



**BIRNS Meridian™  
Interconnect Catalog**



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Established in 1954, BIRNS is a global leader in the design and manufacturing of high performance connectors, penetrators and cable assemblies for deep ocean use. BIRNS solutions are found worldwide on submarines and submersibles, diving bells and decompression chambers; ROVs, AUVs and UUVs; and on everything from massive manned systems to photonics masts and intricate towed arrays. Everywhere, BIRNS interconnect products deliver superior performance: faster data transfer for better telemetry and communications, and safer, more reliable power distribution in severely demanding environments.

BIRNS' comprehensive Quality Management System is integrated throughout each process, from sales, design, and production to receiving, in-process and final inspection, through delivery and customer service. The entire QMS is process-based and dedicated to evidence-based continual improvement, with consistent, extensive employee training, involvement, and internal oversight.

BIRNS' QMS is certified to AS9100:2016 and ISO 9001:2015 by DNV, including SUBSAFE. BIRNS' Oxnard facility is certified by the US Navy's Submarine Maintenance Engineering, Planning and Procurement (SUBMEPP) division to NAVSEA S9320-AM-PRO-020. All cognizant BIRNS QA personnel and production technicians are certified<sup>1</sup> to both J-STD-001 and WHMA-A-620-A Class 3<sup>2</sup>, and BIRNS is also DD-2345-certified and DOS/DDTC/ITAR registered

### BIRNS QUALITY POLICY

*BIRNS' policy is to design, make and deliver high performance products that consistently exceed expectations for quality, value and overall customer experience.*

*To that end we maintain an unwavering customer focus; continually improve our processes, products, and services; use a process-based QMS and evidence-based decision making; and adhere to strict ethical standards and sustainable business practices.*



1. IPC-certified trainers/certifiers are on staff full-time.
2. Class 3 is for products where continued high performance or performance-on-demand is critical, equipment downtime cannot be tolerated, end-use environment may be uncommonly harsh, and the equipment must function when required, such as life support or other critical systems.



## Introduction/General Features

The BIRNS Meridian series is a high performance, high current dry-mate interconnect range suitable for deep submergence applications to 6km depth. This series is available in straight or 90° configurations and offers standard and reverse-gender options. Configurations are open-face rated to 6,000 meters and select sizes are DNV Type-Approved for 6,000 meter rated crewed submersibles.

**BIRNS Meridian cable assemblies provide quantifiably superior performance characteristics:** better electrical transfer and greater safety, greater depth capability, and lower insertion and transfer losses. This has been achieved through meticulous and innovative engineering and rigorous testing, and includes a range of industry-leading design features described in detail in the rest of this section. The result is a powerful, robust subsea connector series providing the highest performance field-proven interconnect solutions on the market.



*BIRNS M40-1RG reverse-gender connector pair.*

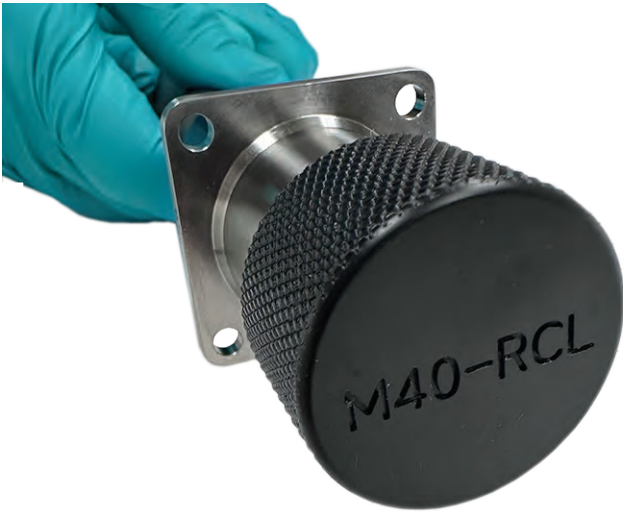


*An M40-1-FR with inboard insulating shield.*



*A standard BIRNS M40-1 titanium connector pair, with primary-key alignment arrows clearly visible.*

Qualification and verification of products' ability to reliably withstand high pressure is fundamental to BIRNS' product development. Connectors and cable assemblies are subjected to hydrostatic testing while mated and open-face. Sometimes high pressure is combined with low temperature to more accurately simulate actual conditions at hadal (6km) seawater depth.



*An M40-1FRTI with M40-RCL installed.*



*A mated M40 connector pair. The obscured fully-mated indicator band shows that the pair is properly mated.*



*An M40-1RG-CPTI cable assembly on 225A cable stock. Hidden from view is the connector's insulating backshell, which works to preclude cathodic delamination.*

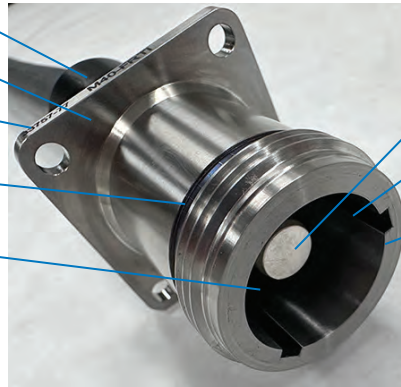


*A standard BIRNS M40-1 titanium connector pair. Note the CP's elongated serialization numbers, which facilitate legibility at an acute viewing angle.*

BIRNS Meridian connectors are high-performance interconnect products, rated for use at depths to 6,000m. The M40 size is in the process of attaining DNV Type Approval for use on 6,000m-rated crewed submersibles, requiring multi-cycle hydrostatic pressure testing to 200% of the maximum dive depth while transferring maximum power load, followed by additional pressure testing with shorn cable.



- Inboard dielectric insulating shield
- Shells available in SS or TI
- Shells are individually serialized for quality and traceability
- Fully-mated indicator band
- Open-face pressure resistance is standard



- Replaceable, interchangeable inserts
- Scoop-proof
- Dual redundant O-ring seals ensure long-term sealing reliability

- Sturdy coupling rings resist mechanical damage
- Special coupling ring Higbee threads facilitate proper coupling
- Dual integral long, square keys provide long-term positive indexing; \*Primary key is clearly identified to facilitate alignment
- Heat-treated BeCu sockets keep spring strength
- Replaceable, interchangeable inserts



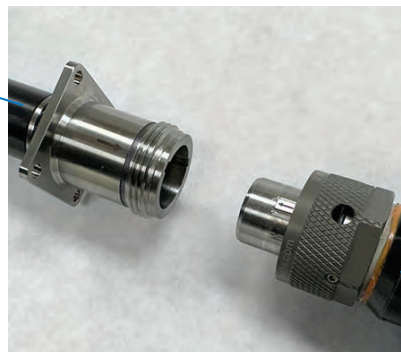
- Locking set screws preclude vibration-loosening in service
- Coupling rings have hex flats for ease of loosening
- Drain/view holes provide visual coupling verification
- Positive stops preclude over-tightening
- Shells are individually serialized for quality and traceability
- Shells available in SS or Ti; Ti shells use Ti coupling rings

- Solder pots are scalloped, making it easier to place wires into solder pots, reducing termination mistakes, costs, and technician fatigue
- Solder pots accept the largest stranding of any wire size
- Inserts can be terminated outside the shell for convenience and cost reduction
- Silver plating on all pins and sockets minimizes contact voltage drop



- Soldering access is unrestricted by wings or other obstructions
- Insulated solder pots are easy to cover with heat-shrink tubing, increasing IR between contacts
- Inserts have smooth, molded-in O-ring lead-in chamfers (don't cut O-rings during installation) for sealing

- Assemblies are completely configurable (length, tolerance, labeling, shield treatment, solder type, overmolding material, clocking, rotation)



- Next-Gen PUR pressure overmolding



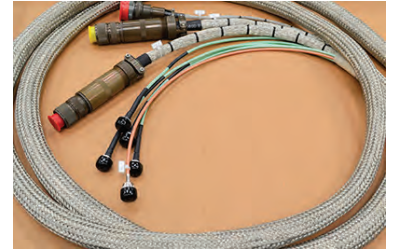
BIRNS performs multiple value-added services in the fabrication of Millennium cable assemblies—many of which are available on a subcontract basis.



High-performance cable assembly connectorization and overmolding. BIRNS is SUBMEPP-certified to NAVSEA S9320-AM-PRO-020, and offers three PUR grades to meet customers' needs.



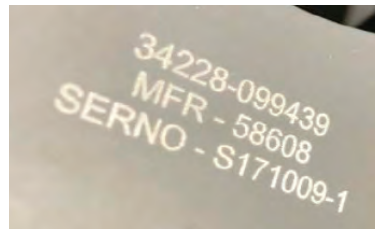
BIRNS' professional assembly, filling (on request) and testing of oil-filled cable assemblies provides turn-key solutions that reduce costs and optimize reliability.



BIRNS' team is expert at electrical<sup>1</sup>, optical and SHF RF terminations and wire harness assembly.



BIRNS' skilled mechanical team terminates steel and aramid-fiber strength members, often combined in EOM cables with optical SMF or MMF and/or low or high-voltage electrical lines.



Custom laser-etching of metal parts is available, as is a choice of six standard cable-marking methods.

1. Technicians are certified to J-STD-001 and WHMA-A-620A Class 3. IPC-certified trainers/certifiers are on staff full-time.





*BIRNS' custom-engineered programmable hydrostatic system has automated digital data recording capabilities. It can simultaneously run three independent pressure circuits in six chambers at pressures up to 20,000 PSI (138 MPa), in fresh or salt water.*



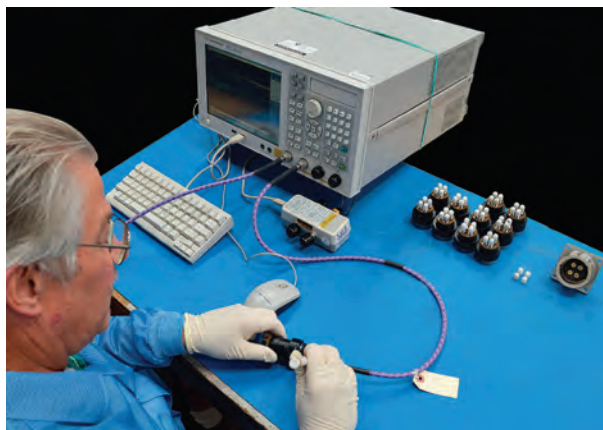
*Low temperature/high pressure test capability simulates actual conditions at depth, with long-term continuous pressure testing in a controlled 2°C (±1°C) environment; programmable, automated multiple pressure cycles; real-time electrical and optical test data recording; and continuous digital output of pressure and temperature data.*



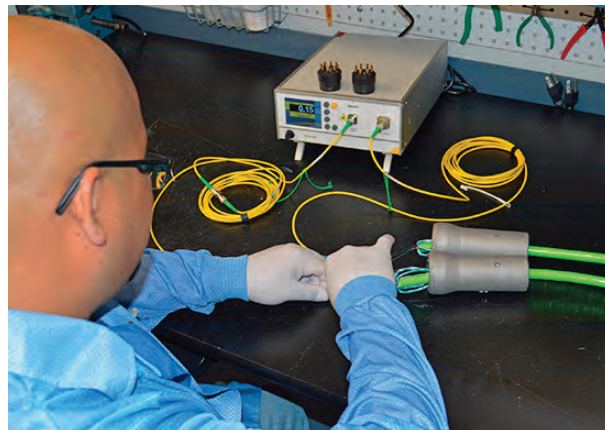
*Final acceptance tests using a Kikusui TOS9213S DC DWV/IR Tester with high voltage scanners. Our custom-made programmable system permits simultaneous testing of up to 16 electrical circuits at voltages up to 6kV, even while under hydrostatic pressure.*



*Testing of complex wire harnesses at voltages up to 2100VDC/1200VAC, with a CAMI 829A HVX-21 128-line test system meeting all IPC/WH-MA-A-620B electrical test requirements.*



*Insertion loss and VSWR testing from 100 kHz to 18GHz using a Keysight Technologies E5063A ENA high frequency vector network analyzer.*



*EIA-455-A testing of electro-optical connector assemblies using an Opto-Test OP940-SM-13/15 Return Loss Meter with dual wavelength InGaAs detectors.*



### Receptacle Assemblies

1. Using your system circuitry needs, determine the required QUANTITY and SIZES of lines and select the appropriate pin configuration from the BIRNS Meridian Pin Configuration chart. (See Pin Configurations, Page 10.) The pin configuration determines the shell size and pin number (e.g., "M40-1").

