Data sheet
Cisco public

Cisco NCS 1004 OTN-XPonder

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Video traffic continues to grow rapidly. It would take more than 5 million years to watch the amount of video that will cross global IP networks each month in 2021. Every second, a million minutes of video content will cross the network. Content Delivery Networks (CDNs) will carry 71 percent of Internet traffic by 2021. Content providers will need to scale their networks at speed to keep up with the demand for more video. Networks need to be designed with "webscale" in mind. A web-scale network needs to scale at deployment speed while being operationally simple. Cisco® Network Convergence System 1004 OTN-XPonder provides the largest flexibility to transport any kind of different services along with complete automation and real-time visibility to deliver a multipurpose/multifunctional card for a variety of different applications.

Product overview

The Cisco NCS 1004 OTN-XPonder (Figure 1) is a single-slot line card capable of supporting multiple functionalities thanks to the all-pluggable interface architecture.

Each NCS 1004 chassis provide four line card slots, and Cisco NCS 1004 OTN-XPonder can be placed in any of them to fill maximum capacity of the shelf (4x).



Figure 1.
NCS 1004 OTN Xponder Line Card

The Cisco NCS 1004 OTN-XPonder Line Card embeds a flexible core FPGA (Field Programmable Gate Array), which allows for support of multiple applications like Muxponder, Transponder, and OTN-Switch, pending future roadmap releases.

The line card features a large variety of different pluggable interfaces:

- 4x DD-QSFP56/QSFP28/QSFP+ ports (two of which can be used as a QSFP-DD trunk as an alternative to CFP2 DCO WDM) for 400GE, 100GE/OTU4, 32G/16G FC, or 10GE/OTU2/OTU2e clients
- 8x QSFP-28/QSFP+ ports for 100G, 32G/16G FC, or 10GE/OTU2/OTU2e clients
- 2x CFP2 DCO WDM for high-performance (with optional encryption) trunks (to be used instead of the DD-QSFP trunk)

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Different FPGA images will support different card configuration, pending SW roadmap availability.

Because of this, the line card is ready to support the following configuration:

1) “Grey Muxponder,” available in Cisco IOS®XR Release 7.2.1 and later.

   10x10G signals multiplexed onto an OTU4 Grey QSFP28. Up to two slices of the 10x10G Muxponder can be configured on the OTN Xponder line card.

   Two major use cases are addressed by such an application:

- Provide 10G fan out option to 1.2T Muxponder line card. In one NCS1004 chassis can be placed a 1x1.2T Muxponder configured (for example) with a 600G trunk multiplexing a 6xOTU4 coming from a 3xOTN-Xponder line card supporting 20x10G each. This configuration is providing 60x10G over a single 600G lambda in 2RU.
- Provide 10G to OTU4 demarcation for a customer who requires an OTN “grey” signal hands off to a third-party network. Up to a 4xOTN-Xponder can be placed in a single NCS 1004 chassis to support 80x10G over 8xOTU4 hands off.

2) In Cisco IOS®XR Release 7.3.1 OTN-XP is able to support 400G wavelengths with new CFP2 DCO at 400G on the following configurations:

- 2x400GE TXPs over 2x400G 16-QAM WDM lambdas. Supported 400G client type will be 400GE.
- 2x4x100G MXPs over 2x400G 16-QAM WDM lambdas. Supported 100G client types will be 100GE and OTU4.
- 1x400G TXPs + 1x4x100GE/OTU4 MXP over 2x400G WDM lambdas.

