DCP-1203

Technical Description

dcp-release-12.0.1

Contents

1 Introduction

This manual provides the technical description for DCP-1203. The DCP-1203 is a traffic unit with three 100/400G transponder functions on same board. The DCP-1203 card belongs to the DCP-series and it can be mounted in DCP-2 chassis.

1.1 General

The DCP-1203 is a transponder unit with 3x100/400G clients and 3x100/400G lines. This card will take one slot in a DCP-2 chassis.

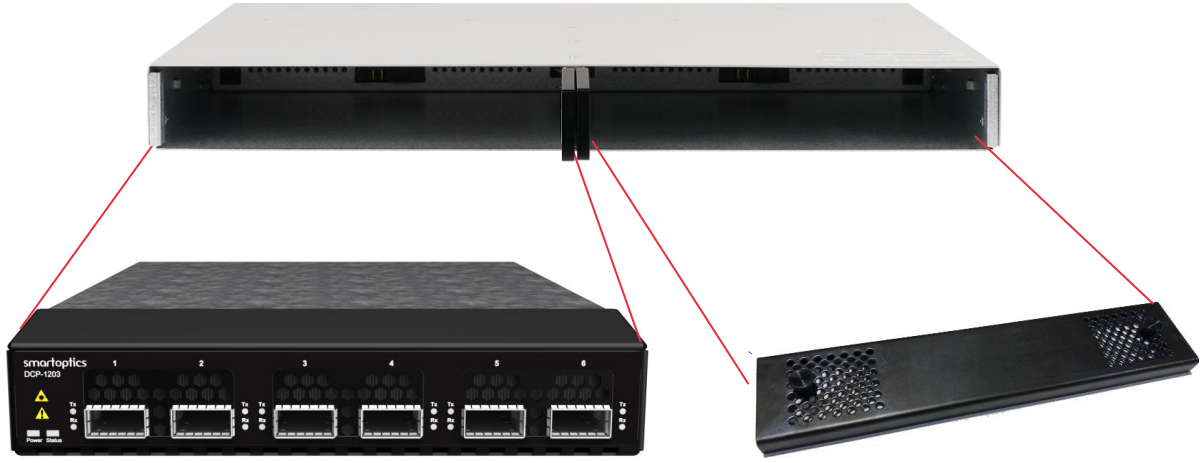


Figure 1. *Front view of DCP-1203 plug-in unit.*

Each DCP-1203 offers three independent transponders operating from 100G to 400G line rates, enabling 6 x 400G DWDM channels per 1U (2.4Tb/s) for high capacity needs.

The client side use combo ports that can host either QSFP28 or QSFP-DD transceivers.

Different options of 100G QSFP28 transceivers can be used, e.g. SR4, LR4, CWDM4, ER4, ZR4. See chapter Technical data for supported formats and QSFP28 transceivers.

Different options of 100G QSFP-DD transceivers can be used, e.g. SR4, LR4, CWDM4, ER4, ZR4.
Different options of 400G QSFP-DD transceivers can be used, e.g. DR4, FR4, LR4. See chapter Technical data for supported formats and QSFP-DD transceivers.

The line side use combo ports that can host either QSFP28 or QSFP-DD transceivers. It is possible to use either grey optics or coherent optics for 100G or 400G.
See chapter Technical data for supported formats and QSFP-DD transceivers for the line side.

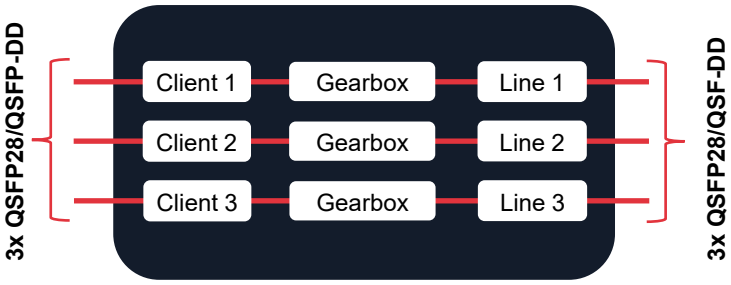


Figure 2. *Functional diagram for DCP-1203.*

The line side can be configured to use different bit rates and modulation formats. Each coherent transceiver may support a number of application codes that can be selected.

1.2 In commercial confidence

The manual is provided in commercial confidence and shall be treated as such.

1.3 Document Revision History

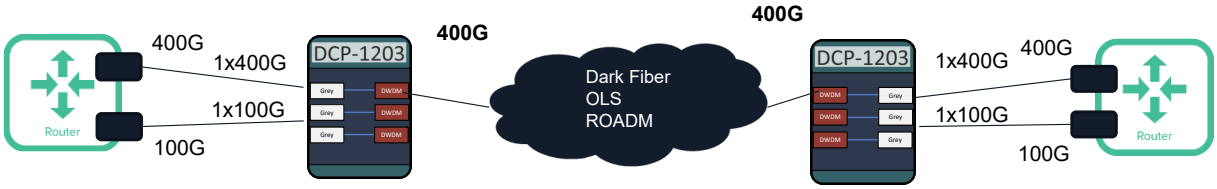
Revision	Date	Description of changes
8.1.1 A	2023-07-05	First revision of R8.1.1 manual Added info about fan speed and boot loader
8.1.2 A	2023-08-10	Updated alarm list
8.1.3 A	2023-10-06	Updated info about fan speed and boot loader
8.1.4 A	2023-10-12	No update
8.1.4 B	2023-10-23	Updated text about high temp shutdown. Updated text about fan replacement Updated severity on eMMC alarm
8.1.5 A	2023-11-02	No update
8.1.6 A	2023-11-17	Updated overlay pictures Updated severity on eMMC alarm
8.1.7 A	2024-01-10	Added text about FW bug that will stop FEC counters
9.0.1 A	2024-01-19	First version
9.0.1 PB1	2024-02-23	Updated transceiver list with TQD017-TUNC-SO
10.0.1 A	2024-06-18	Added support for OTU4 Added support for settable dispersion range Added support for 400G ER4 Lite transceivers
10.0.2 A	2024-09-05	Added support for TQD027

11.0.1 A	2024-12-12	Updated chapter about encryption Added chapter about fiber intrusion Added chapter about breakout mode
12.0.1 A	2025-06-24	Added a chapter about dynamic update of certified transceiver list Added support for ULH 400G, TQD029-TUNC-SO

2 Applications

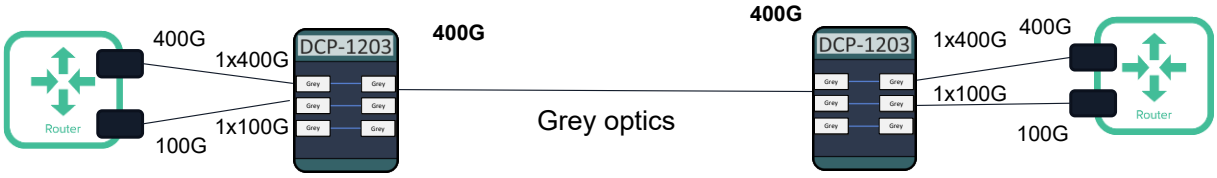
The DCP-1203 can work as a transponder in 100G or 400G mode. Both the client side and the line side can use either grey or coherent DWDM transceivers and can be transported over dark fiber or DWDM line systems, including:

