
Fiberoptic Products
Precise Connection
Fiberoptic Passive Components
Fiberoptic Active Components
Fiberoptic Special Components
Fiberoptic Equipments
Fiberoptic LAN, WAN Products
Fiberoptic Polishing Machine
Fiberoptic Passive Components:
PLC Splitters
Excellent for FTTx network architecture
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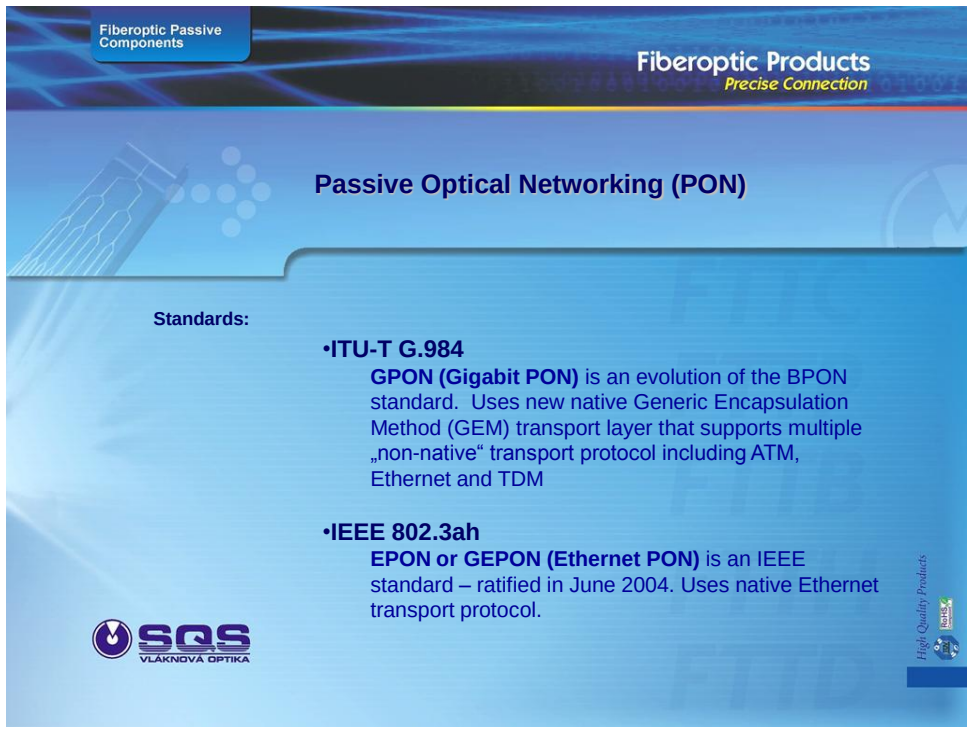
High Quality Products


Fiberoptic Passive Components
Fiberoptic Products
Precise Connection
Passive Optical Networking (PON)
Standards:
•ITU-T G.984
GPON (Gigabit PON) is an evolution of the BPON standard. Uses new native Generic Encapsulation Method (GEM) transport layer that supports multiple „non-native“ transport protocol including ATM, Ethernet and TDM
•IEEE 802.3ah
EPON or GEPON (Ethernet PON) is an IEEE standard – ratified in June 2004. Uses native Ethernet transport protocol.
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Passive Optical Networking - GPON

GPON (Gigabit PON) :

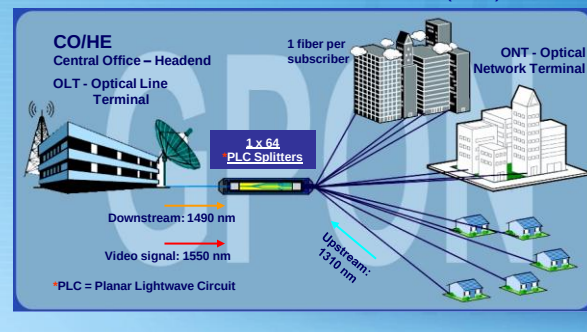
Operating Wavelength Range:

- **1310 nm** (data/voice upstream signal)
- **1490 nm** (data/voice downstream signal)
- **1550 nm** (video signal)

