

SEACON

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# SEACON HydraLight Wet-Mate Connector

Rugged Reliability In Mission Critical Applications

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## Rugged Reliability in Mission Critical Applications

TE Connectivity (TE)'s SEACON HydraLight optical wetmate connector enables high performance and reliability in many of the harshest subsea environments. It is offered in a standard 8 way configuration with Ultra Physical Contact (UPC) contacts. Angled Physical Contact (APC) contact configurations are available in 8 / 12 / 24 way.

### High performance, high reliability

Over 5,000 HydraLight connectors have been sold worldwide. The connectors that have been installed underwater now have an accumulated operating time in excess of 290 million hours, yielding a Mean Time Between Failure (MTBF) of better than 61 million hours with a 99% confidence level.

### FIELD PROVEN RELIABILITY

- Over 5,000 units sold worldwide
- 290 million accumulated operating hours
- Mean Time Between Failure (MTBF) of better than 61 million hours

### EXCELLENT OPTICAL PERFORMANCE

- Optical coupling within "joined chamber"
- Single-mode or multi-mode optical fiber
- Average single-mode insertion-loss of better than 0.2 dB (0.5dB max)
- Average single-mode back-reflection of better than -50dB over mate-cycle life (min of -30dB)

### ROBUST DESIGN

- Oil-filled and pressure balanced
- Qualified to 7,000 m (23,000 ft)
- Synthetic mineral oil compensation fluid
- Field-proven sealing mechanisms

### COMPATIBLE

- Seawater compatible internals and elastomers
- ROV operable interface
- SEACON MKII Pressure Balanced Oil Filled (PBOF) hose

### OPERATION

- **Maximum handling load:** 2,500N (562lb)
- **Maximum ROV load:** 5,000N (1,124lb)
- **Maximum rotational misalignment:** 10°
- **Maximum angular misalignment:** 5°
- **Maximum radial misalignment:** 6.4mm (0.25 inches)
- **Maximum mate/de-mate speed:** 0.3ms<sup>-1</sup> (12 inches per second)
- **Maximum mate force:** 54kg (140lb)
- **Mate stroke length:** 122mm (4.8 inches)

### DESIGN RATINGS

- **Design Life:** Up to 30 years (within its rated number of mating cycles)
- **Minimum Number of Mate/Demate Cycles:** UPC=100 / APC=250
- **Depth Rating:** Qualified for use at 7,000m (23,000ft)
- **Operating Temperature:** -5°C to +40°C (+23°F to +104°F)
- **Storage Temperature:** -25°C to +50°C (-13°F to +122°F)
- Designed to meet the following Optical Wet-Mate Connector Specifications:
  - Statoil TR2390 V2
  - Total GSESPS021 Rev. 07
  - SEAFOM TSD-02
- **Average single-mode insertion-loss:** Better than 0.2dB (Max 0.5dB)
- **Average single-mode back-reflection:** Better than -50dB over mate-cycle life (Min -30dB)

### MATERIALS

- **Main seawater-wetted parts:** Titanium
- **Wave spring, retaining rings:** Hastelloy
- **Front elastomeric seals:** Fluorosilicone compound
- **O-rings:** Fluorosilicone or Nitrile
- **Pressure compensation fluid:** Synthetic mineral oil
- **Scraper ring:** Rulon
- **Internal components:** All seawater compatible