- DCP-F
- DCP-R
- DCP-M



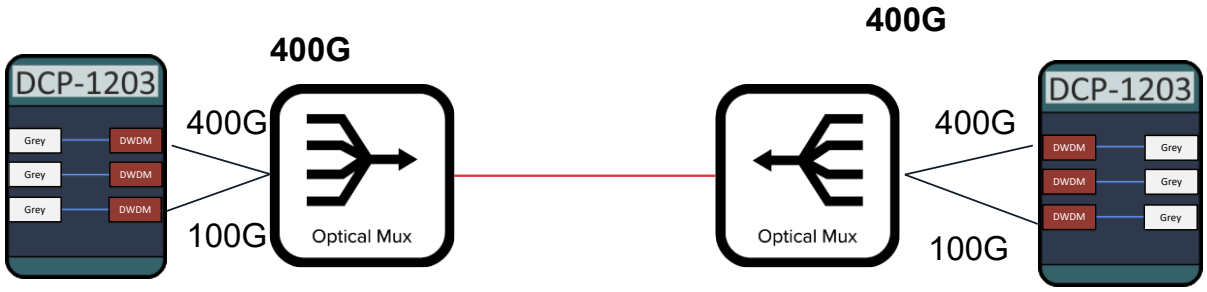
2.1 Transport over dark fiber

DCP-1203 can be used over dark fiber without filters for distance extension. In this case it is possible to use grey optics on both client and line side. Maximum distance and attenuations can be found in the data sheets for the supported QSFP28/QSFP-DD transceivers.



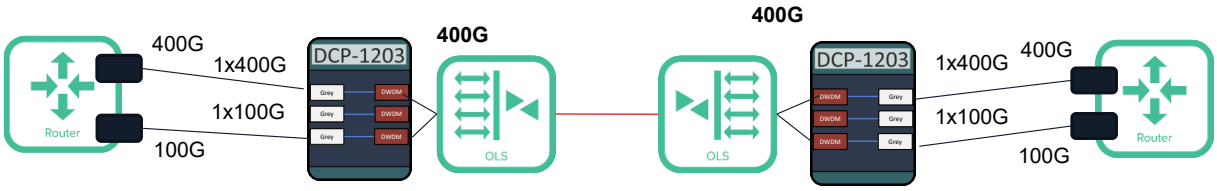
2.2 Transport over passive DWDM filters

It is possible to run DCP-1203 over passive DWDM filters.
Note that the bandwidth, BW, is different for different signal formats. Therefore it is important to select a DWDM filter that is wide enough to support the required BW.
For 100G QPSK the 3dB BW is around 35GHz so 100G can be used in systems with 50GHz channel spacing and 3dB filter BW of >40GHz.
For 200G QPSK, 300G 8QAM and 400G 16QAM the 3dB BW is around 60GHz so they can be used in systems with 100GHz spacing and 3dB filter BW of >72.5GHz.
Several filters in Smartoptics H-series are 400G capable and have 3dB BW >72.5GHz.



2.3 Transport over third party line system

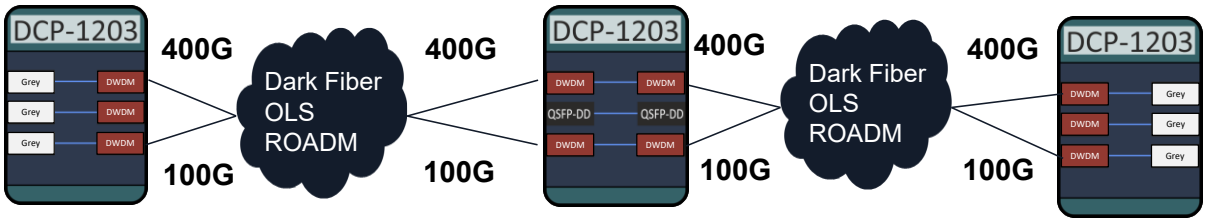
It is possible to use DCP-1203 as an alien traffic unit that is connected to a third-party line system. In this case it is important to make sure that the third-party line system is 400G ready so that it can support the low output power from 400G coherent DWDM QSFP56-DD and the wide spectral width. See manual “Design Rules” for more information about the specific parameters.



2.4 Repeater configuration

It is possible to use DCP-1203 as a repeater with coherent DWDM transceivers both on the client and line side.

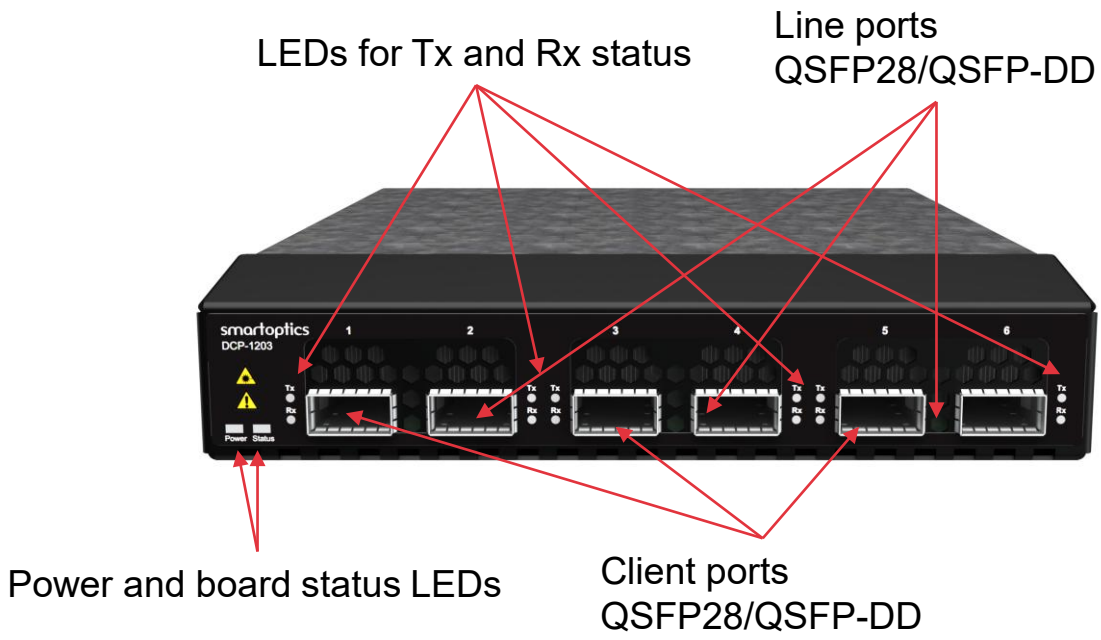
Note that each coherent QSFP-DDs consume up to 25W. From a thermal perspective it is not allowed to use coherent QSFP-DDs on all 6 ports at the same time. It is allowed to use two repeaters at the same time, but then transponder number 2 should not be used at all.