3) In Cisco IOS®XR Release 7.3.2 OTN-XP is able to support:

- 2x4x100G MXPs over 2x400G 16-QAM WDM lambdas over DD-QSFP56 ZR+ ports. Supported 100G client type is 100GE
- 40x10G MXP over1x400G WDM lambda over CFP2 DCO port
  - Hybrid configurations with mixed 10G and 100G are also supported (20x10G + 2x100G and 10x10G + 3 x 100G
  - Supported client rates are 10GE, OTU2 and OTU2e
- Inverse multiplexing for 400GE client over 2x200G CFP2 DCO trunk ports. This feature allows you to split the 400GE client signal and carry it over 2x200G trunks thereby increasing the ease of signal reachability.
- Support of up to 200G trunk rate with QPSK and 8QAM modulation using CFP2 DCO. This feature enhances the signal reachability with reduced noise and can support the 50GHz network.
- support up to 300G trunk rate with 8QAM modulation using CFP2 DCO

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4) In Cisco IOS®XR Release 7.5.1 OTN-XP is able to support:

- 2x400GE TXPs over 2x400G 16-QAM WDM lambdas over DD-QSFP56 ZR+ ports. Supported 400G client type is 400GE
- 2x3x100GE MXPs over 2x300G 8-QAM WDM lambdas over DD-QSFP56 ZR+ ports. Supported 100G client type is 100GE
- 2x2x100GE MXPs over 2x200G QPSK WDM lambdas over DD-QSFP56 ZR+ ports. Supported 100G client type is 100GE
- Additional Hybrid mode 10G/100G on CFP2 DCO trunk port:
  - 30x10G + 1 x 100G
  - 10x10G + 2 x 100G
  - 20x10G + 1 x 100G

5) In Cisco IOS®XR Release 7.5.2 OTN-XP will be able to support:

- 400G CFP2-DCO to CFP2-DCO regen configuration (OpenROADM complaint mode)
- 16G and 32G FC Muxponder configs.
- 2x100G MXPs over 200G 16-QAM OpenROADM configuration.
- 100G TXPs QPSK OFEC OpenROADM configuration.

Management

The Cisco NCS 1004 provides comprehensive management capabilities to support Operations, Administration, Maintenance, and Provisioning (OAM&P) capabilities through IOS-XR CLI, SNMP, syslog, and XML. In addition, iPXE for automated software download and Zero-Touch Provisioning (ZTP) for automated configuration download are available for simplified installation. For machine-to-machine configuration and management of NCS 1004, NETCONF, RESTCONF, and gRPC transport protocols with JSON, XML, and GPB encoding are provided. OpenConfig protocols for management GNMI and operations GNOI are also supported. The NCS 1004 provides a set of native YANG models as well as the ability to map into any industry standard or customer-defined YANG data models. For monitoring, NCS 1004 provides a streaming telemetry feature that relies on a push mechanism to disseminate user-selected PM and status information at user-specified frequencies at granular 10-second intervals. This improves monitoring speed and scale compared to traditional pull-based mechanisms such as SNMP. The telemetry infrastructure also allows for events such as alarms and port-state changes to be notified.

The NCS 1004 OTN-Xponder can be managed completely using CLI or XML.

OpenConfig is supported for 10x10G Grey Muxponder configuration. The reference model names “openconfig-terminal-device.yang.

The line card supports General Communication Channel (GCC) for remote management and, in future, IKEv2:

- The line card supports up to 46 GCCs.
- GCC0 is supported for both client and trunk.

