

Optribution – Optical Transmission and Distribution of RF Signals



Products:

- DEV 71xy -** Optribution Chassis
- DEV 72xy -** Optical Transmitter Modules
- DEV 73xy -** Optical Receiver Modules
- DEV 751x -** Optical Splitter Modules, 1310 nm

Features:

- ▮ Different Chassis providing up to 16 Slots for Optical Modules
- ▮ Different Optical Modules with different Features for different Frequency Ranges and Distances
- ▮ 1+1 or n+1 Redundancy Switching can be integrated for Optical Transmission Lines
- ▮ Cabling, Distribution or Redundancy Options with 50 Ohm or 75 Ohm Impedance
- ▮ Redundant Power Supplies
- ▮ Remote Control and Surveillance
- ▮ Optional Optical Equipment (Splitters, Converters)

Application Areas:

- ▮ Cable Head End Stations with distant Dish Farms
- ▮ Redundant distributed Dish Sites
- ▮ Satellite Ground Stations



Front DEV 7101



Rear DEV 7101



Front DEV 7103



Rear DEV 7103



Front DEV 7104



Rear DEV 7104

The Situation

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

Therefore, the optical transmission of the RF signals is a suitable solution to overcome the problem of high losses providing additional advantages like galvanic isolation and immunity to electromagnetic interferences.

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 Technical Concept

The DEV 7000 series is a modular system, i.e. the available 1 RU, 3 RU and 4 RU chassis can be equipped with different optical transmitter modules DEV 72xx and/or receiver modules DEV 73xx to meet the requirements of the specific application. Optional, the DEV 7000 chassis can be equipped with splitter modules and/or switching modules to realise 1+1 or n+1 redundancy for the optical transmission system. The 4 RU chassis DEV 7104 was mainly developed as a sink for the optical transmission chain and can be equipped with splitter options and matrix switch options to distribute the regained RF signals according to the requirements of the specific application. A key feature is the integrated control and surveillance capability via the integrated Web Interface and via the SNMP remote control protocol support.

Technical Data

DEV 7101 Optribution Chassis 1 RU

Capacity

Front side	2 slots for optical modules
Rear side	1 slot for the modules realising the redundancy functionality in redundancy configurations

Redundant Power Supply

Number of power supplies	2
Bias capability	15+3/-0 V, max. 0,5 A per optical transmitter module; total max. 1,4 A
Power line redundancy	100...240 V AC supplied by two different lines
Power consumption	<80 VA

General Specifications

Housing	19" (483 mm), 1 RU (45 mm), ~360 mm depth + max. 80 mm (optical connectors)
Weight	~5 kg (empty chassis)

Option 59: CPU for DEV 7101

Remote Communication

Interfaces, connectors	• Ethernet, RJ-45; • serial interface RS 232, Sub-D-9 (f)
Remote control & surveillance, interface	• via Web Interface, Ethernet; • via SNMP protocol, Ethernet

DEV 7103 Intelligent Optribution Chassis 3 RU

Capacity

Front side	12 slots for optical modules
Rear side	4 additional slots for optical modules in 1:1 transmission configurations, in redundancy configurations the slots are used for the redundancy functionality

Remote Communication

Interfaces, connectors	• Ethernet, RJ-45; • serial interface RS 232, Sub-D-9 (f)
Remote control & surveillance, interface	• via Web Interface, Ethernet; • via SNMP protocol, Ethernet

Redundant Power Supply

Number of power supplies, power supply module slots	Equipped with 2 power supply modules, 3 power supply slots available, for more than 8 optical modules a 3 rd power supply module is recommended for keeping the power supply redundancy.
Power line redundancy	190...240 V AC (Option 17) or 90...120 V AC (Option 18) supplied by two different lines
Power consumption	<120 VA

General Specifications

Housing	19" (483 mm), 3 RU (133 mm), ~470 mm depth + max. 80 mm (optical connectors)
Weight	~7 kg (empty chassis)

Technical Data (cont.)