3 Functional description

3.1 Front layout

The front layout of DCP-1203 is quite simple and it is dominated by the QSFP28/QSFP-DD combo ports for the clients and lines. The front also contains some LEDs.



Traffic LEDs for Tx and Rx ports can show Green or Yellow light.
Green means OK.
Yellow means that there is a warning or alarm.

The LED for board status can show Green or Red light.
Green means OK.
Red means that there is a critical or major active alarm.

3.1.1 Traffic LEDs

The traffic LED's are used to indicate the status of the traffic.

Rx Off	Not receiving any light.
Rx Fault (yellow)	Receiving light but with alarm (loss of lock).
Rx On (green)	Receiving light and lock on the signal.
Tx Off	Tx is disabled.
Tx Fault (yellow)	An active alarm on the transmitter side (e.g Tx Faulty).
Tx On	Transmitting and no active alarm.

Traffic case		Traffic LED function	
Rx	Tx	Rx	Tx
Off	Off		
Off	Fault		
Off	On		
Fault	Off		
On	Off		
On	Fault		
On	On		
Fault	Fault		

3.1.2 Status LED

The status LED is Red during startup (both warm start and cold start).

When the software is up and running it shall reflect the highest severity of the module.

Green No active alarms.

Red At least 1 active Critical or Major alarm.

3.2 Client/Line port configuration for grey optics

It is no difference regarding the supported optics that can be used on the client and line side. Both sides have combo QSFP28/QSFP-DD 100/400G ports.

For 100G it is possible to use QSFP28 transceivers that follows the QSFP28 MSA and that have power class 7 (max 5W power consumption).

Different options of grey QSFP28 transceivers can be used for 100G, e.g. SR4, LR4, CWDM4, ER4, ZR4, FR, DR, LR, FRx, LRx.

For QSFP-DD it is possible to use either grey, e.g. DR4, FR4, LR4 etc, or coherent DWDM. The coherent QSFP-DD functionality will define what signal formats that can be used on the client and line side.
Note that the QSFP-DDs must have CMIS 4 or higher in order to work in DCP-1203.

See chapter Technical Specifications for supported formats and transceivers.
FEC can be enabled or disabled on the port that use grey optics.

All client/line ports have the possibility to use third party grey QSFP28/QSFP-DD transceivers as long as they have supported formats and follow the QSFP28 and QSFP-DD MSAs.

3.3 Client/Line port configuration for coherent optics

The client and line side can support coherent DWDM QSFP56-DD transceivers with up to max 24W power consumption. The client and line port configuration depend on which electrical interfaces the client and line transceivers have. For coherent units there are certain application codes that will determine the line speed and modulation format.

3.3.1 Frequency settings and channel plan

It is possible to set the central frequency for the Tx laser from 191.30 THz to 196.10 THz in steps of 6.25GHz or 50GHz. The granularity will depend on the selected grid spacing. It is possible to select 6.25GHz or 50GHz grid spacing.

Same frequency that is used on the Tx port is then automatically used on the Rx side as well. It is not possible to have different frequencies on the transmitter and receiver.
The default central frequency on all tunable QSFP-DD is 193.10 THz.

3.3.2 Settable output power

Most coherent DWDM transceiver have a VOA integrated on the Tx port. This parameter can be set from R8.0.

3.3.3 Settable loss threshold

DCP-1203 will use the loss threshold advertised by the QSFP-DD, but it is also possible to change this threshold manually by using the CLI commands “useLosOverride” and “ losThreshold”. See CLI manual for more info.

3.3.4 Settable alarm thresholds for low and high input power

DCP-1203 will use the alarm thresholds for low and high input power advertised by the QSFP-DD, but it is also possible to change those thresholds manually by using the CLI commands “rxPowerAlarmThreshold”, “highRxThreshold” and “lowhRxThreshold”. See CLI manual for more info.

3.3.5 Service modes

DCP-1203 supports different line rate and modulation settings. This is configured in two steps for each individual transponder port. First the parameter “Service” is set. It will determine the bit rate. The exact list of service modes available will be determined by the list of application codes that the QSFP-DD transceiver supports. For most coherent QSFP-DDs it is possible with following service formats:

- 1x400G
- 4x100G
- 3x100G

- 2x100G
- 1x100G
- 4x100G breakout

The service mode will then result in a default setting according to a pre-selected application code. The application code can then be changed in the second step if required.

The CD limits and sensitivity power limits will be set dynamically depending on which application code is used.

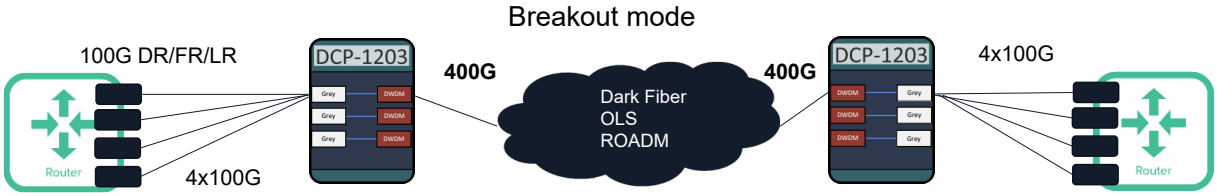
3.3.5.1 OTU-4 support

When coherent QSFP-DDs following the OpenROADM standard is used, it is possible to select a service mode (OTU4-OTU4) for 100G OTN OTU-4.
The OTU-4 mode will only work if correct transceivers are used on the client and line side. For the client side it is required to have QSFP28 transceivers with multi-rate support so that both Ethernet and OTN is supported.
For the line side it is required to use QSFP-DDs that follows the OpenROADM standard, i.e. TQD011-TUNC-SO or TQD017-TUNC-SO.

3.3.5.2 Breakout mode

It is possible to select a special breakout mode on the DCP-1203. This means that the line side can use 400G while the client side use 4x100G.
Breakout worked already in R8.0 optically, but with limited configuration and monitoring capabilities.

From release R11.0 there is support for individual 100G configurations for loop-back, FEC & description. Monitoring of Status information & PM data per individual 100G is also available from R11.0.



In this mode the QSFP-DD on the client side of DCP-1203 should have 4 lanes and the 100G end equipment should use 100G optics with single lane. See table below with combinations of 400G and 100G transceivers.

Clients	400G Transceivers	SM Ribbon-fiber	100G Single Transceivers	1203 Transponder Support
DR4	SO-QSFP-DD-4C-DR4-4-M	**PC-SM-MP-8xLC-8F-xM**	SO-QSFP28-100G-DR	Yes
L4R	TQD015-S31C-SO	**PC-SM-MP-8xLC-8F-xM**	SO-QSFP28-100G-LR	Yes
FR4	SO-QSFP-DD-4C-FR4-4-M	**PC-SM-MP-8xLC-8F-xM**	SO-QSFP28-100G-FR	Yes

3.3.6 Pulse shaping

The pulse shaping parameter will determine the spectral shape of the signal and it will affect the bandwidth, roll-off factor and output power. It is possible to set the parameter “Pulse shaping” to enable or disable. Default is enable. When pulse shaping is enabled, the signal has smaller spectral width, smaller roll-off factor and lower output power. The roll-off factor is about 0.2 when pulse shaping is enabled and around 0.4 when it is disabled. Disabling pulse shaping can increase the Tx power up to 3dB for the bit rates 200G, 300G and 400G on SO-TQSFPDD4CCZRP.