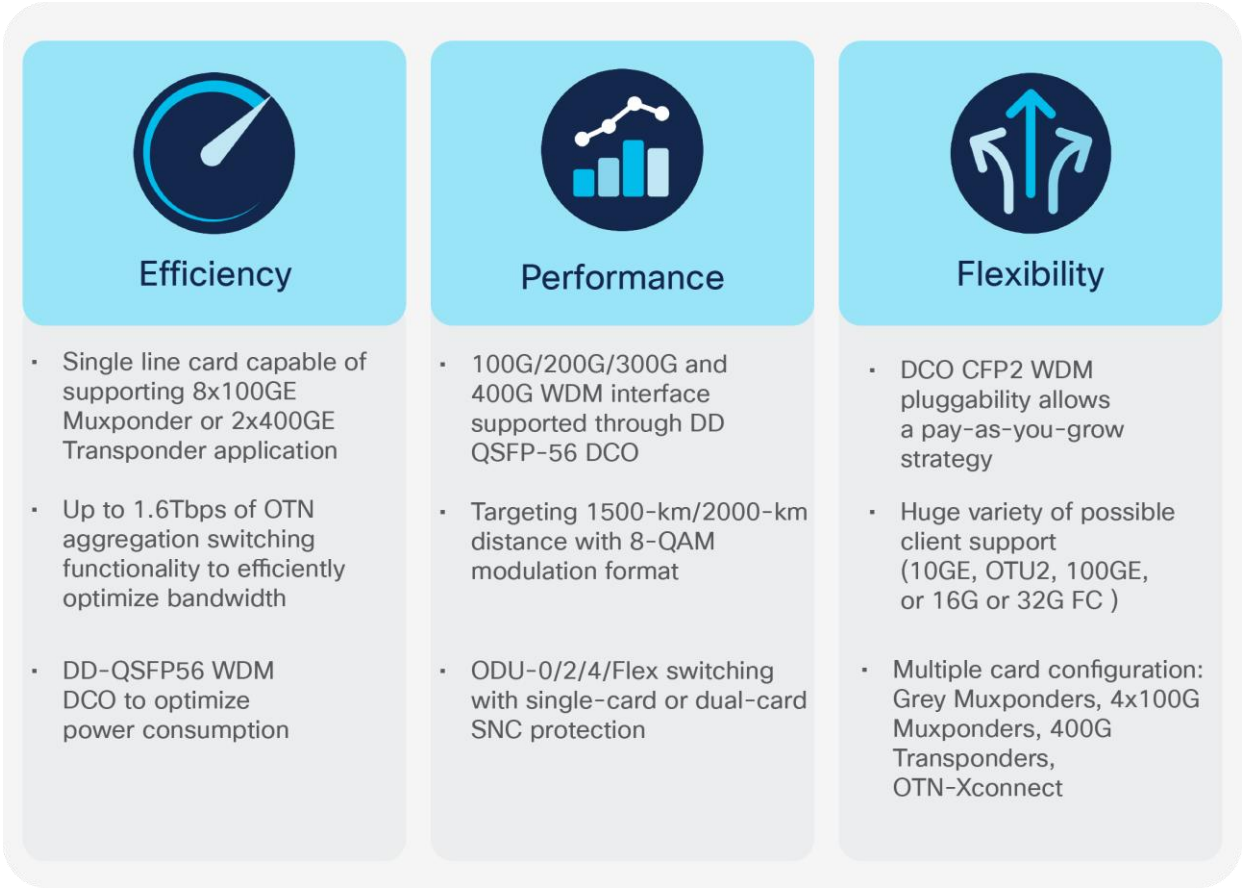
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Performance Monitoring

The Cisco NCS 1004 supports performance monitoring of optical parameters on the client and DWDM line interface, including laser bias current, transmit, and receive optical power. Ethernet RMON statistics for the client ports and OTN error counters for the trunk are also available. Calculation and accumulation of the performance-monitoring data are supported in 15-minute and 24-hour intervals as per G.7710.

Key elevator pitch

The Cisco NCS 1004 OTN-XPonder is dramatically improving efficiency, performance, and flexibility for customer networks.



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Feature summary

The following table summarizes the features of the NCS 1004 OTN Xponder.

