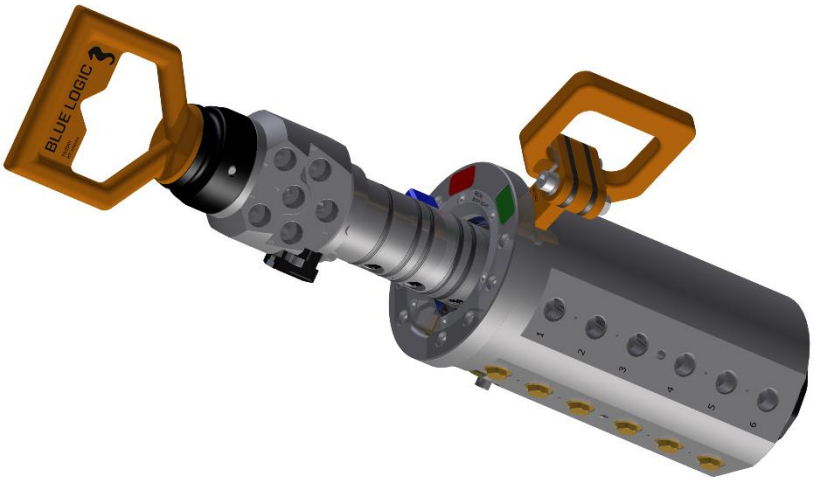
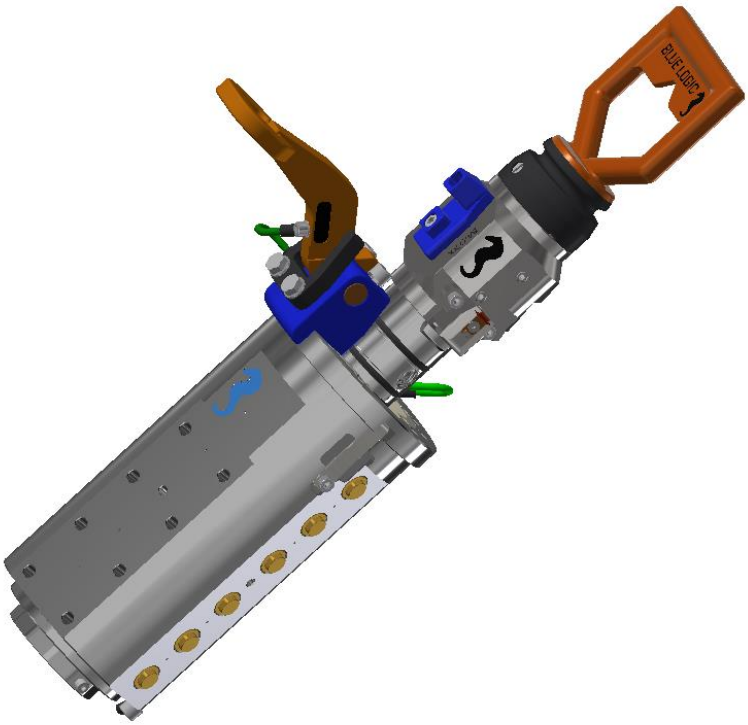
OPERATION AND MAINTENANCE MANUAL

BLUE LOGIC

DOCUMENT TITLE:	Operation and Maintenance Manual Ø55/Ø57 Valve Stab System
PROJECT:	600142-TD-0001
DOCUMENT NUMBER:	600142-TD-0001
REV:	11
NUMBER OF PAGES:	44
DATE:	07.03.2022
CLIENT:	Blue Logic AS
CONTACT PERSON:	Lars Gunnar Hodnefjell





Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

OBJECTIVE

The objective of this document is to present a comprehensive Operation and Maintenance manual for the Blue Logic designed Ø55/57mm Valve Stab™ System with double seals. All relevant aspects with regards to safe and correct use, installation, operation, maintenance and storage are covered.

