OPERATION AND MAINTENANCE MANUAL

BLUE LOGIC

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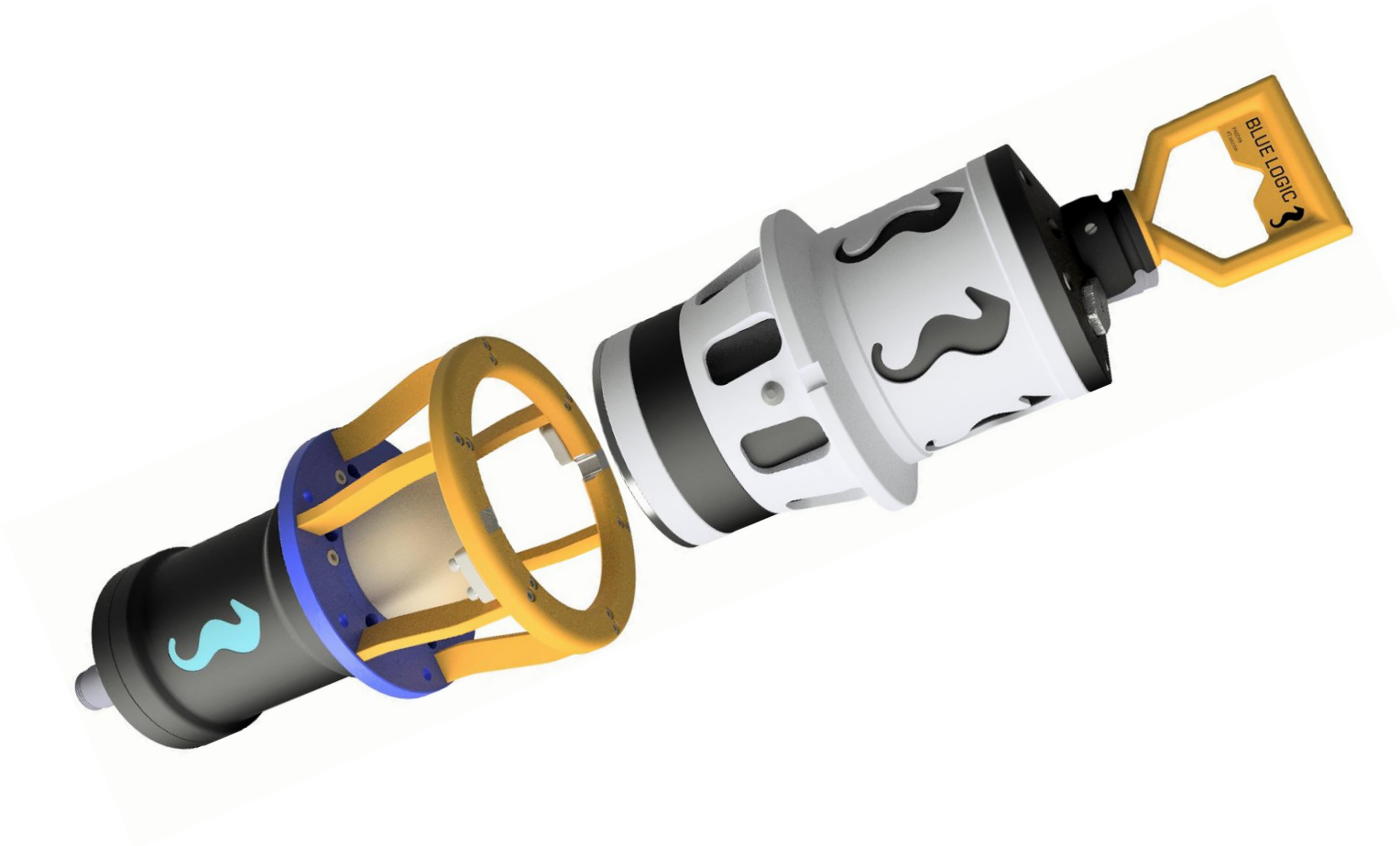

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1. INTRODUCTION

1.1. OBJECTIVE

The objective of this document is to cover all aspects required for safe use, operation and maintenance of the Blue Logic 2kW “Subsea USB” System. Relevant technical aspects for information and familiarization shall be covered as well as required technical data.

1.2. REVISION CHANGE/RECORD

REV	REASON FOR REVISION/ DESCRIPTION OF CHANGES
01	Issued for Use
02	Revised and added information on Torque Tool inductive interface

1.3. SAFETY

WARNING: The equipment to which this manual applies must only be used for the purpose for which it was designed. Improper use or maintenance may cause damage to the equipment and/or injury to personnel. All users must be familiar with the contents of the appropriate manuals before attempting to install, operate, maintain or in any other way work on the equipment.
Blue Logic AS disclaims any responsibility for damage or injury caused by improper installation, use or maintenance of the equipment

CAUTION: The equipment to which this manual applies operates on high voltage, and has the potential to results in death or severe injury if handled incorrect. The equipment should only be used by qualified personnel. The equipment contains no serviceable parts inside.

1.4. GENERAL

The Blue Logic 2kW “Subsea USB” Type C system is based on the WPC/ Blue Logic inductive technology for transfer of electrical power and communication subsea. The 2kW connector system is part of the complete "Subsea USB" family covering power range from 50W to 2kW with Ethernet communication speeds up to 80Mbit, and RS232 or RS485 serial communication speed up to 230 kbps.

Each “Subsea USB” system consists of a Primary and a Secondary side installed in a Male and Female subsea housing. The power is transferred from the Primary side to the secondary side whilst communication is in both directions. Upon request, two-way power transfer is available on some connectors.

The Male and Female Subsea USB Connectors can be configured in the following alternatives:

1. Manually operated by hand
2. ROV operated
3. Bulk head installation
4. Combined with hydraulic connector thus allowing for electrical power, communication and hydraulic connections to be made up using the same connector assembly.

The Blue Logic 2 kW inductive connectors is also possible to combine with Blue Logic's range of Torque Tools, with the Torque Tool connected to the inductive couplers secondary side for receiving power and data from a primary inductive coupler.

The Blue Logic/WPC "Subsea USB " type C System transforms 100-250VAC / 145-350VDC to 325VDC from the primary to the secondary side. The system can also be delivered with other voltage settings thus allowing for optimization of voltage and power on different types of subsea systems and for different consumers. For example, different secondary side connectors can be configured to extract different voltages from the same primary side. This means that different types of consumers (with different voltage or power requirements) can be connected to the same primary side.

1.5. DOCUMENT USE

This document shall be used as general information for all aspects related to safe use, installation, removal, maintenance and storage of the 2kW Subsea USB Connectors.

1.6. ABBREVIATIONS

ROV	Remotely Operated Vehicle
PFC	Power Factor Controller
WPC	Wireless Power & Communication AS
PCD	Pitch Circle Diameter
IP	Internet Protocol

2. TECHNICAL DESCRIPTION

2.1. TYPE-C FAMILY OVERVIEW

The Blue Logic 2kW “Subsea USB” Systems can be delivered with a variety of mechanical configurations and interfaces. In addition to Power and Data transmission, the Blue Logic 2kW system can be combined with Blue Logic Class 1-4 Electrical Torque Tool, where the control system for the Electrical Torque Tool is integrated in the secondary side inductive coupler. Please refer to the Operation and Maintenance Manual for the Electrical Torque Tool for further information on the Blue Logic Electrical Torque Tool.

Electrical alternatives with regards to power/ voltage/ current and communication setup can be delivered upon request.

The 2kW “Subsea USB” connector is a ROV friendly and compact inductive connector system designed primarily for intervention purposes suitable for all types of ROV tools where electrical power and electronic communication is required.