## KEY INTERFACE INFORMATION AND DOCUMENTS

### Top Assembly Drawing, HydraLight Bulkhead Connector:

- A270-101-A-B-C

### Top Assembly Drawing, HydraLight Flying Lead Connector:

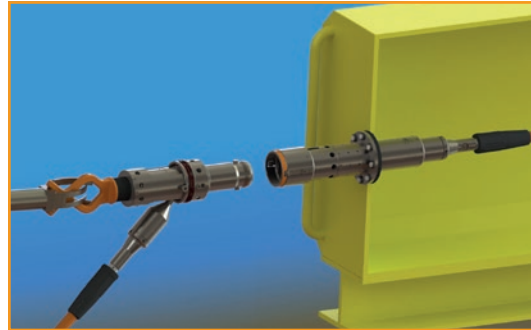
- A269-101-A-B-C

### HydraLight Operation & Maintenance Manual:

- SAPL-OMM-1006

### HydraLight Functional Design Specification:

- SAPL-ENG-1173



## QUALIFICATION TESTING SUMMARY

### Principal Connector Qualification Tests:

- **Optical Tests** - Optical Attenuation, Optical Back-Reflection, Cross-Talk, Optical Performance Longevity
- **Mechanical Tests** - Helium Leak (24 hour), Locking Device, Mating Force, Maximum Misalignment, ROV Force Test
- **Environmental Stress Screening** - Mechanical Shock, Vibration, Thermal Shock
- **Hyperbaric Tests** - Pressure (10,000psi, 690bar), Turbid Sand/Silt (Vertical, Horizontal, 40 degrees), Wet-Mating (10,000psi, 690bar), Partial Wet-Mating, Cold Seawater
- **Connector/Hose Header Tests** - Helium Testing, Nitrogen Testing, Pressure Testing (580psi, 40bar), Long-Term Testing (1,000 hour at 145psi (10bar))
- **Seal Integrity Tests** - Sliding Sleeves, Mate/De-Mate Speed Tests, Internal Gas Pressure and Vacuum Testing, with Simultaneous Mate/De-mating
- **Oil Fill Testing and Evaluation** - Water Ingress Testing and Evaluation, Oil-Filtering, Flushing and Cleanliness
- **Elastomer Compatibility**

### Optical Connector Jumper Assembly Tests:

- Oscillating Jumper, Jumper Pull, Drop, Jumper Handling Simulation and Simulated Deployment

### Optical Jumper Hose and Hose Termination Tests:

- **Environmental Stress Tests** - Hose Absorption/Compensation, Ozone Resistance, Ultra-Violet Resistance, Thermal Shock
- **Destructive Tests** - Tensile Failure, Burst Pressure, Crush Resistance, Outer Sheath Abrasion, Hose Kink