ABSTRACT

The Blue Logic Valve Stab™ System combines the functionality and quality of a ball valve and a pressure balanced Hot Stab thus forming a reliable field proven leakage free high flow ROV Stab Connector System. The Blue Logic Valve Stab™ System Program comprises a variety of sizes configurations and versions. This document focuses on the hexa-port version with double seals. The Valve Stab system includes the following general main components:

- Male Valve Stab™
- Female Valve Stab™ Receptacle
- Protection Stab
- Parking receptacle

In general, the Valve Stab™ System is connected and operated as a standard API/ ISO pressure balanced Hot Stab system. The stab is simply pushed into the receptacle to connect and pulled out to disconnect. The main difference between the Valve Stab™ and the standard Hot Stab with regards to operation is that the Valve Stab™ must be inserted into receptacle with correct alignment. After insertion, the valve function is easy operated by use of the manipulator thus locking the stab into the receptacle for increased safety and control during operation.
All operation is performed directly by use of a Standard ROV manipulator.

Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

REVISION CHANGE/RECORD

REV	REASON FOR REVISION/ DESCRIPTION OF CHANGES
01	Issued for review
02	Added client comments and special cartridge
03	Added content regarding gear operated valve stab receptacle
04	Added flushing kit info
05	Additional flushing info
06	Misc. language fixes
07	Added receptacle lever info
08	Added info regarding pairing receptacle and stab with different number of ports not possible. Moved flushing-procedure to Maintenance section. Added instruction for inspect/lubricate rotation lock.
09	Maintenance section revised
10	Minor updates, typo, missing abbreviations etc.
11	Update wrt. client input

Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

TABLE OF CONTENT

Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

1. INTRODUCTION

The Blue Logic Valve Stab™ is a patented hydraulic connector system combining technology from standard Hot Stab connectors and Ball Valves into a very compact and lightweight subsea connector system. The unique features obtained allows for 100% leakage free subsea connection with full system pressure. Since the system includes built-in valve functionality both in the stab and receptacle side, subsea valve and connector panels can be designed extremely compact compared to alternative solutions.

The Valve Stab™ technology is relevant for use in almost all subsea connector applications and can be easily operated by use of either Diver or ROV. The System is fully pressure balanced and does not introduce any axial forces into the connector or panel system. When the system is connected and the ports are opened, the Stab Connector is locked into the receptacle system automatically.

Despite all included functions, the Valve Stab™ System is a very simple and robust construction with very few mowing parts. All seals can easily be replaced offshore.

1.1. DOCUMENT USE

This document shall be used as general information for all aspects related to safe use, installation, removal, maintenance and storage of the Valve Stab™ System. Included in this Operation and Maintenance Manual are sequential step-by-step procedures for typical offshore operations which can be used for establishing detailed specialized offshore/subsea procedures. These lists can also be used for documentation of performed work and sequences if required.

The Valve Stab™ System includes different sizes, variants and configurations, this document covers Operation and Maintenance of the Ø55/57mm Blue Logic Valve Stab™ w. double seals. Additional manuals are however also available for special variants or client/ project specific designs.

1.2. ABBREVIATIONS

ROV:	Remotely Operated Vehicle
HPU:	Hydraulic Power Unit
FAT:	Factory Acceptance Test
MOB:	Mobilisation
DEMOB:	Demobilisation
CP:	Cathodic Protection

Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

2. TECHNICAL DESCRIPTION

2.1. GENERAL

The Valve Stab™ program includes versions ranging from 1-6 hydraulic ports. The system is also available in other sizes and with other port configurations. Dedicated technical documentation is available for different sizes and configurations although all Valve Stab™ Systems are based on the same core technology and will be operated using the same principles.

It is the responsibility of the end user to make sure that the product is used in such a manner for which it is designed. This includes accounting for material/fluid compatibility, sour service, temperature, pressure rating etc. Refer to specific product drawing which includes all relevant information. If product drawing is lacking information/unclear contact Blue Logic.

Caution!
Please note that a stab can only be mated with a receptacle with corresponding number of ports, i.e. a dual port stab can only be mated with a dual port receptacle. Distance between ports are different for the 1-6 port types. Mating of stab and receptacle with different number of ports may cause injuries, damages to equipment and spill of fluid.

