



# Compensators

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### DCM® Modules for LEAF® Fibre, C and L-Band

#### PowerForm™

- 100% Dispersion Slope Compensation
- Provides Optimised Dispersion Compensation Across the 1525nm to 1565nm Passband (C-Band) or 1570 nm to 1610nm Passband (L-Band) on Non-Zero Dispersion Shifted Fibre
- Environmentally Robust and Fully Passive
- Enhances DWDM System Performance by Reducing Accumulated Residual Dispersion
- Variety of Module Packaging, Connector Types and Pigtail Lengths Available
- Rack Packaging Holds Two Standard Length or One Extended Length LEAF® Fibre DCM® Modules

#### Applications:

- Systems Using LEAF® Fibre or Other Positive Non-Zero Dispersion-Shifted Fibres
- Long-Haul and Ultra Long-Haul Communications Systems
- Multi-Channel High-Bit-Rate DWDM Systems
- Longer Reach Metropolitan Networks



### DCM® Modules Single-Mode Fibre, C and L-Band

#### PowerForm™

- 100% Dispersion Slope Compensation
- Provides Optimised Dispersion Compensation Across the 1525nm to 1565nm Passband (C-Band) or 1567nm to 1616nm Passband (L-Band) on Single-Mode Fibre (ITU G.652)
- Environmentally Robust and Fully Passive
- Enhances DWDM System Performance by Reducing Residual Dispersion
- Variety of Module Packaging, Connector Types and Pigtail Lengths Available
- Rack Packaging Holds Two Standard Length or One Extended Length SMF DCM® Modules

#### Applications:

- Long-Haul and Ultra Long-Haul Communications Systems with Conventional Single-Mode Fibre
- High-Bit-Rate DWDM Systems
- Longer Reach Metropolitan Networks
- Cable Television AM Video Links
- Dispersion Fine Tuning



### Flat-Slope DCM® Modules

#### PowerForm™

- Provides Broadband Compensation over the Conventional Erbium Passband (1525 nm to 1565 nm)
- Environmentally Robust and Fully Passive
- Variety of Module Packaging, Pigtail Lengths and Connector Types Available

#### Applications:

- Long-Haul Communications System
- High-Data-Rate Dense Wavelength Division Multiplexing (DWDM) Systems
- Cable Television
- Dispersion Trimming



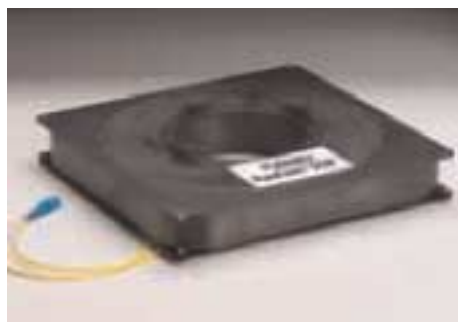
### Positive DCM® Modules

#### PowerForm™

- Positive Dispersion Modules Available with Standard +100, +200, or +300 and Optional +500 ps/nm Dispersion for Negative Dispersion (-D NZ-DSF) Systems
- Broadband Compensation over the Conventional Erbium Passband
- Suitable for Both Single- and Multi-Channel High-Bit-Rate Applications
- Environmentally Robust and Fully Passive

#### Applications:

- Negative Dispersion Non-Zero Dispersion Shifted Fibre Systems
- High-Data-Rate Dense Wavelength Division Multiplexing (DWDM) Systems
- Longer Reach Metropolitan Networks
- Residual Dispersion Clean-Up



### DCM<sup>®</sup> Modules for +NZ DSF Fibres

#### PowerForm<sup>™</sup>

- Provides Optimised Dispersion Compensation Across the 1525nm to 1565nm Passband on Non-Zero Dispersion-Shifted Fibres
- Low Polarisation Mode Dispersion
- Enhances DWDM System Performance by Reducing Accumulated Residual Dispersion
- Environmentally Robust and Fully Passive
- Variety of Connector Types and Pigtail Lengths Available

#### Applications:

- Systems using LEAF<sup>®</sup> Fibre or Any Positive Non-Zero Dispersion-Shifted Fibre
- Long-Haul and Ultra Long-Haul Communications Systems Operating in the 1525 nm to 1565 nm Wavelength Range
- Multi-Channel High-Bit-Rate DWDM Systems
- Longer Reach Metropolitan Networks