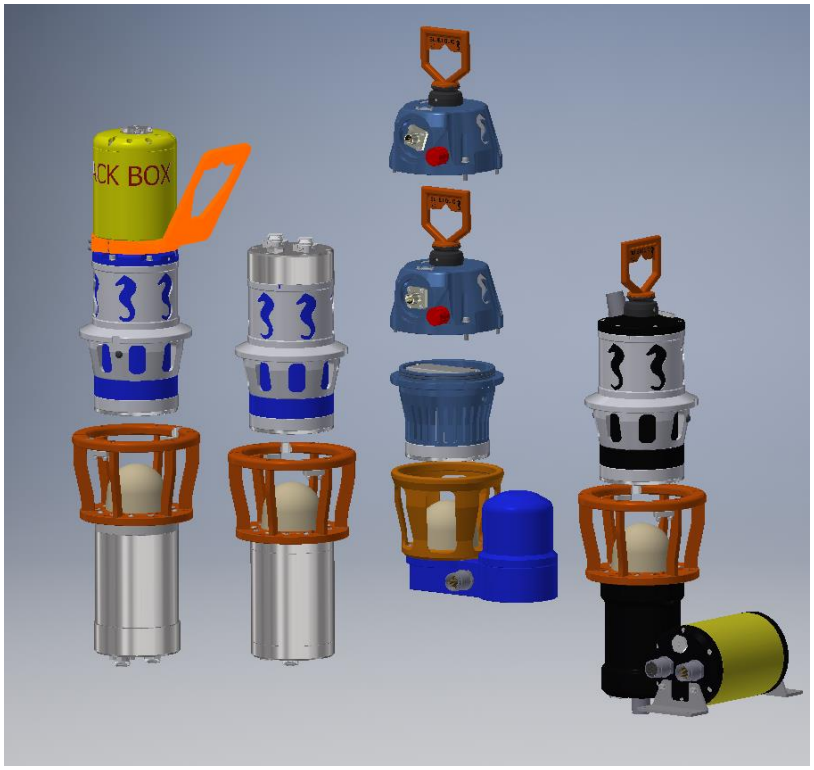


Figure 1 - Type C Inductive Couplers Family

Figure 2 - Male - Female Inductive Coupler with PFC

Figure 3 - Torque Tool Inductive Coupler

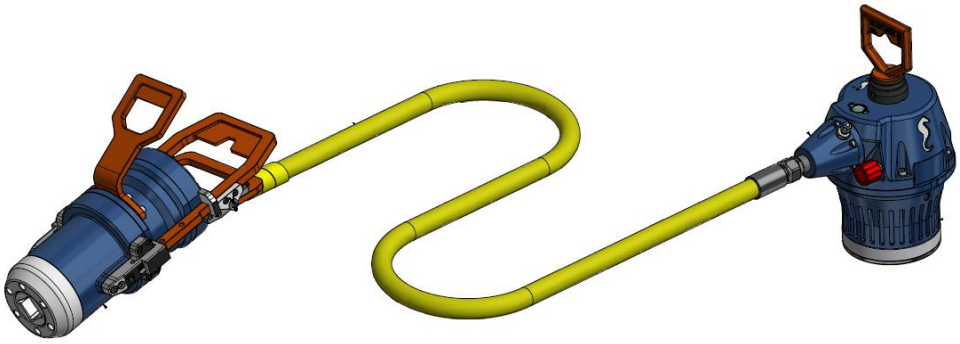


Figure 4 – Blue Logic Electrical Torque Tool System

2.2. SYSTEM OVERVIEW

A typical system will consist on a PFC canister, a Primary inductive connector and a Secondary inductive connector. The PFC canister transforming ROV supplied 100-250VAC / 145-350VDC voltage to 370VDC voltage required for the Primary inductive connector. The Secondary inductive outputs 325VDC/2KW when connected to the Primary Inductive connector.
In addition 80Mbps Ethernet and RS232 or RS485 up to 230kbps is transferred over the inductive connectors.

Primary side inductive connector is equipped with a male Subconn electrical connector, while the Secondary Side is equipped with a female connector. The PFC canister will correspondingly have a male/female connector for input/output.

Cable between the PFC canister and the Primary connector is supplied by Blue Logic. Blue Logic can also assist with the delivery of other cables as well. All cables must be suitable and compatible with the Ethernet Cat5 standard.

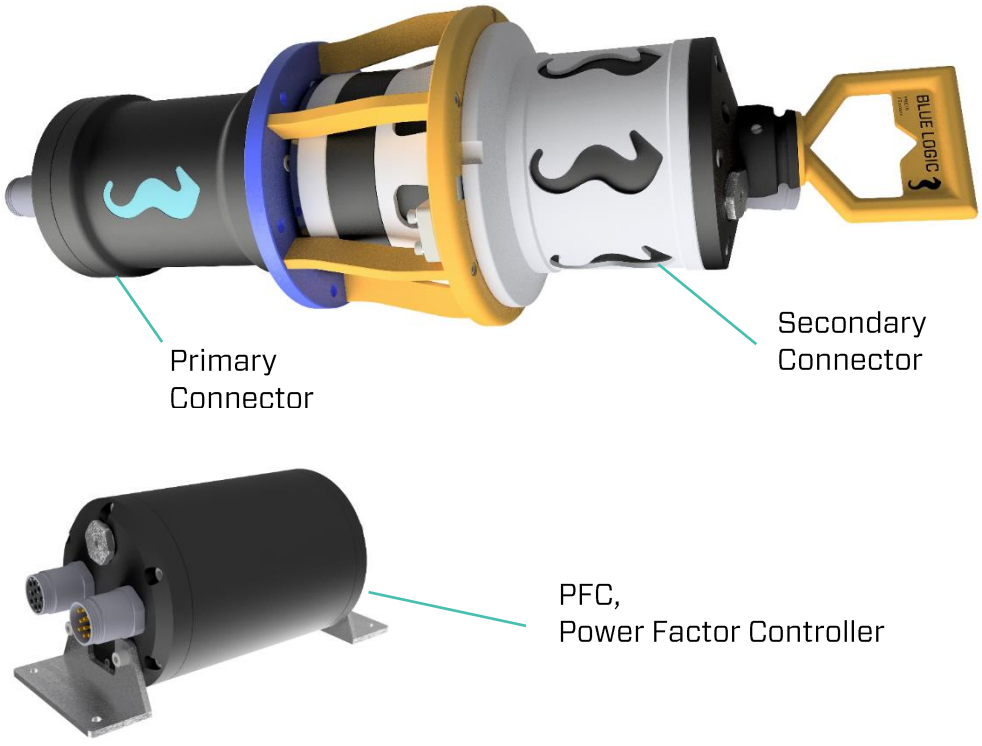


Figure 5 - 2kW Subsea USB System

2.2.1. Male-Female vs Primary-Secondary designation

The male - female designation refers to the shape of the inductive dome and is not linked to its use as a primary or a secondary inductive coupler.

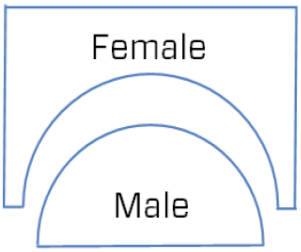


Figure 6 - Male-Female definition

The primary-secondary designation refers to the transfer direction of power. The primary inductive coupler is the “sender” of power, and the secondary inductive coupler is on the “receiver” end of the power transfer.

Some units have the capability of switching the power transfer direction, i.e. a unit can act as a primary or as a secondary unit depending on the required power direction.

2.3. TECHNICAL DATA

Overall dimensions	See Assembly Drawing	
Design Water Depth	3000	m
Input Voltage PFC	100-250VAC or 145-350VDC	*
Output Voltage	325VDC	VDC *
Max Power Transfer	2000	W
Communication Protocol	RS232+ Ethernet	**
Communication speed RS232	230	kbps
Communication Speed Ethernet	80	Mbps

* Other voltage and power configurations are available upon request to meet project or client specific requirements.
** Connector system can be configured for RS485 upon request.

2.4. PRIMARY CONNECTOR

CAUTION: The primary connector operates on high voltage, and has the potential to results in death or severe injury if handled incorrect. The equipment should only be used by qualified personnel. The equipment contains no serviceable parts inside.

Pictures below shows a standard setup of the primary connector. The primary connector is normally static and mounted to a structure or ROV. It should be mounted at a suitable place reachable by the ROV manipulator.

