SEA-BIRD SCIENTIFIC

SBE 16plus V2 SeaCAT Configurations

Housing	Pressure Sensor/Range	Connectors	Communications	Pump
1 – 600 m (plastic)	0 – none	1 – XSG/AG	0 – RS-232	0 - none
2 – 7000 m (titanium)	1 – 20 m strain gauge	2 – MCBH		1 - SBE 5M
3 – 10,500 m (titanium)	2 – 100 m strain gauge			2 - SBE 5P/5T
	3 – 350 m strain gauge			
	4 – 600 m strain gauge			
	5 – 1000 m strain gauge			

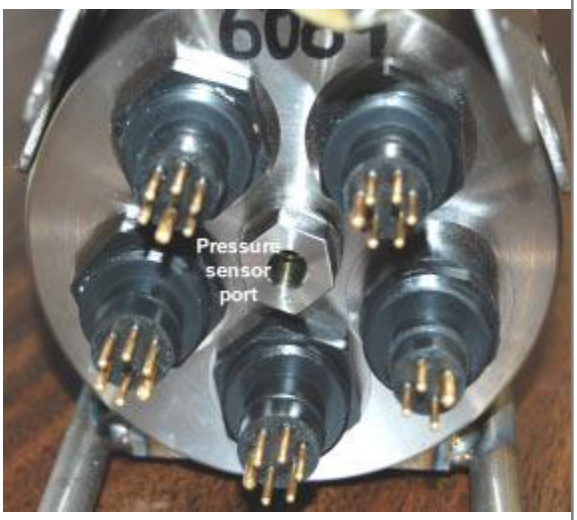
	6 – 2000 m strain gauge			
	7 – 3500 m strain gauge			
	8 – 7000 m strain gauge			
	9 – 10,500 m strain gauge			
	A – 45 psia Digiquartz			
	B – 100 psia Digiquartz			
	C – 200 psia Digiquartz			
	D – 300 psia Digiquartz			

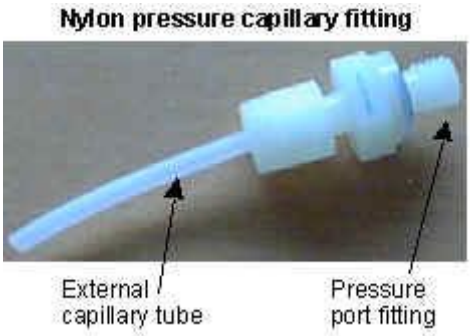
	E – 400 psia Digiquartz			
	F – 1000 psia Digiquartz			
	G – 2000 psia Digiquartz			
	H – 3000 psia Digiquartz			
	I – 6000 psia Digiquartz			
	J – 10,000 psia Digiquartz			
	K – 15,000 psia Digiquartz			

Example: 16P.28201 is an SBE 16plus V2 with 7000 m housing, 7000 m strain gauge pressure sensor, MCBH connectors, RS-232 communications, and SBE 5M pump. See table below for description of each selection:

PART #	DESCRIPTION	NOTES

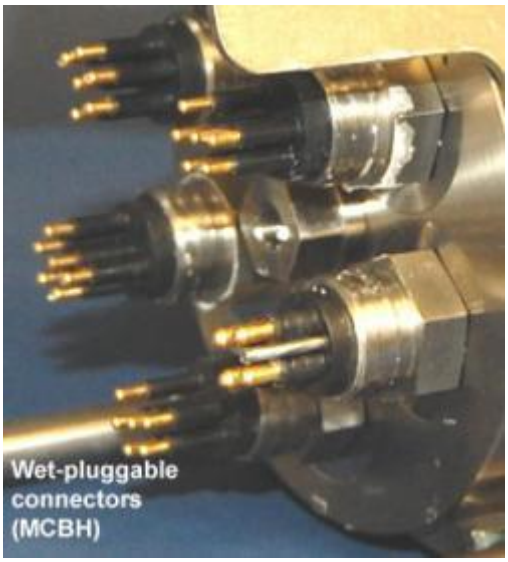
16plus V2	SeaCATplus Version 2 Conductivity & Temperature (pressure optional) Recorder - Includes 64 MB memory, serial interface, 6 differential A/D channels (0 - 5 volt input range), 1 RS-232 data input channel, AF24173 Anti-Foulant Devices, data I/O extension cable, data I/O cable, Seasoft software, & complete documentation.	SBE 16plus V2 is a CTD intended for moored applications.
SBE 16plus V2 Housing (depth) Selections — MUST SELECT ONE		
16P.1xx0x	**600 m** plastic housing	
16P.2xx0x	**7000 m** titanium housing	
16P.3xx0x	**10,500 m** titanium housing	
SBE 16plus V2 Pressure Sensor Selections — MUST SELECT ONE		

