

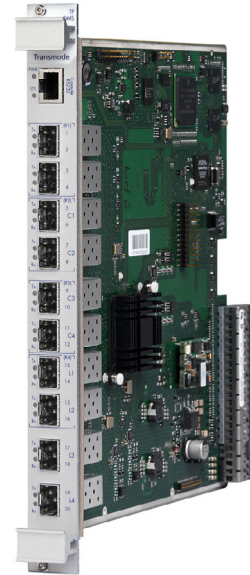
# Quad Multi-Service Transponder

*Four Transponders for compact SAN extension*

## Key benefits:

- Transparent transport of 1G, 2G and 4G Fibre Channel formats
- Multi-functional plug-in unit. Same hardware can be used as Transponder and Regenerator
- Technology agnostic. Pluggable transceivers enable usage in CWDM as well as DWDM networks
- Automatic configuration via protocol recognition
- Forced mode option for enhanced traffic control
- Low Power Design ensures low total cost of ownership

The Quad Multi-Service Transponder (TPQMS) is a powerful part of Transmode's TM-Series platform enabling optimized and cost efficient capacity networks based on CWDM/DWDM technology.



## Optimized for Metro/Access SAN applications

The TPQMS is an extremely compact solution for SAN extension applications in the Metro/access area where multi-service support, compact design and low power consumption are crucial components. The TPQMS has four Transponder functions, each of them capable of transporting 1G, 2G or 4G Fibre Channel (or FICON) traffic formats over a CWDM or DWDM network.

The TPQMS can be set in automatic mode where the Transponders will automatically detect the traffic format and configure the client interface accordingly. There is thus no need to reconfigure the TPQMS when upgrading the SAN switch from 2G to 4G Fibre Channel for example. Alternatively, the client interface can be set in forced mode and only accept the signal type it is configured for.

## Simplified management via iWDM™

The Quad Multi-Service Transponder is based on Transmode's "intelligent WDM" (iWDM) concept where the client signal is wrapped into a digital frame having overhead bytes that are used to carry the management channels as well as providing quality control of the transmission via performance data. The embedded management channel simplifies the management of a Transmode network since management access is provided wherever there is a traffic connection.

## Two operating modes

The TPQMS has two operating modes that can be activated when the unit is initialized. The unit can be set into either a 4x Transponder mode or a 4x Regenerator mode, see figure 1. The latter converts all interfaces into a line interface enabling the unit to regenerate the signal from the TPQMS Transponders.

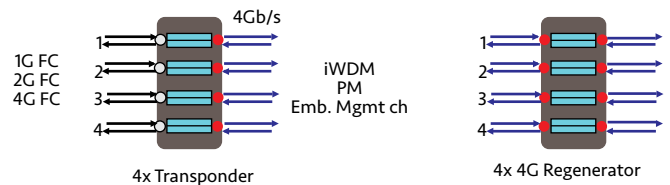


Fig 1. The two main operating modes of the TPQMS; Transponder mode and Regenerator mode

This hardware flexibility reduces the Operational Expenditures (OPEX) since the same plug-in unit can be used to collect and transport client signals as well as regenerate the line signal to extend the bridgeable distance. The regenerator mode can also be used to convert from a CWDM to a DWDM network by using corresponding transceivers (SFPs) on the interfaces, see figure 2. Another application is to use the regenerator mode to convert from one DWDM wavelength to another.