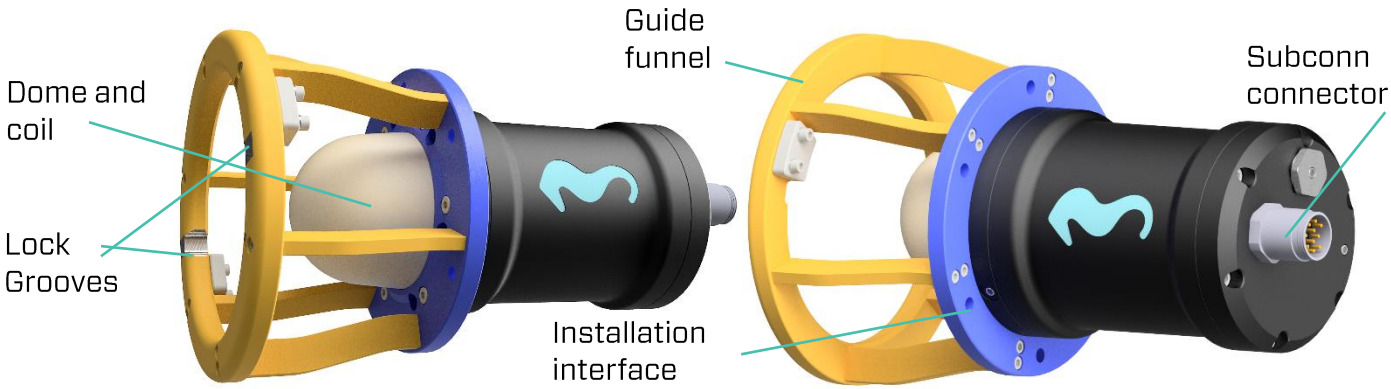


Figure 7 Primary Connector

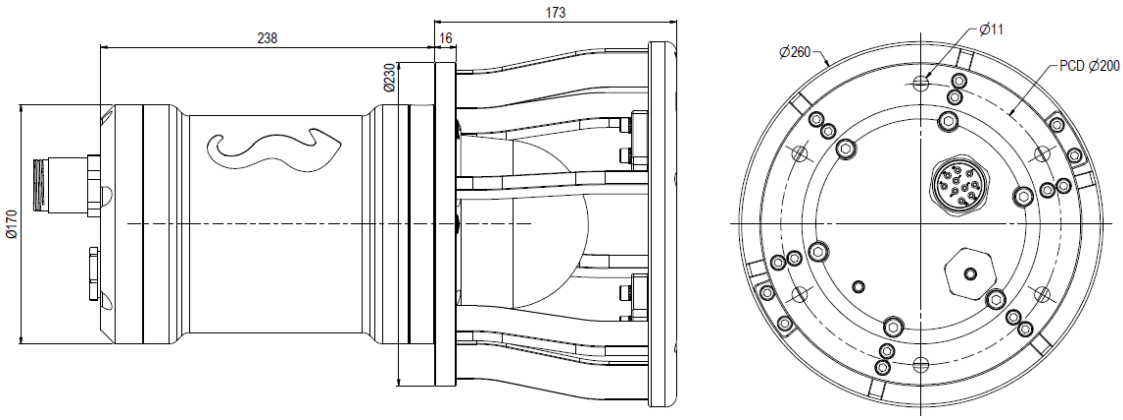


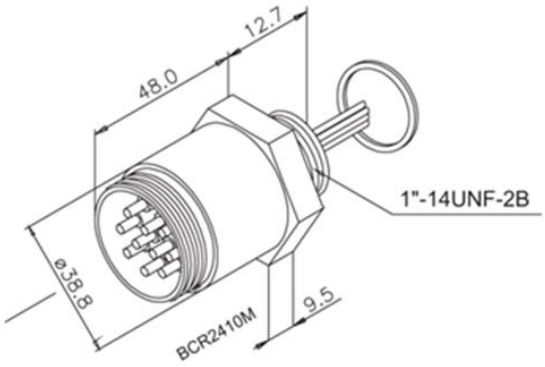
Figure 8 Installation flange interface

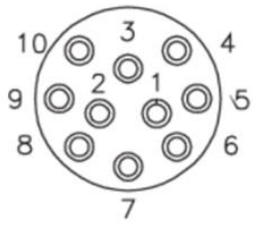
Installation flange interface is 6 x Ø11 on PCD 200mm as shown on above figure.

CAUTION: The bulkhead connector on the Primary Inductive Connector and the input bulkhead connector on the Power Controller Factor canister are identical.
It is therefore possible to mate the cable intended for the Power Factor Controller to the connector on the Primary Inductive Connector. Make certain that the correct cable is used as connecting 230VAC into the Primary Inductive connector may destroy the equipment.

Pin configuration:

Primary Side input	
Connector: Subconn BCR2410M	
Pin #	**Signal**
Pin 1	360-380VDC
Pin 2	0 VDC
Pin 3	CHASSIS
Pin 4	RS232RX (input)
Pin 5	RS232TX (output)
Pin 6	RS232GND
Pin 7	TX_p
Pin 8	TX_n
Pin 9	RX_p
Pin 10	RX_n





Male Face View

For prolonged used of the Primary Inductive Connector in seawater, adequate cathodic protection should be considered by the end user.

2.5. POWER FACTOR CONTROLLER

CAUTION: The power factor controller operates on high voltage, and has the potential to results in death or severe injury if handled incorrect. The equipment should only be used by qualified personnel. The equipment contains no serviceable parts inside.

The Power Factor Controller (PFC) is an atmospheric air filled canister which converts the ROV supplied 100-250 VAC or 145-350 VDC, to 370VDC required for the primary inductive unit. The PFC should be installed onto the ROV frame at a suitable place. The Power Factor Controller is equipped with connectors for Input power & data, and for Output power & data.
All power and data signals shall go through the PFC canister before connected to the Primary inductive coupler.

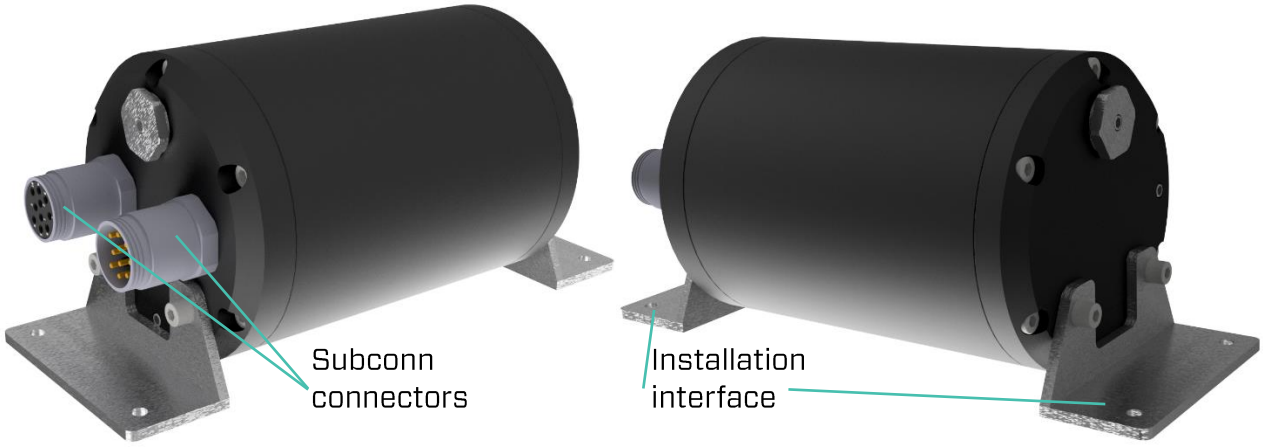


Figure 9 Power Factor Controller

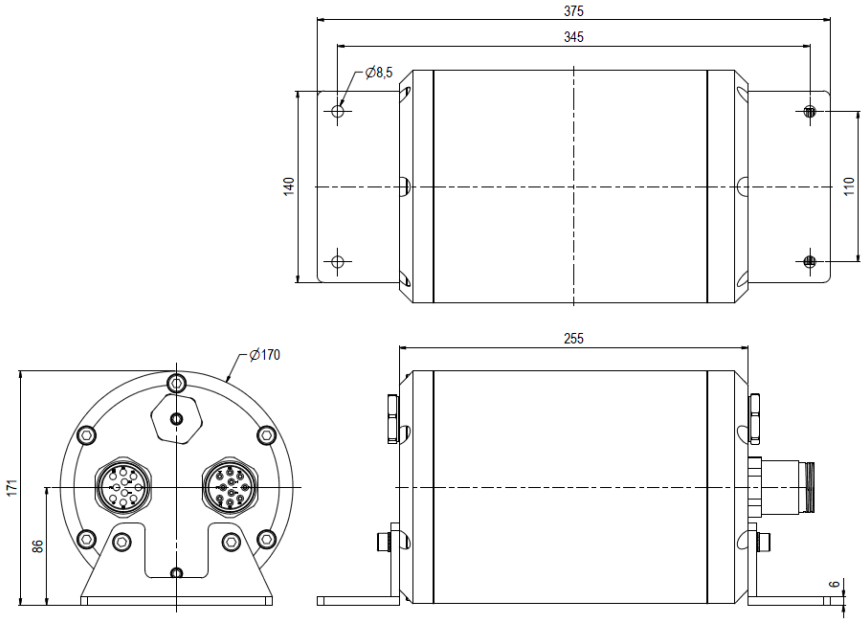
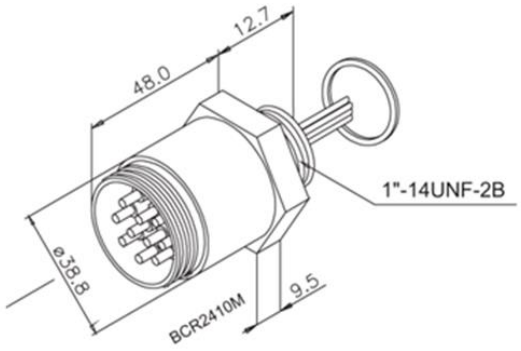
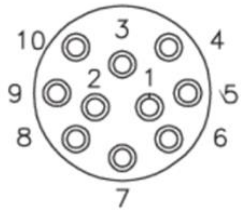


Figure 10 Power Factor Controller Installation interface

Pin configuration:

PFC input with RS232		PFC output with RS232	
Connector: Subconn BCR2410M		**Connector:** Subconn BCR2410F	
Pin #	**Signal**	**Pin #**	**Signal**
Pin 1	100-250VAC / 145-350VDC	Pin 1	370VDC
Pin 2	100-250VAC / 0 VDC	Pin 2	0 VDC
Pin 3	CHASSIS	Pin 3	CHASSIS
Pin 4	RS232RX (input)	Pin 4	RS232RX (input)
Pin 5	RS232TX (output)	Pin 5	RS232TX (output)
Pin 6	RS232GND	Pin 6	RS232GND
Pin 7	TX_p	Pin 7	TX_p
Pin 8	TX_n	Pin 8	TX_n
Pin 9	RX_p	Pin 9	RX_p
Pin 10	RX_n	Pin 10	RX_n





Male Face View

For prolonged used of the Power Factor Controller in seawater, adequate cathodic protection should be considered by the end user.

2.6. SECONDARY CONNECTOR

CAUTION: The secondary connector operates on high voltage, and has the potential to results in death or severe injury if handled incorrect. The equipment should only be used by qualified personnel. The equipment contains no serviceable parts inside.

Pictures below shows a standard setup of the secondary connector. The secondary connector is normally free moving and connected to a tool, gear or other equipment through a cable. The secondary connector will typically be "flown" by an ROV by the D-handle.