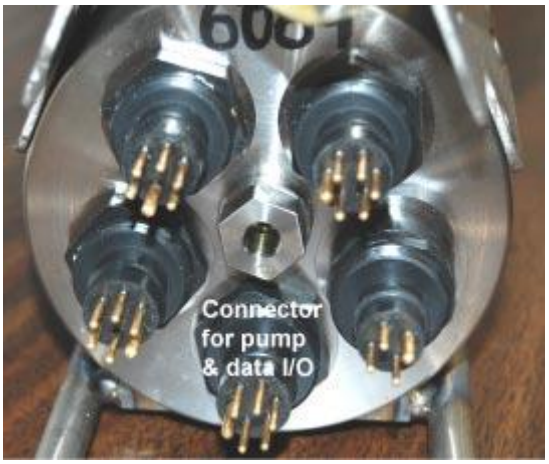
16P.x0x0x	**No pressure sensor**	 Pressure sensor is installed in connector end cap, & is not field replaceable / swappable. While highest pressure rating gives you most flexibility in using 16plus V2, it is at expense of accuracy & resolution. It is advantageous to use lowest range pressure sensor compatible with your intended maximum operating depth, because accuracy & resolution are proportional to pressure sensor's full scale range. For example, comparing 2000 & 7000 m sensors: • 2000 m sensor: initial accuracy = 2 m (= 0.1% * 2000 m), resolution = 0.04 m (= 0.002% * 2000 m) • 7000 m sensor: initial accuracy = 7 m (= 0.1% * 7000 m), resolution = 0.14 m (= 0.002% * 7000 m)
16P.x1x0x	**20 m strain gauge** pressure sensor	
16P.x2x0x	**100 m strain gauge** pressure sensor	
16P.x3x0x	**350 m strain gauge** pressure sensor	
16P.x4x0x	**600 m strain gauge** pressure sensor	
16P.x5x0x	**1000 m strain gauge** pressure sensor	
16P.x6x0x	**2000 m strain gauge** pressure sensor	
16P.x7x0x	**3500 m strain gauge** pressure sensor	
16P.x8x0x	**7000 m strain gauge** pressure sensor	

16P.x9x0x	**10,500 m strain gauge** pressure sensor	
16P.xAx0x	**45 psia (20 m) Digiquartz** pressure sensor with temperature compensation	 Digiquartz pressure sensors provide better accuracy (0.02% of full scale range vs 0.1% of full scale range) & resolution (Digiquartz resolution dependent on user-programmable integration time) than strain gauge pressure sensors. See strain gauge options above for photo of pressure sensor port; when used with Digiquartz, nylon pressure capillary fitting screws into port. Pressure sensor is installed in connector end cap, & is not field replaceable / swappable. While highest pressure rating gives you most flexibility in using 16plus V2, it is at expense of accuracy & resolution. It is advantageous to use lowest range pressure sensor compatible with your intended maximum operating depth, because accuracy & resolution are proportional to pressure sensor's full scale range. For example, comparing 2000 psia (1400 m) & 6000 psia (4200 m) sensors:
16P.xBx0x	**100 psia (60 m) Digiquartz** pressure sensor with temperature compensation	
16P.xCx0x	**200 psia (130 m) Digiquartz** pressure sensor with temperature compensation	
16P.xDx0x	**300 psia (200 m) Digiquartz** pressure sensor with temperature compensation	
16P.xEx0x	**400 psia (270 m) Digiquartz** pressure sensor with temperature compensation	

