

# FSP 3000: secure optical transport

BSI-approved for transport of classified data up to VS-V level

## Benefits

- Scalability**  
 Ultra-high speed wavelengths with up to 800Gbit/s per single-port line interface; 38.4Tbit/s duplex capacity per fiber pair with best-in-class metrics; up to 3.6Tbit/s duplex capacity per IRU chassis
- Flexibility**  
 From complete turnkey systems including all equipment necessary for end-to-end transport applications to disaggregated solutions
- Pay-as-you-grow design**  
 Modular and scalable architecture that ensures both low initial cost and flexibility into the future
- Fully open and programmable**  
 Open line system (OLS) architecture and YANG-based APIs (OpenConfig) for network disaggregation and easy integration into SDN-based environments
- Dynamic and scalable optical layer**  
 Multiple ROADM options from metro-optimized 2-degree ROADM to multi-degree ROADM for flexgrid optical layer
- ConnectGuard™ encryption technology**  
 Certified Layer 1 data encryption, approved by BSI for transport of classified data up to German "VS-V" or "NATO confidential"

## Overview

**Today's optical transport demands are constantly changing.** High-bandwidth services and cloud-based applications are booming and software-defined networking is evolving to the domain of transport networks. Network operators, enterprises, public authorities and critical infrastructure need a flexible and scalable solution that increases agility and automation, while keeping cost and footprint at a minimum.

Our FSP 3000 is a scalable optical transport solution designed to efficiently deal with this new environment, lowering its complexity and minimizing cost-per-bit and operational efforts. With an open and modular design, our FSP 3000 supports a wide range of services and applications, from data center interconnect (DCI) to carrier-optimized infrastructure solutions. Incorporating the latest innovation in photonic networking and our innovative ConnectGuard™ low-latency encryption technology, FSP 3000 enables secure optical network solutions that can scale and accommodate tomorrow's needs. Moreover, with a high-density and energy-efficient design for smallest footprint and power consumption, our FSP 3000 meets the most stringent sustainability requirements.



# FSP 3000: SECURE OPTICAL TRANSPORT

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## High-level technical specifications

### General information

- Up to 38.4Tbit/s duplex capacity per fiber pair
- Point-to-point, ring and mesh topologies with optional protection mechanisms
- Open line system
- Flexgrid support
- Ensemble Controller and open APIs for mgmt. and control

### Services

- Wide range of native service types: Ethernet, OTN, SONET/ SDH, ESCON, Fibre Channel, FICON, Coupling Link, Infiniband, audio and video
- Continuous data rate support from 100Mbit/s to 425Gbit/s

### Terminals

- Fixed line ( $\leq 100$ Gbit/s) and SW-defined ( $> 100$ Gbit/s) transponders/muxponders
- Up to 400Gbit/s per 1-slot card
- Up to 1.2Tbit/s per channel
- Up to 3.6Tbit/s per 1RU chassis
- 400 / 1200Gbit/s OTN switches
- 10Gbit/s QSFP-based service multiplexer (MicroMux™)

### Photonic layer architectures

- DWDM: up to 128 channels
- CWDM up to 16 channels
- Hybrid CWDM + DWDM
- Wide variety of filters and ROADMs options up to 32 degree
- Coherent and direct detection (PAM4) based solutions
- Optimized OLS for 400G ZR DCI
- OTC and OTDR (ALM)

### ConnectGuard™ encryption

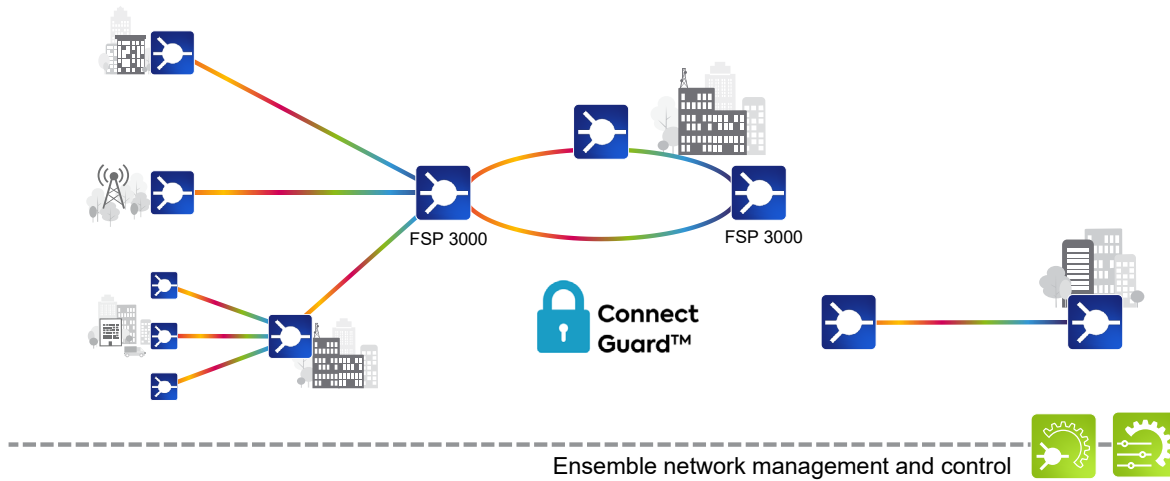
- Layer 1 AES-256 encryption with ultra low latency and 100% throughput
- Dynamic key exchange  $\leq 4096$  bit keys every minute
- FIPS 140-2 and CC EAL-2 certified. BSI approved
- Quantum-safe encryption via PQC or third-party QKD attach