3.3.7 Settable dispersion range

The DSPs inside coherent QSFP-DDs can compensate for chromatic dispersion in a defined range. For each transceiver there is a default value for the min and max chromatic dispersion. From R10.0.1 it is possible to change those values within the specification of the transceiver.

Settable dispersion range is supported on DCP-1203 with following coherent QSFP-DDs:

SO-TQSFPDD4CCZRP, TQD011-TUNC-SO, TQD013-TUNC-SO, TQD017-TUNC-SO

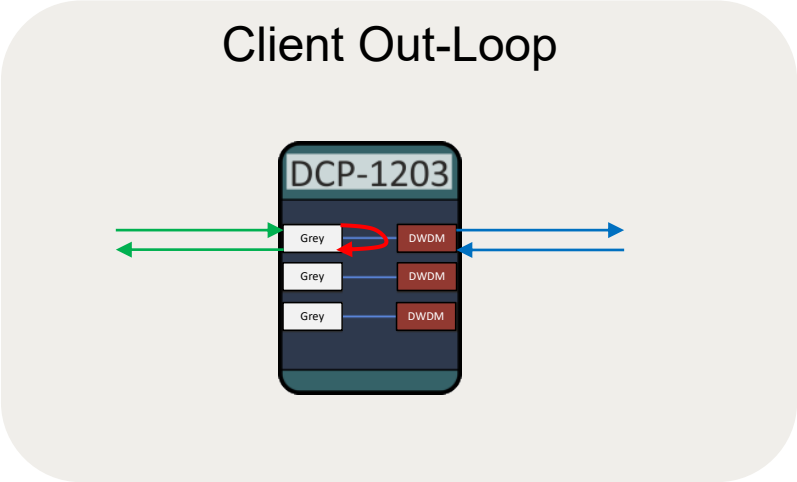
3.4 Loop back

Two different loop back settings are possible for the DCP-1203. A warning will be raised during the time that a port is configured in loop back mode.

3.4.1 Client Out-loop

The client out-loop can be used to loop the signal back to the client equipment or to a test instrument connected on the client port. The loop is mainly done on the ports of the ASIC

sitting after the client QSFP28/QSFP-DD. No real data processing is done inside the ASIC for the looped signal.



3.4.2 Line Out-loop

The line out-loop can be used to loop the signal back to the line side without processing data inside the card. The loop is mainly done on the ports of the ASIC sitting after the line QSFP28/QSFP-DD. No real data processing is done inside the ASIC for the looped signal.

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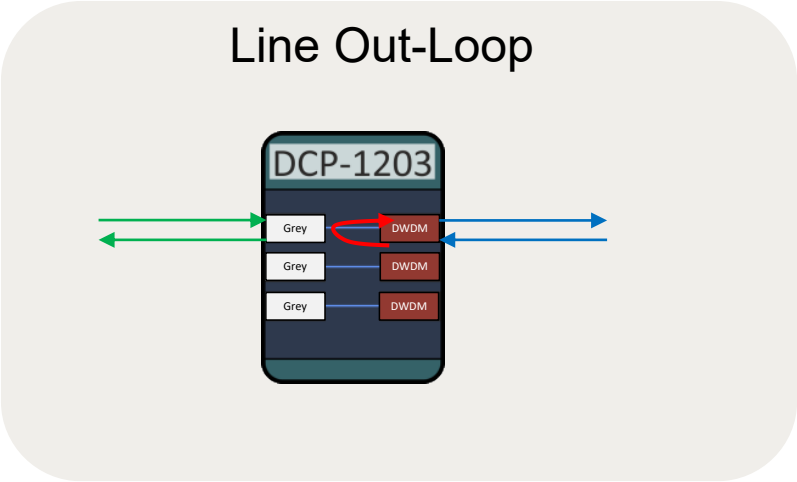


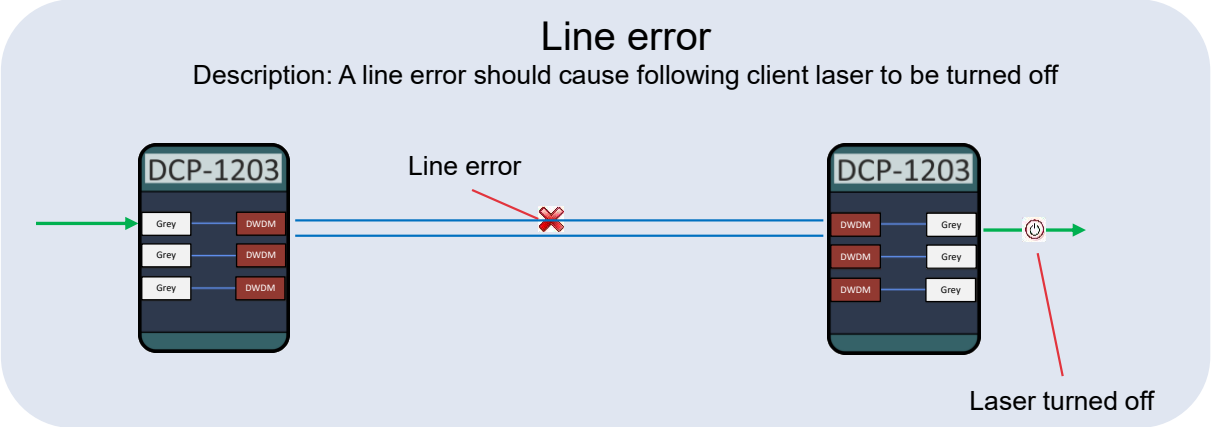
3.5 Link loss forwarding

Link loss forwarding is a setting that can be enabled or disabled via CLI commands. Link loss forwarding can be disabled by setting client laser forced on to enable. Default is that link loss forwarding is on. When link loss forwarding is enabled the client lasers will be turned off in case of an error on the line side

It is possible to use both client link loss forwarding and line link loss forwarding if the coherent QSFP-DD can support it.