DEV 7123 Optribution Chassis 3 RU

Capacity

Front side	12 slots for optical modules
Rear side	4 additional slots for optical modules in 1:1 transmission configurations, in redundancy configurations the slots are used for the redundancy functionality

Redundant Power Supply

Number of power supplies, power supply module slots	Equipped with 2 power supply modules, 3 power supply slots available, for more than 8 optical modules a 3 rd power supply module is recommended for keeping the power supply redundancy.
Power line redundancy	190...240 V AC (Option 17) or 90...120 V AC (Option 18) supplied by two different lines
Power consumption	<120 VA

General Specifications

Housing	19" (483 mm), 3 RU (133 mm), ~470 mm depth + max. 80 mm (optical connectors)
Weight	~6 kg (empty chassis)

DEV 7104 Intelligent Optribution Chassis 4 RU

Capacity

Front side	12 slots for optical modules
Rear side	4 horizontal slots + top slot for the inputs/outputs of cabling options

Remote Communication

Interfaces, connectors	• Ethernet, RJ-45; • serial interface RS 232, Sub-D-9 (f)
Remote control & surveillance, interface	• via Web Interface, Ethernet; • via SNMP protocol, Ethernet

Redundant Power Supply

Number of power supplies, power supply module slots	Equipped with 2 power supply modules, 3 power supply slots available, for more than 8 optical modules a 3 rd power supply module is recommended for keeping the power supply redundancy.
Power line redundancy	100...240 V AC supplied by two different lines
Power consumption	<120 VA

General Specifications

Housing	19" (483 mm), 4 RU (178 mm), ~490 mm depth + max. 80 mm (optical connectors)
Weight	~8 kg (empty chassis)

Technical Data (cont.)

Common Technical Data of Optribution Chassis

Alarms

Two stage alarm signalisation for power line failure	Potential free contacts
Alarm connector	Sub-D-9 (m)
Contact load	60 V; 0,3 A
B-Alarm	One power supply unit does not deliver any secondary power.
A-Alarm	All power supply units do not deliver any secondary power.
Summary Alarm	Via remote interface ¹ and via potential free contacts ¹

General Specifications

Environmental conditions	ETS 300019 Part 1-3 Class 3.1
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Optical Link Specifications DEV 7211 / DEV 7311

Link Specifications

Optical link gain	0±3 dB	(with 100 m optical fibre)
Frequency response	±1 dB	(950...2150 MHz)
	±0,25 dB	(in any 36 MHz interval)
Optical insertion loss	<7 dB @ 10 dB C/N & @ 1 MHz bandwidth	
Equivalent optical distance	<20 km	

Optical Link Specifications DEV 7212 / DEV 7312 or DEV 7313

Link Specifications

Optical link gain	+3...+15 dB ±3 dB	(with 10 km optical fibre)
	-1...+11 dB ±3 dB	(with 100 m optical fibre, w/ Option 37)
Frequency response	±0,6 dB	(950...2150 MHz)
	±1 dB	(700...2300 MHz)
	±0,25 dB	(in any 36 MHz interval)
Optical insertion loss	<14 dB @ 10 dB C/N & @ 1 MHz bandwidth	
Equivalent optical distance	<40 km	

Optical Link Specifications DEV 7221 / DEV 7321

Link Specifications

Optical link gain	0±3 dB	(with 100 m optical fibre)
Frequency response	±1 dB	
Optical insertion loss	<5 dB @ 10 dB C/N & @ 1 MHz bandwidth	
Equivalent optical distance	<15 km	

Common Optical Link Specifications

Link Specifications

Noise figure of complete link	22 dB	(@ 1 dB optical loss)
	27 dB	(@ 5 dB optical loss)
Intermodulation distortion	<-40 dBc	(two tones @ -13 dBm)
Fibre	Single mode 9/125, Corning SMF28 or equivalent	

Technical Data (cont.)

DEV 7211, DEV 7212 - Optical Transmitter Modules L-Band

RF Specifications Input

Frequency range	950...2150 MHz	(DEV 7211)
	700...2300 MHz	(DEV 7212)
Damage level	+10 dBm	
Nominal input level	-10 dBm	

Monitoring Port

Impedance, connector	50 Ohm, SMA (f)
Return loss	>18 dB typ.
Insertion loss	= input level ± 3 dB
Frequency response	$\pm 1,0$ dB