*Pro Tip:* if none meet your needs, contact BIRNS for a custom configuration.

2. Select the desired Receptacle type: FR, OR, BR (e.g. "M40-1-FR"). (See Graphical Overview, Page 11.)

*Pro Tip:* when using OR or BR, remember Nut/Washer sets.

Select the shell material and inboard termination as needed. See Part Numbering, Receptacles, Page 13.

### Cable Assemblies

1. The Receptacle determines its CP mate (e.g. "M40-1-CP"). Select the CP shell material. See Cable Plugs, Page 18.
2. For cable assemblies, see Part Numbering, Molded Cable Assemblies, Page 20, and specify cable type or part number. See Molded Cable Assembly Configuration Guide, Page 22.

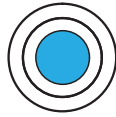
### Incidentals & Accessories

- Value-added services, such as termination, overmolding and testing: see Value-Added Services, page 7.
- Sealing caps: see Caps, DSPs & DSRs, Page 28.

## LEGEND

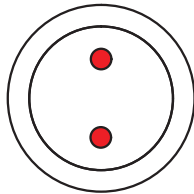
		Ampacity <sup>1</sup>
	000 AWG (85mm <sup>2</sup> )	225A
	0 AWG (50mm <sup>2</sup> )	170A
	2 AWG (34mm <sup>2</sup> )	130A
	4 AWG (21mm <sup>2</sup> )	95A
	6 AWG (13mm <sup>2</sup> )	75A
	10 AWG (8mm <sup>2</sup> )	40A
	14 AWG (3mm <sup>2</sup> )	25A
	16 AWG (2mm <sup>2</sup> )	15A

### M40

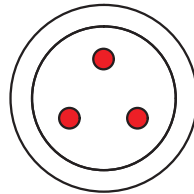


1-000

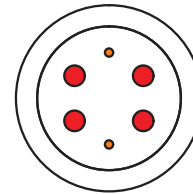
### M60



2-6



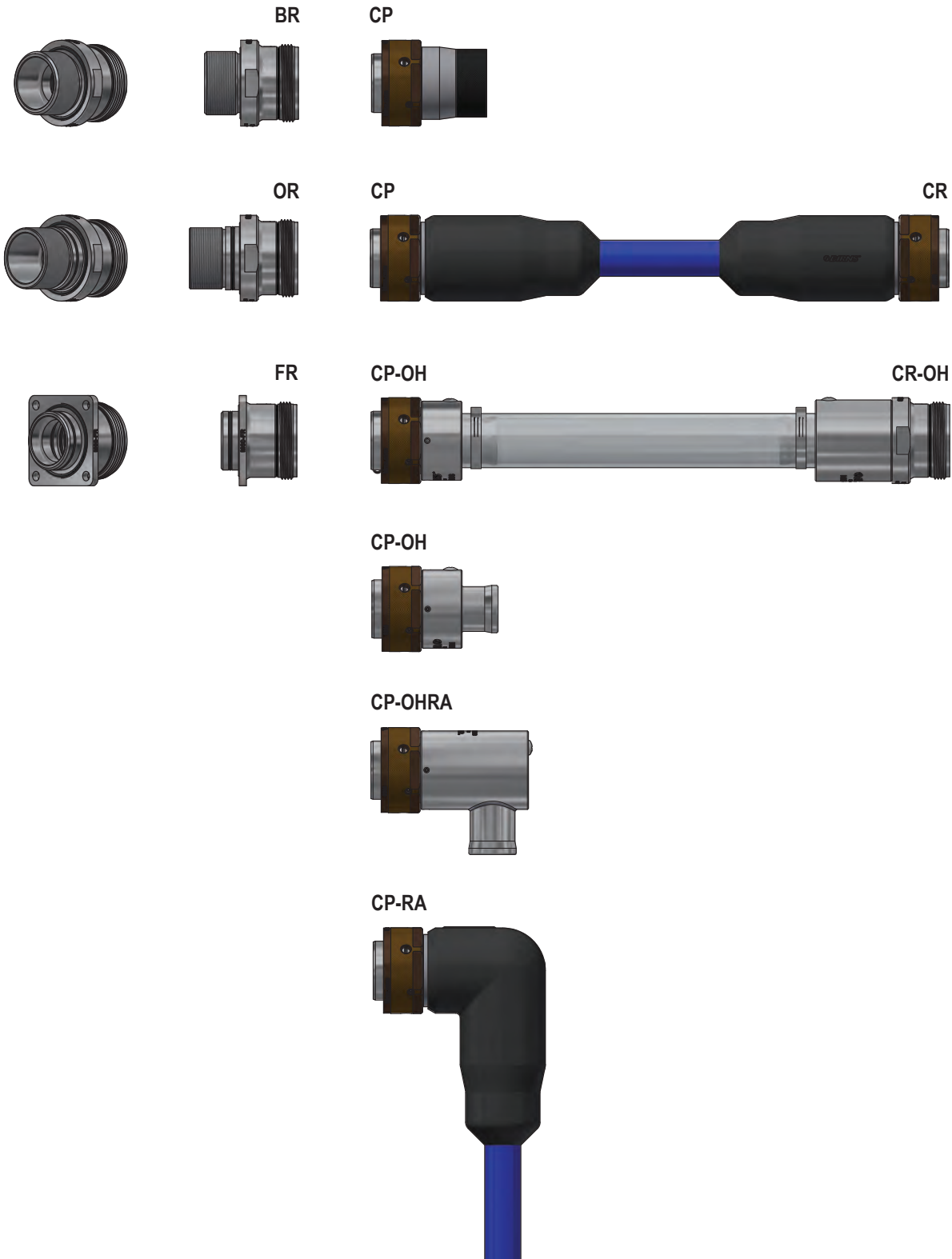
3-6



4-6, 2-16

1. BIRNS ampacity values are informational guidelines, exclusive of bundling derating and ambient temperature adjustments, and assume 90°C-rated insulation. Electrical designers must consider all factors affecting ampacity. See the "Electrical Performance" page for more information.





BIRNS Meridian connectors are designed for power-transfer applications. For enhanced safety, the power source should use sockets instead of pins. For applications in which the Receptacle is the power source, BIRNS offers Reverse-Gender (RG) options. In RG configurations, sockets are in the Receptacle and pins are in the Cable Plug.



*BIRNS Meridian Reverse Gender connectors provide enhanced safety for power-transfer applications in which the Receptacle is the power source.*

These connectivity solutions provide flexibility and enhanced safety and security options for subsea system designers who need the Receptacle to be the power source. The integration of sockets versus pins into the RG Receptacle enhances safety and further protects the system against mechanical damage or electrical shorts in specific applications, e.g., on ROV power supply units.

Reverse-Gender receptacles fit the same mounting profiles as non-RG receptacles, and provide the same depth rating and electrical performance characteristics. Also, standard and RG inserts are interchangeable, so system designers can change existing connectors to an RG configuration by simply replacing the inserts.

### Part Number Explanation

RG and non-RG connectors follow the same part numbering system but RG pin configurations include the “RG” letters which are integrated into the part number. For example, for the M40-1 and M40-RG1 pin configurations, the part numbers are as follows:

M40-1-FR = pins in FR (Standard)

M40-1-CP = sockets in CP (Standard)

M40-RG1-FR = sockets in FR (Reverse-Gender)

M40-RG1-CP = pins in CP (Reverse-Gender)

See “Part Numbering-Receptacles”, Page 13, and “Part Numbering-Molded Cable Assemblies”, Page 20.

Replacement insert part numbers for both RG and non-RG specify the contact gender (pins or sockets). For example, for the M40-1 and M40-RG1 pin configurations, replacement insert part numbers are as follows:

M40-RIP-1 = Receptacle Insert with Pins (Standard)

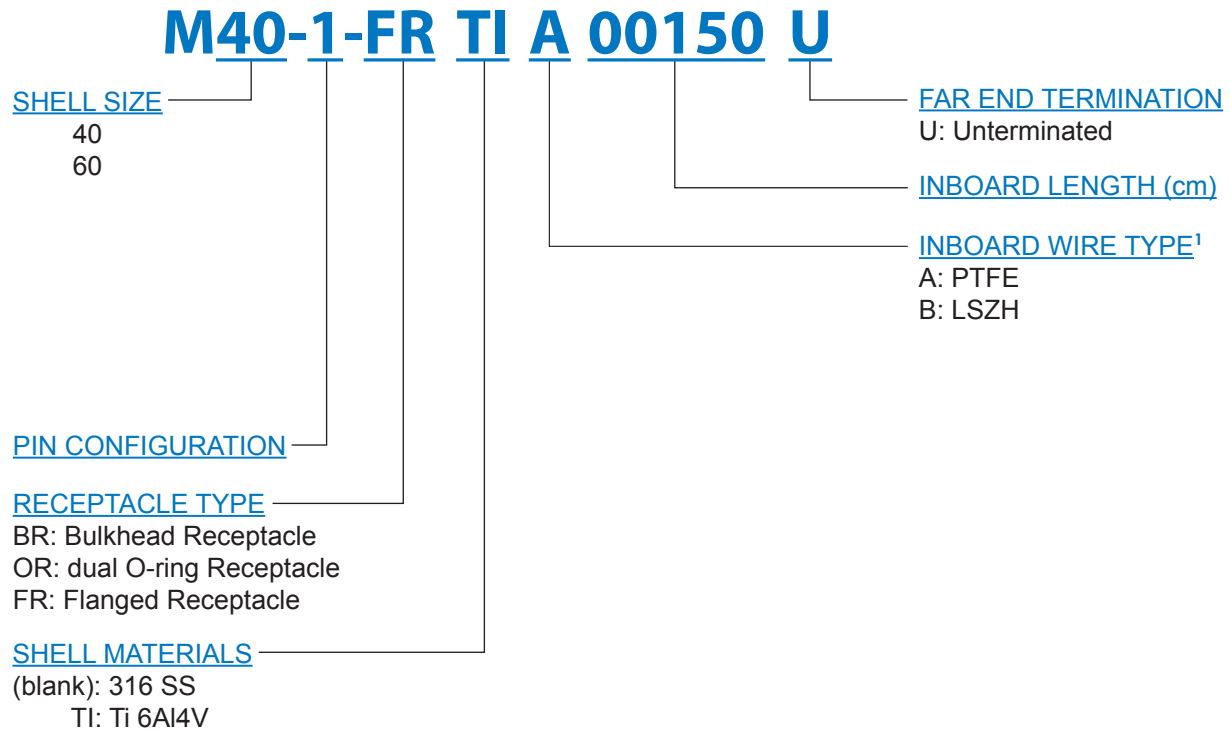
M40-PIS-1 = Plug Insert with Sockets (Standard)  
(Reverse-Gender)

M40-RIS-1 = Receptacle Insert with Sockets  
(Reverse-Gender)

M40-PIP-1 = Plug Insert with Pins

See “Part Numbering-Inserts”, Page 30.