•GPON

-Defined in ITU G.984.2
-2.488 Gb/s Downstream
-1.244 Gb/s Upstream

-Logical reach: up to 60 km
-Split ratio up to 1:128
-Security: Advanced Encryption Standard (AES)



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Passive Optical Networking - EPON

EPON or GEPON (Ethernet PON) :

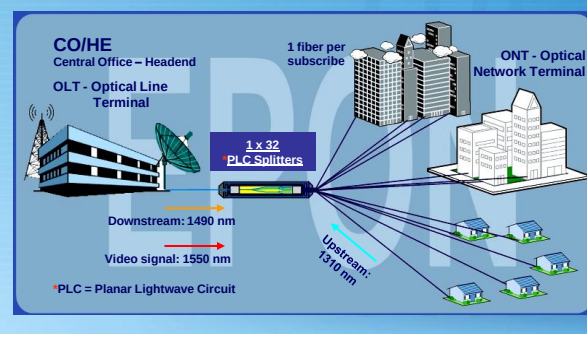
Operating Wavelength Range:

- **1310 nm** (data/voice upstream signal)
- **1490 nm** (data/voice downstream signal)
- **1550 nm** (video signal)

•EPON

-Defined in IEEE 802.3ah
-1.25 Gb/s Downstream
-1.25 Gb/s Upstream

-Logical reach: up to 20 km
-Split ratio up to 1:32
-Security: not defined



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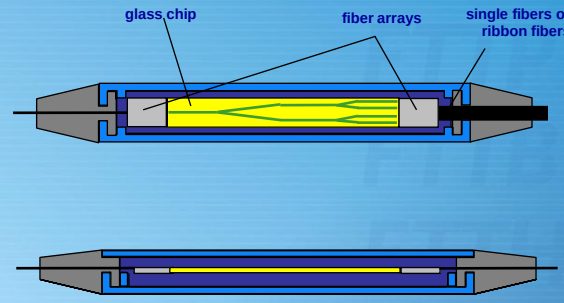
PLC Splitter - packaging

Basic parts:



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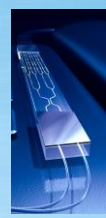
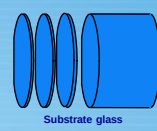
PLC splitters Manufacturing

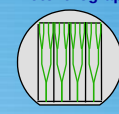
Technological base:



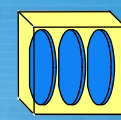
1. Wafer cutting, polishing



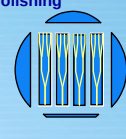
2. Mask design and Photolithography



3. Chip manufacturing (A-C)



4. Chip cutting and polishing



5. FA manufacturing and chip coupling

6. Splitter testing and packaging

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Mask design

Technology:

Primitive

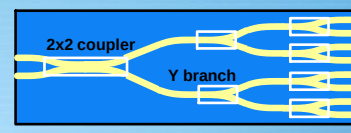
straight waveguide

Y branch
ratio: 5:95 - 50:50

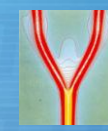
bended waveguide segment

directional coupler
ratio: 50:50

Layout on 2´´ or 3´´ wafer



Example for a waveguide simulation



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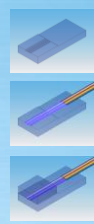
V-Grooves & Fiber Arrays - manufacturing

Design of fiber arrays:

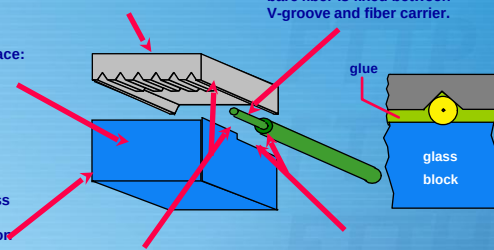


V-groove array:
precise fiber alignment

fiber stress release:
bare fiber is fixed between V-groove and fiber carrier.

fiber chip interface:
special glue

glue



fiber carrier: glass for optimum thermal expansion matching.

assembling:
glue is used to connect V-groove array and fiber carrier.

Fiber bending:
Fixation of the coated fiber in the array preserves the bare part of the fiber from damage.