Bias & Bias Current Alarm

Bias	15+3/-0 V; max. 0,5 A
Adjustable level setting:	
• Upper alarm level	max. 400 mA (DEV factory setting: 350 mA)
• Lower alarm level	min. 50 mA (DEV factory setting: 150 mA)
Alarm indication	Via LED on the front panel & via remote communication ¹

RF Sensing

Adjustable threshold level	0 dBm > threshold level > -60 dBm
Threshold level accuracy	± 3 dB
DEV factory setting	-40 dBm
Alarm indication	Via LED on the front panel & via remote communication ¹

General Specifications

Power consumption	16 V; 0,25 A (without bias)
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DEV 7221 - Optical Transmitter Module CATV-Band

RF Specifications Input

Frequency range	47...862 MHz
Damage level	0 dBm
Nominal input level	-10 dBm

Monitoring Port

Impedance, connector	75 Ohm, Precision F (f)
Return loss	>14 dB
Insertion loss	= input level ± 3 dB
Frequency response	$\pm 1,0$ dB

General Specifications

Power consumption	16 V; 0,25 A
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Technical Data (cont.)

Common Technical Data of Optical Transmitter Modules

Optical Specifications 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	<3 dBm
Connector	E2000 HRL (Option 08) SC/APC (Option 09)

Low Laser Radiation Alarm

Alarm indication	Via LED on the front panel & via remote communication ¹
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General Specifications

Housing	3 RU (133 mm), 5 HP (25 mm)
Weight	~0,5 kg
Environmental conditions	ETS 300019 Part 1-3 Class 3.1

DEV 7311, DEV 7312, DEV 7313 - Optical Receiver Modules L-Band

RF Specifications Output

Number of outputs	1 (standard) 2 (Option 43)
Frequency range	950...2150 MHz (DEV 7311) 700...2300 MHz (DEV 7312, DEV 7313)
Max output level	-6 dBm

Monitoring Port

Impedance, connector	50 Ohm, SMA (f)
Return loss	>18 dB typ.
Frequency response	±1,0 dB

Gain Control

Gain control	Fixed gain (DEV 7311) MGC (DEV 7312) MGC and AGC (DEV 7313)
MGC: manual gain control	Via buttons on the front panel & via remote communication ¹ (DEV 7312 and DEV 7313 only)
AGC: set point control	Via buttons on the front panel & via remote communication ¹ (DEV 7313 only)
AGC: selection of AGC/MGC	Via buttons on the front panel & via remote communication ¹ (DEV 7313 only)

RF Sensing

Adjustable threshold level	0 dBm > threshold level > -60 dBm
Threshold level accuracy	±3 dB
DEV factory setting	-40 dBm
Alarm indication	Via LED on the front panel & via remote communication ¹

Low Laser Reception Alarm

Alarm indication	Via LED on the front panel & via remote communication ¹
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Technical Data (cont.)

DEV 7321 - Optical Receiver Module CATV-Band

RF Specifications Output

Number of outputs	1
Frequency range	47...862 MHz
Max output level	-6 dBm

Monitoring Port

Impedance, connector	75 Ohm, Precision F (f)
Return loss	>14 dB
Frequency response	±1,0 dB

Common Technical Data of Optical Receiver Modules

Optical Specifications Input

Wavelength	1150...1600 nm	
Connector	E2000 HRL	(Option 08)
	SC/APC	(Option 09)

General Specifications

Power consumption	16 V; 0,25 A
Housing	3 RU (133 mm), 5 HP (25 mm)
Weight	~0,3 kg
Environmental conditions	ETS 300019 Part 1-3 Class 3.1

DEV 7512, DEV 7514, DEV 7518 - Optical Splitter Modules

Optical Specifications

Number of optical inputs	1	
Number of optical outputs	2	(DEV 7512)
	4	(DEV 7514)
	8	(DEV 7518)
Wavelength	1310±20 nm	
Connectors	E2000 HRL	(Option 08)
	SC/APC	(Option 09)
Optical insertion loss	3 dB	(DEV 7512)
	7 dB	(DEV 7514)
	10 dB	(DEV 7518)

General Specifications

Housing	3 RU (133 mm), 4 HP (20 mm) 6 HP (30 mm) 8 HP (40 mm)	(DEV 7512) (DEV 7514) (DEV 7518)
Weight	~0,3kg (DEV 7512) ~0,4 kg (DEV 7514) ~0,5 kg (DEV 7518)	
Environmental conditions	ETS 300019 Part 1-3 Class 3.1	