## Receptacle Kit/Assembly Part Numbering Guide<sup>2</sup>

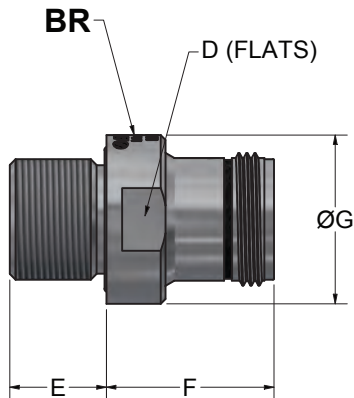
1. Select a pin configuration from the chart.
2. On the Pin Configuration chart, note the shell size (e.g., M40) and configuration label (e.g., M40-1)
3. Select receptacle type (BR, OR, FR) [For locking nuts, see Page 14]
4. Select shell material (SS, TI)

Steps 1-4 are for the receptacle kit without assembly or inboard termination. For a complete terminated assembly:

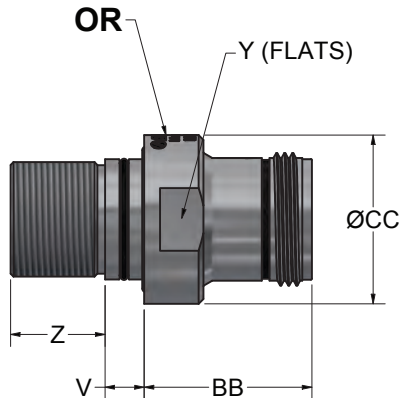
5. Select the inboard wire type letter
6. Select the desired termination length in centimetres
7. Select the far-end termination

1. PTFE wire is required for oil-filled cannisters; LSZH is required for PVHO (Pressure Vessels for Human Occupancy).

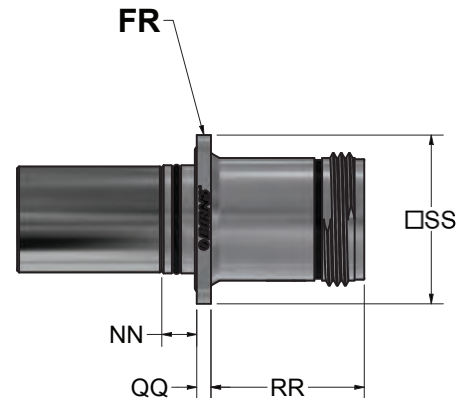
## Dimensions



**Bulkhead Receptacle**



**dual O-ring Receptacle**



**Flanged Receptacle**

Receptacle Dimensions (mm)			
Item	Description	M40	M60
D	BR Wrench Flats	41	57
E	BR Thread Length	25	25
F	BR Body Height	44	41
G	BR Body Diameter	44	60
V	OR Shaft Seal Depth	10	10
Y	OR Wrench Flats	41	57
Z	OR Thread Length	25	25
BB	OR Body Height	44	41
CC	OR Body Diameter	44	60
NN	FR Shaft Seal Depth	9	13
QQ	FR Flange Thickness	4	5
RR	FR Body Height	40	35
SS	FR Flange Dimension	44	64

Receptacle Dimensions (inch)			
Item	Description	M40	M60
D	BR Wrench Flats	1.63	2.25
E	BR Thread Length	1.00	1.00
F	BR Body Height	1.74	1.60
G	BR Body Diameter	1.75	2.38
V	OR Shaft Seal Depth	0.41	0.41
Y	OR Wrench Flats	1.63	2.25
Z	OR Thread Length	0.98	1.00
BB	OR Body Height	1.74	1.60
CC	OR Body Diameter	1.75	2.38
NN	FR Shaft Seal Depth	0.36	0.50
QQ	FR Flange Thickness	0.15	0.20
RR	FR Body Height	1.59	1.39
SS	FR Flange Dimension	1.75	2.50

Meridian Nut/Washer Sets		
Shell Size	BR Nut/Washer	OR Nut/Washer
M40	24I-125	24I-119
M60	24I-175-2	24I-169

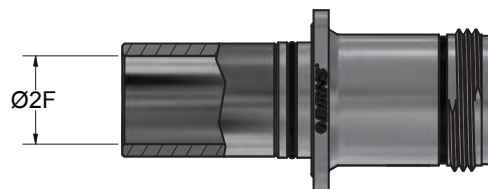
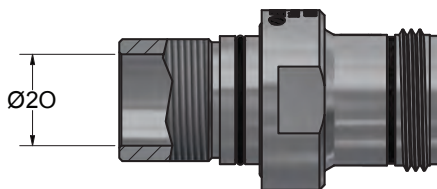
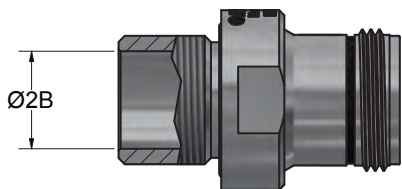


**Nuts/Washer**



## Internal Wire Clearance

In high-density applications, and especially when using twisted pairs or quads, it is important to ensure sufficient internal clearance for wire bundles. Below are wire bundle clearance dimensions for BIRNS Millennium receptacles.



Receptacle Internal Wire Clearance Dimensions (mm)			
Item	Description	M40	M60
2B	BR Wire Clearance	24	37
2O	OR Wire Clearance	23	36
2F	FR Wire Clearance	22	34

Receptacle Internal Wire Clearance Dimensions (inch)			
Item	Description	M40	M60
2B	BR Wire Clearance	0.95	1.44
2O	OR Wire Clearance	0.89	1.40
2F	FR Wire Clearance	0.86	1.35

## Receptacle Mass<sup>1</sup>

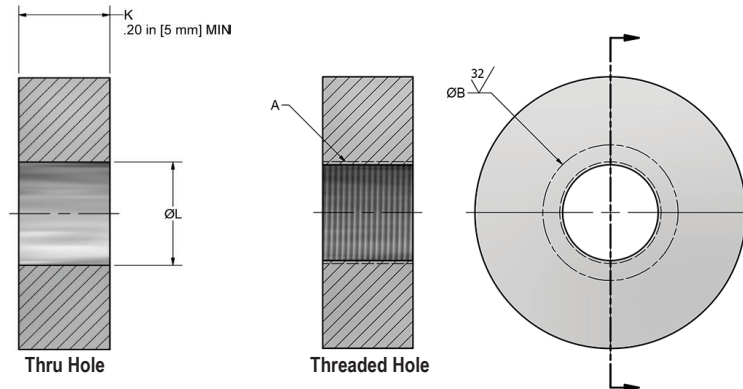
Receptacle Mass (g)			
Type	Material	M40	M60
BR	Stainless Steel	291	434
BR	Titanium	165	247
OR	Stainless Steel	315	468
OR	Titanium	178	265
FR	Stainless Steel	191	370
FR	Titanium	108	209

Receptacle Mass (oz.)			
Type	Material	M40	M60
BR	Stainless Steel	10	15
BR	Titanium	6	9
OR	Stainless Steel	11	17
OR	Titanium	6	9
FR	Stainless Steel	7	13
FR	Titanium	4	7

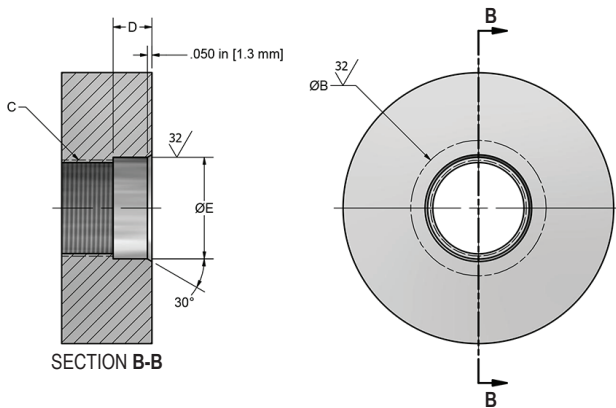
1. These figures exclude the mass of the insert.

## Mounting

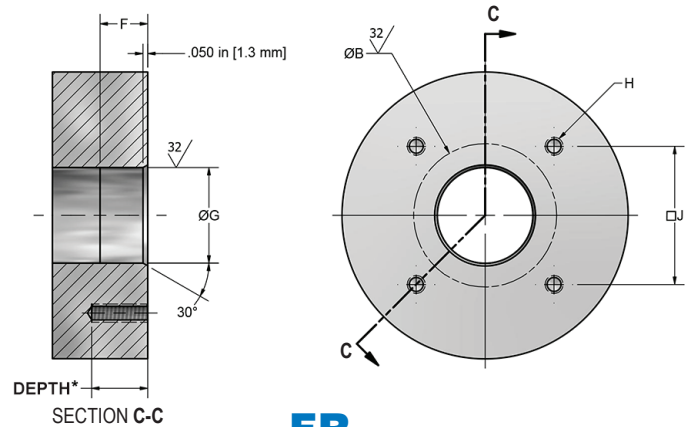
These are recommended mounting methods for BIRNS Meridian receptacles.