2.1.1. Stab

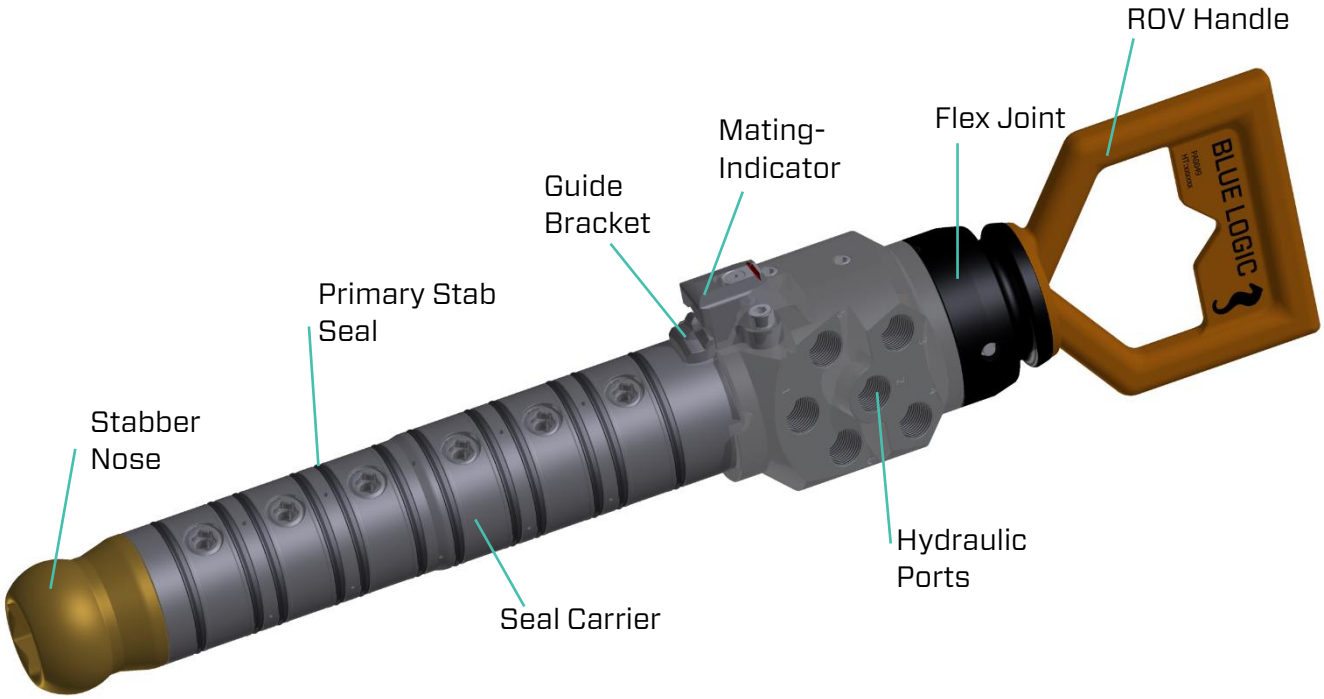
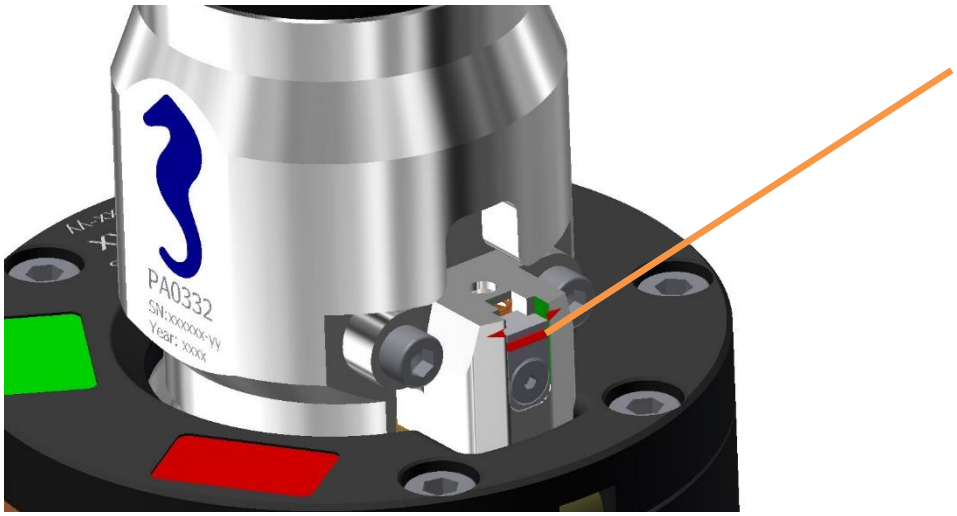