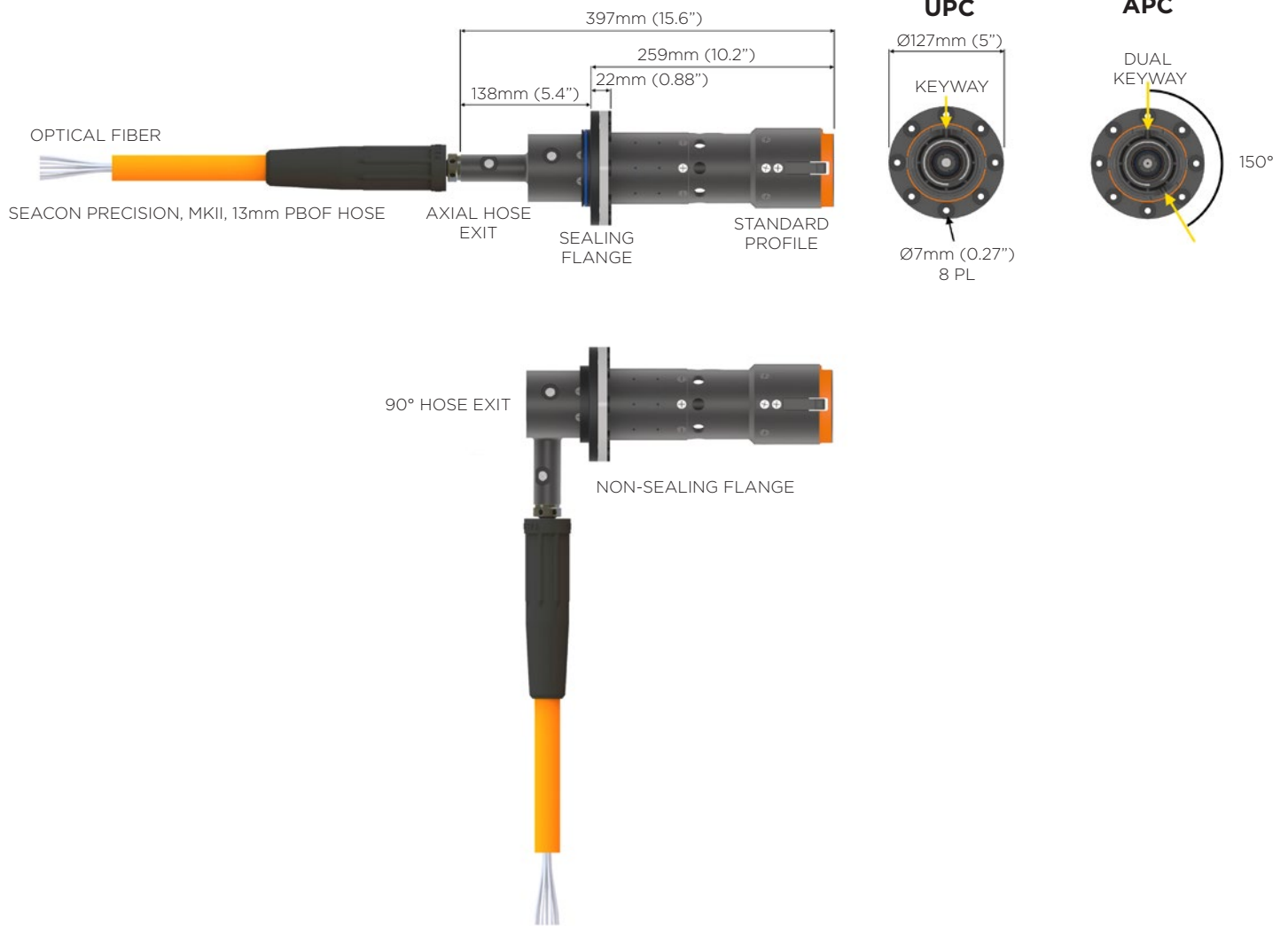
## FIELD MAINTENANCE

The HydraLight Optical Connector Systems incorporates SEACON MKII PBOF hose fittings and are able to be maintained in the field. Provisions have been made in the design to simplify field maintenance of the connector, terminations, and hose configurations.

SEACON recommends a functional test, maintenance check and final check of the oil-fill and air-vent as part of the Subsea System pre-deployment checks (or whenever the connector host-system is brought to the surface).



## Standard HydraLight Bulkhead Connectors



### Bulkhead Options

#### CONNECTOR TYPE

- Bulkhead
- Loopback
- Protective Cap
- Parking Place

#### NUMBER OF OPTICAL CIRCUITS

- 08
- 12
- 24

#### CONTACT TYPE

- UPC (Ultra Physical Contact)
- APC (Angled Physical Contact)

#### MOUNTING OPTIONS

- Sealing Flange
- Non-sealing Flange
- Fixed (Stab Plate Only)
- Floating/Compliant (Stab Plate Only)