3.5.1 Line Link Loss Forwarding

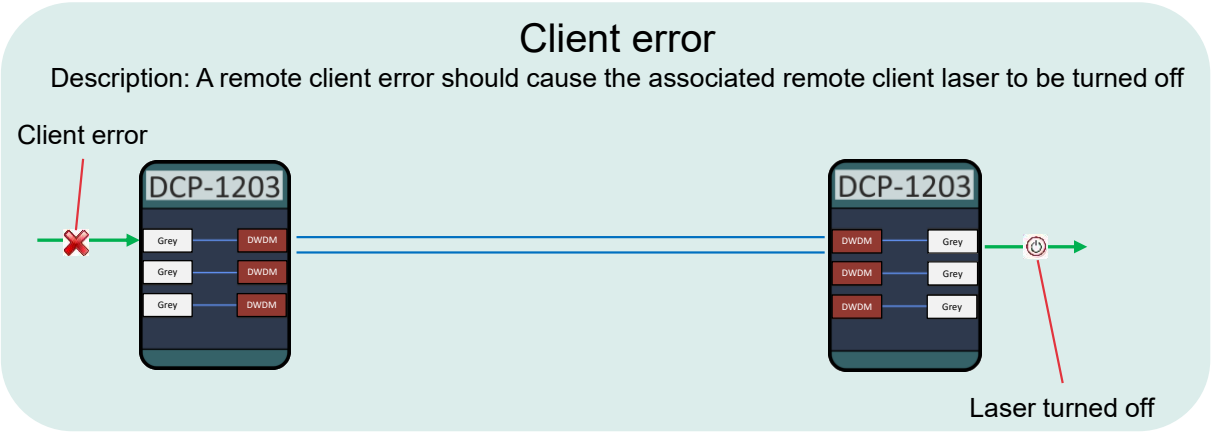
If the link loss forwarding is enabled (client laser forced on = disabled) then all client lasers will be automatically turned off if there is a line error..



3.5.2 Client Link Loss Forwarding

If the link loss forwarding is enabled (client laser forced on = disabled) then the corresponding client lasers on the remote site will be automatically turned off if there is a local client error.

This feature is only possible on coherent QSFP-DDs that support this feature, e.g. TQD013-TUNC-SO and TQD014-TUNC-SO.



3.6 Performance monitoring

Many optical performance parameters are available on the DCP-1203. The performance value presented is the current value for the last second. Accumulated or historical data are not presented.

Performance parameters on board level

Parameter	Unit	Description
Temperature	C°	Board temperature

Table 1. Performance parameters on board level

Performance parameters on client ports

Parameter	Unit	Description
Total Optical Rx power	dBm	Total received power for all lanes
Optical Rx power	dBm	Received power level per lane
Optical Tx power	dBm	Transmitted power level per lane
Total Optical Tx power	dBm	Total transmitted power for all lanes
Temperature	C°	QSFP28 temperature
Tx bias current	mA	Laser bias current

Table 2. Performance parameters on client ports

Performance parameters on the line ports

Parameter	Unit	Description
Total Optical Rx power	dBm	Total received power
Optical Signal Rx power	dBm	Received signal power level
Optical Tx power	dBm	Transmitted power level
Tx bias current	mA	Laser bias current
Temperature	C°	QSFP56-DD temperature
OSNR	dB	Optical signal to noise ratio
CD	ps/nm	Chromatic dispersion
DGD	ps	Differential Group Delay
Pre-FEC BER	Errors/s	BER before error correction
Pre-FEC BER avg	Errors/s	Average BER before error correction
Post-FEC BER	Errors/s	BER after error correction
Uncorrected BER	Errors/s	Uncorrected errors

Uncorrected BER avg	Errors/s	Average uncorrected errors
PDL	dB	Polarization Dependent Loss
SOP	Rad/s	State of polarization
Q-value	dBQ	Quality of transmission performance related to BER
Q-margin	dB	Margin for Quality of transmission performance related to BER

Table 3. Performance parameters on the line port

Note that the SO-TQSFPDD4CCZRP unit has a bug that will stop counting FEC parameters (Pre-FEC BER, Pre-FEC BER avg, Uncorrected BER, Uncorrected BER avg, Q-value, Q-margin) after LOS (loss of signal). The counters can be restarted by clearing the FEC counters. (clear interface if-1/<slot>/5 diagnostics)

There is a firmware bug in SO-TQSFPDD4CCZRP that causes FEC counters stop counting after toggling application code or frequency. This means that diagnostics will show 0 all the time for the FEC counters. It is possible to clear this fault by doing reboot, clear interface diagnostics or toggle admin status.

It is also possible to monitor FEC counters by using the command "*show interface diagnostics*".
Two values will be shown for each parameter, per second value and accumulated value.

Performance parameters for FEC counters

Parameter	Unit	Description
Uncorrected errors	errors	Number of errors that have not been corrected
Corrected errors	errors	Number of errors that have been corrected
Corrected 0 -> 1	errors	Number of bits identified as 0, but that have corrected to 1.
Corrected 1 -> 0	errors	Number of bits identified as 1, but that have corrected to 0.

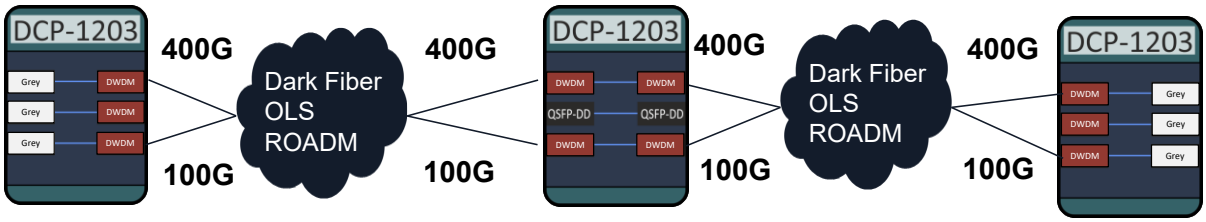
Table 4. FEC counters in interface diagnostics

Note that the FEC counters in interface diagnostics are related to FEC counters on the ASIC on DCP-1203, i.e. not the FEC counters in the coherent QSFP-DD. The FEC counters on the coherent QSFP-DD are presented as parameters Pre-FEC BER, Post-FEC BER and Uncorrected BER.
In 1x400G mode the ASIC on the DCP-1203 will be in pass-through mode and it will not report any FEC counters in interface diagnostics.
In 4x100G mode the ASIC will report FEC counters for both client and line side.

3.7 Regeneration

Regeneration of the traffic can be done by using coherent DWDM transceivers on both the client and line ports. It is possible to regenerate the signal 8 times, i.e. in 8 intermediate regeneration nodes.

Note that each coherent QSFP-DDs consume up to 25W. From a thermal perspective it is not allowed to use coherent QSFP-DDs on all 6 ports at the same time. It is allowed to use two repeaters at the same time, but then transponder number 2 should not be used at all.



3.8 In-band management

In-band management is not supported in this release.

3.9 Encryption

DCP-1203 is HW prepared with a crypto chip to support encryption, but it is also required to have a QSFP-DD that supports encryption and a SW encryption license. QSFP-DDs based on OpenROADM standard support encryption. Following coherent QSFP-DDs can be used for encryption: TQD017-TUNC-SO (100G-400G) and TQD011-TUNC-SO (100G)

The encryption solution is based on layer 1 AES-256 GCM encryption with Diffie-Hellman key exchange.