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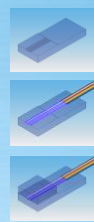
V-Grooves & Fiber Arrays - parameters

V-Grooves & Fiber Arrays:



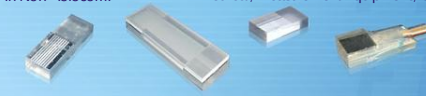
Specification :

Fiber Arrays		Unit
Types available :	from Single Channel up to 64 Channels	
Material :	Glass (Quartz, Pyrex or Tempax), Silicon, Ceramic	
Pitch :	127, 250 or Custom	µm
Fiber :	SM, MM and special fiber	
Polished end face :	flat or angled 8° + /- 0.2 and better or customer specified	
*Fiber Core Offset :	< 0,5	µm
**PM version		
Angle deviation :	± 3° (±1,5°)	
Extinction ratio :	≥ 25	dB
*Fiber Core Offset :	< 1,0	µm

* The distance between each actual and ideal core position
** Fiber type: for wavelength 1310/1550 nm

Applications :

In Telecom:	FTTH, AWG packaging
In Non- Telecom:	Medical, Measurement Equipment, Sensors



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PLC Splitter - characteristics

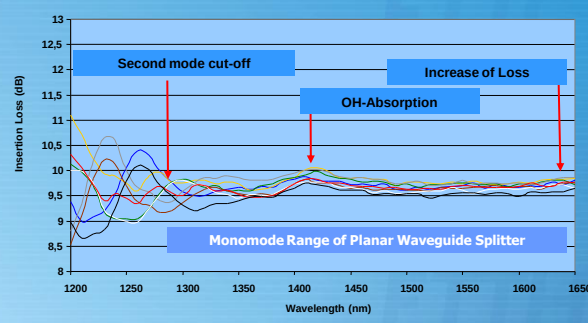
Optical characteristics:

Splitter models:

1xN, 2xN PLC Splitters
Asymmetric Splitters
Multiple Monolithic Splitters

Customized mask design

available cut-off wavelengths:
λ= 480 nm, 630 nm, 850 nm, 980 nm, 1060 nm, 1260 nm



Application: FTTx Networks, Analog/Digital Passive Optical Networks, CATV Networks, Medical, Chemistry, Instrumentation sensors, Test equipments, Photonics

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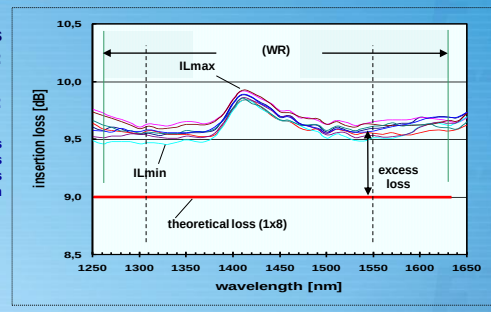
PLC Splitter - characteristics

Parameters definition:

Splitter models:

1xN, 2xN PLC Splitters
Asymmetric Splitters
Multiple Monolithic Splitters
Customised mask design



Wavelength Ranges (WR):
WR : 1260nm -1650nm

Insertion Loss (RT):
Max/Min IL(WR)

Uniformity:
Umax=ILmax-ILmin
Over whole WR

Temperature dependet Loss (TDL):
ΔIL (T) t=-40°C - +85°C

Polarisation dep. Loss (PDL):
PDL=ILmax(POL) – ILmin (POL)
POL: All states of polarization

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IL: **Remember the IL mentioned in the table is max. value valid over full operating wavelengths and temperature range for all states of polarization. The uniformity is defined over the whole wavelength range !!!**