### Power and environmental

- Highest energy efficiency, TEER-proven Eco design
- Redundant power supplies for -48VDC or 100-240VAC PSUs
- Variety of active and passive chassis from 1RU to 12RU; 19in/ETSI/NEBS rack mounting

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## Applications in your network



### End-to-end network infrastructure

- Scalable system architecture for cost-effective access, metro and backbone optical network infrastructure
- Built-in access for optical timing channel (OTC) and OTDR (ALM)

### DCI for cloud and business continuity applications

- Terascale data center connectivity
- Open hardware architecture and YANG-based software (OpenConfig) modelling for easy integration into SDN-based environments

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## Product specifications

### Wavelength technologies

- CWDM: 16 wavelengths/20 nm according to ITU-T G.694.2
- DWDM schemes
  - 4, 8, 16, 40 channel, C-band, 100 GHz spaced
  - 80-channel, C-band, 50 GHz spaced
  - 96-channel, C-band, 50 GHz spaced
  - 128-channel, C-band, 37.5 GHz spaced
  - Flexgrid with down to 6.25 GHz channel width granularity
- Hybrid CWDM/DWDM

### Topologies

- Point-to-point
- Point-to-multipoint
- Linear add/drop
- Multiplexed add/drop (drop and continue)
- Ring (+ feeder + dual homing)
- Hubbed-ring
- Meshed

### Maximum distance

- Total optical transparent distance (without regeneration) >3500km
- Maximum span budget: 50dB with full channel load and beyond 70dB with adapted capacity

### Services

- Ethernet: FE, GbE, 10GbE (LAN and WAN), 25GbE, 40GbE, 100GbE and 400GbE
- ESCON and Fibre Channel/FICON 1Gbit/s, 2Gbit/s, 4Gbit/s, 8Gbit/s, 10Gbit/s, 16Gbit/s and 32Gbit/s
- InfiniBand 5G and 10G
- STM-1, -4, -16, -64 / OC-3, -12, -48, -192
- OTU-1, -2, -3 and -4
- Uncompressed video (SD-SDI, HD-SDI, 3G-SDI)
- CPRI up to 10Gbit/s

### Service protection

- Versatile protection
- Channel protection
- Path protection
- Channel card protection
- Client layer protection

### Channel modules with fixed line format

- Transponders (from 1G to 100G)
- Muxponders (aggregating services in the range from 100M to 40G)
- Add/drop multiplexers (dynamic routing of sub-aggregate traffic 100M to 40G services)
- OTN switch (for 10G services)

### Channel modules with SW-defined line optics

- Transponders (from 100G to 400G)
- Muxponders (aggregating services in the range from 10G to 400G)
- Add/drop multiplexers (dynamic routing of sub-aggregate traffic 10G to 100G)
- OTN switch (for sub-aggregated services from 10G to 100G)

### Optical layer

- Fixed filter from 1 to 128 channels WDM
- Reconfigurable optical add/drop modules (ROADM) from 1 to 32 degrees with multiple fixed, colorless, directionless and contentionless add/drop structures
- Multiple amplifications solutions using Erbium fiber and/or Raman amplifiers
- Automated optical layer with channel equalization and span loss equalization
- Optical supervisory functions like optical channel monitoring with full support of third-party wavelengths
- Tailored solutions for access, metro and regional/long-haul
- Dedicated amplifier suite for direct detect and coherent signals (like SmartAmp™ designed for PAM4 solutions)
- Dedicated OLS optimized for 400G ZR DCI links at over 25Tbit/s per fiber pair

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## Common equipment

- 1RU, 2RU, 3RU, 4RU, 7RU, 9RU and 12RU shelf variants
- Power supply modules from 50 to 1200W (AC, DC, full redundant)
- Various controller modules (from compact to redundant and high performance)
- Multiple management interfaces (USB, RJ45, digital IO-housekeeping)

## Equipment management

- Embedded CRAFT/CLI
- Embedded web-based graphical user interface with “point and click” provisioning via HTTPS
- Full support of SNMP, TLI, REST, NETCONF (OpenConfig)
- Streaming telemetry (gRPC)
- Full support of FTP, SFTP, SCP, SSH, TELNET
- Remote authentication via RADIUS or TACACS+
- Equipment management using DCN or in-band management tunnels
- Enhanced user management with multiple security options
- Zero-touch provisioning methods using automated set-up, scripting environment like Ansible and network-wide profile management
- Use of augmented reality and equipment identification for guided installation and fault identification

## Laser safety

- Class 1M laser product with hazard Level 1M

## Environmental

- Standard temperature (operating): +5°C to +40°C
- Extended temperature active (operating): -40°C to +65°C
- Extended temperature passive: -40°C to 85°C
- Relative humidity (non-condensing): 5% to 85% (operating) / 5% to 90% (short-term)
- Outdoor enclosures for passive components

## Regulatory compliance

- NEBS level 3
- Transport and storage:
- ETS 300-019-1-2 class 1.2 and 2.3
- Operation: ETS 300-019-1-3 class 3.1
- Laser safety: IEC 60825-1, IEC 60825-2, ITU-T G.664-2012
- EMC: CISPR 22, CISPR 24
- Product safety: IEC 60950-1
- RoHS 10: directive 2011/65/EU and Commission Delegate Directive (EU) 2015/863
- WEEE: directive 2012 / 19 / EU, EN 50419:2006
- IP20. Use in a pollution degree 2 environment and indoor controlled office environments only
- CE, FCC, NRTL, VCCI
- WCAG 2.0 certification for embedded web GUI
- Eco design ISO-14001:2015 certified