Technical Data (cont.)
Cabling Options
RF Specifications

Number of ports	1 per cabling option	(for DEV 7101 & DEV 7104)
	4 per cabling option	(for DEV 7103 & DEV 7123)
Frequency range	47...2300 MHz	(Option 40)
	47...862 MHz	(Option 41)
	700...2300 MHz	(Option 42)
Impedance, connectors	50 Ohm, SMA (f)	(Option 40)
	75 Ohm, Precision F (f)	(Option 41, Option 42)
Return loss	>16 dB	(Option 40)
	>14 dB	(Option 41, Option 42)

General Specifications

Weight	~0,1 kg	(Option 40)
	~0,2 kg	(Option 41, Option 42)
Environmental conditions	ETS 300019 Part 1-3 Class 3.1	

Distribution Options for DEV 7101 / DEV 7104 ²

The "Y" in Y/50 or Y/75 in the following table is used as a placeholder which can be 8, 16, 32, 64, or 128; "zz" stands either for 50 Ohm or 75 Ohm. To achieve the specifications stated below, DEV 7312 or DEV 7313 optical receiver modules need to be installed.

RF Specifications

Number of outputs	8, 16, 32, 64, or 128 per distribution option	
Frequency range	700...2300 MHz	
Impedance, connectors	50 Ohm, SMA (f)	(Option Y/50)
	75 Ohm, Precision F (f)	(Option Y/75)
Insertion loss	0±3 dB	(for up to 16 outputs)
	4±3 dB	(Option 32/zz)
	8±3 dB	(Option 64/zz)
	12±3 dB	(Option 128/zz)
Return loss	>16 dB	(Option Y/50)
	>14 dB	(Option Y/75)
Frequency response (full band)	±1,0 dB	(for up to 16 outputs)
	±1,5 dB	(Option 32/zz)
	±2,0 dB	(Option 64/zz)
	±2,5 dB	(Option 128/zz)
Frequency response (in any 36 MHz interval)	±0,3 dB	(for up to 16 outputs)
	±0,5 dB	(for >16 outputs)
Isolation between output ports	>25 dB	
Intermodulation distortion (2 tones, -13 dBm each)	<-40 dBc	

General Specifications

Weight	~0,3 kg	(Option 8/50)
	...	
	~2,2 kg	(Option 128/75)
Environmental conditions	ETS 300019 Part 1-3 Class 3.1	

Technical Data (cont.)

Matrix Switch Options and Matrix Switch Option Extensions for DEV 7104

The “Y” in 4xY/75 in the following table is used as a placeholder which can be 16, 32, 48, or 64. To achieve the specifications stated below, DEV 7312 or DEV 7313 optical receiver modules need to be installed.

RF Specifications

Number of inputs	4	(Option 4xY/75)
Number of outputs	16, 32, 48, or 64 per matrix switch option (Note, that matrix switch options with 16 or 32 outputs can be extended optionally with 4 * 8 outputs hard wired to each of the 4 electrically converted signals.)	
Frequency range	950...2150 MHz	
Impedance, connectors	50 Ohm, SMA (f)	(Option 4x8/50 only)
	75 Ohm, Precision F (f)	
Insertion loss	0±3 dB	
Tilt	4 dB over entire band	
Return loss	>14 dB	
Frequency response	±0,6 dB	(950...1100 MHz)
(in any 36 MHz interval)	±0,3 dB	(1100...2150 MHz)
Isolation between input ports	>25 dB	
Intermodulation distortion	<-35 dBc @ 85 dBμV	
IMA ₃ output level	<89 dBμV	
IMA ₂ output level	<87 dBμV	

Input Selection

Switch control	14 V, 18 V and 0 Hz, 22 kHz at the output
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General Specifications

Weight	~1,5 kg	(Option 4x16/75)
	~2,5 kg	(Option 4x32/75)
	~3,5 kg	(Option 4x48/75)
	~4,5 kg	(Option 4x64/75)
	~0,7 kg	(Option 4x8/50)
	~0,8 kg	(Option 4x8/75)
Environmental conditions	ETS 300019 Part 1-3 Class 3.1	

1+1 Redundancy Options

In the following “Xx” stands either for Rx or Tx; and “zz” is used either for 50 Ohm or 75 Ohm.