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PLC Splitters

1xN PLC Splitters:
1x2, 1x3, 1x4, 1x6, 1x8, 1x12x, 1x16, 1x24 1x32, 1x64, 1x128

2xN PLC Splitters:
2x2, 2x4, 2x8, 2x16, 2x32

housing material nickel plated brass
44 x 4 x 4 mm

Optical Specification 1xN:												Unit
Configurations :	1x2	1x3	1x4	1x6	1x8	1x12	1x16	1x24	1x32	1x64	1x128	
* Insertion Loss max. :	3.9	6.2	7.4	9.3	10.8	13.0	14.1	16.5	17.3	21.0	25.3	dB
* Insertion Loss typ. :	3.5	5.8	6.9	9.0	9.8	12.6	13.5	15.9	16.5	20.0	23.5	dB
Uniformity max. :	0.5	0.6	0.6	0.8	1.0	1.2	1.3	1.5	1.6	2.0	2.8	dB
Polarization Dependent Loss :						< 0.15					< 0.2	dB
Optical Specification 2xN:												
Configurations :				2x2	2x4	2x8	2x16	2x32				
* Insertion Loss max. :				5.0	8.0	11.0	14.5	17.5				dB
* Insertion Loss typ. :				4.3	7.5	10.5	13.8	17.0				dB
Uniformity max. :				1.2	1.3	1.5	2.0	2.0				dB
Polarization Dependent Loss :					≤ 0.2			≤ 0.3				dB
Return Loss :						> 55						dB
Directivity :						≥ 55						dB
Wavelength range :						1260 - 1650						nm

*Note: Valid over full operating wavelengths and temperature ranges for all states of polarization.

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Fiberoptic Passive Components

Fiberoptic Products
Precise Connection

PLC Splitters

1xN PLC Splitters:
1x2, 1x3, 1x4, 1x6, 1x8, 1x12x, 1x16, 1x24 1x32, 1x64, 1x128

2xN PLC Splitters:
2x2, 2x4, 2x8, 2x16, 2x32

housing material nickel plated brass
44 x 4 x 4 mm

Mechanical Specification		Unit
**Fiber type :	SM fiber (G652d, G657a)	
Standard length of fiber :	1	m
Dimension :	69x10x5.6 / 67x19,5x7 / 64,5x31,5x6	mm
	53x7x4 / 50x15x6 / 44x4x4	

Environmental Specification		Unit
Operating temperature :	- 40 to + 85	°C
Storage temperature :	- 40 to + 85	°C

Specifications are subject to change without notice !

Housing material & dimension :

- plastic (black, blue): 69x10x5,6 mm configurations: 1x2, 1x4 , 1x8, 1x16, 1x32
- aluminium: 67x19,5x7 mm (for cassette Teco) configurations: 1x128
- aluminium: 64,5x31,5x6 mm (for cassette Corning) configurations: 1x128
- nickel plated brass: 53x7x4 mm configuations 1x32
- plastic (black): 50x15x6 mm configuations 1x64
- nickel plated brass: 44x4x4 mm configuations 1x2, 1x4, 1x8, 1x16

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Performance and Reliability Testing

Based on Telcordia 1209 and 1221:

Environmental Tests
(Damp Heat, Cold and Hot Storage, Temperature Cycling)

Damp Heat Test 2000 hrs Test Conditions	
Temperature	+85° C
Humidity	85% RH
Duration	2000 hrs
IL	monitored in-situ
Wavelength	1310 nm + 1550 nm
Specified maximum Δ IL	± 0.50 dB

Mechanical Tests
(Vibration, Twist, Pull)

Vibration Test Test Conditions	
Frequency range	10 … 2000 Hz
Amplitude	1.52 mm
Sweep time	10 Hz - 2000 Hz - 10 Hz in 20 min
Number of sweeps	12 per axis
Direction	3 perpendicular axes
IL	before, after
Wavelength	1310 nm + 1550 nm
Specified maximum Δ IL	± 0.50 dB

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Performance and Reliability Testing

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Test Report
QM – 017/06

Table of Contents

2 Test Equipment

	Device	Type	Manufacturer	Inventory No.
1	Optical multimeter	HP 8153A	Hewlett Packard	SN 2946G02683
3	Power meter	Molectron PM3	Molectron	No.01276 01
4	Power meter	RT-150 CHD	Laser Precission Corp.	SN: 0522466
5	EDFA	OAB 1552	JDSU	SN 126E0047

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Performance and Reliability Testing

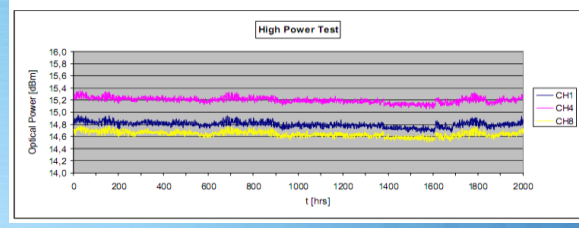
3 Test Specification and Results

3.1 High Power Test

Test Conditions:

- Saturated output power [P] 25,2 dBm
- Operating wavelength 1552,12 nm
- Power monitoring period 1 hour
- Duration 2000 hrs

Test Results:



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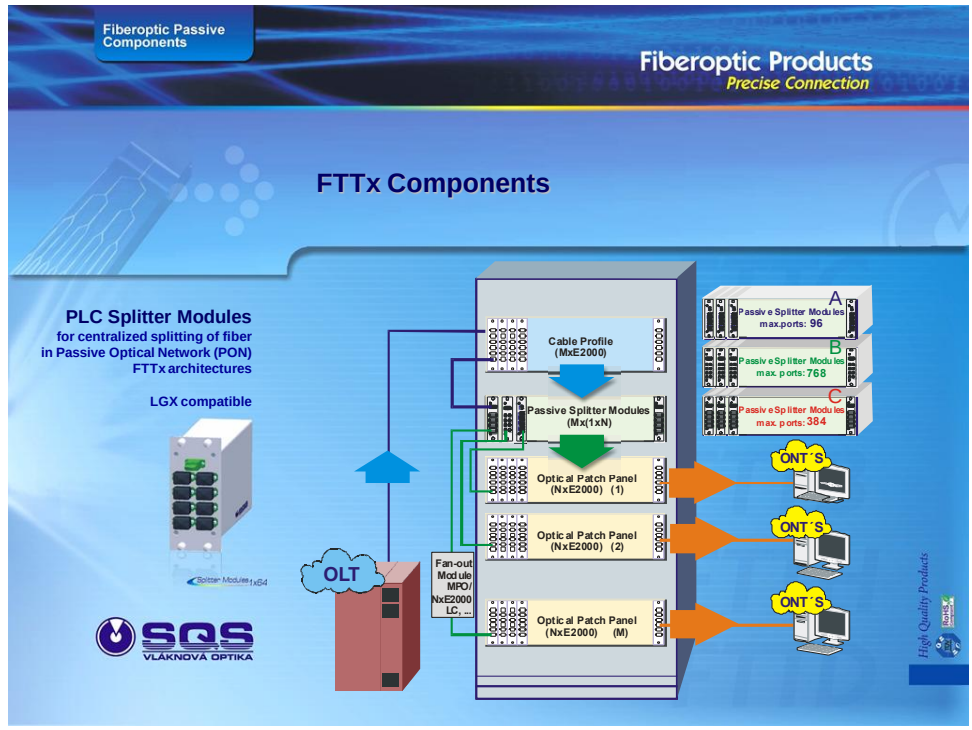
Fiberoptic Passive Components
Fiberoptic Products
Precise Connection
FTTx Components
PLC Splitter Modules
for centralized splitting of fiber
in Passive Optical Network (PON)
FTTx architectures
LGX compatible
Cable Profile (MxE2000)
Passive Splitter Modules (Mx(1xN)
Optical Patch Panel (NxE2000) (1)
Optical Patch Panel (NxE2000) (2)
Optical Patch Panel (NxE2000) (M)
Fan-out Module MPO/ NxE2000 LC, ...
OLT
A
Passive Splitter Modules max.ports: 96
B
Passive Splitter Modules max. ports: 768
C
Passive Splitter Modules max. ports: 384
ONT´S
ONT´S
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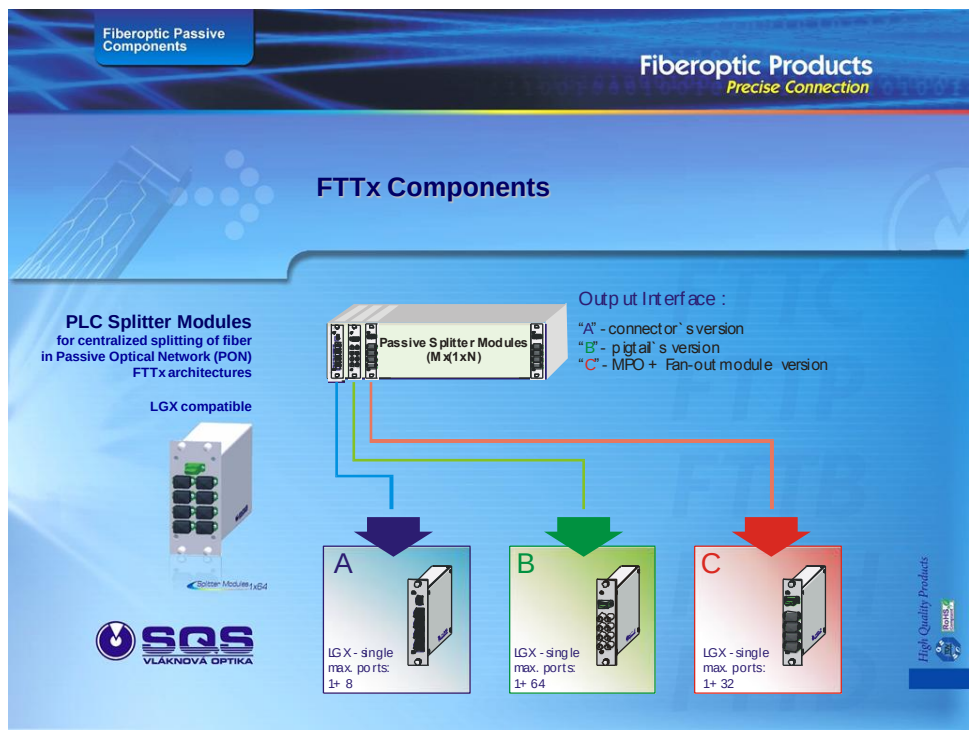
Fiberoptic Passive Components
Fiberoptic Products
Precise Connection
FTTx Components
PLC Splitter Modules
for centralized splitting of fiber
in Passive Optical Network (PON)
FTTx architectures
LGX compatible
Passive Splitter Modules (Mx(1xN)
Output Interface :
"A" - connector`s version
"B" - pigtail`s version
"C" - MPO + Fan-out module version
A
LGX - single
max. ports:
1+ 8
B
LGX - single
max. ports:
1+ 64
C
LGX - single
max. ports:
1+ 32
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Fiberoptic Passive Components

