front panel and/or via microcontroller**
Selection of AGC or MGC:	Via microcontroller**
Common Specifications:	
Input:	
Wavelength:	1150...1600 nm
Optical sensitivity:	<-17 dBm with 36 dB (S+N)/N
Connector:	E2000 HRL (Option 08) SC/APC (Option 09)
Output:	
Max. output level:	-6 dBm
Monitoring Port:	
Amplitude frequency response:	<±1 dB with respect to output signal
Return loss:	>18 dB
Connector:	SMA (f)
RF Sensing:	
Adjustable threshold level (THL) for RF sensing:	-10 dBm > THL > -55 dBm
DEV factory setting:	-30 dBm
Alarm indication:	Via LED
Separate alarm output:	Via microcontroller**
Low Laser Reception Alarm:	
Alarm indication:	Via LED
Separate alarm output:	Via microcontroller**
General Specifications:	
Power consumption:	16 V; 0,25 A
Housing:	3 RU (129 mm), 5 HP (25 mm)
Weight:	~0,5 kg
Environmental conditions:	ETS 300019 Part 1-3 Class 3.1

* The chassis is equipped with 2 power supply modules by default. Depending on the number and the type of installed optical modules, and whether power supply redundancy is required or not, a third power supply module can be installed.

** This applies only, if the module is installed in a DEV 7103 chassis.



DEV 7000 Series Order Information

DEV 7000 Series Chassis

DEV 7103	Chassis for optical transmission equipment, 19", 3 RU
DEV 7123	Chassis for optical transmission equipment without microcontroller, 19", 3 RU
DEV 14-0018:	Optical to Ethernet converter module (for DEV 7103 only)
DEV 12-0011:	Third power supply module

DEV 7000 Series Optical Transmitter Modules

DEV 7211	Single channel optical transmitter module, L-Band (950...2150 MHz), 3 RU, 5 HP
DEV 7212	Single channel optical transmitter module, extended L-Band (700...2300 MHz), 3 RU, 5 HP
Option 08:	Optical connector: E2000 HRL
Option 09:	Optical connector: SC/APC

DEV 7000 Series Optical Receiver Modules

DEV 7311	Single channel optical receiver module, L-Band (950...2150 MHz), 20 km, 3 RU, 5 HP
DEV 7312	Single channel optical receiver module, extended L-Band (700...2300 MHz), 40 km, MGC, 3 RU, 5 HP
DEV 7313	Single channel optical receiver module, extended L-Band (700...2300 MHz), 60 km, AGC/MGC, 3 RU, 5 HP
Option 08:	Optical connector: E2000 HRL
Option 09:	Optical connector: SC/APC
Option 37:	Short distance option for optical links (for DEV 7312 and DEV 7313 only)

DEV 7000 Series Cabling

DEV 7781	RF-cabling for one optical transmitter or one optical receiver, 50 Ohm, SMA
DEV 7783	RF-cabling for one optical transmitter or one optical receiver, 75 Ohm, F
DEV 7711/50	Redundancy Kit 1+1, L-Band, 50 Ohm SMA
DEV 7711/75	Redundancy Kit 1+1, L-Band, 75 Ohm F
DEV 7712/50	Redundancy Kit 2+1, L-Band, 50 Ohm SMA
DEV 7712/75	Redundancy Kit 2+1, L-Band, 75 Ohm F
DEV 7714/50	Redundancy Kit 4+1, L-Band, 50 Ohm SMA
DEV 7714/75	Redundancy Kit 4+1, L-Band, 75 Ohm F
DEV 7716/50	Redundancy Kit 6+1, L-Band, 50 Ohm SMA
DEV 7716/75	Redundancy Kit 6+1, L-Band, 75 Ohm F
DEV 7718/50	Redundancy Kit 8+1, L-Band, 50 Ohm SMA
DEV 7718/75	Redundancy Kit 8+1, L-Band, 75 Ohm F

- NOTE:**
- The number of DEV 778x cabling to be ordered per chassis DEV 71x3has to be **min.** equal to the number of optical modules in the chassis and **max.** 16.
 - Only the chassis DEV 7103 can be equipped with DEV 771x redundancy kit(s) instead of DEV 778x cabling. The 7711/xx can be installed up to 6x per chassis, all other DEV 771x/xx redundancy kits only 1x per chassis.

DEV 7000 Series Optical Passive Devices

DEV 7512	Optical splitter 1:2, 1310 nm
Option 08:	Optical connector: E2000 HRL
Option 09:	Optical connector: SC/APC

Technical specifications are subject to change



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Our asset is know-how! - Our product is functionality!