Crypto chip functions:

- Digital signature generation and verification
- Secure storage of certificates, public keys, private and secret keys
- Cryptographic algorithms supported by the crypto chip include ECC, ECDSA signature scheme, SHA and MAC digest algorithms.
- Secure Hash: SHA-256
- MAC Digest: HMAC-SHA256
- Signature Schemes: Elliptic Curve Digital Signature Algorithm (ECDSA) (FIPS 186-4)
- Random Number Generation: True RNG

AES 256 GCM encryption details:

- Data encryption, key generation, certificate generation, key verification and storage of keys is all implemented in the hardware crypto chips

- A new pair of Tx and Rx AES keys are generated every 10 minutes for every active encrypted channel.
- The process of generating a new pair of AES keys for each channel starts by authenticating the boards, and the keys are always randomly generated uniquely for each channel.
- Secret session keys for data encryption are never stored, only temporarily residing in a secure environment
- All private and public keys generated randomly and saved securely inside the crypto chips and the software doesn't have access to the private keys nor to the shared secret generated after a successful Diffie Hellman key exchange
- Support for custom authentication ID for each port

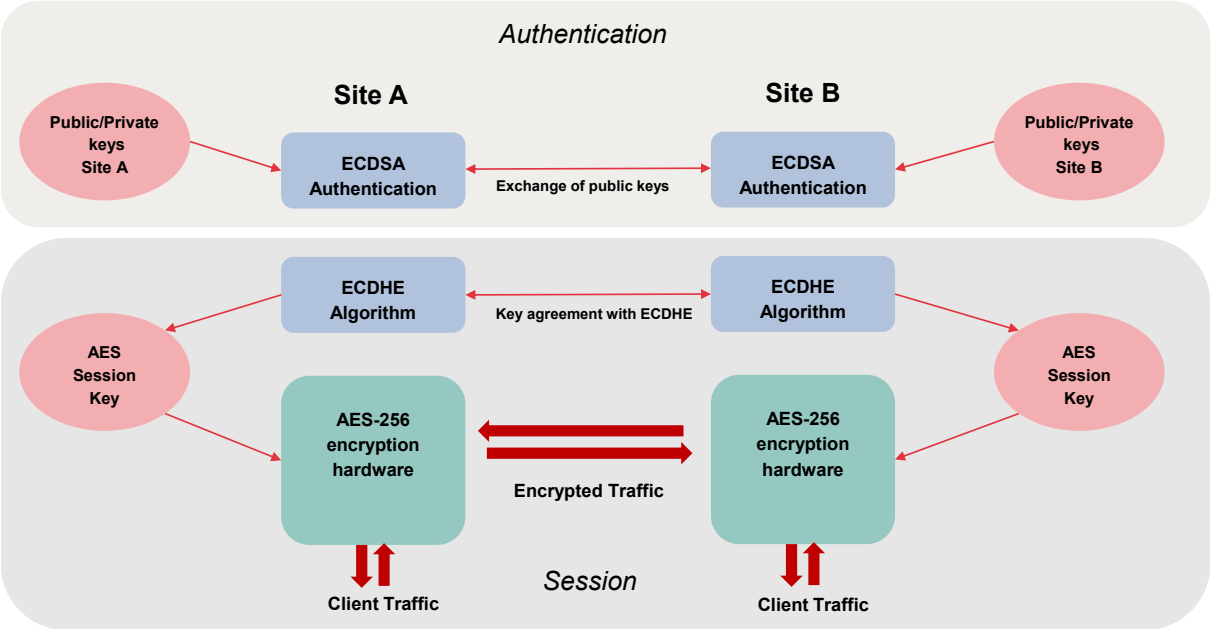
Authentication and key exchange details:

Endpoint Authentication: Elliptic Curve Digital Signature Algorithm (ECDSA)
Pre-defined private/public Elliptic Curve Cryptography (ECC) keys in DCP-1610, DCP-404, DCP-1203 and DCP-110 HW
Optional use of custom certificates for each port

Session Key Agreement: ECC Diffie-Hellman Ephemeral (ECDHE)
Ephemeral (temporary) keys, only used once per session
Perfect forward secrecy

Authenticated Encryption: AES-256 GCM

Advanced Encryption Standard (AES) and Galois Counter Mode (GCM) for encryption and authentication on byte level



is enabled, the latency will increase 2.35ms per side.

3.9.1 Fiber intrusion alarm

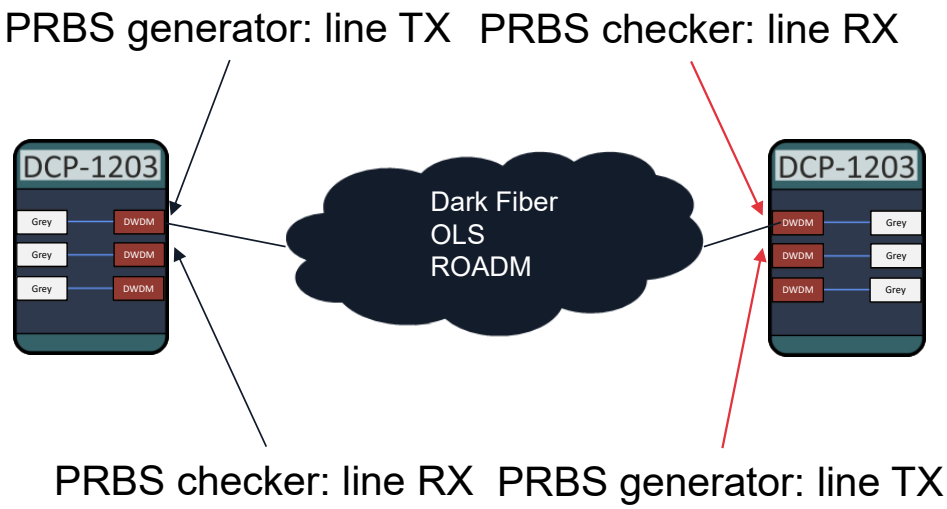
When encryption is used, it is possible to configure a fiber intrusion threshold.
A fiber intrusion alarm will be triggered if the power level on the line side is below the configured threshold.

3.10 PRBS

It is possible to start PRBS (Pseudo Random Binary Sequence) test sessions in DCP-1203 if the coherent QSFP-DD supports it. It is possible to set a defined test time or just start and stop the test manually.