Table 1. Feature Summary

Feature	Description
Software Compatibility	• IOSXR 7.2.1 or later
Port Density	• 8 QSFP+/QSFP28 ports • 4 QSFP+/QSFP28/DD-QSFP56 ports (2 of each can also support WDM DCO pluggable) • 2 CFP2 DCO WDM trunk ports
Line Card Functionality	• 10x10G Grey Muxponder mapping up to 10 clients at 10G over a QSFP28 OTU4 LR4 trunk (IOS XR 7.2.1 or later) • 400GE Transponder (IOS XR 7.3.1 or later) • 4x100G Muxponder (IOS XR 7.3.1 or later) • 40x10G Muxponder (IOS XR 7.3.2 or later) • 16G and 32G Fiber Channel Muxponder (IOS XR 7.5.2 or later) • 400G and 200G WDM Regenerator • Single-card 1.2Tbps OTN Switching (future roadmap) • Dual-card 1.6Tbps OTN Switching (future roadmap)
OTN Feature Summary	• Alarm reporting for Loss of Signal (LOS), Loss of Frame (LOF), Loss of Multiform (LOM), Alarm Indication Signal (AIS), Backward Defect Indicator (BDI) • OTUk, ODUk, OPUk Performance Monitoring • Threshold Crossing Alerts (TCAs) • Local (internal) and line (network) loopbacks • Trunk Trace Identifier, Generic Communication Channel
Ethernet Feature Summary	• Alarms and Performance Monitoring • Squelch and Local Fault Propagation • LLDP Snooping • Performance Monitoring and Threshold Crossing Alerts (TCAs) • Local (internal) and line (network) loopbacks
Availability	• Headless mode of operation
Network Management	• iPXE and Zero-Touch Provisioning (ZTP) • IOS XR CLI • SNMP • Streaming telemetry, including event-driven telemetry • NETCONF, RESTCONF, gRPC with YANG data models
Physical Dimensions (NCS 1002-K9)	• Occupies 1 of the 4 line card slots of the NCS 1004 2RU chassis • Up to 4 line cards in the NCS 1004 2 RU chassis without any limitation on slot placement
Environmental Conditions	Operating temperature: 0 to 40° C (32 to 104° F)

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Licensing

NCS 1004 OTN-Xponder is offered with an unlicensed approach as well a PAYG model base on Smart and Non-Smart Licensing.

The unlicensed PID (NCS1K4-OTN-XP=) is offering all the features (including the roadmap one) without the need for any additional licenses, with the exception of the future Encryption License that will be associated with the Trunk WDM DCO Pluggable.

The base license HW NCS1K4-OTN-XPL= PID arrives with zero BW. So, for any 100G increment, the 1x100G license shall be added. Please make use of S-NCS1K4-100G-CL= (or E-NCS1K4-100G-CL= in case of an honor base where the customer doesn't want to use the Smart Account). For any 400G TXP, the 1x400G license shall be added. Please make use of S-NCS1K4-400G-CL= (or E-NCS1K4-400G-CL= in case of an honor base where the customer doesn't want to use the Smart Account).

In case Card is configured as Muxponder, an upgrade License for 400G TXP is required. Please make use of S-NCS1K4-400GUPGL= (or E-NCS1K4-400GUPGL= in case of an honor base where the customer doesn't want to use the Smart Account).

In case of Regenerator configuration please make use of S-NCS1K4-400G-RG= for 400G wavelengths or S-NCS1K4-200G-RG= for 200G wavelengths.

For a typical IOSXR release 7.2.1 application with the "Grey Muxponder," the 100G BW License is covering up to 10x 10G clients. The OTU4 uplink is already included for this application.

Cisco Smart Licensing is a flexible licensing model that provides you with an easier, faster, and more consistent way to purchase and manage software across the Cisco portfolio and across your organization. And it's secure – you control what users can access. With Smart Licensing you get:

- **Easy Activation:** Smart Licensing establishes a pool of software licenses that can be used across the entire organization—no more PAKs (Product Activation Keys).
- **Unified Management:** Cisco License Central (CLC) provides a complete view into all of your Cisco products and services in an easy-to-use portal, so you always know what you have and what you are using.
- **License Flexibility:** Your software is not node-locked to your hardware, so you can easily use and transfer licenses as needed.

To use Smart Licensing, you must first set up a Smart Account on Cisco License Central.

For a more detailed overview on Cisco Licensing, visit the Licensing Hub.

