

SEACON ADVANCED PRODUCTS, LLC PRODUCT DATASHEET

CM2000 3.3kVAC HIGH INTEGRITY, WET-MATE, ELECTRICAL CONNECTORS



DESCRIPTION

The **CM2000 3.3kVAC** underwater mateable electrical connector is modular in design and particularly well suited for adaptation to special designs, however it is also available in industry standard configurations. The unique design features combine superior electrical isolation and ensure the highest connector reliability.

KEY FEATURES

- Over 180 **CM2000 3.3kVAC** units sold worldwide
- Over 2,700 **CM2000** units in total sold worldwide
- Modular electrical contacts
- Oil filled, pressure balanced socket contacts
- Redundant sealing barriers for each contact
- No single point failures
- Extensive qualification testing data available
- Simple and robust with few moving parts
- Voltage ratings to 3.3kVAC phase-to-earth
- Current ratings up to 60 amps
- Rated for deepwater applications
- PBOF hose or molded interface terminations
- Wide operational temperature rating
- Elastomers have over 20 years of use underwater
- Stab, diver or ROV configurations
- Many different body materials available
- Industry standard mounting for bulkhead connectors
- Patented design and features
- High quality electrical high-current wire

QUALITY

- **SEACON** Advanced Products, LLC operate a Quality Management System certified to ISO 9001:2008, ISO 14001:2004 and OHSAS 18001:2007.





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CONFIGURATIONS

- Stab, diver and ROV configurations
- Ø3mm and Ø6mm electrical contact sizes available
- Standard 1, 4, 7 and 12 contact configurations available
- Modular contacts
- Other configurations available upon request
- Oil filled, pressure balanced socket contacts
- Redundant sealing barriers for each contact
- Available in both plug and receptacle configurations:
 - Flying lead
 - Bulkhead mounted, flange mounted
 - Straight terminations, 90° terminations
 - Omnitec MKII pressure balanced oil-filled hose interface
 - Molded terminations
 - Parking places
 - Long-term & short-term protective caps

DESIGN RATINGS

- Design life: 25 years
- Depth Rating: Tested to 450 Bar (6,525psi)
- Socket contacts never see the outside environment, are always contained in dual and nested oil-filled bladders
- Voltage rating: Up to 3.3kVAC phase-to-earth
- Current Rating: Up to 60 amps
- Ø3mm contacts, 3.3kVAC, 30 amps
- Ø6mm contacts, 3.3kVAC, 60 amps
- Life-Cycle: Minimum 100 mate/de-mates
- Maintenance-free over design life (within number of mate/de-mate cycles)
- Operating Temperature: 0°C to +65°C (32°F to +149°F)
- Storage Temperature: -20°C to +65°C (-4°F to +149°F)

OPERATION

- Typical mate force: 3 to 6 lbs (1.36 to 2.72kg) per contact plus latch force (which is dependant on specific configuration).
- De-mate force: 25% of mating force per contact plus de-latch force (which is dependent on specific configuration)
- Typical misalignment tolerances (dependent on model and configuration):
 - Maximum rotational misalignment: 0.5°
 - Maximum angular misalignment: 0.5°
 - Maximum radial misalignment: 0.8mm (0.032 inches)
 - Maximum axial separation: 2.5mm (0.1 inches)

MATERIALS

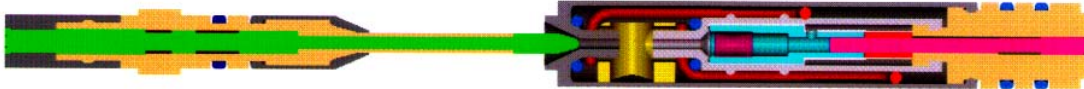
- Housing of choice: Titanium, 17-4 PH, Nitronic 50, Inconel, Ferralium, 316SS, Al Ni Bronze, Beryllium copper and PEEK
- Insulator: PEEK
- Compensation bladders: Natural rubber (Alternative elastomers available for special fluid compatibility requirements)
- O-rings: Nitrile

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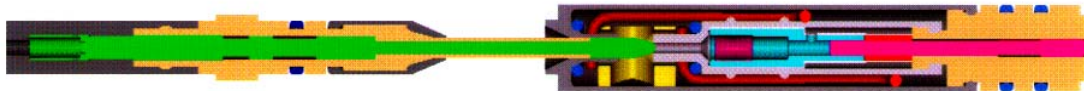
PRINCIPLE OF OPERATION

The critical electrical contact is made without exposure to external contamination in a harsh subsea environment. This is achieved as described by the following mating sequence:

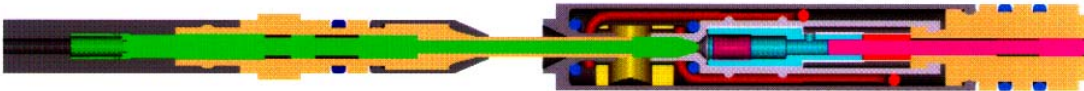
Step 1: The contact pin enters the outer bladder entry of the receptacle contact.