### Fixed Dispersion Slope Etalon Compensator

#### PowerShaper<sup>™</sup>

- Flat-Slope or 100% Dispersion Slope Compensation
- Small Form Factor
- High Power Handling
- Totally Passive
- Versatile Design

#### Applications:

- 2.5 Gb/s and 10 Gb/s Systems
- Metro and Long-Haul Networks
- Cable TV Links
- Submarine Applications
- Pre and Post Terminal Compensation



### Tunable Dispersion Compensation Module

#### PowerShaper<sup>™</sup>

- Low Loss
- Small Form Factor
- Low PDL and PMD
- High Power Handling

#### Applications:

- 2.5 Gb/s and 10 Gb/s Systems
- Metro and Long-Haul Networks
- Cable TV Links
- Submarine Applications
- Pre and Post Terminal Compensation



## Fixed Dispersion Compensator

HiLynx®

- Low Group Delay Ripple
- Low Insertion loss Ripple
- Global loss budget optimisation
- Low PMD
- Non-linear effect reduction
- Sub-band approach ability
- Pay-as you grow ability
- Athermal package
- Telcordia GR 1221 qualified

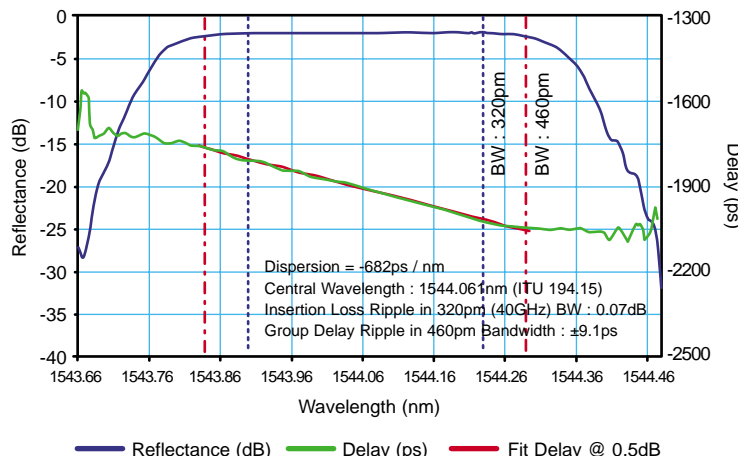
### Applications

- LH and ULH systems
- Simplest upgrade from 2.5 to 10 GB/s for already installed systems
- New 10 Gb/s and 40 Gb/s systems installation
- Per-channel or sub-band compensation:
  - Pre-compensation at emitters
  - Compensating add-drop nodes
  - Post compensation at receivers
  - Pre-chirp or post-correction for distortion sensitive analogical links

The HiLynx® Fixed Dispersion Compensator is the right component and represents a cheap system solution to design and start with the next 10 and 40 Gbit/s systems and it is also the best pick-it-up component in order to upgrade the already installed links from 2.5 Gbit/s rate till 10 Gbit/s at a lower costs.

Our FBG can be used in reflection in combination with a circulator or in transmission as it plays as a Drop Module for the compensated ITU channels. HighWave can propose any custom solutions, from the solely circularly packaged device till the complete module including packaged FBG, circulator and couplers if required.

Our writing process affords greater control over the group delay ripple as well as a reduction of the Polarisation Mode Dispersion.



### Optical Specifications

		HiLynx F series Single channel	HiLynx F4I series 100 GHz / 4 channels
Dispersion value	ps/nm	- 2000 to + 2000	
Channel Bandwidth (BW)	GHz	20 to 80 GHz	
Insertion loss	- Component	dB	
	- Module (including circulator)	dB	
Insertion loss Ripple	dB	< 0.3	< 0.4
Raw Group Delay Ripple	ps	< +/-10	< +/-15
GDRipple (100 pm smoothing avg.)	ps	< +/- 2	< +/- 3
PDL (averaged in BW)	dB	< 0.1	
PMD (averaged in BW)	dB	< 0.5	

### Example of Reflectance and Delay of an HWT F-DCM

Mechanical specifications		HiLynx F series and F4I series Single channel / 4 channels
Athermal Package dimensions	mm	168 x f12
Circulator included Module dimensions	mm	230 x 60 x 16
Operating temperature	°C	- 5 to + 70
Storage temperature	°C	- 40 to + 85