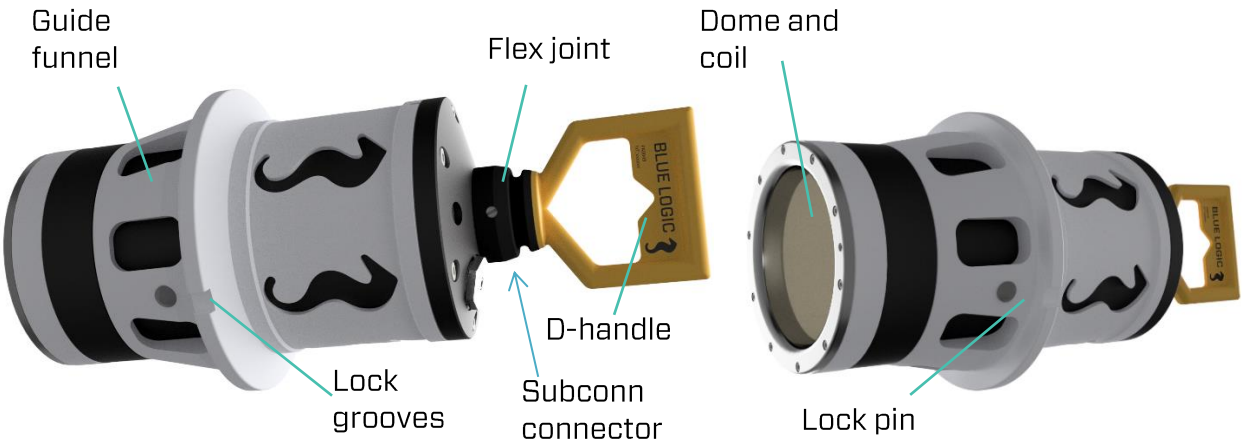


Figure 11 Secondary Connector

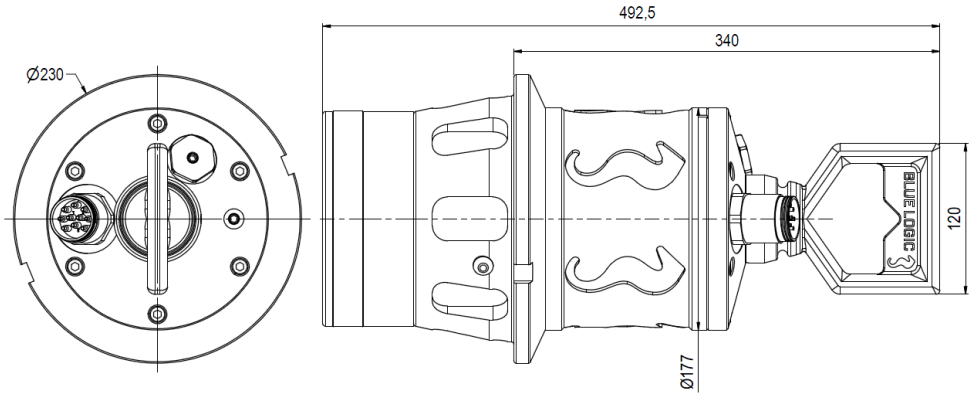
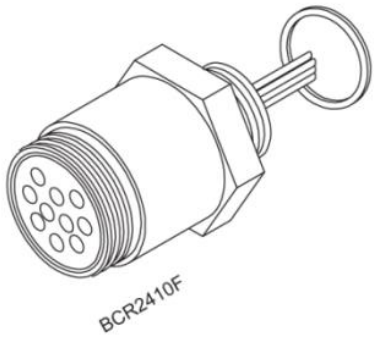


Figure 12 Secondary Connector Dimensions

CAUTION: The bulkhead connector on the Secondary Inductive Connector and the output bulkhead connector on the Power Controller Factor are identical.
Make certain that the correct cable is used when connecting the equipment. Using incorrect cable may destroy the equipment.

Pin configuration:

Secondary Side output with RS232	
Connector: Subconn BCR2410F	
Pin #	**Signal**
Pin 1	325VDC
Pin 2	0 VDC
Pin 3	CHASSIS
Pin 4	RS232RX (input)
Pin 5	RS232TX (output)
Pin 6	RS232GND
Pin 7	TX_p
Pin 8	TX_n
Pin 9	RX_p
Pin 10	RX_n



For prolonged use of the Secondary Inductive Connector in seawater, adequate cathodic protection should be considered by the end user.

2.7. LOCK INTERFACE

The connector 2kW USB System features a lock system which prevents the secondary connector from disconnecting unintentionally. The primary connector has a groove that lets the lock pin on the secondary connector pass thru. When the lock pin is through the secondary connector can be rotated slightly to the right to achieve a lock. Both sides have a surface to help with the alignment, when they are lined up the lock pin will pass thru.
On the primary side there is a bracket to prevent locking when turning to the left, this is made to ease the disconnection. The secondary connector must be turned/rotated slightly to the right to achieve locking.
For disconnecting/unlocking simply rotate secondary connector slightly to the left until surfaces align and separate by pulling straight out. Both secondary and primary have symmetrical lock interfaces each 180°.

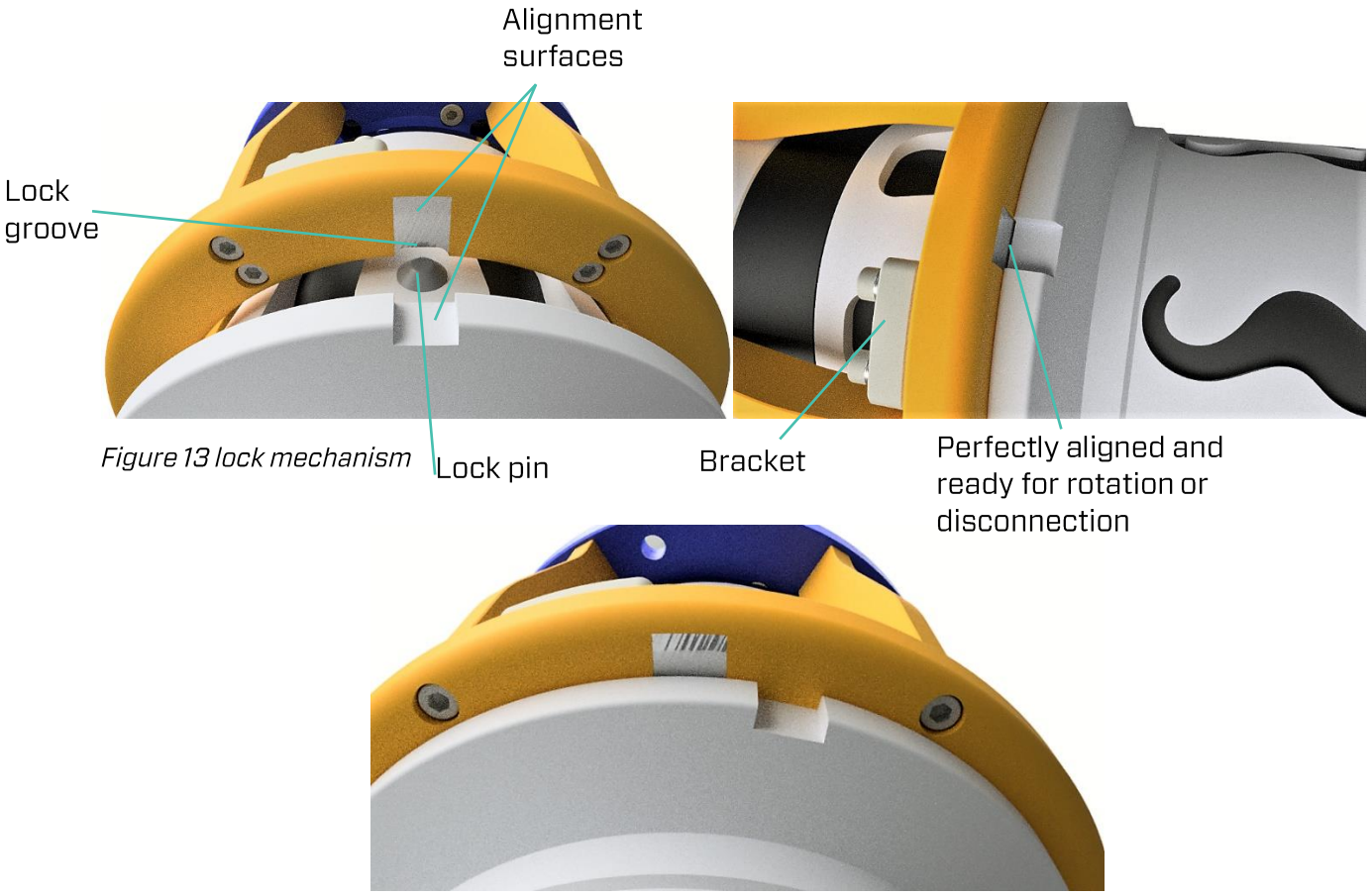


Figure 13 lock mechanism

Figure 14 locked position

2.8. IP ADDRESS CONFIGURATION

All Subsea USB systems are delivered with a fixed IP address. The used addresses are listed in table below. It is recommended to avoid having other equipment in the same network using the same IP address. The IP addresses of the Subsea USB system do not affect the transmission of data and it is not required that the IP address of the Subsea USB system lies within the IP range of the network.

Unit	IP Address
Primary side	192.168.1.253
Secondary side	192.168.1.254

2.9. LED INDICATOR LIGHTS

Some models of the 2 kW USB coupler have LED indicators integrated. The 2kW USB couplers with LED indicator lights, visible to ROV, indicate the status of the USB connector during use and connection.

A start up sequence going through all LED light is performed when minimum voltage level is achieved. The start-up sequence is performed before the Power LED can be turned on. It is then turned on when the input voltage is high enough to start all system functions including transfer of power and communication. It will be continuously lit during normal operation.