#### HOSE EXIT

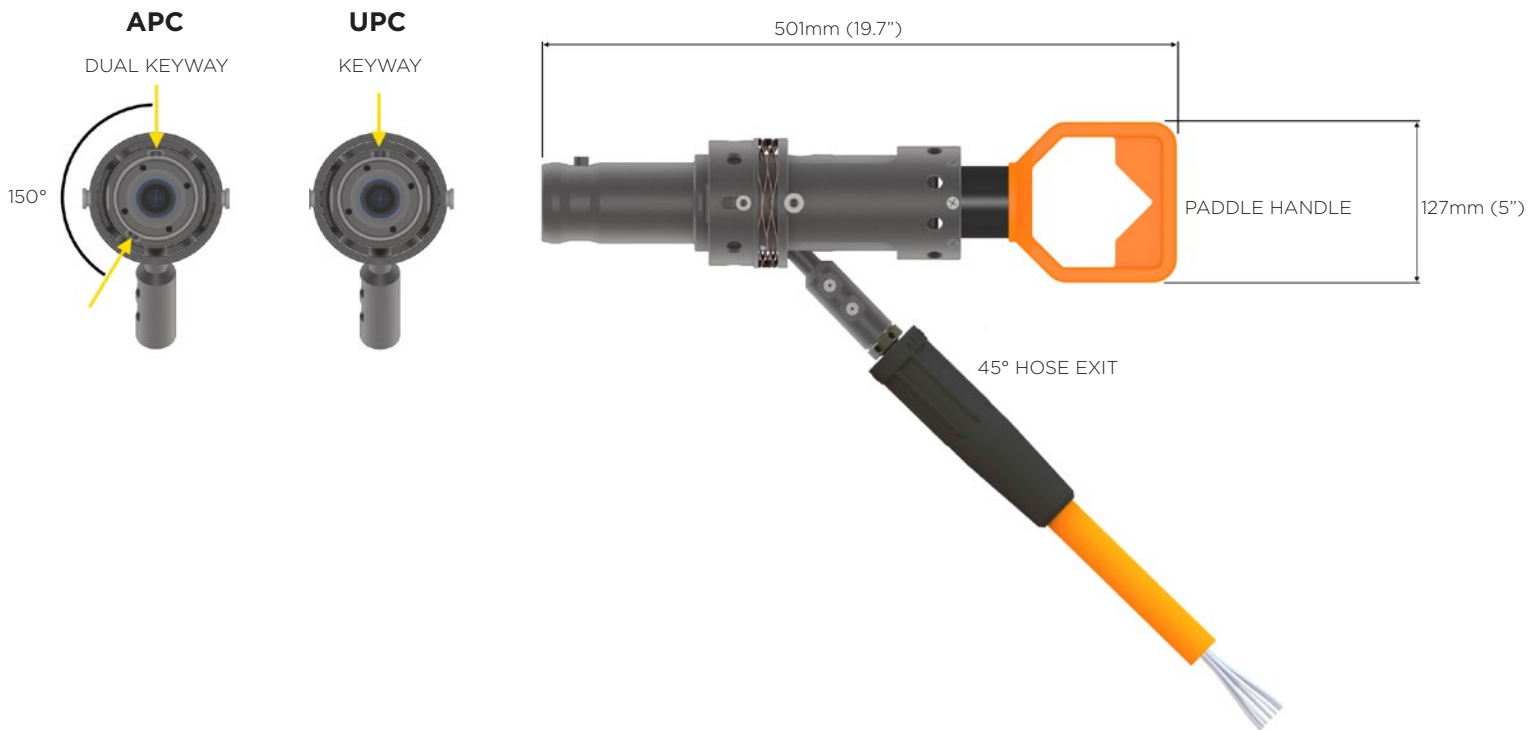
- 0° (Axial)
- 45°
- 90°

#### WIRING OPTIONS

- 1,2,3,4...
- 1-3, 2-4, 5-7, 6-8... (Loopback Only)
- 1-2, 3-4, 5-6, 7-8... (Loopback Only)



## Standard HydraLight Flying Lead Connectors



### Flying Lead Options

#### CONNECTOR TYPE

- Flying Lead
- Loopback
- Protective Cap
- Parking Place

#### NUMBER OF OPTICAL CIRCUITS

- 08
- 12
- 24

#### CONTACT TYPE

- UPC (Ultra Physical Contact)
- APC (Angled Physical Contact)

#### MOUNTING OPTIONS

- Fixed (Stab Plate Only)
- Floating/Compliant (Stab Plate Only)