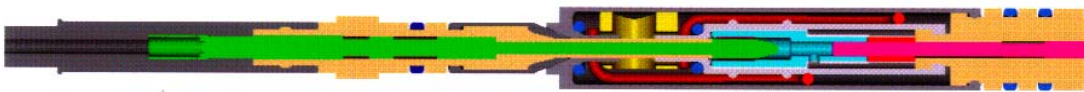
Step 2: The contact pin is wiped and bathed in dielectric fluid as the entry throat maintains a force around the pin ensuring a secure seal.



Step 3: The contact pin continues and enters a second inner bladder entry and is wiped and bathed in dielectric fluid again.



Step 4: The pin engages with the mating socket within the dielectric filled inner bladder enclosure.



Mated Contact: During and after the mating activity, two seals are created and maintained around the pin contact within the oil-filled and pressure-compensated bladders

CONFIGURATIONS AVAILABLE

CM2000 DESIGNATION

CM200X / Ymm

X = Number of Contact

Y = Contact Size

<u>Ø3mm</u> 3.3kVAC, 30A	<u>Ø6mm</u> 3.3kVAC, 60A
CM2004 CM2007 CM2008 CM2012	CM2001 CM2004 CM2012



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QUALIFICATION TESTING

Full details of this testing are highlighted in SEACON document SC-ENG-1011.

(1) Original Performance & Qualification Testing - Performed by independent third party

Insulation resistance, thermal shock, misalignment (radial, angular, rotational and axial-separation), cold temperature (36°F-40°F (2°C-4°C)), silted seawater at ambient and pressure (2,700psi (186bar)), clear seawater at ambient and pressure (2,700psi (186bar)), drop tests, power on mate/de-mate at 600 volts.

(2) Long-term testing - Performed by independent third party in Norway

3 years duration, pressure cycling (0 to 3,625 psi (250 bar)), temperature cycling (ambient to 86°F (30°C)), plus flooded jumper assembly (failure mode simulation) test.

(3) Deepwater Testing - Performed by SEACON

Mated connector to 10,000 psi (690 bar), open face to 10,000 psi (690 bar)

(4) Lifecycle Testing - Performed by SEACON

200 cycles extended rating, 1,000 cycles at reduced temperature, 1,000 cycles un-lubricated

(5) High Current Testing - Performed by SEACON

Temperature rise tests on 3mm contacts and 6mm contacts

(6) High Voltage Testing

- 3mm: Tested to 17.5kVAC and 16kVDC phase-to-earth
- 6mm: Tested to 12kVAC and 9kVDC phase-to-earth

(7) Summary of other testing completed - Performed for US Military

MIL-S-901C&D Grade "A" Explosive Shock (UNDEX: Underwater Explosive Shock Testing), MIL-STD-464 Hazards of Electromagnetic Radiation to Ordnance (HERO), MIL-STD-167 vibration testing, MIL-STD-461 radiated emissions / susceptibility (EMI), MIL-STD-1344 cable seal flexing (method 2017), thermal shock, wet-mating, hydrostatic pressure testing, accelerated life testing simulating 4 years of operational use.

TRACK RECORD

CM2000 3.3kVAC

(1) Over 180 CM2000 3.3kVAC connectors have been sold for higher voltage applications.

CM2000

(1) Over 2,700+ CM2000 connectors are being used on a variety of underwater applications including: subsea control systems; seabed seismic systems; sonar systems; umbilicals; deepwater drilling systems; work-over systems; ROV's; scientific research programs; general oceanographic use; submarines and other classified military programs.

(2) Deepest recorded actual operating depth to 15,420 feet (4,700m).

(3) CM2000's have been used in Africa, Brazil, Canada, Gulf of Mexico, Italy, Japan, Norway, UK and USA.

(4) The CM2000's currently in service have now reached accumulated operating hours in excess of 120 million hours with a Mean Time Between Failure of better than 29 million hours.

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