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Product specifications

Table 2. NCS 1004 OTN-Xponder Specifications

Physical		
Power Consumption		
2x 10x10G to OTU4 MXP	**Typical**	**Max**
4x10G MLR Client Plug	**185W**	**204W**
40G SR4 Client Plug	**169W**	**183W**
2x 400GE TXP configuration with QDD FR4 clients	**260W**	**270W**
2x 4x100GE MXP configuration with QSFP28 LR4 clients	**270W**	**290W**
2x 4xOTU4 MXP configuration with QSFP28 LR4 clients	**300W**	**320W**
1x 400GE TXP + 4x 100GE MXP	**265W**	**280W**
Other Physical Parameters		
Dimensions	NCS1K4-OTN-XP 6.4” wide x 11” deep x 1.1” tall	
MTBF	474,920 hours	
Weight	NCS1K4-OTN-XP 2.5 kg	
Storage temperature	-28 to 70°C (-20 to 158°F)	
Operating temperature **Normal**	0 to 40°C (32 to 104°F)	

Latency					
PPM TYPE	**Payload**	**Client FEC**	**Trunk FEC**	**Latency Value in us)**	**Throughput (in %)**
QSFP-4x10-MLR	10GE	NA	STANDARD (OTU4)	5.99	100
QSFP-4x10-MLR	OTU2	STANDARD	STANDARD (OTU4)	8.25	NA
QSFP-4x10-MLR	OTU2e	STANDARD	STANDARD (OTU4)	8.12	NA
ONS-QSFP28-LR4	100GE	STANDARD		7.5	100
ONS-QSFP28-LR4	OTU4	STANDARD		8.6	N/A
QDD-400G-FR4-S	400GE	STANDARD		7.5	100

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Physical	
Relative humidity • Normal • Short-term[1]	 5% to 85%, noncondensing 5% to 90% but not to exceed 0.024 kg water/kg of dry air

[1] Short-term refers to a period of not more than 96 consecutive hours and a total of not more than 15 days in 1 year (a total of 360 hours in any given year, but no more than 15 occurrences during that 1-year period).

Regulatory compliance

The following table lists regulatory compliance information for the trunk card. Note that all compliance documentation may not be completed at the time of product release. Please check with your Cisco sales representative for countries other than Canada, the United States, and the European Union.

Table 3. NCS 1004 OTN-Xponder regulatory compliance

ANSI System	ETSI System
Countries and Regions Supported	
Canada United States Korea Japan European Union	European Union Africa CSI Australia New Zealand China Korea India Saudi Arabia South America
EMC (Emissions)	FCC 47CFR15, Class A AS/NZS CISPR 22, Class A CISPR 22, Class A EN55022, Class A ICES-003, Class A VCCI, Class A KN 22, Class A CNS-13438, Class A

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ANSI System	ETSI System
EMC (Immunity)	IEC/EN61000-4-2 Electrostatic Discharge Immunity IEC/EN61000-4-3 Radiated Immunity IEC/EN61000-4-4 EFT-B Immunity IEC/EN61000-4-5 Surge AC Port IEC/EN61000-4-6 Immunity to Conducted Disturbances IEC/EN61000-4-11 Voltage Dips, Short Interruptions, and Voltage Variations KN 24
EMC (ETSI/EN)	EN 300 386 Telecommunications Network Equipment (EMC) EN55022 Information Technology Equipment (Emissions) EN55024/CISPR 24 Information Technology Equipment (Immunity) EN50082-1/EN61000-6-1 Generic Immunity Standard EN61000-3-2 Power Line Harmonics EN61000-3-3 Voltage Changes, Fluctuations, and Flicker
Safety	
CSA C22.2 #60950-1 – Edition 7, March 2007 UL 60950-1 - Edition 2, 2014	IEC 60950-1 Information technology equipment Safety Part 1: General requirements - Edition 2, 2005 + Amendment 1 2009 + Amendment 2 2013 EN 60950-1: Edition 2 (2006) Information technology equipment - Safety - Part 1: General requirements + A11:2009 + A1:2010 + A12:2011 + A2:2013 CE Safety Directive: 2006/95/EC
Laser	
21CFR1040 (2008/04) (Accession Letter and CDRH Report) Guidance for Industry and FDA Staff (Laser Notice No. 50), June 2007	IEC 60825-1: 2007 Ed. 2.0 Safety of laser products Part 1: Equipment classification, requirements, and users guide IEC60825-2 Ed.3.2 (2010) Safety of laser products Part 2: Safety of optical fiber communication systems
Optical	
ITU-T G.691	ITU-T G.975
Quality	
TR-NWT-000332, Issue 4, Method 1 calculation for 20-year Mean Time Between Failure (MTBF)	