#### HOSE EXIT

- 0° (Axial)
- 45°
- 90°

#### WIRING OPTIONS

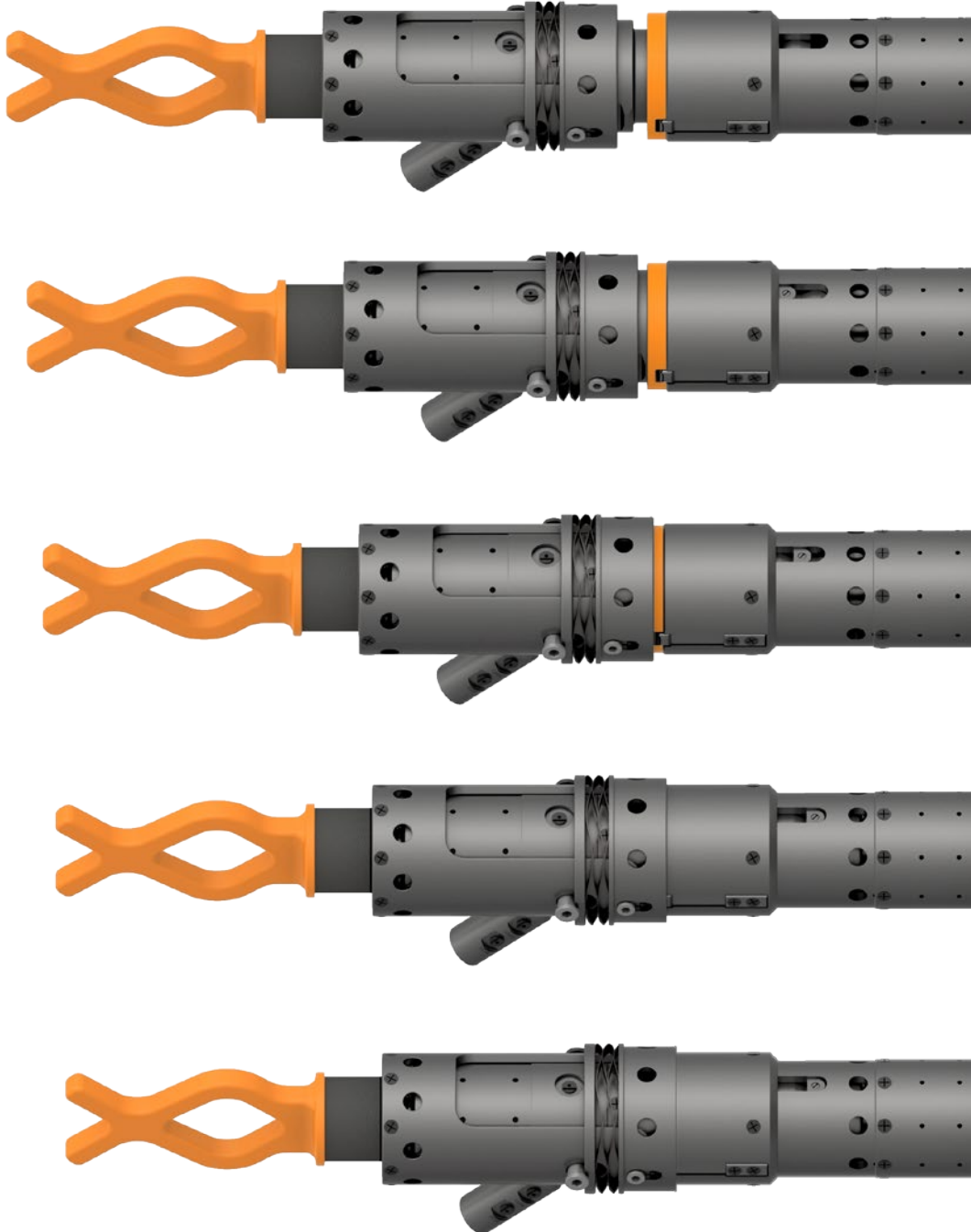
- 1,2,3,4...
- 1-3, 2-4, 5-7, 6-8... (Loopback Only)
- 1-2, 3-4, 5-6, 7-8... (Loopback Only)