### BR



### OR



### FR

BIRNS Meridian Receptacle Mounting Dimensions (mm)			
Item	Description	M40	M60
A	BR Mounting Thread	1 1/4-16 UN-2B	1 3/4-16 UN-2B
B	O-Ring Face Seal	44.5	57.2
C	OR Mounting Thread	1 3/16-16 UN-2B	1 11/16-16 UN-2B
D	OR Shaft Seal Depth	11.4	11.4
E	OR Shaft Seal Diameter (+.05/-.00)	31.75	44.45
F	FR Shaft Seal Depth	10.2	12.7
G	FR Shaft Seal Diameter (+.05/-.00)	28.58	41.28
H	FR Mounting Screw Size	M5 x 0.8	M6 x 1
J	FR Mounting Screw Pattern	34.93	49.78
K	BR Vessel Thickness, MAX	10	9
L	BR Thru Hole Diameter	32.3	45.0

BIRNS Meridian Receptacle Mounting Dimensions (inch)			
Item	Description	M40	M60
A	BR Mounting Thread	1 1/4-16 UN-2B	1 3/4-16 UN-2B
B	O-Ring Face Seal	1.75	2.25
C	OR Mounting Thread	1 3/16-16 UN-2B	1 11/16-16 UN-2B
D	OR Shaft Seal Depth	0.45	0.45
E	OR Shaft Seal Diameter (+.002/-.000)	1.250	1.750
F	FR Shaft Seal Depth	0.40	0.50
G	FR Shaft Seal Diameter (+.002/-.000)	1.125	1.625
H	FR Mounting Screw Size	#10	1/4
J	FR Mounting Screw Pattern	1.375	1.960
K	BR Vessel Thickness, MAX	0.38	0.35
L	BR Thru Hole Diameter	1.27	1.77

**\*DEPTH:** An appropriate threaded hole depth is one that provides a minimum thread engagement equal to at least twice the diameter of the screw to be used. Many factors affect the choice of hole depth, such as the materials of the screw and the substrate (housing, bulkhead, or hull) and the thread quality. BIRNS is not able to predict or control these variables. Thus, the customer is responsible to design an appropriate mounting system, including the selection of screw hole depth.

## FR Mounting Screw Torque

FR	Screw Size	Torque (Nm)		
		SS	Ti (Gr. 2)	Ti (Gr. 5)
M40	M5 x 0.8	3.1	3.2	7.8
M60	M6 x 1	5.3	5.4	13.2

FR	Screw Size	Torque (in-lbs)		
		SS	Ti (Gr. 2)	Ti (Gr. 5)
M40	#10	20	21	51
M60	1/4	49	50	123

These are the recommended screw sizes and torque values for installation of FR mounting screws. Please refer to the value in the correct column for your screw material.

These values are considered appropriate for well-lubricated threads in good condition and assumes that the threaded length is sufficiently long for the materials. However, they are ultimately merely approximate guideline suggestions. Many variables affect the torque value, such as screw material quality, screw length, thread class, cleanliness and lubrication, all of which are impossible for BIRNS to predict or control. Thus, the customer is ultimately responsible to ensure proper installation including the selection of appropriate torque values.

## Connector Serialization



In accordance with its comprehensive Quality Management System, BIRNS individually and permanently serializes all connector shells, allowing quality traceability back to the shell's original manufacturing material certificates and dimensional inspection reports. Serialization marking is performed by means of laser etching.



## Materials

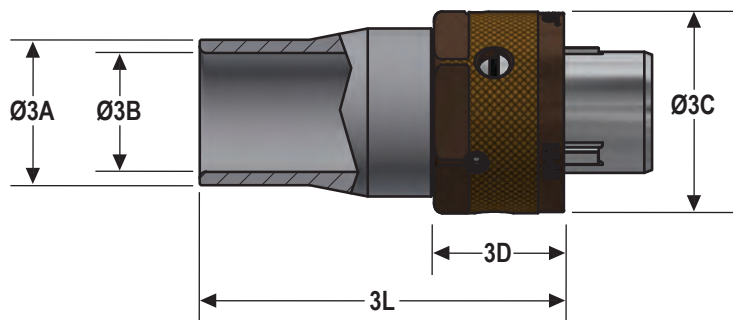
BIRNS Meridian Cable Plugs are available in Stainless Steel (CP) or Titanium (CPTI). Inserts, backshells, cables, and overmolds are all compatible and interchangeable.



Cable Plug Materials		
	CP	CPTI
<b>Shell:</b>	316 Stainless Steel	Titanium 6Al-4V
<b>Coupling Ring:</b>	C54400 Phosphor Bronze	Titanium 6Al-4V
<b>Hardware:</b>	316 Stainless Steel	Titanium 6Al-4V

*Pro tip:* for oil-filled cable assemblies, select a backshell made of the same material as the Cable Plug shell.

## Dimensions



BIRNS Millennium Cable Plugs are dimensionally equivalent irrespective of material.

Cable Plug Dimensions (mm)		
Type	M40	M60
Ø3A	33.0	50.8
Ø3B	23.4	42.4
Ø3C	39.6	60.3
3D	25.5	27.6
3L	71.6	73.6

Cable Plug Dimensions (inch)		
Type	M40	M60
Ø3A	1.300	2.000
Ø3B	0.920	1.670
Ø3C	1.560	2.375
3D	1.005	1.085
3L	2.817	2.897

## Mass

BIRNS Meridian Cable Plug mass is detailed in the following tables. These figures do not include the mass of any cable or wire, solder, insulating tubing, or potting or overmolding materials. Due to the different insert masses as a result of various contact quantities and sizes, these mass figures exclude the insert.

Cable Plug Mass (g)			Cable Plug Mass (oz.)		
Item	M40	M60	Item	M40	M60
CP	190	348	CP	7	12
CPTI	109	198	CPTI	4	7

## Connector Serialization



In accordance with its comprehensive Quality Management System, BIRNS individually and permanently serializes all connector shells, allowing quality traceability back to the shell's original manufacturing material certificates and dimensional inspection reports. Serialization marking is performed by means of laser etching.

## M40-1-CP TI-RA-A 00300 D

**SHELL SIZE**

40  
60

**PIN CONFIGURATION**

**SHELL TYPE**

CP: Cable Plug  
CR: Cable Receptacle

**SHELL MATERIALS**

(blank): 316 SS shell, Phosphor Bronze ring  
TI: All titanium:Ti Shell, Ti ring

**FAR-END TERMINATION**

U: Unterminated  
D: Double-ended  
E: one end CP, other CR  
R: one end 180°, other 90°

**CABLE LENGTH (cm)**

**CABLE TYPE**

**CABLE OVERMOLDING ANGLE**

(blank): 180° (straight)  
RA: 90°

**CP Materials Table**

CP Type	Shell	Hardware	Coupling Ring
CP:	SS	SS	Bronze
CPTI:	Ti	Ti	Ti

### Molded Cable Assemblies Part Numbering Guide<sup>1</sup>

1. Select a pin configuration from the chart; note the shell size (e.g. 3M) and pin configuration label (e.g. 3M-13).
2. Select the connector type (CP, CR).
3. Select shell material (SS, TI)<sup>2</sup>

Steps 1-3 are for the connector kit without termination or overmolding. For a complete molded assembly:

4. Select the overmold angle (180°, 90°)
5. Select the cable type
6. Select the length in centimetres
7. Select the far-end termination (U, D, R, E)

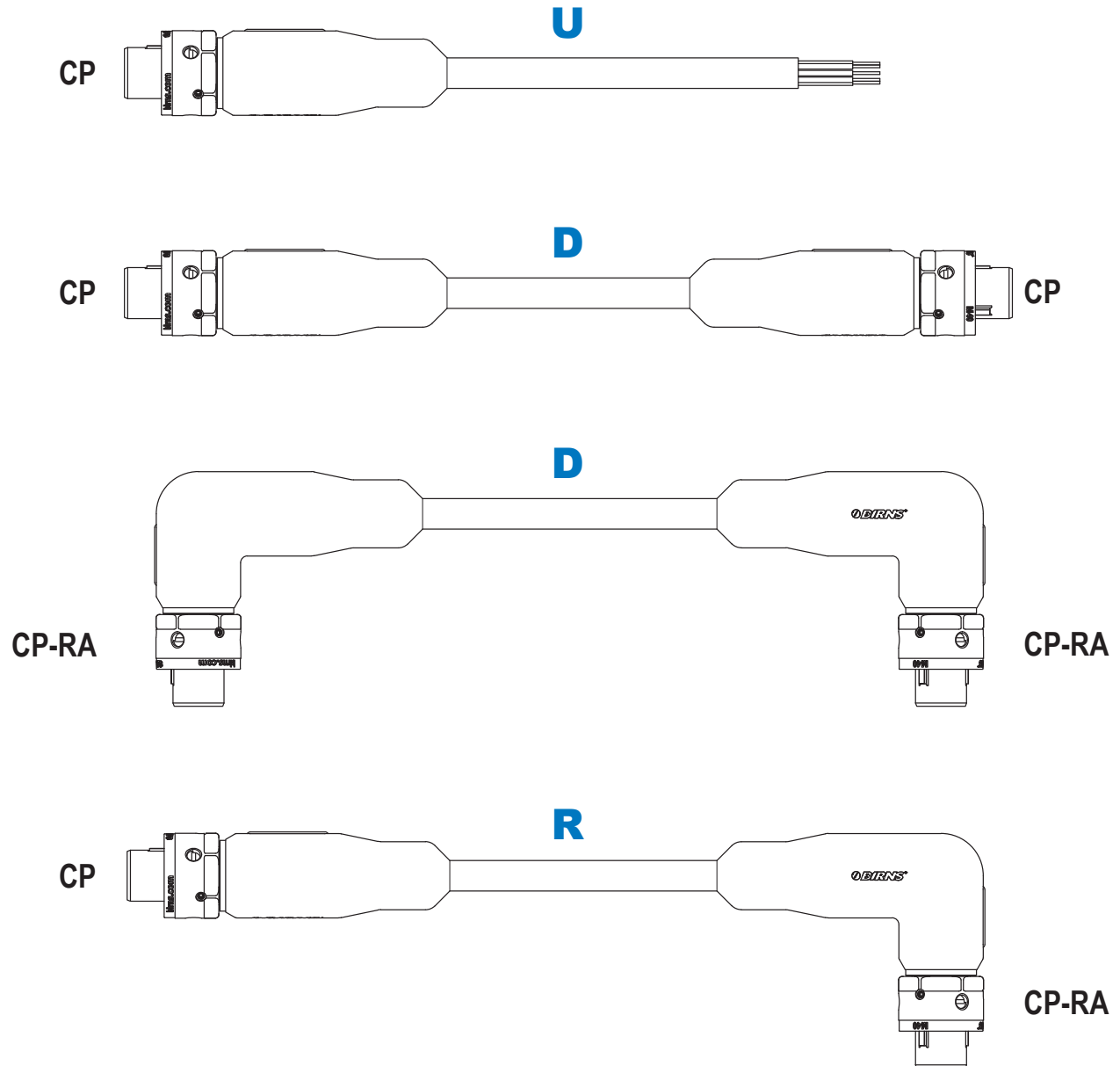
The part number does not include information such as wiring diagram, shield treatment, labeling, length tolerance, clocking, rotation, or overmolding material. Please ask for a BIRNS Configuration Drawing to define these details. See Molded Cable Assembly Configuration Guide, Page 22.

<sup>1</sup> Contact BIRNS for the correct replacement of legacy or obsolete part numbers.

<sup>2</sup> TI Cable Receptacles have titanium shells, TI Cable Plugs have titanium shells and titanium coupling rings.

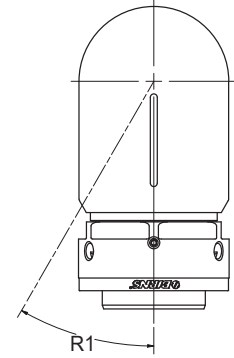


The following outlines represent BIRNS's standard cable assembly configurations, correlating to the "Far-End Termination" section of the part numbering system for molded cable assemblies (see Part Numbering, Molded Cable Assemblies, page 20).