16P.xFx0x	**1000 psia (680 m)** **Digiquartz** pressure sensor with temperature compensation	• 2000 psia (1400 m) sensor: initial accuracy = 0.28 m (= 0.02% * 1400 m) • 6000 psia (4200 m) sensor: initial accuracy = 0.84 m (= 0.02% * 4200 m)
16P.xGx0x	**2000 psia (1,400 m)** **Digiquartz** pressure sensor with temperature compensation	
16P.xHx0x	**3000 psia (2,000 m)** **Digiquartz** pressure sensor with temperature compensation	
16P.xIx0x	**6000 psia (4,200 m)** **Digiquartz** pressure sensor with temperature compensation	
16P.xJx0x	**10,000 psia (6,800 m)** **Digiquartz** pressure sensor with temperature compensation	
16P.xKx0x	**15,000 psia (10,500 m)** **Digiquartz** pressure sensor with temperature compensation	

SBE 16plus V2 Connector Selections — MUST SELECT ONE		
16P.xx10x	**XSG/AG** connectors on SeaCAT bulkhead connectors and on extender and data I/O cables	Wet-pluggable connectors may be mated in wet conditions. Their pins do not need to be dried before mating. By design, water on connector pins is forced out as connector is mated. However, they must not be mated or un-mated while submerged. Wet-pluggable connectors have a non-conducting guide pin to assist pin alignment & require less force to mate, making them easier to mate reliably under dark or cold conditions, compared to XSG/AG connectors. Like XSG/AG connectors, wet-pluggables need proper lubrication & require care during use to avoid trapping water in sockets.

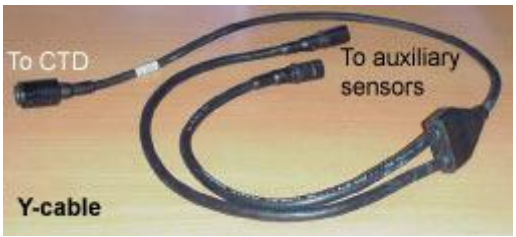
16P.xx20x	**Wet-pluggable (MCBH)** connectors on SeaCAT bulkhead connectors and on extender and data I/O cables	  These selections include extender & data I/O cable compatible with data I/O - pump bulkhead connector.
SBE 16plus V2 Submersible Pump Selections — MUST SELECT ONE		

<table>
<tr><td>16p.xxx00</td><td>No pump</td><td rowspan="3"> 

SBE 5M pump is intended for providing pumped conductivity only. Pump provides better conductivity response & anti-foulant protection than non-pumped configuration. SBE 5M pump with plastic housing is supplied for 16plus V2 with 600 m housing; SBE 5M pump with titanium housing is supplied for 16plus V2 with 7000 or 10,500 m housing.

Larger, more powerful SBE 5P or 5T is required if also planning to pump auxiliary sensors (such as dissolved oxygen, etc.). Operational characteristics of SBE 5P & 5T are identical. SBE 5P plastic pump is supplied for 16plus V2 with 600 m housing; SBE 5T titanium pump is supplied for 16plus V2 with 7000 or 10,500 m housing.

Data I/O - Pump bulkhead connector on 16plus V2 is standard, so pump can be added in field without requiring any modifications to 16plus V2. SBE 5M or 5P/5T selection includes pump (with same connector type as 16plus V2), pump mount, & data I/O - pump Y-cable (cable</td></tr>
<tr><td>16p.xxx01</td><td>Add SBE 5M pump for sensor flushing</td></tr>
<tr><td>16p.xxx02</td><td>Add SBE 5P/5T pump for sensor flushing</td></tr>
</table>