## Tunable Dispersion Compensation Modules

HiLynx®

- Low Group Delay ripple
- Low Insertion loss ripple
- Large tuning range over high bandwidth
- Low PMD and Low power consumption
- Optimised global loss budget
- Pay-as you grow ability
- Inventory savings
- Space saving
- Telcordia (GR 1221) qualified

### Applications

- LH, ULH and reconfigurable metro systems
  - Smart upgrade from 2.5 to 10 Gb/s for already installed systems
  - New 10 Gbit/s systems installation
  - Next 40 Gbit/s systems design
- Per-channel and Nx (4 tunable  $\lambda$ )? sub-band compensation:
  - Pre-compensation at emitters
  - Reconfigurable OADM nodes
  - Post compensation at receivers
- Single/low-count channel end-to-end compensation

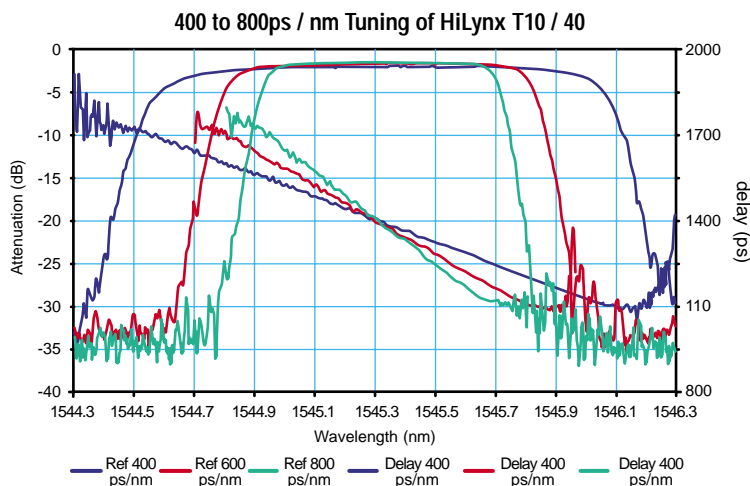
The HiLynx® Tunable Dispersion Compensation Modules are both a key factor for leading 10 Gbit/s systems and also an indispensable component for next generation 40 Gbit/s systems:

Our chirped Fibre Bragg Grating based DCMs are thermally tuned and computerised over the whole temperature range.

Our photo-inscription process affords greater control over the group delay ripple as well as a reduction of the Polarisation Mode Dispersion.

Our line of products can operate in both a per-channel compensation fashion and/or a sub-band compensation strategy.

HighWave proposes conveniently available off-the-shelf products as well as custom-made solutions, including butterfly device alone or complete modules with circulator and dedicated electronics.



Example of Reflectance and Delay of an HWT F-DCM

### Ordering Information

PART Number : **HWT-GFF-Typ-WR-EF-Pack-Cr**

**Typ : WR : EF : Pack : Cr**

**C** : Chirped Wavelength Range Peak to Peak **ATH** : Athermal Package Connector  
**S** : Slanted (To be specified) Error Function **SLE** : Sleeve protection (To be specified)  
**S/C** : Slanted / Chirped (To be specified)

Optical Specifications	Units	HiLynx T10 (10 Gbit/s systems)	HiLynx T10 / 40 (10 and 40 Gbit/s systems)
Dispersion tuning range	ps/nm	700 to 1300	400 to 800
Channel Bandwidth (BW)	GHz	Up to 40	Up to 80
Insertion loss (including a circulator)	dB	< 2 dB	
Insertion loss Ripple	dB	< 0.5 dB	
Raw Group Delay Ripple (over full T° range)	ps	< +/-20 ps	< +/-15 ps
GDRipple (100 pm smoothing avg.)	ps	< +/- 5 ps	< +/- 3 ps
PDL (averaged in BW)	dB	< 0.1 dB	
PMD (averaged in BW)	ps	< 0.5 ps	

Mechanical and Electrical specifications	HiLynx T10 and T10/40	
Complete module dimension	mm	200 x 100 x 15
Standalone Butterfly dimension	mm	140 x 15 x 12
Operating temperature	°C	-5 to +70
Storage temperature	°C	-5 to +70
Tuning control		RS232 interface
Tuning Technology		Thermo-elec. cooler
Power consumption over all T°	W	<5