## Rotation

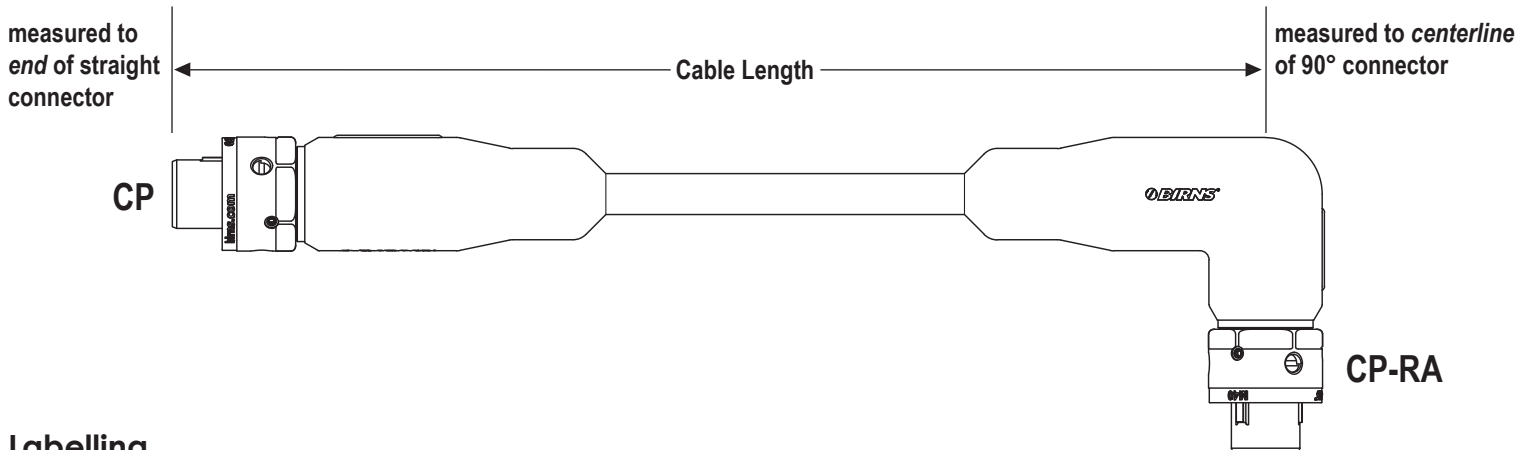
“Rotation” is the angle between the connector’s alignment ridge and the cable. The default position is 0°, and the tolerance is  $\pm 30^\circ$ . The angle is positive clockwise (maximum 180°), negative counterclockwise, and is specified per connector.



## Length Tolerance

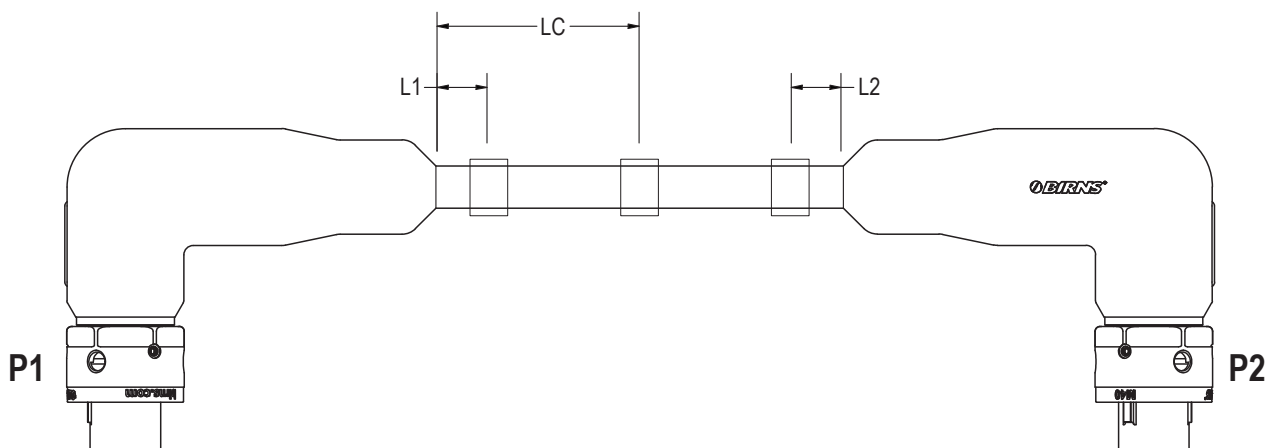
BIRNS manufactures cable assemblies with these standard overall length tolerances. Other tolerances can be specified (with possible price and/or schedule impact). Cable assembly length is measured from the *end* of a straight connector and the *centerline* of a 90° connector.

Cable Length Tolerances					
Tolerance		Length (cm)		Length (feet)	
+ (plus)	- (minus)	From	To	From	To
12%	0%	30	50	1	2
7%	0%	50	200	2	7
5%	0%	200	500	7	16
4%	0%	500	3,000	16	100
3%	0%	3,000	30,000	100	1,000



## Labelling

Optional Marking/Labels can be applied in various locations. The most common locations are at the connector, in the cable center, and/or at the far end; these are LAB1, LABC, and LAB2, respectively.



The part number does not include information relating to the wiring diagram, shield treatment, labeling, length tolerance, clocking, or rotation. Contact the BIRNS Technical Sales Team to arrange these details

## Wiring Diagram

A Wiring Diagram (or equivalent written instructions) is required to start any cable assembly work. Wiring Diagram options are:

1. Provide your own Wiring Diagram (preferred). Note the connector pin sizes: additional charges will apply if you specify to terminate wires of different size(s) to the connector pins.
2. Specify to "Wire pin to pin ('straight through')".
3. Use the default pre-established wiring diagram for that interconnect.

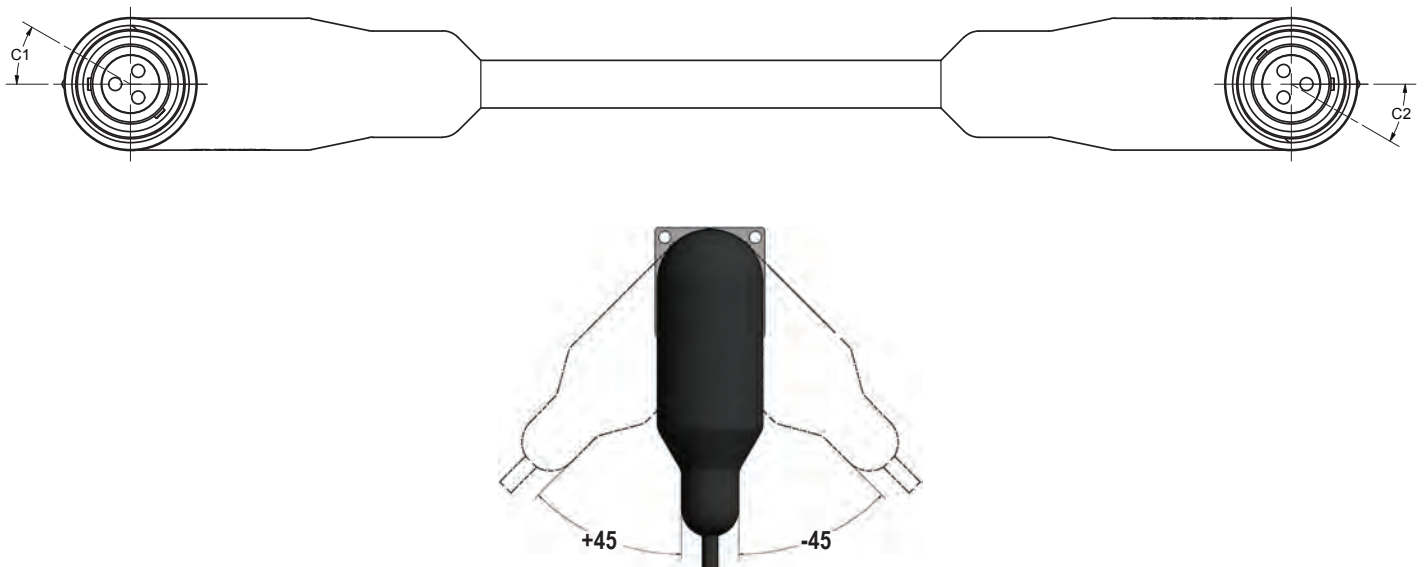
## Shield Method

Some cables incorporate OAS (F/, S/, or SF/). Available Shield Method (treatment) options are:

1. **None:** no OAS exists in the cable
2. **Not Connected:** an OAS exists but is not terminated to anything (isolated or "floating")
3. **Jumper Wire to Shell:** a wire connects the OAS to the connector shell
4. **360-degree to Shell:** the OAS forms a Faraday cage around the shell
5. **Connected to Pin:** the OAS is terminated to a specific connector pin

## Clocking

"Clocking" is the angle between a right-angle connector's No. 1 key and the cable's long axis. The default position is  $0^\circ$ , and the tolerance is  $\pm 15^\circ$ . The angle is positive clockwise (maximum  $180^\circ$ ), negative counterclockwise, and is specified per connector.





## Label Types

Various types of Marking/Labels are available as follows.  
(Note: labels provide more data space than tags.)

1. **Bag & Tag Only:** no marking on the product; a printed label is on the packaging
2. **Label with Clear Heat-Shrink:** data is on white tubing and covered with clear tubing
3. **Wrap-Around Tag:** small plastic tags secured with cable ties
4. **K-Type Label (plastic ties):** Pre-printed "macaroni" rings on a carrier, secured with plastic cable ties
5. **K-Type Label (SS ties):** As above but with SS cable ties
6. **Stamped SS Tag:** marker plates (max. 17 characters) secured with SS cable ties

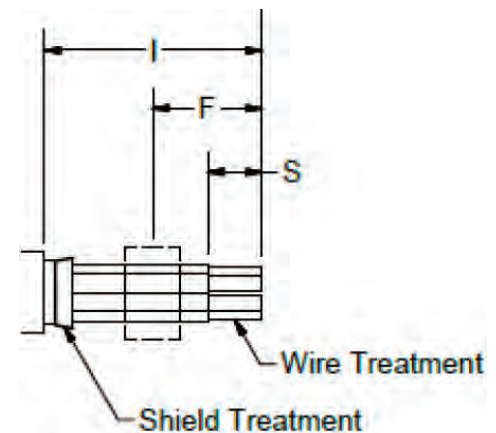


Label options available for all BIRNS cable assemblies.

## Type 'U' Cable Assemblies (one end unterminated)

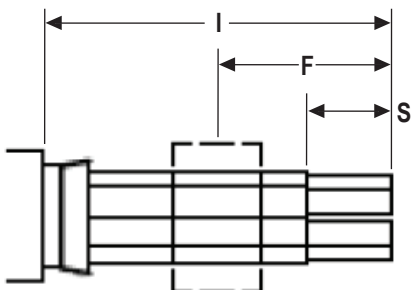
### Jacket Strip and Insulation Strip

Cables with an unterminated end allow additional options. Among other things, customers can specify the desired length of cable jacket ('I') and insulation ('S') removal.