If the primary side enters an alarm state the LED will blink with 500ms on, 500ms off. The Power LED will be turned off if the input voltage goes below the minimum limit.

A lit Power LED does not verify that the output voltage is within the specified input voltage range. It only verifies that the input voltage has passed the lower limit for system start-up.

Primary side

POW:	LED on when power in is ok
ETH:	LED on when Ethernet is active, blinks when data is transmitted
RX:	LED on continuously when RS is ready to receive data
	Led is blinking when RS data is received from secondary side
TX:	LED on continuously when TX is ready to transmit RS data
	Led is blinking when RS data is transmitted to secondary side

Secondary side

POW:	LED on when power in is ok
ETH:	LED on when Ethernet is active, blinks when data is transmitted
RX:	LED on continuously when RS is ready to receive data
	Led is blinking when RS data is received from primary side
TX:	LED on continuously when TX is ready to transmit RS data
	Led is blinking when RS data is transmitted to secondary side

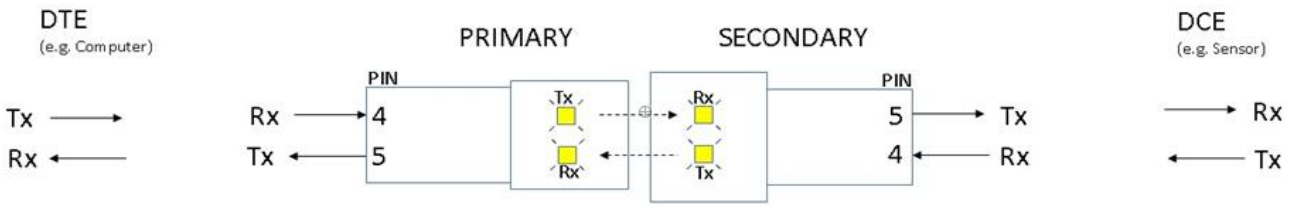


Figure 15 RS232 Data Flow

2.10. OVERLOAD PROTECTION

In case of an overload the voltage will be reduced and limited to ensure that the maximum current limit is never exceeded. The system can be reset by recycling the power on the primary inductive coupler.

2.11. DIAGNOSTIC INTERFACE

Diagnostic data are available through the Ethernet interfaces by sending request commands. Available diagnostic data are listed below:

- Input voltage on primary side
- Current drawn on primary side
- Output voltage on secondary side
- Current drawn on secondary side
- Voltage alarm primary side
- Current alarm primary side
- Temperature alarm primary side
- System alarm primary side
- Voltage alarm secondary side
- Current alarm secondary side
- Temperature alarm secondary side
- System alarm secondary side

2.11.1. Communication format

The internal communication endpoint in the products is a UART connection with 8 data bit, odd parity, 1 stop bit and no flow control. This endpoint is connected to a UART/IP gateway which enables the described diagnostic Ethernet interface. The gateway unpacks/packs the IP frames and forwards raw data in both directions. Any data and timing requirements on the UART interface are directly applicable to the IP endpoint as well.

All bytes in a message will normally be sent continuously with no, or a very short pause, between bytes. Maximum time between bytes within a message is 50ms. If the delay is more, the message is considered corrupt.

Communication is point-to-point with one master and one slave.

2.11.2. Message format

Each message consists of three parts, a "header" with ASCII character STX, address and message ID, a "container" with a byte count and data, and a "footer" containing a checksum for the message. A message is either a command or a response.

2.11.3. Command format

All commands will always have these parts:

STX	ADDR	CMD	NO	DATA	DATA	. . .	DATA	CHS
0x02	Address	Command ID	Number of bytes	1. byte	2. byte		n. byte	Check sum

Some commands do not have any DATA bytes in the container. These commands will have the byte count value of zero.

Explanation of each part:

Abbr.	Name	Size	Description
STX	Start of message	1 byte	STX character, 0x02.
ADDR	Address	1 byte	Reserved for future address information, set to 0.
CMD	Command identification	2 byte	This is an explicit identification of each command type. Possible value for each byte is any characters in upper case from 'A' (0x41) to 'Z' (0x5A).
NO	Number of bytes	1 byte	Byte count including all DATA bytes in the container part of the command.
DATA	Data	0-255 byte	Data needed to fulfil the command. NOTE: Data values are coded with MSB first.
CHS	Checksum	2 byte	Checksum for the message.

2.11.4. Response format

The response message format is almost the same as the command message format, and will always have these parts:

STX	ADDR	RSP	NO	DATA	DATA	. . .	DATA	CHS
0x02	Address	Response ID	Number of bytes	1. byte	2. byte		n. byte	Check sum

Some responses do not have any DATA bytes in the container. These responses will have the byte count value of zero.

Explanation of the specific response parts:

Abbr.	Name	Size	Description
STX	Start of message	1 byte	STX character, 0x02.
ADDR	Address	1 byte	Reserved for future address information, set to 0.
RSP	Response identification	2 byte	The same characters as for the command, but in lower case.
NO	Number of bytes	1 byte	Byte count including all DATA bytes in the container part of the response.
DATA	Data	0-255 byte	Response data. NOTE: Data values are coded with MSB first.
CHS	Checksum	2 byte	Checksum for the message.

2.11.5. Addresses

For current use, no address information is needed, since the communication bearer is always a point-to-point connection and there are no bridging or other functionality requiring an address system. However, to be able to use the product in future applications an address field is included in the message. The address shall for now be set to 0.

2.11.6. Checksum

All bytes in the header part and the container part (not the footer part) of a message are included when calculating checksum. The algorithm used is CRC-16 with polynomial 0xa001. Checksum is included in message with MSB first.

A module with checksum procedures written in programming language C is available and can be shipped to any development team implementing this protocol to their product.

2.11.7. Unknown messages and messages with checksum error

When receiving a message with unknown message ID, a message with checksum error or a message that do not fulfil the protocol, the message shall be rejected. The WDP takes no action with such messages. If the master receives a response with an error, the master may retransmit previous command.

2.11.8. Timing and retransmission

Although the protocol supports a full duplex connection, timing and retransmission system are set to meet the requirements for typical half duplex communication bearer as RS485, radio etc.

There are to be a pause of at least 10 ms between a command and a response.

The slave will execute received command and build corresponding response immediately. Sending response shall start as soon as possible after the required pause of 10 ms. Maximum delay before sending first byte of response is 50 ms after received last byte of the command.

If the master did not receive at least the first byte of a response within 100 ms after last byte of the command was sent the master may consider the response lost and send another command. The master may continue to retransmitting or sending new messages as long as it would like, the only requirement is that there is a pause of 100ms between each command transmission.

2.11.9. Messages

All messages are built according to the specified message format, see section 2.11.3 and 2.11.4. In the tables below only the CMD, RSP, NO and DATA fields are pointed out. The STX, ADDR and CHS shall be added when building messages.

2.11.10. Read Immediate

<table>
<tr><th>Command</th><th></th><th>Values and comment</th></tr>
<tr><td>CMD</td><td>RI</td><td>Read immediate diagnostic data.</td></tr>
<tr><td>NO</td><td>0x00</td><td>Number of bytes</td></tr>
<tr><td>Response</td><td></td><td></td></tr>
<tr><td>RSP</td><td>ri</td><td>Immediate readings of diagnostic data.</td></tr>
<tr><td>NO</td><td>0x09</td><td>Number of bytes</td></tr>
<tr><td>DATA1 – DATA2</td><td>16 bit unsigned value</td><td>Input voltage reading on Primary side.
Resolution 100mV. Example: 2123 for 212.3V.</td></tr>
<tr><td>DATA3 – DATA4</td><td>16 bit unsigned value</td><td>Current drawn reading on primary side.
Resolution 10mA. Example: 554 for 5.54A.</td></tr>
<tr><td>DATA5 – DATA6</td><td>16 bit unsigned value</td><td>Output voltage reading on secondary side.
Resolution 100mV. Example: 2123 for 212.3V.</td></tr>
<tr><td>DATA7 – DATA8</td><td>16 bit unsigned value</td><td>Current drawn reading on secondary side.
Resolution 10mA. Example: 554 for 5.54A.</td></tr>
<tr><td>DATA9</td><td>8 bit</td><td>Status bits:
<table>
<tr><th>BIT number:</th><th>Description:</th></tr>
<tr><td>0</td><td>0 – Primary input voltage OK
1 – Primary input voltage ALARM</td></tr>
<tr><td>1</td><td>0 – Primary current drawn OK
1 – Primary current drawn ALARM</td></tr>
<tr><td>2</td><td>0 – Primary temperature OK
1 – Primary temperature ALARM</td></tr>
<tr><td>3</td><td>0 - Primary system OK
1 - Primary system ALARM</td></tr>
<tr><td>4</td><td>0 – Secondary output voltage OK
1 – Secondary output voltage ALARM</td></tr>
<tr><td>5</td><td>0 – Secondary current drawn OK
1 – Secondary current drawn ALARM</td></tr>
<tr><td>6</td><td>0 – Secondary temperature OK
1 – Secondary temperature ALARM</td></tr>
<tr><td>7</td><td>0 - Secondary system OK
1 - Secondary system ALARM</td></tr>
</table></td></tr>
</table>

Table 1 Read Immediate data format

2.11.11. Activation of diagnostic

When a primary unit is up and running the diagnostic server endpoint is available. Connection information:

- Protocol: TCP/IP
- Address: IP address of unit
- Port: 5000

3. PREPERATION FOR USE

3.1. ONSHORE PREPERATIONS

Prior to shipping offshore a mobilisation/ verification should be performed. All functions should be tested and verified. The following check list should be used as a guideline for activities to be performed prior to offshore mobilisation

3.1.1. Mobilisation check list

No.	Description	Check/Verified
01	Inspect Inductive couplers and PFC canister for visual damage or unusual wear and tear. Special attention should be focused on its connectors. Always apply grease (Molykote 44) to the Subconn connectors before mating.	
03	Inspect supplied Cables for visual damage or unusual wear and tear	
04	Inspect that the Lock interface	
05	Assemble the Inductive couplers system and connect to power.	
06	Verify the output voltage.	
07	Verify data transfer.	
09	Disassemble and store in transport box	
10	Verify correct packing and documentation in the transport box.	