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Ordering information

Table 4. NCS 1004 OTN-XPonder Line Cards and Licenses Product ID

Part #	Product Description
NCS1K4-OTN-XP=	NCS1004 4x DDQSFP56, 6x QSFP28, 2 CFP2 DCO OTN Xponder
NCS1K4-OTN-XPL=	NCS1004 OTN Xponder Licensed
S-NCS1K4-100G-CL=	100G Client Bandwidth - Smart License
E-NCS1K4-100G-CL=	100G Client Bandwidth - On Honor Base
S-NCS1K4-400G-CL=	400G Client - TXP mode - Smart License
E-NCS1K4-400G-CL=	400G Client - TXP mode - E-Delivery
S-NCS1K4-400GUPGL=	400G Client - UPG to TXP mode - Smart License
E-NCS1K4-400GUPGL=	400G Client - UPG to TXP mode - E-Delivery
S-NCS1K4-400G-RG=	400G Trunk - REGEN mode - Smart License
E-NCS1K4-400G-RG=	400G Trunk - REGEN mode - E-Delivery
S-NCS1K4-200G-RG=	200G Trunk - REGEN mode - Smart License
E-NCS1K4-200G-RG=	200G Trunk - REGEN mode - E-Delivery

Table 5. NCS 1004 OTN-XPonder Pluggable List

Part #	Product Description
ONS-QSFP-4X10-MLR=	4x10Gbps Multirate QSFP+, LR
QSFP-40G-SR4=	40GBASE-SR4 QSFP Transceiver Module with MPO Connector
ONS-QSFP28-LR4=	100Gbps Multirate QSFP28, LR
QSFP-100G-SR4-S	100GBASE SR4 QSFP Transceiver, MPO, 100m over OM4 MMF
QSFP-100G-LR4-S	100GBASE LR4 QSFP Transceiver, LC, 10km over SMF
QSFP-100G-CWDM4-S	100GBASE CWDM4 QSFP Transceiver, LC, 2km over SMF
QSFP-100G-ER4L-S	100GBASE QSFP Transceiver, 40KM reach over SMF, Duplex LC
QSFP-100G-PSM4-S	100GBASE PSM4 QSFP Transceiver, MPO, 500m over SMF
QSFP-100G-SM-SR	100GBASE CWDM4 Lite QSFP Transceiver, 2km over SMF, 10-60C
QSFP-100G-FR-S	100G QSFP28 Transceiver 100G-FR, 2km SMF, duplex, LC

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Part #	Product Description
QSFP-100G-LR-S	100G QSFP28 100G-LR, 10km SMF, duplex, LC Connector
QDD-400G-DR4-S	400G QSFP-DD Transceiver, 400GBASE-DR4, MPO-12,500m parallel
QDD-400G-FR4-S	400G QSFP-DD Transceiver,400G-FR4,Duplex LC,2km Duplex SMF
QDD-400G-LR8	400G QSFP-DD Transceiver, 400GBASE-LR8, Duplex LC, 10km Duple
QDD-400-AOC1M	400G QSFP-DD Active Optical Cable, 1M
QDD-400-AOC3M	400G QSFP-DD Active Optical Cable, 3M
QDD-400-AOC5M	400G QSFP-DD Active Optical Cable, 5M
QDD-400-AOC7M	400G QSFP-DD Active Optical Cable, 7M
QDD-400-AOC10M	400G QSFP-DD Active Optical Cable, 10M
QDD-400-AOC15M	400G QSFP-DD Active Optical Cable, 15M
QDD-400-AOC20M	400G QSFP-DD Active Optical Cable, 20M
QDD-400-AOC25M	400G QSFP-DD Active Optical Cable, 25M
QDD-400-AOC30M	400G QSFP-DD Active Optical Cable, 30M
ONS-CFP2D-400G-C=	400G CFP2 DCO Multi-rate WDM C Band Tuneable