Figure 1 Valve Stab™ Main Parts

Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

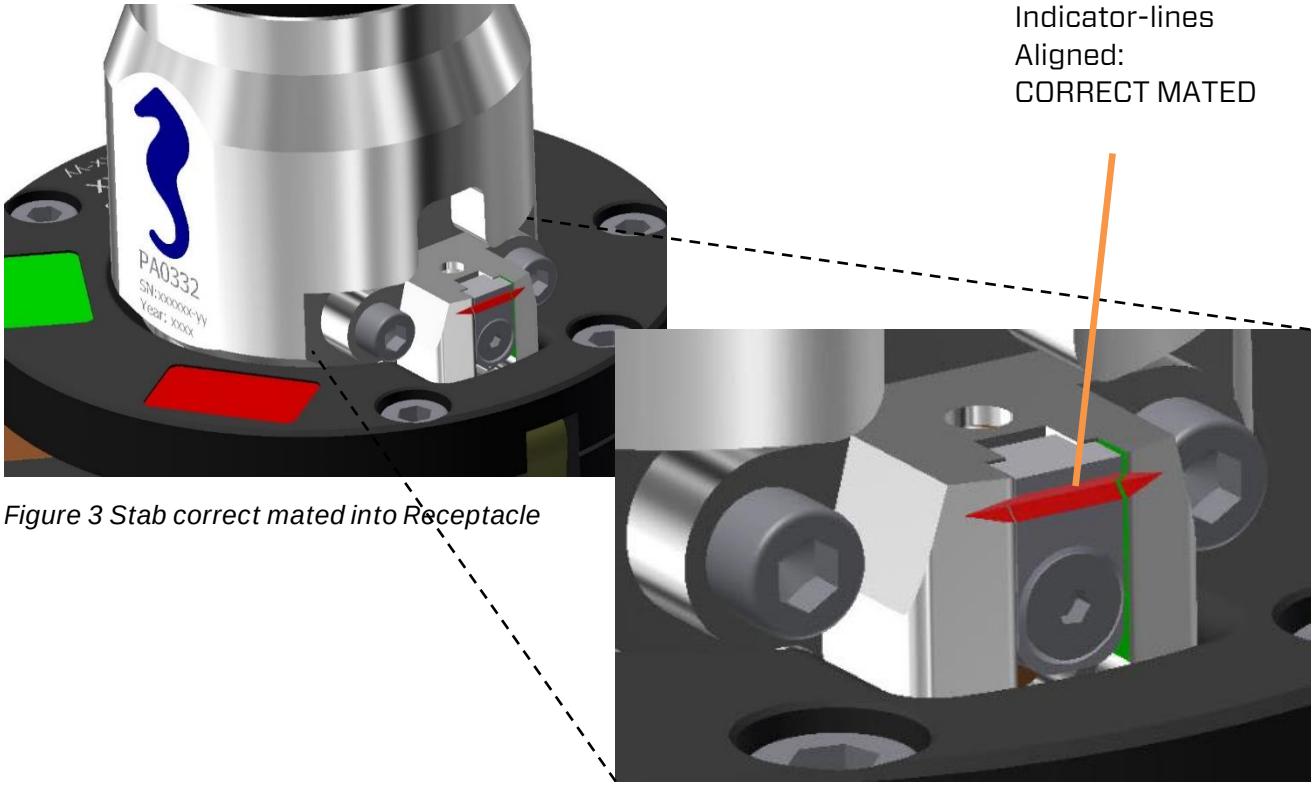
2.1.1.1. Aligning Red Lines

The purpose of the Valve Stab™ Mating-Indicator is to visually confirm correct mating of the Valve Stab™ into the Receptacle prior to operation of the Valve Stab™ Valve function
The Mating-Indicator consists of a set of Red Lines, as illustrated on the figures below.
The Stab is correctly mated with the receptacle and ready for operation
when the Red Lines in the Mating-indicator aligns.