		compatible with connectors on 16plus V2 and pump). See cable DN 31551 for XSG/AG connectors, DN 32896 for wet-pluggable connectors.
SBE 16plus V2 Dissolved Oxygen Sensor Options		
16p-7g	SBE 63 Optical Dissolved Oxygen Sensor, with **XSG** connector, **600 m** (cable & mount included, requires 16p-4f or -4b & 16P.xx10)	SBE 63 is available in 600 m (16p-7g or -7h) or 7000 m titanium (16p-7e or -7f) housing, and its connector type (XSG or wet-pluggable) must match 16plus V2 connector type.
16p-7h	SBE 63 Optical Dissolved Oxygen Sensor with **Wet-pluggable** connector, **600 m** (cable & mount included, requires 16p-4h or -4d & 16P.xx20)	SBE 63 is plumbed in line between conductivity sensor & pump; consequently, system requires more powerful SBE 5P plastic pump or SBE 5T titanium pump instead of SBE 5M pump. Operational characteristics of SBE 5P & 5T are identical.
16p-7e	SBE 63 Optical Dissolved Oxygen Sensor with **XSG** connector, **7000 m housing with 5000 m mount** (cable & mount included, requires 16p-4b & 16P.xx10)	 All 16p-7 options include SBE 63, mount, & straight cable to connect sensor to 16plus V2 bulkhead connector. If connecting 2 sensors to 1 bulkhead connector, extra

16p-7f	SBE 63 Optical Dissolved Oxygen Sensor with **Wet-pluggable** connector, **7000 m housing with 5000 m mount** (cable & mount included, requires 16p-4d & 16P.xx20)	charge to substitute Y-cable applies in addition to 16p-7_ price. Additional sensors not listed here — fluorometers, transmissometers, turbidity meters, PAR sensors, etc. from third party manufacturers — are compatible with 16plus V2. These sensors can be purchased from Sea-Bird & integrated with 16plus V2 at our factory, or you can purchase mount kits & cables from Sea-Bird & perform integration yourself. See Third Party portion of price list.
16p-7i	SBE 63 Optical Dissolved Oxygen Sensor with **XSG** connector, **7000 m housing with 7000 m mount** (cable & mount included, requires 16p-4b & 16P.xx10)	
16p-7j	SBE 63 Optical Dissolved Oxygen Sensor with **Wet-pluggable** connector, **7000 m housing with 7000 m mount** (cable & mount included, requires 16p-4d & 16P.xx20)	
SBE 16plus V2 Spares & Accessories		

801542	AF24173 Anti-Foulant Device pair (spare, bagged, labeled for shipping)	 Anti-foulant devices fit into anti-foulant device cups at each end of conductivity cell. Anti-foulant devices included with standard shipment; these are spares. Useful life varies, depending on several factors. We recommend that customers consider more frequent replacement when high biological activity & strong current flow (greater dilution of anti-foulant concentration) are present. Moored instruments in high growth & strong dilution environments have been known to obtain a few months of quality data, while drifters that operate in non-photic, less turbid deep ocean environments may achieve years of quality data. Experience may be strongest determining factor in specific deployment environments.
233540 Buy Now	Anti-foulant cap **without hose barb**, black	Cap without hose barb is used for: ● Intake end of conductivity cell ● Exhaust end of conductivity cell, when 16plus V2 is not pumped

<table>
<tr><td>233538.01</td><td>Anti-Foulant cap with hose barb, black</td><td>Barbed cap is used for:
Exhaust end of conductivity cell when 16plus V2 is pumped, for connection of Tygon tubing
Intake end of conductivity cell during cleaning and storage only, to allow you to connect Tygon tubing for flushing plumbing</td></tr>
<tr><td>80291</td><td>9-cell series alkaline battery pack (solder connected)</td><td rowspan="3">Batteries are easily accessed by unscrewing battery end cap. 16plus V2 comes standard with 9 D cell alkaline batteries (nominal 14 Ah), but can be powered with Electrochem lithium batteries for more power intensive / longer deployments.
Notes:
Sea-Bird does not supply Electrochem lithium batteries; you must purchase them elsewhere (see WGT's website for purchasing information). Shipping restrictions apply for Electrochem lithium batteries & assembled battery packs.
Lithium battery packs cannot be used with a 16plus V2 that is integrated with SBE 5T or 5P pump, because of current limitations. They can be used with a 16plus V2 with no pump, or with an SBE 5M pump.</td></tr>
<tr><td>801483</td><td>Battery pack assembly kit for 80547 9 D 10.8v/42Ah Lithium pack with instructions, cells not included (DN 67143)</td></tr>
<tr><td>801479</td><td>Battery pack assembly kit for 80540 3 DD 10.8v/30Ah Lithium pack with instructions, cells not included (DN 67144)</td></tr>
</table>