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- Regular housing, I/O ribbon fiber 250um

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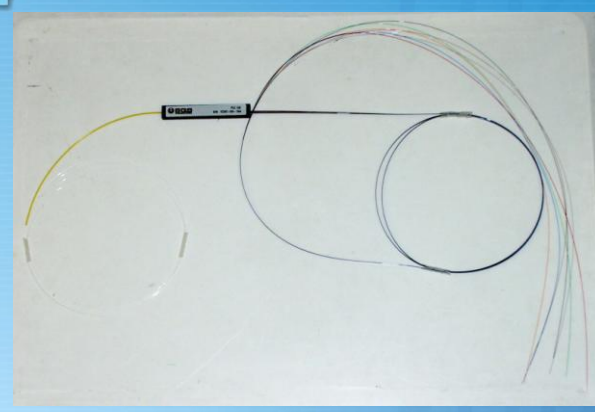
- Regular housing, I/O de-ribbonized Leads 250um



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Fiberoptic Passive Components

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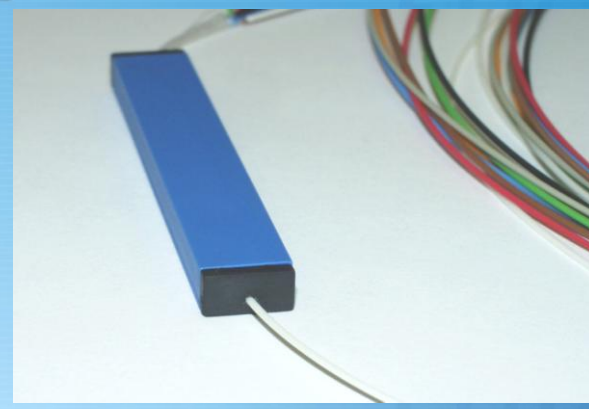
- Regular housing, Input fiber 900um



