FSP 3000
Open and future-proof terascale optical transport

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 and enterprises 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.

Your 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 1RU 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 for German government (“VS-V”) and NATO-restricted (“NATO confidential”) data transport
### High-level 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 (<=100Gbit/s) and SW-defined (>100Gbit/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 ROADM 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 <=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

### Applications in your network

#### Optical access
- Distance extension
- Optical demarcation
- Passive optical access

#### Network infrastructure
- Open metro and core infrastructure

#### Data center interconnect
- Hyperscale DCI
- Business continuity
- Disaster recovery

#### 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 are subject to change without notice or obligation.
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) >3500 km
- Maximum span budget: 50 dB with full channel load and beyond 70 dB with adapted capacity

Services
- Ethernet: FE, GbE, 10GbE (LAN and WAN), 25GbE, 40GbE, 100GbE and 400GbE
- ESCON and Fibre Channel/FICON 1 Gbit/s, 2 Gbit/s, 4 Gbit/s, 8 Gbit/s, 10 Gbit/s, 16 Gbit/s and 32 Gbit/s
- InfiniBand 5 G and 10 G
- 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 10 Gbit/s

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

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

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

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 400 G ZR DCI links at over 25 Tbit/s per fiber pair

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

Equipment management
- Embedded CRAFT/CLI
- Embedded web-based graphical user interface with “point and click” provisioning via HTTPS
- Full support of SNMP, TL1, 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
- Class1M 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
  - EMC: CISPR 22, CISPR 24
- Product safety: IEC 60950-1
- 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