RF Specifications

Frequency range	47...862 MHz	(Option 44/zz/Xx)
	950...2150 MHz	(Option 45/zz/Xx)
Impedance, connectors	50 Ohm, SMA (f)	(Option 45/50/Xx)
	75 Ohm, precision F (f)	(Option 44/75/Xx, Option 45/75/Xx)
Additional insertion loss	<2 dB	(Option 44/zz/Rx, Option 45/zz/Rx)
	<4 dB ±1 dB	(Option 44/zz/Tx, Option 45/zz/Tx)
Switching cycles	>10E6 (no DC)	(Option 44/zz/Rx, Option 45/zz/Rx)

General Specifications

Weight	~0,3 kg
Environmental conditions	ETS 300019 Part 1-3 Class 3.1

Technical Data (cont.)

n+1 Redundancy Kits for DEV 7103

The “n” in n+1 in the following table stands for 2, 4, 6, or 8; and “Xx” stands either for Rx or Tx.

RF Specifications

Number of signal channels (n) per redundancy kit	2, 4, 6, or 8	
Frequency range	950...2150 MHz	
Impedance, connectors	50 Ohm, SMA (f)	(Option 47/50/n+1/Xx)
	75 Ohm, precision F (f)	(Option 47/75/n+1/Xx)
Return loss (signal path)	>16 dB	(Option 47/50/n+1/Xx)
	>14 dB	(Option 47/75/n+1/Xx)
Additional insertion loss (signal path)	<2 dB	(Option 47/50/n+1/Xx)
	<2,5 dB	(Option 47/75/n+1/Xx)
Additional insertion loss (redundancy path)	<7 dB	
Isolation between input ports	>50 dB	
Switching cycles	>10E6 (no DC)	

General Specifications

Weight	~0,9 kg	(Option 47/50/2+1/Xx)
	~1,2 kg	(Option 47/75/2+1/Xx)
	~1,4 kg	(Option 47/50/4+1/Xx)
	~2,1 kg	(Option 47/75/4+1/Xx)
	~2,1 kg	(Option 47/50/6+1/Xx)
	~2,9 kg	(Option 47/75/6+1/Xx)
	~2,7 kg	(Option 47/50/8+1/Xx)
	~3,6 kg	(Option 47/75/8+1/Xx)
Environmental conditions	ETS 300019 Part 1-3 Class 3.1	

Order Information

Optribution Chassis

DEV 7101	Optribution Chassis 1 RU
Option 59	CPU for DEV 7101
DEV 55-0129	Blanking Plate (to cover an empty slot)
DEV 7103	Intelligent Optribution Chassis 3 RU
DEV 7123	Optribution Chassis 3 RU
Option 17	Supply Voltage 190...240V AC
Option 18	Supply Voltage 90...120V AC
DEV 12-0013	Additional Power Supply Module for DEV 7103/DEV 7123
DEV 14-0018	Optical to Ethernet Converter Module for DEV 7103
DEV 7104	Intelligent Optribution Chassis 4 RU
DEV 12-0020	Additional Power Supply Module DEV 7104

Optical Transmitter Modules

DEV 7211	Optical Transmitter Module L-Band
DEV 7212	Optical Transmitter Module Extended L-Band
DEV 7221	Optical Transmitter Module CATV-Band
Option 08	Optical Connector E2000/HRL
Option 09	Optical Connector SC/APC

Optical Receiver Modules

DEV 7311	Optical Receiver Module L-Band
DEV 7312	Optical Receiver Module Extended L-Band, MGC
DEV 7313	Optical Receiver Module Extended L-Band, MGC/AGC
DEV 7321	Optical Receiver Module CATV-Band
Option 08	Optical Connector E2000/HRL
Option 09	Optical Connector SC/APC
Option 37	Short distance option for optical links (less than 10 km) (DEV 7312, DEV 7313 only)
Option 43	Second RF Output (DEV 7311, DEV 7312, DEV 7313 only)

Optical Splitter Modules

DEV 7512	Optical 1:2 Splitter Module, 1310 nm
DEV 7514	Optical 1:4 Splitter Module, 1310 nm
DEV 7518	Optical 1:8 Splitter Module, 1310 nm
Option 08	Optical Connector E2000/HRL
Option 09	Optical Connector SC/APC