### Number Flags

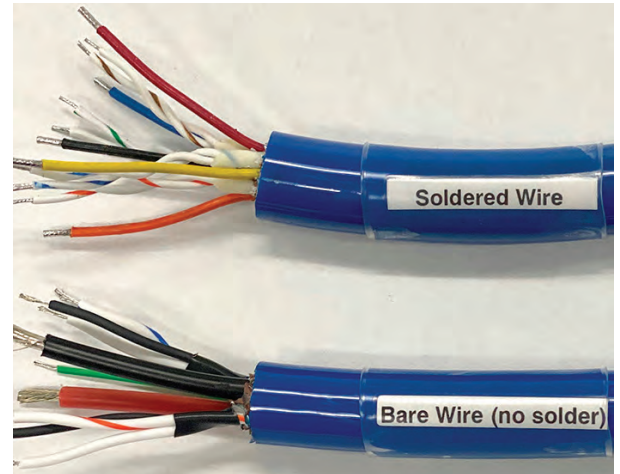
Optional number flags (one for each wire) are available and their location ('F') can be specified.



## Wire Treatment

Stripped wires can be tinned, if desired. Options are:

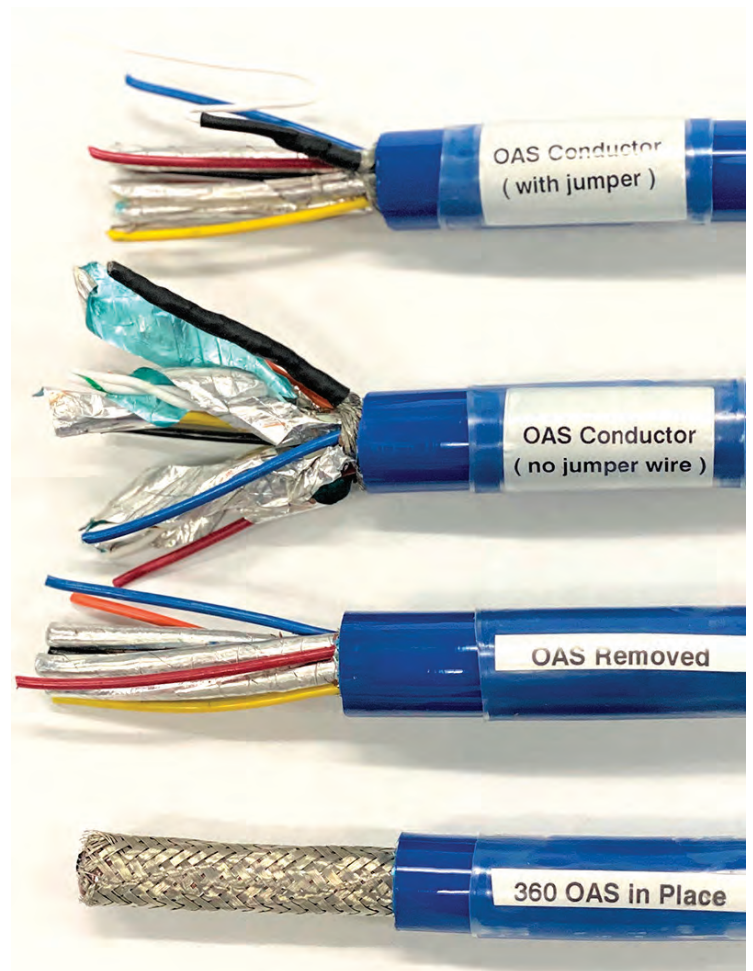
1. **Bare wire** (no tinning)
2. **Lead-based solder**
3. **Tin-based solder** (RoHS)



## Shield (OAS) Treatment

Jacket removal regularly exposes an OAS. Shield treatment options are:

1. **Attach Jumper:** attach a conductor to the OAS so that it can be terminated into a system
2. **Twist into Conductor:** manipulate the OAS into a conductor without using a jumper wire
3. **Remove Exposed Shield:** cut it short to be approximately level with the jacket end
4. **Maintain 360:** leave the OAS in place (this could interfere with wire stripping and/or flagging)

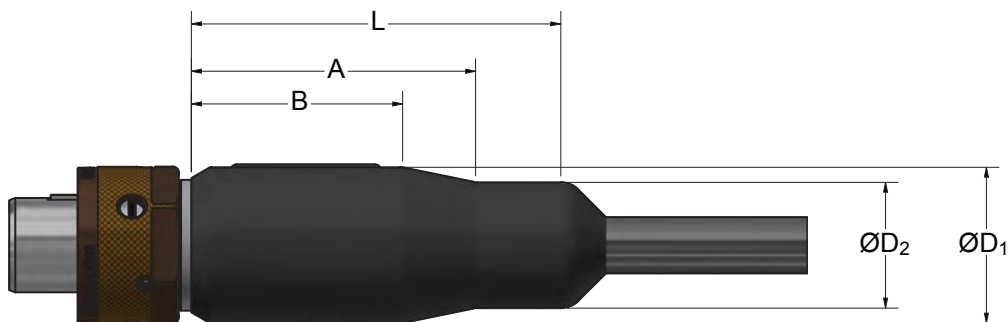


Shield treatment options available for BIRNS cable assemblies with F, S, or SF shields (screens).



## Next-Gen

BIRNS overmold designs optimize cable strain relief, size, and depth capacity.



*Pro Tip:* if desired, alternate overmold dimensions may be available on special order—please contact the BIRNS Sales Team for details.

Note the maximum cable diameter limitations in the tables below.

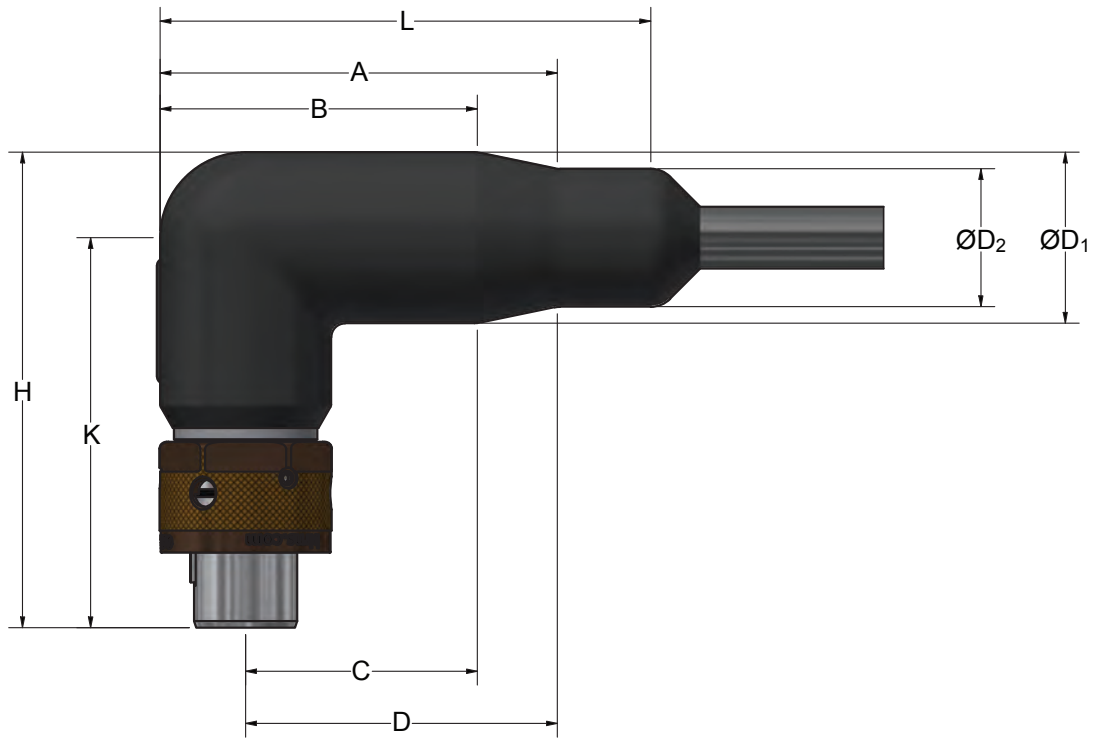
POM-ST Molds (mm)							
Size	Mold	D1	D2	L	A	B	Cable Max OD (≤Ømm)
M40	M40-POM-ST.9	39	32	93	72	53	25
M60	M60-POM-ST.11	60	52	107	85	67	44

POM-ST Molds (inch)							
Size	Mold	D1	D2	L	A	B	Cable Max OD (≤Øin)
M40	M40-POM-ST.9	1.55	1.25	3.67	2.83	2.10	1.00
M60	M60-POM-ST.11	2.36	2.06	4.20	3.35	2.63	1.75



*BIRNS Meridian overmolds provide an alignment ridge for positional tactile feedback. Unless specified otherwise, the alignment ridge aligns with the Primary Key (unless specified otherwise). For alternate alignments, see “Rotation” in the Molded Cable Assembly Configuration Guide, Page 22.*





POM-RA Molds (mm)											
Size	Mold	D1	D2	L	A	B	C	D	H	K	Cable Max OD (≤Ømm)
M40	M40-POM-RA.9	39	32	113	91	73	53	72	109	90	25
M60	M60-POM-RA.11	60	52	137	115	97	67	85	121	91	44

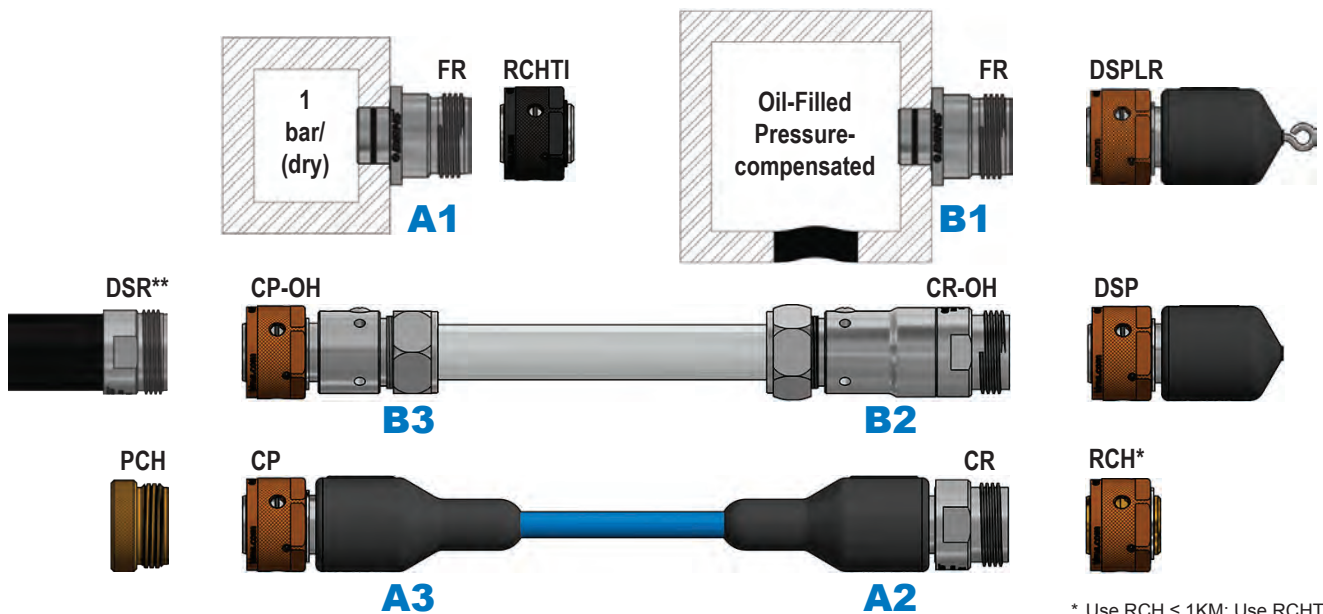
POM-RA Molds (inch)											
Size	Mold	D1	D2	L	A	B	C	D	H	K	Cable Max OD (≤Øin)
M40	M40-POM-RA.9	1.55	1.25	4.45	3.60	2.88	2.10	2.83	4.31	3.54	1.00
M60	M60-POM-RA.11	2.36	2.06	5.38	4.53	3.81	2.63	3.35	4.75	3.57	1.75

## Caps

BIRNS sealing caps securely protect unmated BIRNS Meridian connectors. Caps are available for 100 bar and 600 bar, and for face and rear (reverse) pressure.