Indicator-lines
Not Aligned:
NOT MATED

Figure 2 Stab prior to docking into Receptacle



Indicator-lines
Aligned:
CORRECT MATED

Figure 3 Stab correct mated into Receptacle

Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

2.1.1.2. Stabber Nose

The Stabber Nose secures correct and gentle guiding of the Stab into the Receptacle. It is constructed by use of an Aluminum Bronze alloy to protect the receptacle internals. The Stabber nose is connected to the Stabber by use of threads and can be unscrewed by use of a hex key. Stab nose Hex key size is 30mm. The Stabber Nose secures and locks the Seal Carrier onto the Stab.

2.1.1.3. Primary Stab Seal

The Primary Stab Seals separates the different hydraulic ports and seals toward the receptacle. Different alternative seal profiles and materials are available depending on application and fluid. Seal material is XSPU on this delivery, which is compatible with most relevant fluids and have mechanical ensuring long service life without need for replacement. The Primary Stab Seals can however easily be replaced offshore without need for any disassembly of the stab. Please see following sections for details with regards to seal replacement.

2.1.1.4. Seal Carrier

All stabber seals are placed in the Valve Stab™, both the internal Core Seals and the outer Primary Seals.

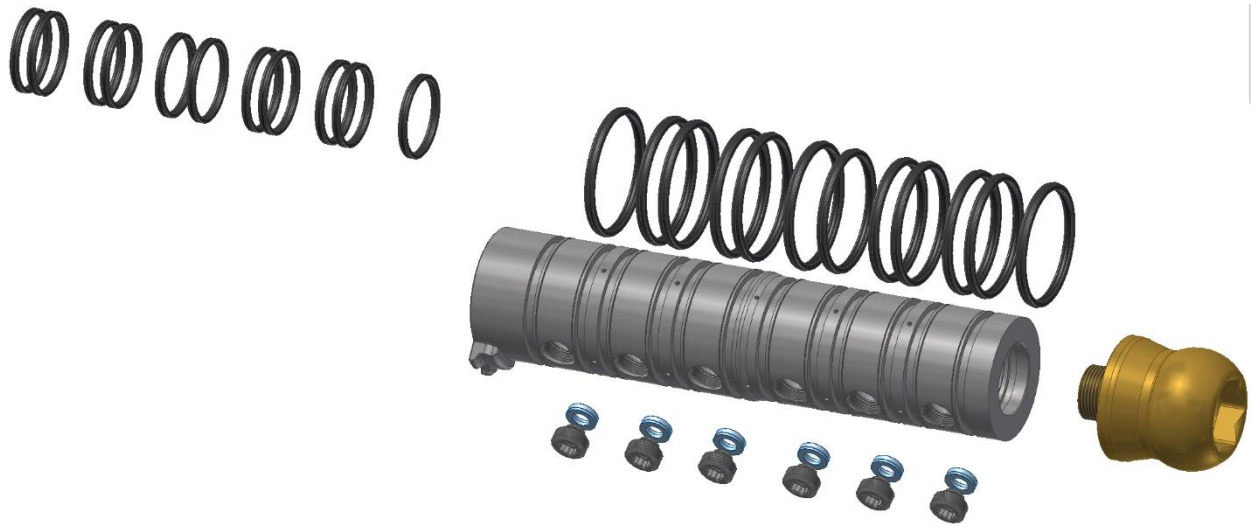


Figure 4 Valve Stab™ Seal Carrier with internal and external seals

Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

2.1.1.5. Seal Cartridges

The Seal Cartridges includes the Spherical Core Seal which seals toward the Valve Stab™ Core placed inside the Seal Carrier.