4. OPERATION

4.1. PRE DIVE CHECK LIST

No.	Description	Chk/Verified
01	Perform a function test by connecting primary and secondary side. - Test communication - Test Power transfer	

No.	Description	Chk/Verified
02	Perform a visual inspection of primary side connector - Housing - Seals - Coil Surface - Connector - Lock interface	
03	Perform a visual inspection of secondary side connector - Housing - Seals - Coil Surface - Connector - Lock interface -	

4.2. CONNECTION

No.	Description	Chk/Verified
01	Inspect the stab/receptacles to be mated by ROV visually. Verify that mating surfaces are clean	
02	By use of the ROV manipulator gently mate the male and female (primary/secondary) connectors.	
03	Rotate slightly to the right to lock connectors together	
04	Verify that the connectors are fully mated and that cables are undamaged	
05	Verify that power and communication is transferred between the connectors	

4.3. DISCONNECTION

No.	Description	Chk/Verified
01	Inspect the male/female stab system	
02	Inspect cables and connectors	
03	Gently grab the connector through the ROV handle and rotate it left to align lock interface	
04	Pull the stab slowly out from receptacle	
05	Inspect stab, receptacle, cables and connectors	

4.4. POST DIVE CHECK LIST

No.	Description	Chk/Verified
01	Recover system to deck	
02	Inspect all components and parts. Special attention to the following: - Housing - Surface treatment - Corrosion - Seal - Coil surfaces - Cables - Penetrators - Connectors - Mechanical interfaces	
03	Flush all components and parts thoroughly with fresh water	
04	Connect System and perform a full system check	

5. STORAGE AND TRANSPORT

5.1. STORAGE

5.1.1. Preservation for storage

No.	Description	Check/Verified
01	Visual inspect the Inductive coupler for damages and wear.	
02	Ensure correct post dive sequence are followed, see section 4.4	
03	Apply preservation oil, WD40 or similar, and secure in storage box.	

5.1.2. Transport and Shipping

Subsea USB to be transported in a dedicated transport box.

Verify the following:

1. Sender Name and Address clearly visible
2. Receiver Name and address clearly visible
3. Inventory list correct filled out

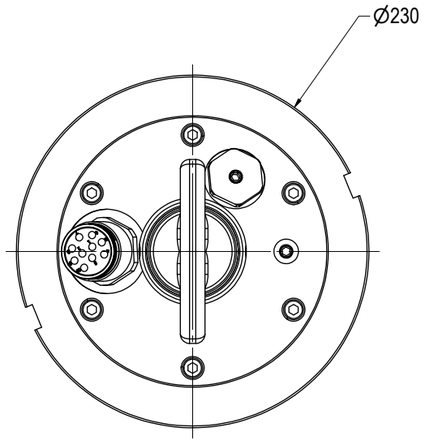
6. SUPPORT CONTACTS

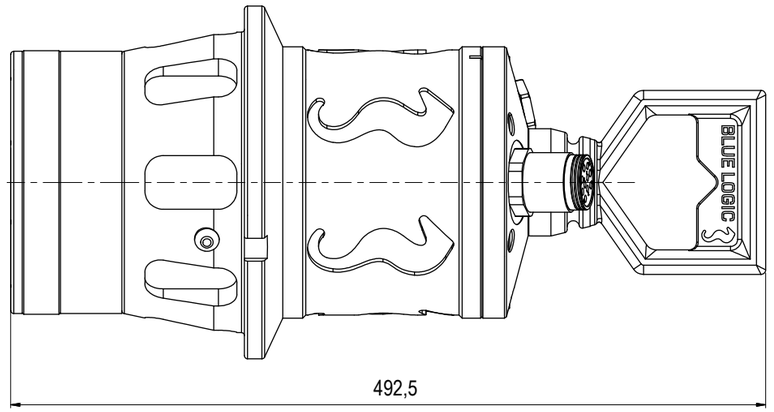
BLUE LOGIC AS
Forus
Stokkamyrveien 18
4313 SANDNES
NORWAY

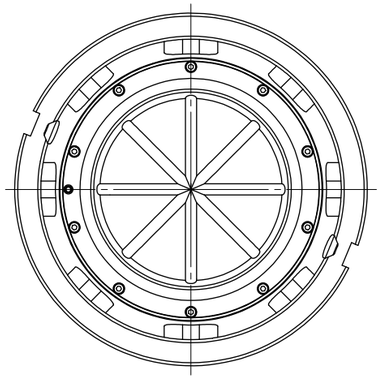
Lars Gunnar Hodnefjell
R&D Manager
Mob: +47 992 63 950
lgh@bluelogic.no

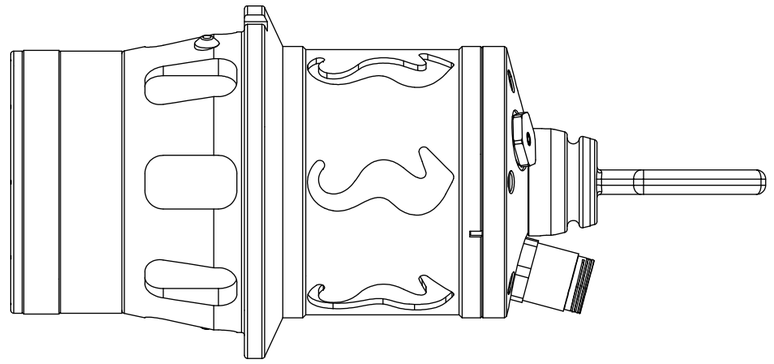
7. APPENDIX - DRAWINGS

7.1. DRAWING BA7714 ROV FEMALE 2KW SUBSEA USB









NOTE: 1
DESIGN CODE:
N/A

NOTE: 2
TECHNICAL CLASSIFICATION:

Article Type:	006-El. Connectors
Main Group:	6.01. Subsea USB
Intermediate Group:	6.28.04. 0,9-3,6KW Subsea USB
Sub Group:	6.28.157.02. Female Connector

NOTE: 3
INTERFACE INFORMATION:

Pressure Rating Bar:	300 (3000m)
Material:	Hard Anodized Aluminium
Weight:	14,4 kg
Volume:	7,58 dm^3
Surface Area:	18034 cm^2
Hydraulic:	N/A
Mechanical:	ROV D-Handle
Electrical:	325 VDC, Connector BCR2410F
Com. & Protocol:	Ethernet & RS232/RS485*

NOTE: 4
ADDITIONAL INFORMATION:
Inductive Subsea Connector for transfer of electrical power and communication type Blue Logic USB C.
The Blue Logic USB C series inductive connector is a multipurpose electrical connector with the capacity of transferring up to 2kW electrical power, 80Mbps Ethernet and 230kbps serial communication. The active part is spherical shaped giving unique properties with regards to guiding and self-alignment between male and female part and very rough angular tolerances. Easy to connect and disconnect by divers, ROV or AUV's. BA7714 is a female connector, configured to be the secondary side (receiving part) in a connector system.

Operation and Maintenance Manual BL ROV Power Supply: 600128-TD-0013

*RS485 Optional

Rev.	Date	Reason for issue	Revision change	Made	Chk'd	Appr.
06	15.1.2019	9-IFU (Issued for Use)		WTJ	LGH	WTJ
05	27.6.2018	9-IFU (Issued for Use)		WTJ	LGH	WTJ
04	1.11.2017	9-IFU (Issued for Use)		WTJ	LGH	WTJ
03	1.9.2016	9-IFU (Issued for Use)		WTJ	LGH	WTJ