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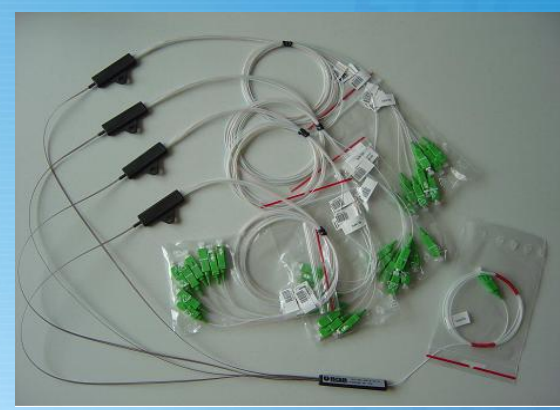
- Regular housing, FOB interface (900um fiber / 2,0mm Cable)



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- Splice Tray cassette storage, I/O Ribbon 250um

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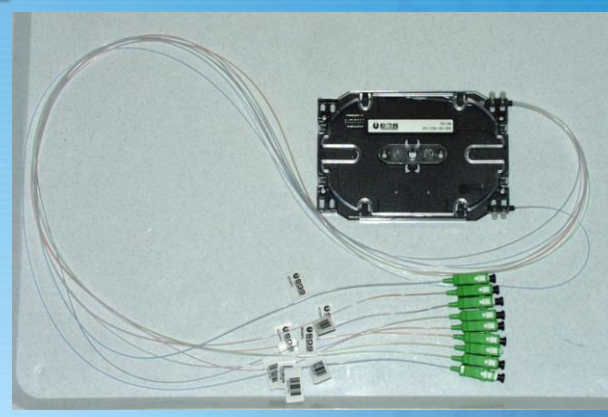
- Splice tray storage, Input & Output buffered fiber 900um



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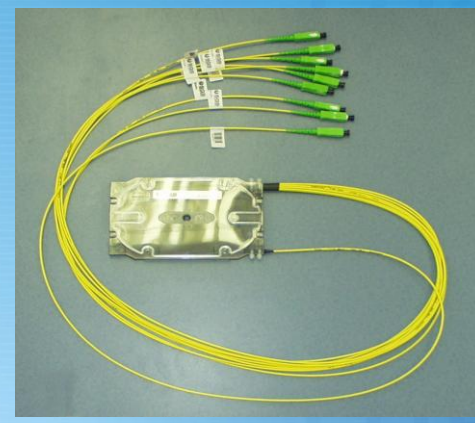
- Splice Tray storage, Output cable fiber 2,0mm



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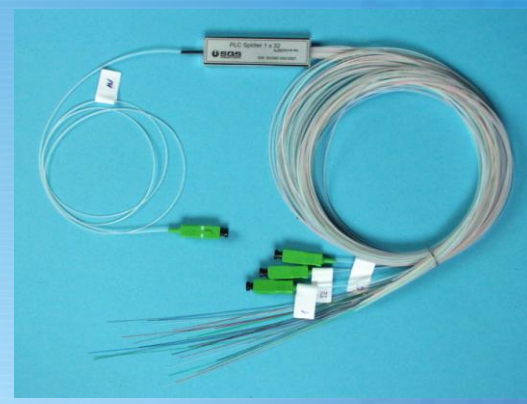
- Special housing, I/O buffered fiber 900um



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- Special housing, I/O cable 2,0mm

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- LGX cassette design, I/O bufered fiber 900um

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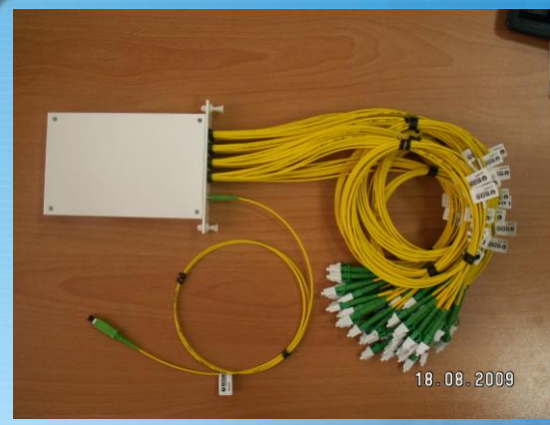
- LGX Cassette design, I/O cable 2,0mm