BIRNS Meridian receptacles withstand high face pressure (illustrations A1 & A2) and use RCH and RCHTI. When the Receptacle is subjected to rear pressure, as part of an oil-filled cable (CR-OH) or on an oil-filled pressure-compensated canister (B1 & B2), it must be capped with the DSP (Dummy Sealing Plug). The DSP is specific to the receptacle's pin configuration: an M60-3-FR uses a M60-3-DSP, etc. The DSP is optionally available with a 316 stainless steel Lanyard Ring [Ø6mm (Ø¼") eye ID]

BIRNS Meridian cable plugs use PCH for face pressure (A3). In an oil-filled cable assembly (B3), the CP-OF withstands 100 bar while capped with a PCH; for higher pressures, the CP-OF must be capped with a DSR (Dummy Sealing Receptacle). Titanium PCH (PCHTI) are available for all-titanium systems.



\* Use RCH ≤ 1KM; Use RCHTI ≤ 6KM  
 \*\*Use PCH ≤ 1KM; Use DSR ≤ 6KM

Caps (Protective and Sealing/Pressure-Proof)				
	Receptacle Caps		Plug Caps	
Face Pressure :	RCL	splash-proof	PCL	splash-proof
	RCH	≤ 100 bar	PCH	≤ 600 bar
	RCHTI	≤ 600 bar	PCHTI	≤ 600 bar
Rear Pressure : (reverse)	DSP	≤ 600 bar	PCH	≤ 100 bar
			DSR	≤ 600 bar

## Dummy Sealing Connectors

### M40-1-DSP

Shell Size  
40  
60

Contacts

DSP: Dummy Sealing Plug  
 DSR: Dummy Sealing Receptacle  
 DSPLR: Dummy Sealing Plug with Lanyard Ring

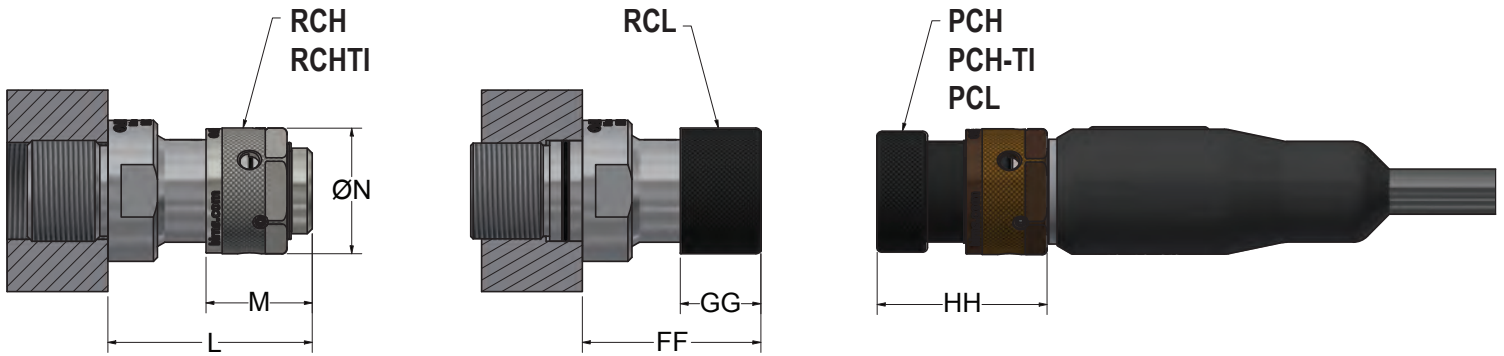
## Pressure Caps

### M40-RC H-TI

Shell Size  
40  
60

RC: Receptacle Cap  
 PC: Plug Cap

L: IP56  
 H: 1,000m  
 H-TI: 6,000m



Cap Dimensions (mm)			
Item	Description	M40	M60
L	BR/RCH Combined Height	64	61
M	RCH Height	34	36
N	Coupling Ring Diameter	40	60
FF	OR/RCL Combined Height	56	51
GG	RCL Height	25	25
HH	Coupling Ring/PCH Combined Length	54	54

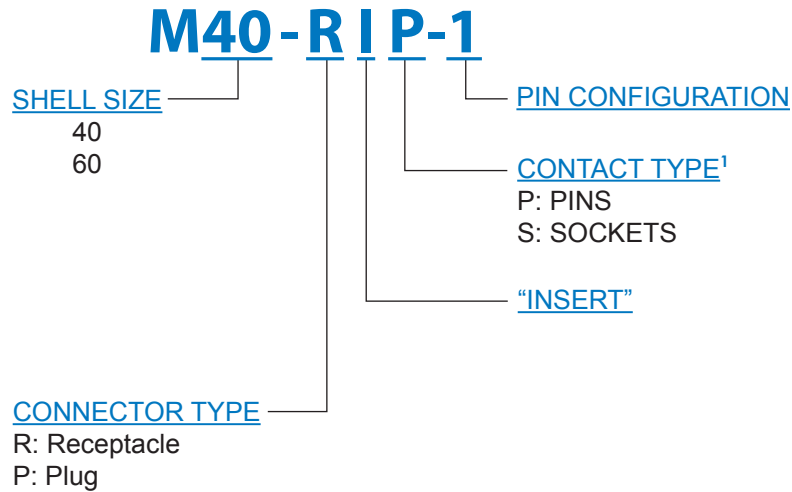
Cap Dimensions (inch)			
Item	Description	M40	M60
L	BR/RCH Combined Height	2.54	2.41
M	RCH Height	1.32	1.41
N	Coupling Ring Diameter	1.56	2.38
FF	OR/RCL Combined Height	2.22	2.00
GG	RCL Height	1.00	1.00
HH	Coupling Ring/PCH Combined Length	2.11	2.11

Receptacle Cap Materials			
Cap Type	Cap	Hardware	Coupling Ring
RCL:	Delrin	N/A	Delrin
RCH:	Brass	SS	Bronze
RCHTI:	Ti	Ti	Ti

Plug Cap Materials	
Cap Type	Material
PCL:	Delrin
PCH:	Brass
PCHTI:	Ti



An insert is included with every connector kit (and/or assembly). If spares are needed, part numbering of the inserts is as follows.



1. Receptacles have pins and plugs have sockets, except for RG (Reverse Gender) configurations. Standard inserts are RIP and PIS for the Receptacle and Plug, respectively. In RG configurations, sockets are in the Receptacle and pins are in the Cable Plug; Inserts for the Receptacle and Plug are RIS and PIP, respectively.

BIRNS Meridian connectors are high-performance interconnect products, rated for use at depths to 6,000m. The M40 size is in the process of attaining DNV Type Approval for use on 6,000m-rated crewed submersibles, requiring multi-cycle hydrostatic pressure testing to 200% of the maximum dive depth<sup>1</sup> while transferring maximum power load, followed by additional pressure testing with shorn cable.

Stainless steel BIRNS Meridian connectors incorporate hard-tempered phosphor bronze coupling rings to mitigate against potential galling<sup>2</sup> ("seizing") between the components. Titanium versions incorporate titanium coupling rings. To prevent galling, BIRNS titanium coupling rings are anodized per AMS 2487 in a 12.4 pH alkaline bath and impregnated with PTFE for superb friction reduction and galling resistance.

Materials	
Item	Material
SS Shells:	316 SS, Passivated per ASTM A967
Coupling Rings:	C54400 Phosphor Bronze, ASTM B139, Hard temper H04
SS Hardware:	300-series SS, Passivated
Ti Shells:	Ti 6Al4V, Grade 5, Passivated per ASTM B600
Ti Coupling Rings:	Titanium, Grade 2, Anodized per AMS 2487 & PTFE-impregnated
Ti Hardware:	Ti 6Al4V Grade 5
Pins:	C36000 Copper Alloy, plated per QQ-S-365 Type II Grade A or MIL-G-45204 Type II Grade D Class 1
Sockets:	C17300H BeCu, heat-treated, plated per QQ-S-365 Type II Grade A or MIL-G-45204 Type II Grade D Class 1
Inserts:	GRE (glass-reinforced epoxy)
O-rings (standard):	NBR (standard)

The listed Temperature Range is based on engineering analysis of materials. The Operating and Non-Operating Temperatures and the Thermal Shock (hot and cold) data are derived by extension from actual testing performed on BIRNS Millennium connectors. Please contact the BIRNS Technical Sales Team for more information.

Temperature/Thermal Performance	
Temperature Range:	-34°C to +80°C
Operating Temperature:	-40°C to +65°C
Non-Operating Temperature:	-40°C to +71°C
Thermal Shock hot:	+65°C hot air to +20°C warm air
Thermal Shock cold:	-54°C cold air to 0°C cold water

1. Actual testing was performed to 1,212 bar, equivalent to a simulated depth of 12,000 meters. This is 10% deeper than the very deepest part of the seabed.  
 2. Galling is adhesive wear, particularly in high-ductility metals, caused by transfer of material between surfaces during transverse motion.  
 Per ASTM G40: "Galling is a form of surface damage arising between sliding solids, distinguished by microscopic, usually localized, roughening and creation of protrusions (e.g., lumps) above the original surface".

BIRNS Meridian electrical interconnect products are ideal for high performance subsea systems requiring outstanding power transfer. They provide excellent contact engagement per MIL-STD-39029D, with insulated solder pots to minimize EMI. Sockets are heat-treated BeCu for longevity and superior electrical contact, and all contacts are plated per QQ-S-365 or MIL-G-45204 for longevity.