50434 Buy Now	SBE 16plusV2/19plusV2 Spares Kit (**XSG/AG** connectors) - Complete support kit containing spare data I/O cable, bulkhead connectors, dummy plugs, Triton X-100, o-ring lubricant, & other mechanical spares & maintenance items.	Order appropriate spares kit for connector type on 16plus V2: • 50434 for 16plus V2 with XSG/AG connectors — See document 67196 for complete listing of parts. • 50435 for 16plus V2 with wet-pluggable connectors — See document 67197 for complete listing of parts.
50435 Buy Now	SBE 16plusV2/19plusV2 Spares Kit (**Wet-pluggable** connectors) - Complete support kit containing spare data I/O cable, bulkhead connectors, dummy plugs, Triton X-100, o-ring lubricant, & other mechanical spares & maintenance items.	
801385 Buy Now	**Data I/O** Cable, **RMG-4FS** with DB-9S & power leads, 2.4 m (DN 32277)	These test cables are used for setting up system & uploading data from memory after recovery. Data I/O cable connects to one of following cables: • 4-pin end of pump-data I/O Y-cable (for 16plus V2 used with a pump), or • 4-pin end of data I/O extension cable (for 16plus V2 used without a pump)
801374 Buy Now	**Data I/O** cable, **Wet-pluggable** (MCIL-4FS) with DB-9S, 2.4 m (DN 32715)	

		Connector type (RMG or wet-pluggable) must match 16plus V2 connector type. Applicable cable is included with 16plus V2; these are spares.
17762	Data I/O **extension cable, AG-206 to RMG-4MP**, 0.8 m (DN 31605)	This cable connects 6-pin data I/O pump bulkhead connector to 801385 data I/O cable, for 16plus V2 used without a pump.
172393	Data I/O **extension cable, MCIL-6FS to MCIL-4MP**, 0.8 m (DN 33329)	
177797	Y-cable, **Pump-Data I/O**, **RMG/AG** connectors (DN 31551)	These Y-cables connect 6-pin data I/O - pump bulkhead connector to pump (2-pin leg) & to data I/O cable (4-pin leg).
172220	Y-cable, **Pump-Data I/O**, **Wet-pluggable** (DN 32896)	
23170 Buy Now	Seacat/Searam battery endcap handle (DN 20220)	
23114 Buy Now	Seacat/Searam battery endcap lifting eye (DN 20217)	

231787	Seacat connector guard, titanium (DN 21910)	
90087 Buy Now	Universal plumbing kit (includes pump air release valve, Y-fitting, & tubing) - Application Note 64-1	Application Note 64-1 details installation of plumbing for SBE 43 & pump on a CTD.
50087.1 Buy Now	Cell filler/storage device with hose barbs (Application Note 34)	For cleaning conductivity cell after each use & storing instrument between uses. See document 67043 & Application Note 2D: Instructions for Care and Cleaning of Conductivity Cells.
30411 Buy Now	Triton X-100 cleaning solution, 500 ml bottle	
20200	USB to Serial Port Adapter, FTDI UC232R-10 (connects computers with USB ports to RS-232 instruments)	Many newer PCs & laptop computers have USB port(s) instead of RS-232 serial port(s). USB serial adapter plugs into USB port, & allows a serial device to be connected through adapter. Multi-port adapters are available from other companies; see Application Note 68.
various	Plumbing	For assorted sizes of Tygon tubing, see SBE 5M or 5P or 5T Configuration.