## Configurations

- Modular contacts: 8, 12, 24
- Parking Places: Wet-mate-able Long-term & Low Cost Long-term
- Angled hose fittings for specific orientations
- Protective Caps: Wet-mate-able Long-term, Low Cost Long-term, Topside

## Standard Latch Indication During Mating Sequence

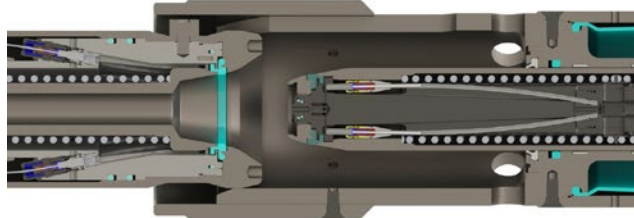




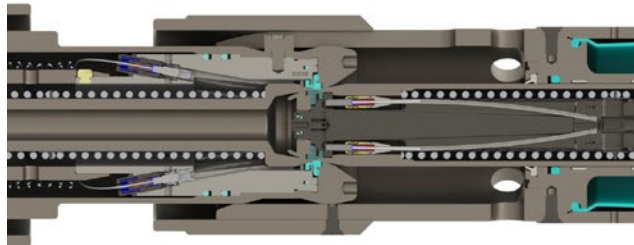
## Principles of Operation

The critical fiber-to-fiber joint is made without exposure to external contamination in a harsh subsea environment. This is achieved as both ends of the optical termination are protected from seawater, sand and silt by being enclosed within separate, oil-filled and pressure compensated chambers. The sequence of operation is shown on the right.

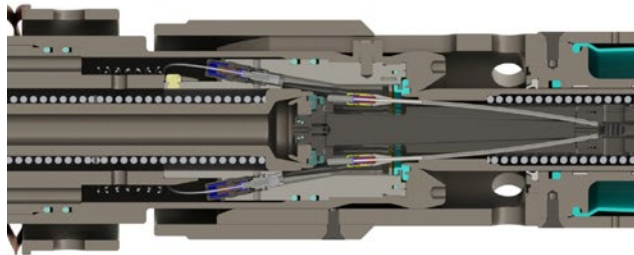
1. Physical alignment of receptacle (left) & plug (right)



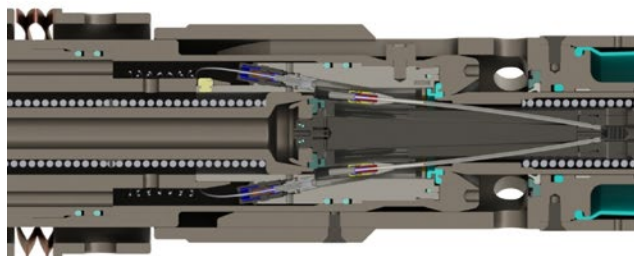
2. 'Front seals' of each connector half contact & engage on their respective other half.



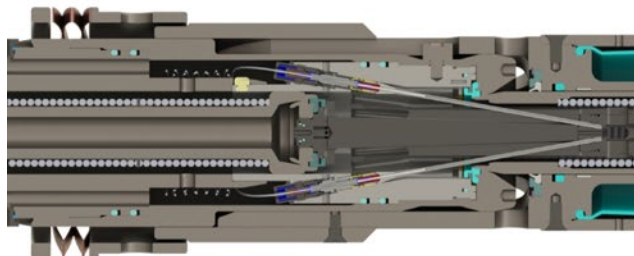
3. Both halves then open up into a single patented 'joined chamber'.



4. Continued mating 'squeezes out all external fluids & contaminants' as the connector halves seal against each other.



5. Flexible contact guide tubes splay and align via guide-ways in their opposite half, allowing the coupling of the optical ferrules within the benign oil-filled environment.  
The connector is now fully mated.





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## Technical Support

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