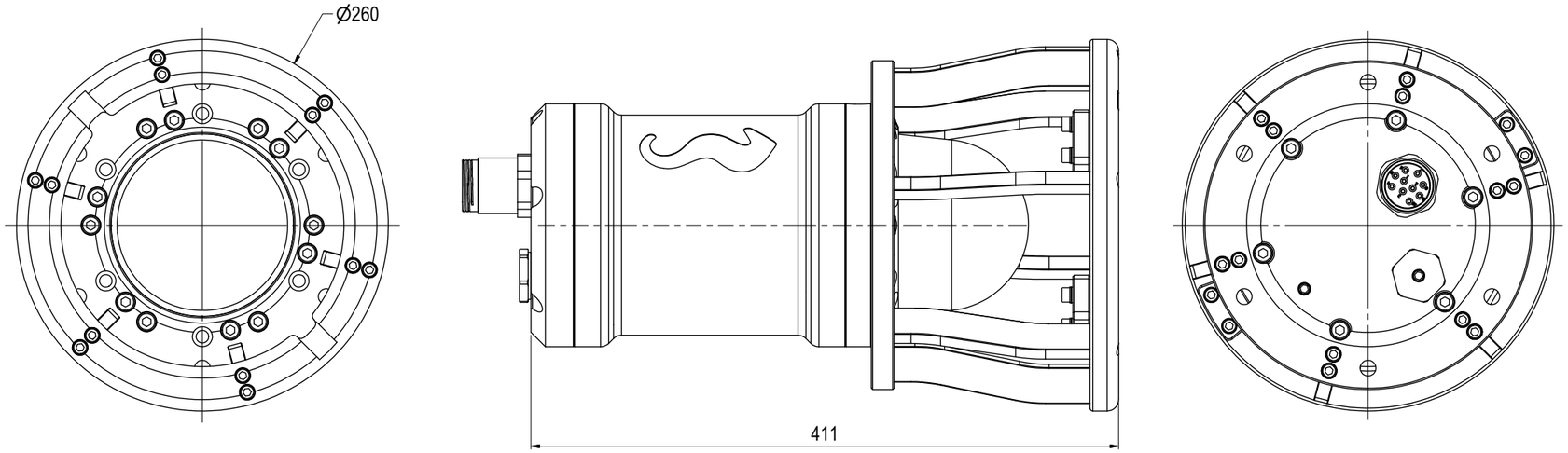
BLUE LOGIC 3

Dwg Scale: NTS
Dwg Proj:
Dwg Format: A3

Drawing title: BL ROV Female 2kW Subsea USB

Drawing number: BA7714

Rev. 06



NOTE: 1
DESIGN CODE:
N/A

NOTE: 2
TECHNICAL CLASSIFICATION:

Article Type:	006-El. Connectors
Main Group:	6.01. Subsea USB
Intermediate Group:	6.28.04. 0,9-3,6KW Subsea USB
Sub Group:	6.28.157.01. Male Connector

NOTE: 3
INTERFACE INFORMATION:

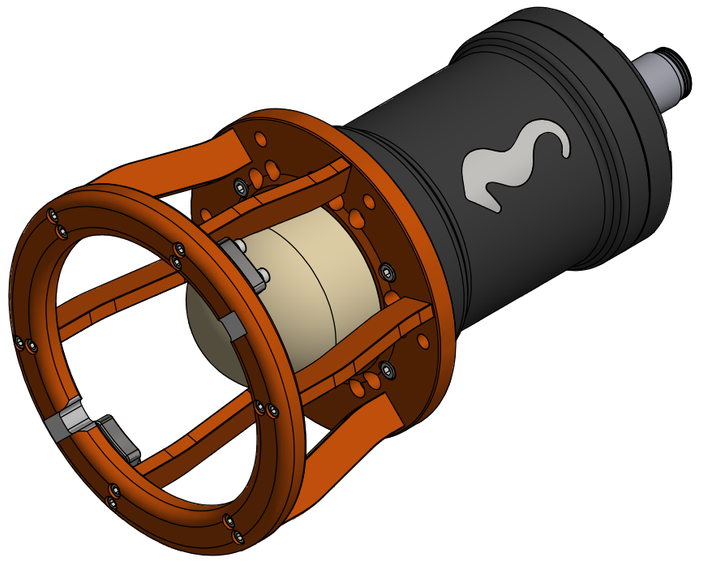
Pressure Rating Bar:	300 (3000m)
Material:	Hard Anodized Aluminium
Weight:	18,3 kg
Volume:	7 dm^3
Surface Area:	16778 cm^2
Hydraulic:	N/A
Mechanical:	Flange
Electrical:	370 VDC, Subcon BCR 2410M
Com. & Protocol:	Ethernet and RS232/RS485*

NOTE: 4
ADDITIONAL INFORMATION:
Inductive Subsea Connector for transfer of electrical power and communication type Blue Logic USB C.
The Blue Logic USB C series inductive connector is a multipurpose electrical connector with the capacity of transferring up to 2kW electrical power, 80Mbps Ethernet and 230kbps serial communication. The active part is spherical shaped giving unique properties with regards to guiding and self-alignment between male and female part and very rough angular tolerances. Easy to connect and disconnect by divers, ROV or AUV's. BA7713 is a male connector, configured to be the primary side (transmitting part) in a connector system.

Full galvanic isolation between primary and secondary side connector
Connect and disconnect "hot" with full power and voltage
Possible to transform voltage between primary and secondary side
Built in diagnostic and housekeeping functionality.

Operation and Maintenance Manual BL ROV Power Supply:
600128-TD-0013

* RS485 Optional



Rev.	Date	Reason for issue	Revision change	Made	Chk'd	Appr.
04	15.1.2019	9-IFU (Issued for Use)		WTJ	LGH	WTJ
03	27.6.2018	9-IFU (Issued for Use)		WTJ	LGH	WTJ
02	18.08.2016	9-IFU (Issued for Use)		WTJ	LGH	WTJ
01	2.12.2015	9-IFU (Issued for Use)		WTJ	LGH	N/A

BLUE LOGIC

Dwg Scale: NTS
Dwg Proj:
Dwg Format: A3

Drawing title: BL ROV Male 2kW Subsea USB
Drawing number: BA7713
Rev. 04

2kW Inductive Subsea Connector

Parameter	Min	Typ	Max	Unit	Comment
Depth rating				m	
Axial transmission distance	0	0.5	4	mm	
Rotation during operation		360		°	
Ambient temperature	-10		+45	°C	See max continuous on time with max load
Max continuous operation with 2kW load. In air		45		min	22°C Air.
Max continuous operation with 2kW load. In water		∞		min	22°C Water.
Overheat protection			55	°C	Internal casing temperature
Vin DC**	360		415	VDC	For PFC usage, 280VDC-350DC
Vout	310	325	340	VDC	
Max Pout		2		kW	
Max Iout		6.2		A	
Max load step		2		kW	From 0W load. Rise time = 20ms
Max load drop		2		kW	From 2kW load. Fall time = 20ms
Max resistive load at startup		300		W	Until output voltage has reached +310VDC
Power draw no load		15		W	370VDC input voltage
Efficiency 1kW		93		%	370VDC input voltage
Efficiency 2kW		91		%	370VDC input voltage
Startup time power		12		sec	
Startup time RS232		12		sec	
Startup time RS485		12		sec	
Startup time Ethernet		90		sec	
Data rate RS232	1.2		230	kbps	Full Duplex. No need for configuration of data rate
Data rate RS485	1.2		230	kbps	Half Duplex. No need for configuration of data rate
Data rate Ethernet	60	80	94	Mbps	

**All tests performed with PCF, if nothing else is stated.*
*** 280VDC-350DC can be used.*

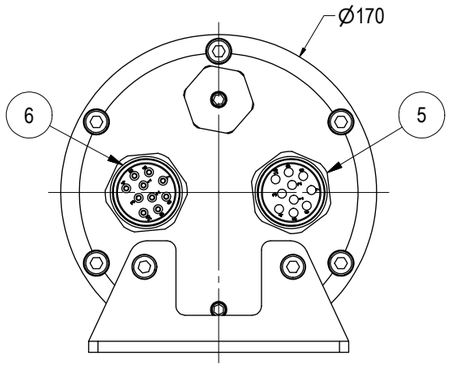
PFC and 2kW Inductive Subsea Connector

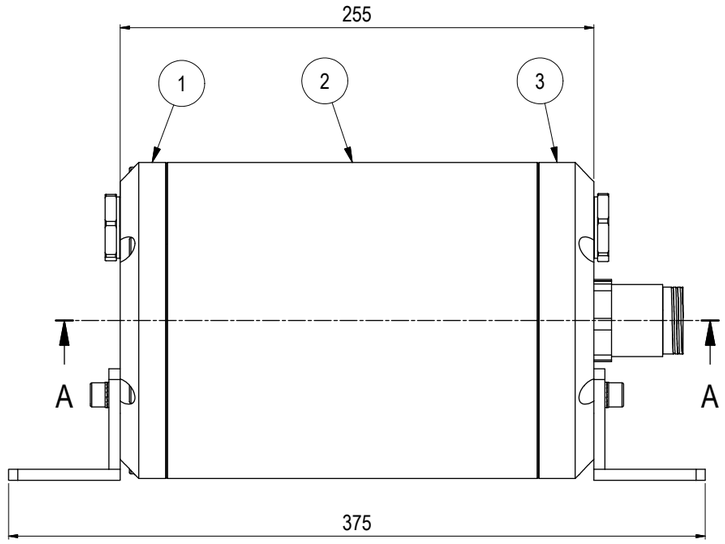
Parameter	Min	Typ	Max	Unit	Comment
Depth rating				m	
Axial transmission distance	0	0.5	4	mm	
Rotation during operation		360		°	
Ambient temperature	-10		+45	°C	See max continuous on time with max load
Max continuous operation with 2kW load. In air		30		min	22°C Air.
Max load with continuous operation. In air		∞		min	22°C Air.
Vin AC	100		250	VAC	
Vin DC	145		350	VDC	
Vout	310	325	340	VDC	
Max Pout		2		kW	
Max Iout		6.2		A	
Max load step		2		kW	From 0W load. Rise time = 20ms
Max load drop		2		kW	From 2kW load. Fall time = 20ms
Max resistive load at startup		200		W	
Power draw no load		23		W	230VAC input voltage
Efficiency 1kW		89		%	230VAC input voltage
Efficiency 2kW		86		%	230VAC input voltage
Startup time power		12		sec	
Startup time RS232		12		sec	
Startup time RS485		12		sec	
Startup time Ethernet		90		sec	
Data rate RS232	1.2		230	kbps	Full Duplex. No need for configuration of data rate
Data rate RS485	1.2		230	kbps	Half Duplex. No need for configuration of data rate
Data rate Ethernet	60	80	94	Mbps	