Table 6. NCS 1004 OTN-XPonder - Specific Client Cables

Part #	Product Description
ONS-FMPO-SM-5=	MPO- Foldable MPO cables - Single Mode - 5 meter
ONS-FMPO-SM-10=	MPO- Foldable MPO cables - Single Mode - 10 meter
ONS-FMPO-SM-20=	MPO- Foldable MPO cables - Single Mode - 20 meter
ONS-FMPO-SM-30=	MPO- Foldable MPO cables - Single Mode - 30 meter
ONS-FMPO-SM-40=	MPO- Foldable MPO cables - Single Mode - 40 meter
ONS-FMPO-SM-50=	MPO- Foldable MPO cables - Single Mode - 50 meter
ONS-FMPO-SM-60=	MPO- Foldable MPO cables - Single Mode - 60 meter
ONS-FMPO-SM-70=	MPO- Foldable MPO cables - Single Mode - 70 meter
ONS-FMPO-SM-80=	MPO- Foldable MPO cables - Single Mode - 80 meter
ONS-FMPO-SM-90=	MPO- Foldable MPO cables - Single Mode - 90 meter
ONS-4X10-MMCBL-5=	4x 10G Foldable MPO to LC cable - Multimode - 5 meter

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Part #	Product Description
ONS-4X10-MMCBL-10=	4x10G Foldable MPO to LC cable - Multimode - 10 meter
ONS-4X10-MMCBL-20=	4x10G Foldable MPO to LC cable - Multimode - 20 meter

Warranty

The following warranty terms apply to the Cisco NCS 2006 as well as services you may use during the warranty period. Your formal warranty statement appears in the Cisco Information Packet that accompanies your Cisco product.

- Hardware warranty duration: 5 years
- Software warranty duration: 1 year
- Hardware replacement, repair, or refund procedure: Cisco or our service center will use commercially reasonable efforts to ship a replacement part for delivery within 15 working days after receipt of the defective product at Cisco's site. Actual delivery times of replacement products may vary depending on customer location.

Product warranty terms and other information applicable to Cisco products are available at: https://www.cisco.com/go/warranty.

Product sustainability

Information about Cisco's environmental sustainability policies and initiatives for our products, solutions, operations, and extended operations or supply chain is provided in the "Environment Sustainability" section of Cisco's **Corporate Social Responsibility** (CSR) Report.

Reference links to information about key environmental sustainability topics (mentioned in the "Environment Sustainability" section of the CSR Report) are provided in the following table:

Table 7. Cisco environmental sustainability information

Sustainability Topic		Reference
General	Information on product-material-content laws and regulations	Materials
	Information on electronic waste laws and regulations, including our products, batteries and packaging	WEEE Compliance
	Information on product takeback and resuse program	Cisco Takeback and Reuse Program
	Sustainability Inquiries	Contact: csr_inquiries@cisco.com
Power	Card Power	Table 2: NCS 1004 OTN-Xponder Specifications
Material	Product packaging weight and materials	Contact: environment@cisco.com

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Cisco services for migrating converged IP + optical solutions

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Document history

New or Revised Topic	Described In	Date
First release of the NCS 1004 OTN – Xponder supporting Grey Muxponder application	Whole Datasheet	Oct. 23rd 2020
Aligned with IOS XR Release 7.3.1 with new 400G functionalities	Feature List and Ordering info	Feb. 28th 2021

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