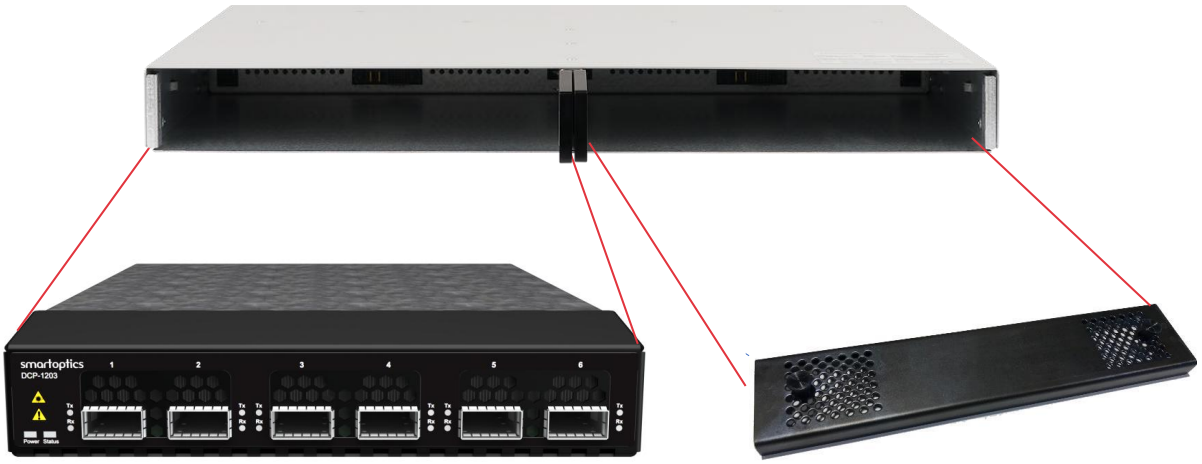
Note that the customer traffic cannot run at the same time as a PRBS test.

The PRBS test pattern will be generated in the coherent QSFP-DD so the test will always start on the Tx port of the QSFP-DD. The PRBS test will also be terminated in a QSFP-DD.



3.11 Temperature requirements

The 400G QSFP56-DD modules are sensitive to high temperatures and can even shut down itself if the temperature is too high. It is important to get best possible air flow for cooling. When DCP-1203 is used in DCP-2 chassis it is mandatory to use a blind panel in the other slot if no other card is already used there. The blind panel will ensure that the air for cooling will take the optimum path through the chassis.



It is also important to use two power supplies in the chassis so that air flow on the back side will be correct. If one power supply is missing some of the air will leak out through the empty slot and the cooling will not be optimized.

Note that the FAN units are essential for the cooling and the DCP-1203 will not work without them. During FAN unit replacement there is a risk that the temperature will rise quickly and that the QSFP-DD will turn off. For this reason it is recommended to do FAN unit replacements during a service window.

3.11.1 Boot loader and fan speed

Note that the fan units will start with low fan speed during boot for systems with boot loader “2016.09.01-DCP-R2.1” and earlier. This means that there is a risk that high temperature alarms on QSFP-DD may be triggered during boot. This is only an issue with DCP-1203 with transceiver TQD014-TUNC-SO.

Note that the fan units are essential for the cooling and the DCP-404 will not work without them.
For fan DCP-2-FAN-FB there is a risk that the temperature will rise quickly and that the QSFP-DD will turn off during fan unit replacement. For this reason it is recommended to do fan unit replacements for DCP-2-FAN-FB during a service window.
For DCP-FAN-UNIT-01 it is possible to change one fan module at a time and then a service window is not needed for replacement.

3.11.2 Temperature alarms in QSFP-DD

The temperature of the QSFP56-DD is presented in the CLI and there are three alarm levels related to this:

- “High temperature warning”: Will give a warning if the temperature of the QSFP56-DD exceeds 75 deg C.
  The alarm will automatically be cleared when the temperature drops below the limit again.
- “High temperature alarm”: Will raise a critical alarm if the temperature of the QSFP56-DD exceeds 80 deg C. In this case it is critical to find out why the

temperature is so high and to fix it.
The alarm will automatically be cleared when the temperature drops below the limit again.

- "High temperature shutdown": The QSFP56-DD will shut down to protect itself from being damaged due to high temperature. This will typically happen when the QSFP-DD temperature is around 85 deg C. A critical alarm will also be raised at the same time.
  This alarm will not automatically be cleared when the temperature drops below the limit again. Here it is necessary to toggle the admin status of the port so that the QSFP56-DD can be restarted.

3.12 Alarms

The DCP-2 keeps a list of the alarms currently detected on the system and collected by the system. When an alarm is detected, it is added to the active alarm list. When the alarm is cleared the alarm is removed from the active alarm list. Previously cleared alarms can be found in the alarm log.

The following information is stored for each alarm:

Start time: The date and time when the alarm was detected.

End time: The date and time when the alarm was cleared.

Location: The entity that caused the alarm.

Severity: The severity of the alarm.

The alarms available for DCP-1203 are listed in the table below:

ALARM MESSAGE	LOCATION	SEVERITY	INTERPRETATION
Loopback enabled	if-<chassi>/<slot>/<Interface>	Warning	Loopback Enabled is raised when an interface is configured in loopback mode.
Loss of lock	if-<chassi>/<slot>/<Interface>	Critical	Loss of lock has been detected on the interface. Check that the input signal format is correct.
Loss of optical input power	if-<chassi>/<slot>/<Interface>	Critical	The optical power of the interface has gone below the minimum power level. Check the fiber connection and/or clean the fiber connector.
High optical input power	if-<chassi>/<slot>/<Interface>	Major	The optical power of the interface is above the high optical input power threshold. Insert attenuator or lower the power in another way.
Low optical input power	if-<chassi>/<slot>/<Interface>	Major	The optical power of the interface is below the low optical input power threshold.

			Check the fiber connection and/or clean the fiber connector.
PRBS enabled	if-<chassi>/<slot>/<Interface>	Warning	PRBS testing enabled. Traffic is down while PRBS test is running. Turn off PRBS test when it has finished.
Transmitter failure	if-<chassi>/<slot>/<Interface>	Major	The transceiver is not transmitting. Replace the optical module.
Transceiver missing	if-<chassi>/<slot>/<Interface>	Critical	The Transceiver has been removed. Insert an Transceiver or disable the alarm with “clear interface portreset <interface_id>”
High temperature warning	if-<chassi>/<slot>/<Interface>	Warning	The temperature of the QSFP56-DD has exceeded the limit 75 deg C. Check if the second slot in DCP-2 has a card or a dummy front panel. If not, insert a dummy front panel to improve air flow.
High temperature alarm	if-<chassi>/<slot>/<Interface>	Critical	The temperature of the QSFP56-DD has exceeded the limit 80 deg C. Check if the second slot in DCP-2 has a card or a dummy front panel. If not, insert a dummy front panel to improve air flow.
High temperature shutdown	if-<chassi>/<slot>/<Interface>	Critical	The QSFP56-DD has shutdown due to high temperature. Check if the second slot in DCP-2 has a card or a dummy front panel. If not, insert a dummy front panel to improve air flow. Restart the QSFP56-DD by toggling the admin status of the interface.
eMMC failure		Minor	The memory is not formatted. Contact support.

Table 5. Alarm list

3.13 Dynamic update of certified transceiver list

From R12.0.1 it is possible to update the list of certified transceivers dynamically. The system contains one file with Smartoptics certified transceivers that is installed from start, but it is also possible to add an additional file with transceivers that should be treated as certified. See DCP-Series_User_Manual for more information.

4 Spare part handling

4.1 Replacing DCP-1203 card

A new DCP-1203 card that is inserted in same slot as the replaced unit will automatically get the same configuration as the previous one. If the SW revision on the new card is different it is necessary to upgrade the SW to same release as the chassis.