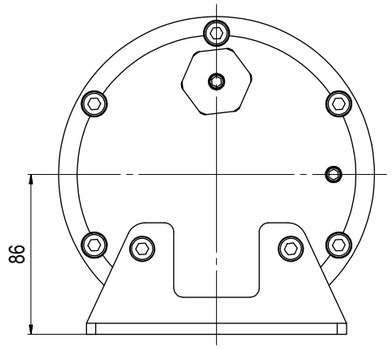
**All tests performed with PCF, if nothing else is stated.*

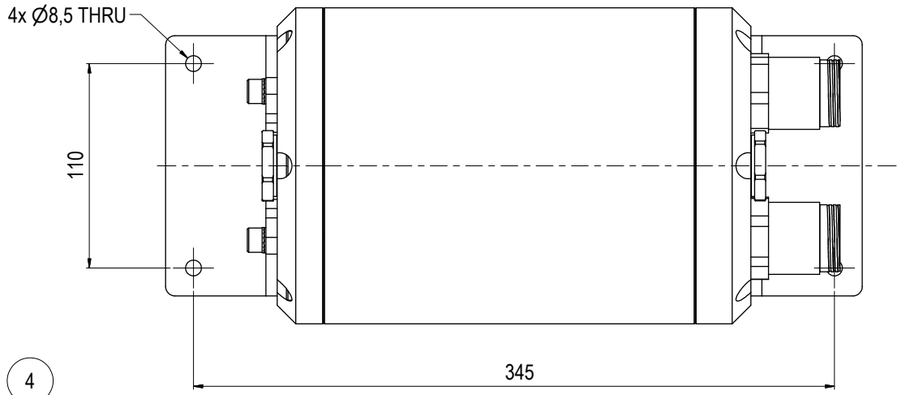
7.3. DRAWING BA7719 ROV PFC

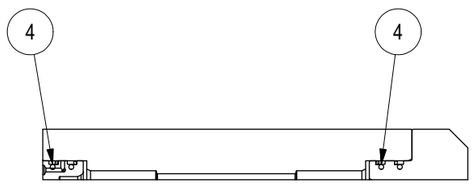
Parts List				
ITEM	QTY	PART No.	TITLE	MATERIAL
1	1	BA7106	Flange Housing PFC	AL 6082 T6
2	1	BA6785	Housing PFC	AL 6082 T6
3	1	BA6784	End Flange Housing PFC	AL 6082 T6
4	4	101770	O-Ring	NBR Shore 70
5	1	100782	Connector Subcon BCR 2410F	Stainless Steel
6	1	100780	Connector Subcon BCR 2410M	Stainless Steel



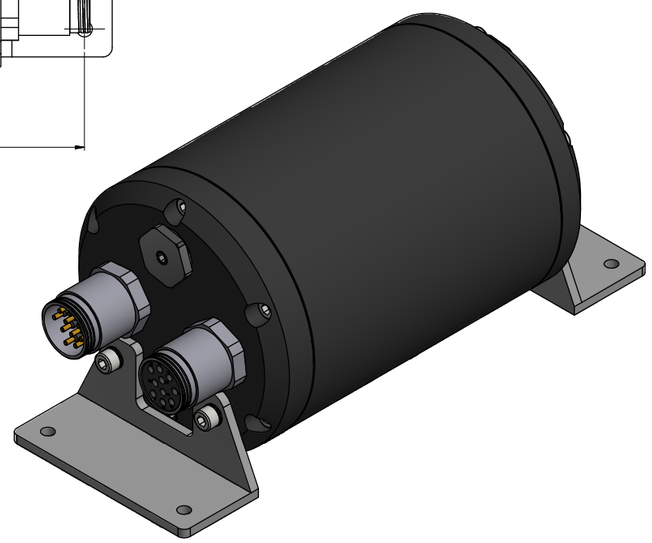








SECTION A-A



NOTE: 1
DESIGN CODE:
N/A

NOTE: 2
TECHNICAL CLASSIFICATION:

Article Type:	006-El. Connectors
Main Group:	6.01. Subsea USB
Intermediate Group:	6.28.03. 200-900W Subsea USB
Sub Group:	6.28.156.00. Generic

NOTE: 3
INTERFACE INFORMATION:

Pressure Rating Bar:	300 (3000m)
Material:	Hard Anodized Aluminium
Weight:	11,4 kg
Volume:	5,98 dm^3
Surface Area:	13400 cm^2
Hydraulic:	N/A
Mechanical:	Flange Mount.
Electrical:	In: 100-250 VAC/145-350 VDC Out: 370 VDC
Com. & Protocol:	Pin to Pin, Ethernet, RS232 feed through

NOTE: 4
ADDITIONAL INFORMATION:
The Blue Logic 2kW Power Supply is an atmospheric air filled canister which converts the ROV supplied voltage (100-250 VAC or 145-350 VDC) to 370 VDC voltage required for the primary Subsea-USB connector. The Power Supply will typically be installed onto the ROV frame at a suitable place, and is equipped with input and output connectors for power & communication. All power& communication signals will go through the 2 kW Power Supply canister before connected to the primary connector.
The unit is designed for intervention applications. Canister material is hard anodized aluminium.

Design test pressure - 365Bar.
Max operating pressure - 304Bar
Communication speed RS232 - Approx. 230 kbps
Communication speed Ethernet - Approx. 80 Mbps
Operating ambient temperature (0-30°C)
Storage temperature (-30-55°C for one month continuously)

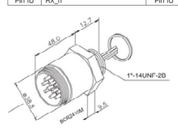
Operation and Maintenance Manual BL ROV Power Supply:
600128-TD-0013

NOTE 5
Connector Housing is atmospheric and not compensated

NOTE 6
Subonn Pin Configuration:

PFC input with RS232		PFC output with RS232	
Connector: Subconn BCR2410M		Connector: Subconn BCR2410F	
Pin #	Signal	Pin #	Signal
Pin 1	100-250VAC / 145-350VDC	Pin 1	370VDC
Pin 2	100-250VAC / 0 VDC	Pin 2	0 VDC
Pin 3	CHASSIS	Pin 3	CHASSIS
Pin 4	RS232RX (input)	Pin 4	RS232RX (input)
Pin 5	RS232TX (output)	Pin 5	RS232TX (output)
Pin 6	RS232GND	Pin 6	RS232GND
Pin 7	TX_p	Pin 7	TX_p
Pin 8	TX_n	Pin 8	TX_n
Pin 9	RX_p	Pin 9	RX_p
Pin 10	RX_n	Pin 10	RX_n

Secondary Side output with RS232		
Connector: Subconn BCR2410F		
Pin #	Signal	
Pin 1	225VDC	
Pin 2	0 VDC	
Pin 3	CHASSIS	
Pin 4	RS232RX	(input)
Pin 5	RS232TX	(output)
Pin 6	RS232GND	
Pin 7	TX_p	
Pin 8	TX_n	
Pin 9	RX_p	
Pin 10	RX_n	



Male Face View

Rev.	Date	Reason for issue	Revision change	Made	Chk'd	Appr.
07	10.4.2019	9-IFU (Issued for Use)		WTJ	TBA	WTJ
06	15.1.2019	9-IFU (Issued for Use)		WTJ	LGH	WTJ
05	27.6.2018	9-IFU (Issued for Use)		WTJ	LGH	WTJ
04	8.1.2018	9-IFU (Issued for Use)		WTJ	WPC	WTJ

BLUE LOGIC

Dwg Scale: NTS
Dwg Proj:
Dwg Format: A3

Drawing title: BL Power Supply 2kW

Drawing number: BA7719

Rev. 07

Doc name:			
Data sheet PFC and 2kW System			
Doc. num:	Last saved:	Project:	Comment:
130318AUA02	13.02.19	Subsea USB	

Rev.	Comment:	Issued by:	Reviewed by:	Approved by:
0.1	Initial version	GOG/13.02.2019	GOG	KEJ

PFC

Parameter	**Min**	**Typ**	**Max**	**Unit**	**Comment**
Depth rating				m	
Ambient temperature	-10		+45	°C	See max continuous on time with max load
Max continuous operation with 2.2kW load. In air		30		min	22°C Air and 110VAC
Max continuous operation with 2.2kW load. In water		∞		min	22°C Water and 110VAC
Overheat protection			60	°C	Internal casing temperature
Vin AC	100		250	VAC	
Vin DC	145		350	VDC	
Vout**	360	370	415	VDC	See comment for max load drop
Max Pout		2.2		kW	
Max Iout		6		A	
Max load step		2.2		kW	From 0W load. Rise time = 300ms**
Max load drop		2.2		kW	From 2.2kW load. Fall time = 10ms
Max resistive load at startup		200		W	Until output voltage has reached +360VDC
Power draw no load 230VAC input		5		W	
Efficiency 1.1kW 230VAC input		97		%	
Efficiency 2.2kW 230VAC input		96		%	
Power draw no load 110VAC input		4		W	
Efficiency 1.1kW 110VAC input		94		%	
Efficiency 2.2kW 110VAC input		95		%	

**All tests performed with PCF, if nothing else is stated.*
***Output voltage will drop below 360VDC for faster rise time than 300ms*