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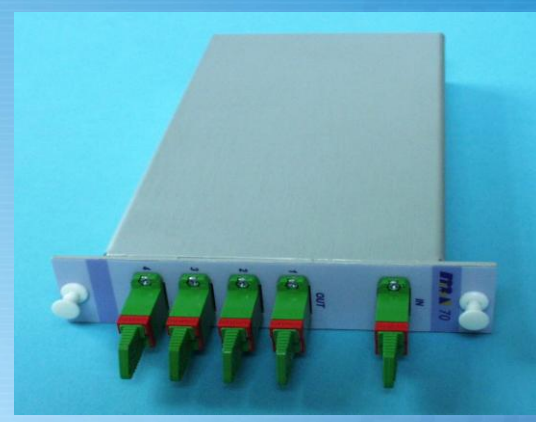
- LGX Cassette design, Optical connector interface



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- LGX Cassette design, MPO optical interface

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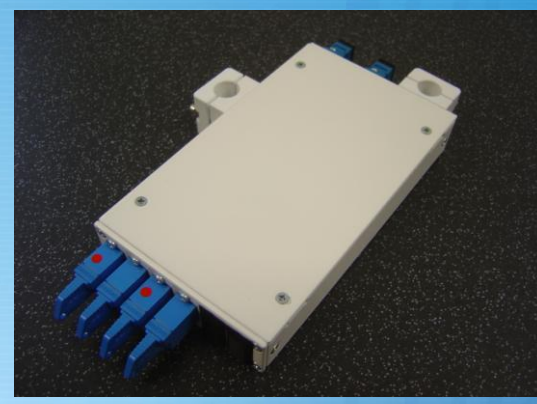
Precise Connection

- Special Cassette design, XX connector interface



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Fiberoptic Passive Components

Fiberoptic Products
Precise Connection

- Special Cassette design, XX connector interface

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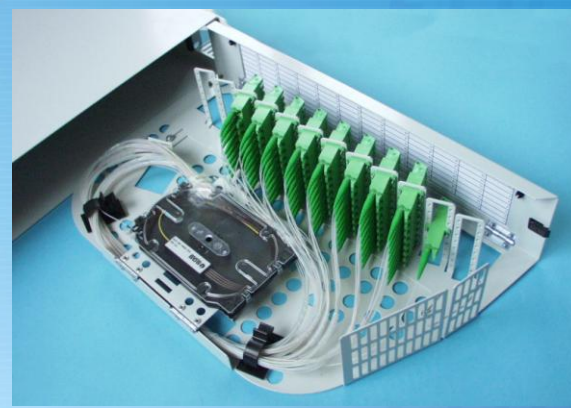
- 19“ modules with optical connector interface



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- 19“ Modules with optical connector interface

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US FED STD 209E cleanroom standards

SQS Cleanrooms / Photo gallery

- **ISO14644-1**
- **FED STD 209E**
- **Cleanroom Standards**

Class	maximum particles/m³						FED STD 209E
	≥0.1 µm	≥0.2 µm	≥0.3 µm	≥0.5 µm	≥1 µm	≥5 µm	equivalent
ISO 1	10	2					
ISO 2	100	24	10	4			
ISO 3	1000	237	102	35	8		Class 1
ISO 4	10000	2370	1020	352	83		Class 10
ISO 5	100000	23700	10200	3520	832	29	Class 100
ISO 6	1,000,000	237000	102000	35200	8320	293	Class 1000
ISO 7				352000	83200	2930	Class 10,000
ISO 8				3,520,000	832000	29300	Class 100,000
ISO 9				35,200,000	8,320,000	293000	Room air

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Conclusion:
PLC splitters made by SQS Vlaknova optika a.s.

- **Integrated splitter modules**
  (cassettes, connectors)
- **Clearly defined parameters**
  (ILmax, uniformity)
- **Ideal location in the Centre of Europe**
  (Czech Republic)
- **High level of technical support**
- **Complete in house testing solution**
  (Spectrometers, temperature chambers, FA geometry measuring devices, etc.)
- **Reasonable price**

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