

**PRODUCT SPECIFICATION
TELECOMMUNICATIONS FIBER OPTIC CLOSURES**

Closure System Description

- A. Closure system shall consist of a base assembly and a dome, joined together with a clamp compressing an o-ring.
- B. Closures must contain ground points that are accessible independent of cable entry ports.
- C. Cables entering the closure shall be sealed via a single re-useable, re-enterable compressed gel seal with 4 or more cable entry ports. The compression of this seal can be adjusted to accommodate various cable diameters.
- D. Closure systems utilizing grommet seals are not allowed.
- E. Closure system must utilize hinging trays.
- F. Closure system must include facility for fiber storage.
- G. Product components shall withstand storage temperatures of -30°C to 60°C and storage humidity levels of up to 93% relative humidity.
- H. Closure kits shall contain all of the necessary components for a complete installation.
- I. Closure system shall be installable at temperatures between -5°C and 45°C .
- J. Closure shall be capable of use in aerial, pedestal, buried, or underground applications.
- K. The closure system shall allow the accommodation of fibers with a minimum bend radius of 30mm.

Closure Performance

TIGHTNESS

Requirement: No continuous emission of bubbles

Test temperature	$(+23 \pm 3)^{\circ}\text{C}$
Internal pressure	$(40 \pm 2) \text{ kPa}$
Test time	15 min

PRESSURE LOSS DURING TEST

Requirement: Difference in pressure before and after the test $\leq 2 \text{ kPa}$ at the same atmospheric conditions.

Test temperature	$(+23 \pm 3)^{\circ}\text{C}$
Internal pressure	$(40 \pm 2) \text{ kPa}$
Elapsed time	$< 12 \text{ hours}$

AXIAL TENSION

Requirements: Tightness: Pressure loss during test Displacement $\leq 3 \text{ mm}$

Test temperature	$(+23 \pm 3)^{\circ}\text{C}$
Test pressure	$(40 \pm 2) \text{ kPa}$ sealed
Load/cable	cable diameter/45 \times 1000 N (max. 1000 N)
Test duration	1 hour/cable

FLEXURE

Requirements: Tightness: Pressure loss during test; Appearance

Test temperature	$(-15 \pm 2)^{\circ}\text{C}$ and $(+45 \pm 2)^{\circ}\text{C}$
Test pressure at room temperature	(40 ± 2) kPa sealed
Bend radius / Force Max.	30° bending or max. 500 N force
Force application	400 mm from end of base
Number of cycles	5 per cable, 10 min. per cycle

IMPACT

Requirements: Tightness: Pressure loss during test; Appearance

Test temperature	$(-15 \pm 2)^{\circ}\text{C}$ and $(+45 \pm 2)^{\circ}\text{C}$
Test pressure at room temperature	(40 ± 2) kPa sealed
Impact tool	1 kg steel ball
Drop height	2 m
Location	0°, 90°, 180° and 270°
Number of impacts	1 per location

RE-ENTRY

Requirements: Tightness; Appearance

Number of re-entries	10
Ageing between each re-entry min.	1 cycle
Temperature range	$(-30 \pm 2)^{\circ}\text{C}$ to $(+60 \pm 2)^{\circ}\text{C}$
Transition time	2 hours
Dwell time	4 hours
Cycle duration	12 hours
Test pressure	0 kPa sealed off at room temperature

SHOCK

Requirements: Tightness, Appearance, Pressure loss during test

Test temperature	$(+23 \pm 3)^{\circ}\text{C}$
Test pressure	(40 ± 2) kPa sealed
Severity	15 g (150 m/s ²)
Duration	11 milliseconds
Wave form	Half sine
Number of shocks	3 up & 3 down
Axes	3 mutually perpendicular

STATIC LOAD

Requirements: Tightness, No pressure loss during test, Appearance

Test temperature	$(-15 \pm 2)^{\circ}\text{C}$ and $(+45 \pm 2)^{\circ}\text{C}$
Test pressure at room temperature	(40 ± 2) kPa sealed
Load	1000 N/25 cm ²
Positions	0° and 90°
Test duration	10 min.

TORSION

Requirements: Tightness, Pressure loss during test, Appearance

Test temperature	$(-15 \pm 2)^{\circ}\text{C}$ and $(+45 \pm 2)^{\circ}\text{C}$
Test pressure at room temperature	(40 ± 2) kPa sealed
Max. rotation or max. torque	Max. 90° or max. 50 Nm
Torque application	400 mm from end of base
Number of cycles	5 per cable, 10 min. per cycle

VIBRATION

Requirements: Tightness, Appearance

Test temperature	$(+23 \pm 3)^{\circ}\text{C}$
Test pressure	(40 ± 2) kPa regulated
Frequency	(10 ± 1) Hz
Cycle	Sinusoidal
Amplitude	3 mm
Cable clamping	500 mm from end of base
Test duration	10 days

RESISTANCE TO AGGRESSIVE MEDIUM: PH 2

Requirements: Tightness, Appearance: no visible degradation

Test temperature	$(+23 \pm 3)^{\circ}\text{C}$
Test pressure	(40 ± 2) kPa sealed
Test medium	Chemical solution of HCl (pH 2)
Test duration	5 days of complete immersion

RESISTANCE TO AGGRESSIVE MEDIUM: PH 12

Requirements: Tightness, Appearance: no visible degradation

Test temperature	$(+23 \pm 3)^{\circ}\text{C}$
Test pressure	(40 ± 2) kPa sealed
Test medium	Chemical solution of NaOH (pH 12)
Test duration	5 days of complete immersion

RESISTANCE TO AGGRESSIVE MEDIUM: KEROSENE

Requirements: Tightness, Appearance: no visible degradation

Test temperature	$(+23 \pm 3)^{\circ}\text{C}$
Test pressure	(40 ± 2) kPa sealed
Test medium	Bath with kerosene (lamp oil), ISO 1998/I 1.005
Test duration	5 days of complete immersion

RESISTANCE TO AGGRESSIVE MEDIUM: PETROLEUM JELLY

Requirements: Tightness, Appearance: no visible degradation

Test temperature	$(+23 \pm 3)^{\circ}\text{C}$
Test pressure	(40 ± 2) kPa sealed

Test medium	Petroleum jelly
Test duration	5 days of complete immersion
RESISTANCE TO AGGRESSIVE MEDIUM: DIESEL FUEL FOR CARS	
Requirements: Tightness, Appearance: no visible degradation	
Test temperature	(+23 ± 3)°C
Test pressure	(40 ± 2) kPa sealed
Test medium	Bath with diesel fuel for cars EN 590
Test duration	5 days of complete immersion

RESISTANCE TO STRESS CRACKING

Requirements: Tightness, Appearance: no visible cracking

Test temperature	(+50 ± 2)°C
Test pressure	(40 ± 2) kPa sealed
Test medium	10 % Igepal
Test duration	5 days of complete immersion

TEMPERATURE CYCLING

Requirements: Tightness, Appearance

Temperature range	(-30 ± 2)°C to (+60 ± 2)°C
Transition time	2 hours
Dwell time	4 hours
Cycle duration	12 hours
Internal pressure	(40 ± 2) kPa regulated
Number of cycles	20

WATER HEAD

Requirement: No water ingress

Test temperature	(23 ± 3)°C
Column height	5 m water
Test pressure	0 kPa
Test duration	7 days

Quality Assurance Provisions

- A. It shall be the supplier's responsibility to assure qualification to lot conformance to this specification.
- B. The supplier may utilize his own or other testing and inspection facilities acceptable to the buyer.
- C. Regular requalification testing shall be performed.