Cabling Options

Option 40	Cabling for 1 (DEV 7101 / DEV 7104) or 4 (DEV 7103 / DEV 7123) Optical Module(s), 50 Ohm, SMA connector(s)
Option 41	Cabling for 1 (DEV 7101) or 4 (DEV 7103 / DEV 7123) Optical Module(s), CATV-Band, 75 Ohm, precision F connector(s)
Option 42	Cabling for 1 (DEV 7101 / DEV 7104) or 4 (DEV 7103 / DEV 7123) Optical Module(s), L-Band, 75 Ohm, precision F connector(s)
Option 43	Cabling for the 2 nd RF Output of 1 (DEV 7101 / DEV 7104) or 4 (DEV 7103 / DEV 7123) Optical Receiver Module(s), Impedance/Frequency Range corresponding to Primary Cabling ³

Order Information (cont.)

Distribution Options for DEV 7101 / DEV 7104 ²

The "Y" in Y/50 or Y/75 in the following is used as a placeholder which can be 8, 16 ³, 32 ³, 64 ³ or 128 ³; the number is to be specified for the order!

Option Y/50	1:Y, outputs: 50 Ohm, SMA connectors
Option Y/75	1:Y, outputs: 75 Ohm, precision F connectors

Matrix Switch Options for DEV 7104

The "Y" in 4xY/75 in the following is used as a placeholder which can be 16, 32 ³, 48 ³ or 64 ³; the number is to be specified for the order!

Option 4xY/75	4 inputs and Y outputs with 75 Ohm precision F connectors
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Combinations of Option 8/50 or 8/75 with Option 4x16/75 or 4x32/75 are possible ³

1+1 Redundancy Options ⁴

The "Xx" in the following stands either for Rx or Tx; this is to be specified for the order!

Option 44/75/Xx	Redundancy 1+1 Xx, CATV-Band, 75 Ohm, precision F connectors
Option 45/50/Xx	Redundancy 1+1 Xx, L-Band, 50 Ohm, SMA connectors
Option 45/75/Xx	Redundancy 1+1 Xx, L-Band, 75 Ohm, precision F connectors

n+1 Redundancy Kits for DEV 7103 ⁵

The "n" in n+1 in the following is used as a placeholder which can be 2, 4, 6 or 8; "Xx" stands either for Rx or Tx; both is to be specified for the order!

Option 47/50/n+1/Xx	Redundancy Kit n+1 Xx, L-Band, 50 Ohm, SMA connectors
Option 47/75/n+1/Xx	Redundancy Kit n+1 Xx, L-Band, 75 Ohm, precision F connectors

Remarks

- ¹ Not in combination with DEV 7123 and with DEV 7101 without Option 59.
- ² Distribution options for the DEV 7101 are possible with 8 outputs (up to two times) or with 16 outputs (once) only.
- ³ Option 43 needs to be ordered for an optical receiver module accordingly.
- ⁴
 - 1+1 redundancy options can be applied once per DEV 7101 and up to six times for a chassis DEV 7103/DEV 7123.
 - 1+1 redundancy options for a DEV 7123 can be applied for the Tx side only.
 - 1+1 redundancy options are not available for the DEV 7104.
 - It is not possible to have mix of optical paths with and without redundancy within one chassis.
 - The only permissible mixed (Tx and Rx) 1+1 redundancy configuration within a DEV 7103 chassis is the configuration 2 * 1+1 Tx plus 2 * 1+1 Rx.
 - Option 43 can not be ordered in combination with a redundancy option for the DEV 7103.
- ⁵
 - n+1 redundancy kits can be applied once per chassis.
 - It is not possible to have mix of optical paths with and without redundancy within one chassis.
 - Option 43 can not be ordered in combination with a redundancy option.

Contact

DEV Systemtechnik GmbH & Co. KG
 Grüner Weg 4A
 D-61169 Friedberg
 Tel.: +49 (0) 6031 18999-0
 Fax: +49 (0) 6031 18999-15
 E-Mail: info@dev-systemtechnik.com
 URL: <http://www.dev-systemtechnik.com>

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