The SW for the new traffic card can be upgraded by running the same swupgrade commands as for the whole DCP-2 chassis. It is only the boards with the wrong SW that will be upgraded. DCP-2 chassis and other slot modules with correct SW from start will not be affected by the upgrade.

Note that the QSFP-DD from a newly replaced DCP-1203 card may be quite hot. The fan units may not start with full speed when the new DCP-1203 card is inserted. This means that there is a risk that the QSFP-DD may reach the temperature for shutdown and not start up. Then it is necessary to wait until the QSFP-DD has cooled down and then toggle the admin status of the port or reinsert the QSFP-DD again.

4.2 Replacing FAN unit in DCP-2 chassis

Note that the fan units are essential for the cooling and the DCP-404 will not work without them.
For fan DCP-2-FAN-FB there is a risk that the temperature will rise quickly and that the QSFP-DD will turn off during fan unit replacement. For this reason it is recommended to do fan unit replacements for DCP-2-FAN-FB during a service window.
For DCP-FAN-UNIT-01 it is possible to change one fan module at a time and then a service window is not needed for replacement.

5 Technical Specifications

CERTIFIED GREY TRANSCEIVERS FOR CLIENT/LINE SIDE OF DCP-1203	
PART NUMBER	Description
SO-QSFP28-SR4	QSFP28, 100G Ethernet SR4, MM 4x 850nm, 100m, 1.9dB, MPO
SO-QSFP28-LR4	QSFP28, 100G Ethernet LR4, OTU4, SM 1296/1300/1305/1309nm, 10km, 6.3dB, LC
SO-QSFP28-LR4-10L	QSFP28, 100G Ethernet LR4, SM 1296/1300/1305/1309nm, 10km, 6.3dB, LC
SO-QSFP28-CWDM4	QSFP28, 100G Ethernet CWDM4, SM 1271/1291/1311/1331nm, 2km, 5dB, LC
SO-QSFP28-ER4	QSFP28, 100G Ethernet 100G 4WDM-40, SM 1296/1300/1305/1309nm, 40km, 18dB, LC
SO-QSFP28-ZR4	QSFP28, 100G Ethernet ZR4, SM 1296/1300/1305/1309nm, 80km, 31dB, LC
SO-QSFP28-100G-FR	QSFP28 100G Ethernet FR SM 1x 1311nm PAM4 2km 4dB LC
SO-QSFP28-100G-DR	QSFP28 100G Ethernet DR SM 1x 1311nm PAM4 500m 3dB LC
SO-QSFP28-100G-FRX	QSFP28 100G Ethernet FR SM 1x XXXXnm PAM4 2km 4dB LC
SO-QSFP28-100G-LRX	QSFP28 100G Ethernet LR SM 1x XXXXnm PAM4 10km 6.3dB LC
SO-QSFP28-100G-LR	QSFP28 100G Ethernet LR SM 1x 1311nm PAM4 10km 6.3dB LC
SO-QSFP28-AOCXM	QSFP28 100GE AOC 1m
SO-QSFP28-PCUXM	QSFP28 100GE DAC Xm pass
SO-QSFP28-PSM4	QSFP28 100GE 1310nm SM 2km MPO
TQ2020-BXXC-SO	QSFP28 BiDi 100G xxxx/yyyy SM 10km
TQ2021-BXXC-SO	QSFP28 BiDi 100G xxxx/yyyy SM 20km
SO-QSFP-DD-4C-LR4-4	QSFP-DD 400G-LR4 Ethernet, 4x100G-LR, PAM4 CMIS4.0, 1271nm/1291nm/1311nm/1331nm 10km 6.3dB LC
SO-QSFP-DD-4C-FR4-4	QSFP-DD 400G-FR4 Ethernet, 4×100G-FR, PAM4 CMIS4.0, 1271nm/1291nm/1311nm/1331nm 2km 4dB LC
SO-QSFP-DD-4C-DR4-4-M	QSFP-DD 400G-DR4 Ethernet, 4x100G-DR PAM4 CMIS4.0, 4x 1311nm 500m 3dB MPO12
TQD023-SL4C-SO	QSFP-DD 400G-ER4 Lite Ethernet, PAM4 CMIS4.0, 1296/1300/1305/1309nm, 30km 15.5dB
TQD015-S31C-SO	QSFP-DD 400G-LR4 Ethernet, 4x100G-LR, PAM4 CMIS4.0, 4x 1311nm 10km 6.8dB MPO
SO-QSFP-DD-4C-FR4-4-M	QSFP-DD 400G-FR4 Ethernet, 4x100G-FR, PAM4 CMIS4.0, 4x 1311nm 2km 4dB MPO12

Table 6. Client transceivers

CERTIFIED COHERENT TRANSCEIVERS FOR CLIENT/LINE SIDE OF DCP-1203	
PART NUMBER	Description
SO-TQSFPDD4CCZRP	QSFP-DD OIF400G/OpenZR+ Coh Tunable Flexgrid, LC
TQD011-TUNC-SO	QSFP-DD 100G COH-T SM 450KM CMIS4.1
TQD013-TUNC-SO	QSFP-DD OPENZR+ HIGH TX POWER COH TUNABLE FLEXGRID CMIS5.0 LC
TQD014-TUNC-SO	QSFP-DD OPENZR+ HIGH TX POWER COH TUNABLE FLEXGRID CMIS5.1 LC
TQD017-TUNC-SO	QSFP-DD OTN HIGH TX POWER COH TUNABLE FLEXGRID ENCRYPTION CMIS5.0
TQD027-S55C-SO	QSFP-DD, 400G ETHERNET COHERENT 193.7THZ, 40KM, CMIS 5.0
TQD029-TUNC-SO	QSFP-DD 400G ULTRA LONG HAUL COH TUNABLE FLEXGRID CMIS5.3 LC

Table 7. Line transceivers

GENERAL	
OPERATING TEMPERATURE	0° C to 45° C
POWER CONSUMPTION	DCP-1203 <40 W QSFP28 ~5W QSFP-DD grey LR4 ~10W QSFP56-DD ~24W Max total <136 W (regen mode 4xQSFP-DD) Typical power, full populated card with 400G coherent + 400G LR4 at 25° C = 142 W
MTBF	xx years xxx FITs
LATENCY	Latency for SO-TQSFPDD4CCZRP, DP01QSDD-ZT1-001[1], TQD011-TUNC-SO[1] 400G CFEC: 8 µs 400G OFEC: 5 µs 300G OFEC: 6 µs 200G OFEC: 7 µs 100G OFEC: 11 µs Latency for FTCD3323R1PCL-**: 400G CFEC: 8 µs 400G OFEC: 5 µs 300G OFEC: 6 µs 200G OFEC: 7 µs 100G OFEC: 11 µs

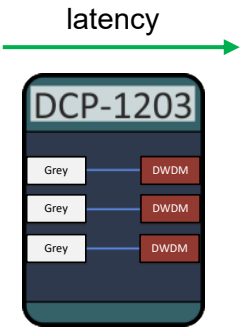
	Max 1 μs for the card [1]Only for 100G Latency is for one direction through the card from client to line or vice versa. 

Table 8. General parameters for DCP-1203