When multiple conductors are in proximity, each heats the others and decreases availability for cooling, so conductors' allowed current should be derated when conductors are bundled in a grouping or cable. NFPA 70 (NEC)<sup>1</sup> Table 310.15(C)(1) provides ampacity bundling-derating factor guidelines.

Bundling Current Derating	
Conductors	% of Current Values
4-6	80
7-9	70
10-20	50

Ambient Temperature Correction Factors		
Ambient Temperature (C)	Correction Factor	Ambient Temperature (F)
≤10	1.15	≤50
11-15	1.12	51-59
16-20	1.08	60-68
21-25	1.04	69-77
26-30	1.00	78-86

Ambient temperature can affect conductors' safe ampacity. NFPA 70 (NEC)<sup>2</sup> Table 310.15(B)(1) provides correction factors for operating environments in which the ambient temperature is other than 30°C (86°F). Factors in the abridged table shown on this page assume 90°C conductor insulation ratings throughout.



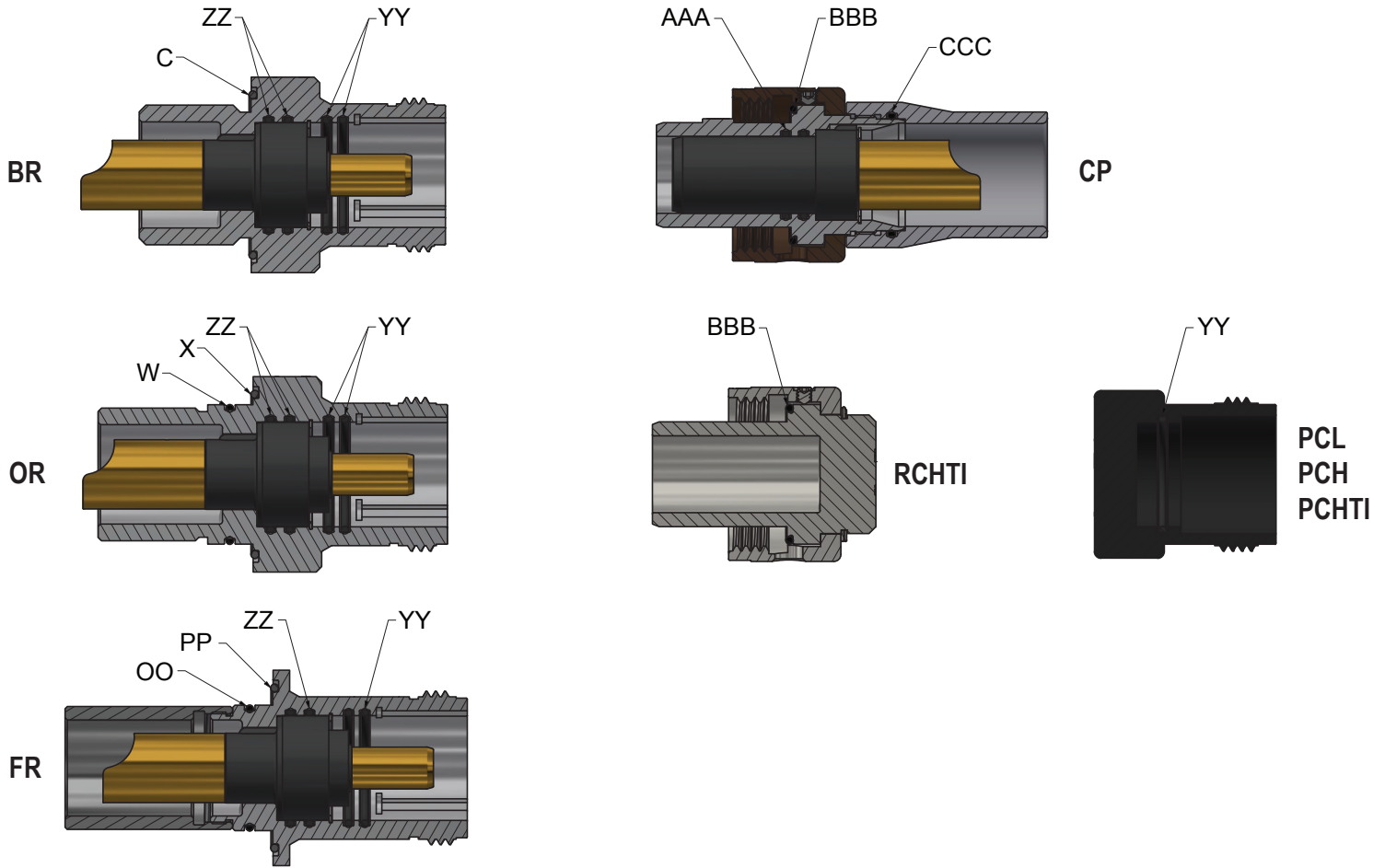
BIRNS Connector Pins							
AWG	Ø (in.)	Ø (mm)	A (mm <sup>2</sup> )	I (A)	Max Wire Ø (in.)	Max Wire Ø (mm)	Max Wire A (mm <sup>2</sup> )
16	0.063	1.60	2.01	15	0.07	1.8	1.8
14	0.078	1.98	3.08	25	0.09	2.4	4.4
10	0.125	3.18	7.92	40	0.13	3.2	7.9
6	0.218	5.54	24.1	75	0.18	4.6	16.4
4	0.236	5.99	28.2	95	0.23	5.7	25.9
2	0.281	7.14	40.0	130	0.29	7.4	43.2
0	0.325	8.25	53.5	170	0.33	8.3	53.5
000	0.375	9.53	71.3	225	0.53	13.5	142.4

Actual measurements of AWG sizes can vary from manufacturer to manufacturer. BIRNS conductors are larger than some standard sizes for additional flexibility and safety.

BIRNS ampacity values are merely informational. The system's electrical designers are responsible to perform detailed engineering analyses of the many factors affecting ampacity.

1. National Fire Protection Association 70, National Electric Code.  
 2. Assumes use of 90°C-rated insulation.





O-rings' standard material is NBR (Nitrile/Buna-N) compound N0674-70, 70±5 Type A Durometer hardness.

Meridian O-Ring Sizes / Part Numbers				
Callout	Description		M40	M60
C	BR Face O-Ring	size: Part ID:	2-028 59A-132	2-032 59A-180
W	OR Shaft Seal O-Ring	size: Part ID:	2-024 59A-101	2-030 59A-169
X	OR Face Seal O-Ring	size: Part ID:	2-028 59A-132	2-032 59A-180
OO	FR Shaft Seal O-Ring	size: Part ID:	2-022 59A-070	2-029 59A-020
PP	FR Face Seal O-Ring	size: Part ID:	2-028 59A-132	2-032 59A-180
YY	Mating Axial Seal O-Ring	size: Part ID:	2-021 59A-079	2-030 59A-169
ZZ	Receptacle Insert Seal O-Ring	size: Part ID:	2-021 59A-079	2-030 59A-169
AAA	Plug Insert Seal O-Ring	size: Part ID:	2-017 59A-060	2-028 59A-132
BBB	Mating Face Seal O-Ring	size: Part ID:	2-024 59A-101	2-032 59A-180
CCC	CP Backshell Seal O-Ring	size: Part ID:	2-022 59A-079	2-031 59A-183

## General

**All installation and maintenance should be performed by qualified technicians.**

The BIRNS Meridian series is a dry-mate connector system. It is not designed to be coupled or uncoupled while underwater or wet. Before mating or demating the connectors, always verify that the connectors are dry, and that the circuit is de-energized.



**ENERGIZE SYSTEM CIRCUITS ONLY WHEN THE CONNECTORS ARE FULLY AND PROPERLY MATED!**

## Before Mounting and Coupling

Verify that mounting dimensions are correct and that all sealing surfaces have the correct surface finish and are clean. Lightly lubricate all O-rings with an appropriate grease (we recommend 52K-014 silicone lubricant, Dow Corning compound 111) to form a thin film.



**Excessive grease will interfere with the seal.**

Ensure that all contacts and internal connector areas are completely clean and FOD-free. Clean as needed.

## Mounting

Install the receptacle into the bulkhead and secure appropriately. Place the cable assembly into position, avoiding bends which are smaller than the cable's rated bend radius, and secure it into place using appropriate clamping methods if seawater drag (water-current flow) is expected.

## Coupling

Remove sealing caps, and clean the connectors as needed. Align the arrow on the CP key with the arrow on the receptacle, and gently insert the CP into the receptacle. Rotate the coupling ring to mate the connectors until the receptacle's fully-mated indicator band is covered. Check that the fully-mated indicator band is covered by the coupling ring (and/or look through the coupling ring's drain holes) to verify complete mating. Secure the coupling ring's locking set screws if desired.

All unmated connectors should be protected with pressure-proof (high-pressure) caps prior to water immersion (see Caps, DSPs and DSRs, page 28).

## Maintenance

After the connectors are fully and properly mated, very little maintenance is required. We recommend that all connectors be well rinsed with fresh water, if possible, after each deployment, to remove any sand, dirt, salt and marine growth. O-rings should be well cleaned and re-lubricated if the connectors are uncoupled. O-rings should be periodically replaced.

**ATM:** Atmosphere

**AWG:** American Wire Gauge

**BR:** Bulkhead Receptacle

**CP:** Cable Plug

**cm:** Centimetres

**CR:** Cable Receptacle

**dB:** Decibel

**DSP:** Dummy Sealing Plug

**DSR:** Dummy Sealing Receptacle

**DWV:** Dielectric Withstanding Voltage

**FTP:** Foil-shielded Twisted Pair

**FOD:** Foreign Object Debris/Foreign Object Damage

**FR:** Flanged Receptacle

**GIPS:** Galvanized Improved Plow Steel

**GRE:** Glass-Reinforced Epoxy

**HV:** High Voltage ( $\leq 3\text{kV}$ )

**HZ:** Hertz

**IR:** Insulation Resistance

**IAW:** In Accordance With

**LSZH:** Low Smoke Zero Halogen

**NBR:** Nitrile Butadiene Rubber (Buna-N)

**NCC:** Non-Conductive Coating

**OAS:** Overall Shield

**OR:** Dual O-ring Receptacle

**PCH:** Plug Cap, High pressure

**PCL:** Plug Cap, Low pressure

**PIS:** Plug Insert, Sockets

**PP:** Polypropylene

**PTFE:** Polytetrafluoroethylene (e.g. Teflon)

**PUR:** Polyurethane

**RIP:** Receptacle Insert, Pins

**RCL:** Receptacle Cap, Low pressure

**RCH:** Receptacle Cap, High pressure

**SS:** Stainless Steel

**TI:** Titanium

**TIA:** All-Titanium

**TP:** Twisted Pair



### **Technical/Warranty**

This brochure supersedes all previous editions. Technical data herein apply to standard products only. Custom and special designs may differ. BIRNS reserves the right to modify products and technical information listed herein, without notice, due to technical improvements and product improvement. All reasonable efforts have been taken to ensure that the information contained herein is accurate at the date of publication, but no representation or warranty as to the accuracy or completeness of such information is intended or implied by its inclusion herein. Any and all representations and warranties pertaining to the information and products referred to herein shall be as stated in the BIRNS standard terms and conditions of sale.

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