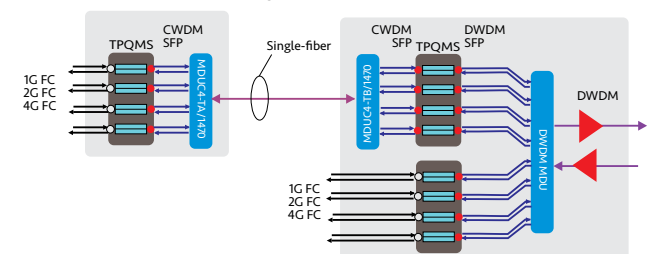


Fig 2. Regenerator mode can be used for CWDM to DWDM transition

The figure shows an example network. In the left node a TPQMS is combined with a 4ch CWDM Mux/Demux Unit (MDU) for single-fiber configuration. This configuration can be mounted in a 1U TM-101 or TM-102 chassis. The CWDM wavelengths are carried to a hub node where the wavelengths are converted to DWDM using a TPQMS in regenerator mode. In the same hub node another TPQMS collects 4 additional FC signals and all eight are then transported on the amplified DWDM network.

### Protected configurations

To provide high availability configurations, 1+1 protection can be applied between two Transponder functions within the same TPQMS, or between two Transponder functions on separate TPQMS units, see figure 3. The protection is provided via a passive optical coupler placed between the client equipment (i.e. SAN switch) and the TPQMS. The two Transponder functions are configured into a protection group via the Embedded Node Manager (ENM). Protection switching is performed within 20ms providing rapid recovery in fault conditions.

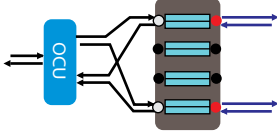


Fig 3. 1+1 equipment protection for increased network availability

### Tailored Network Element options

The TPQMS can be mounted in any of the TM-Series chassis options;

- As a self-managed Network Element in a 1U TM-101/102 chassis
- As one of many traffic units in a TM-3000 (10<sup>1/3</sup>U) or TM-301 (3U) chassis

This enables a tailored setup depending on current and future capacity needs of the site.

In the TM-101/102 option, the TPQMS initiates the complete Embedded Node Management (ENM) on the on-board micro processor. This enables local management simply by connecting any PC or work station and launching a standard internet browser. The embedded management channels enable easy remote management via the line signal. There is therefore no need to provide access to the customer DCN network if the TPQMS is placed at a customer site.

### Certified and with low latency

The TPQMS provides transparent transport of the SAN format, i.e. without any bit manipulation and with low latency. From SAN-switch perspective the TPQMS is seen as a part of the fiber path. Certifications towards the major SAN vendors ensure secure interoperability.

### Low Power Design

A fully equipped TPQMS consumes less than 20W. Low power consumption in combination with a small footprint reduces site costs and enables more capacity to be handled at sites with restrictions on power consumption, cooling and space.

## Technical specifications:

Software release 12.0 or later

<b>Supported traffic formats</b>	1G, 2G and 4G Fibre Channel (and FICON)
<b>Layer-1 performance monitoring</b>	SAN formats: Based on CRC and 8B10B coding errors Line signal: Based on CRC Collected every 15min/24h and presented according to G.826 using ES, SES etc
<b>Protection</b>	1+1 Client/equipment protection. Non-revertive switching <20ms
<b>Power consumption</b>	Max 20W, worst case (with all client ports active and using DWDM SPFs) 12W w/o SPFs
<b>Misc line interface features</b>	Embedded management channels on line signals Trail Trace insertion to validate connection
<b>Operational modes</b>	4x Transponder mode 4x Regenerator mode (with embedded management channels on all 8 line ports)
<b>Released traffic Combinations</b>	1G, 2G or 4G FC per Transponder function via automatic protocol recognition or via forced settings. Other traffic combinations can be provided in future releases.
<b>Interfaces</b>	Client interfaces: SFP MM, SM @ 1310nm/1550nm versions covering 1G to 4G FC Line interfaces: SFP 4Gb/s 40km/70km CWDM (up to 8 channels) or 80km DWDM (up to 40 channels)
<b>Latency</b>	1G=17.9us, 2G=9.5us, 4G= 5.4us
<b>Certifications</b>	Brocade Fabric Aware (Also applies on HP B-Series SAN switches)

The specifications and information within this document are subject to change without further notice. All statements, information and recommendations are believed to be accurate but are presented without warranty of any kind. Contact Transmode for more details.

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