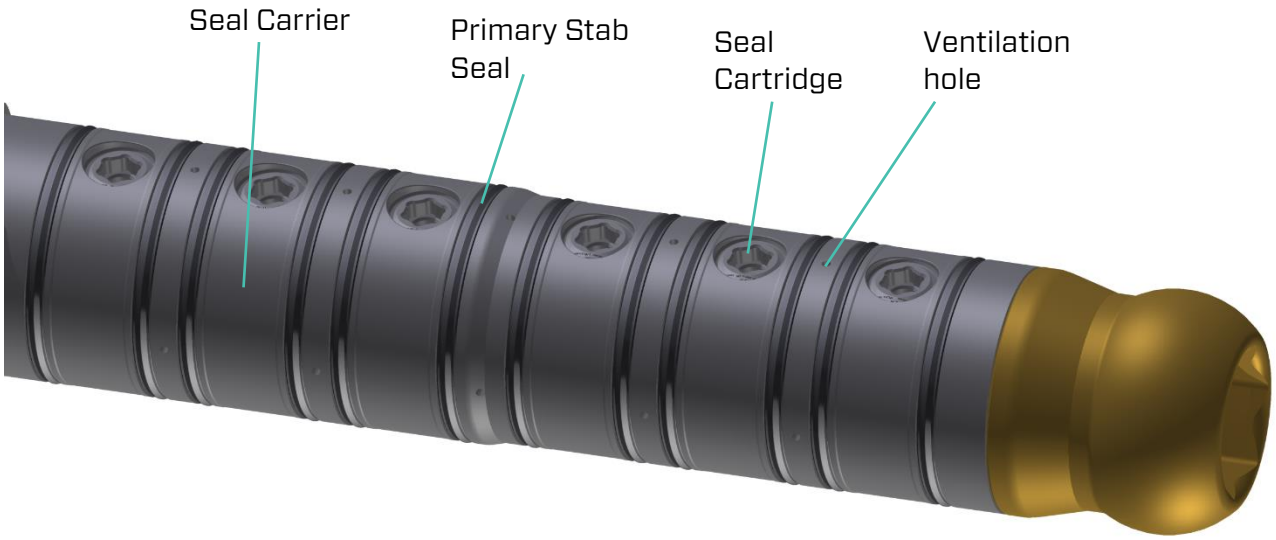


Figure 5 Seal Carrier and Seal Cartridges typical Valve Stab design

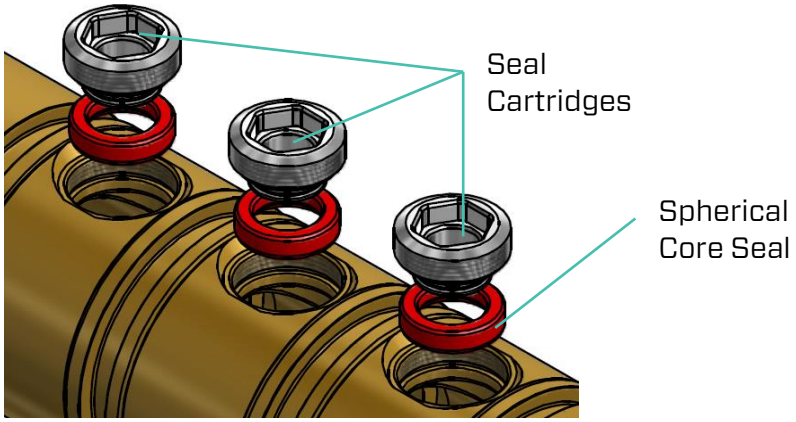


Figure 6 Seal Cartridges removed

Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

2.1.1.6. Double Seal version

As shown in figure 5 above this version of the Valve Stab system have 2 seals between each port. This is to prevent the possibility of pressure bleeding between ports. The double seal version has 2 seals and a ventilated cavity between each port, thus making it completely impossible to achieve any bleeding between them. The cavity in between the ports have each 4 ventilation holes 90° offset from each other so that fluid trapped inside will escape when stab is brought topside.

2.1.1.7. Flex Joint

The Flex Joint connects the Valve Stab™ body to the ROV Handle. It consists of an outer flexible element and an inner mechanical connection. The Flex Joint allows for a smooth angle deviation of approx. 20 degrees in all directions between the ROV handle and Valve Stab™. The flex element can easily be replaced, see maintenance section for details with regards to replacement of flex element.

2.1.1.8. Guide Bracket

The Guide Bracket ensures that the Valve Stab™ is aligned correctly prior to connection into the Receptacle. The Guide Bracket fits into the machined Orientation Groove in the receptacle and once correct inserted triggers the receptacle position lock system.

2.1.2. Receptacle

The Valve Stab™ receptacle consists of the following main parts;

1. Outer Housing
2. Inner Center Core
3. ROV/Diver Handle
4. Seal Cartridges
5. Internal seals
6. Bracket/ securing interface
7. Orientation Groove
8. Hydraulic Ports
9. Receptacle Top Plate

Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

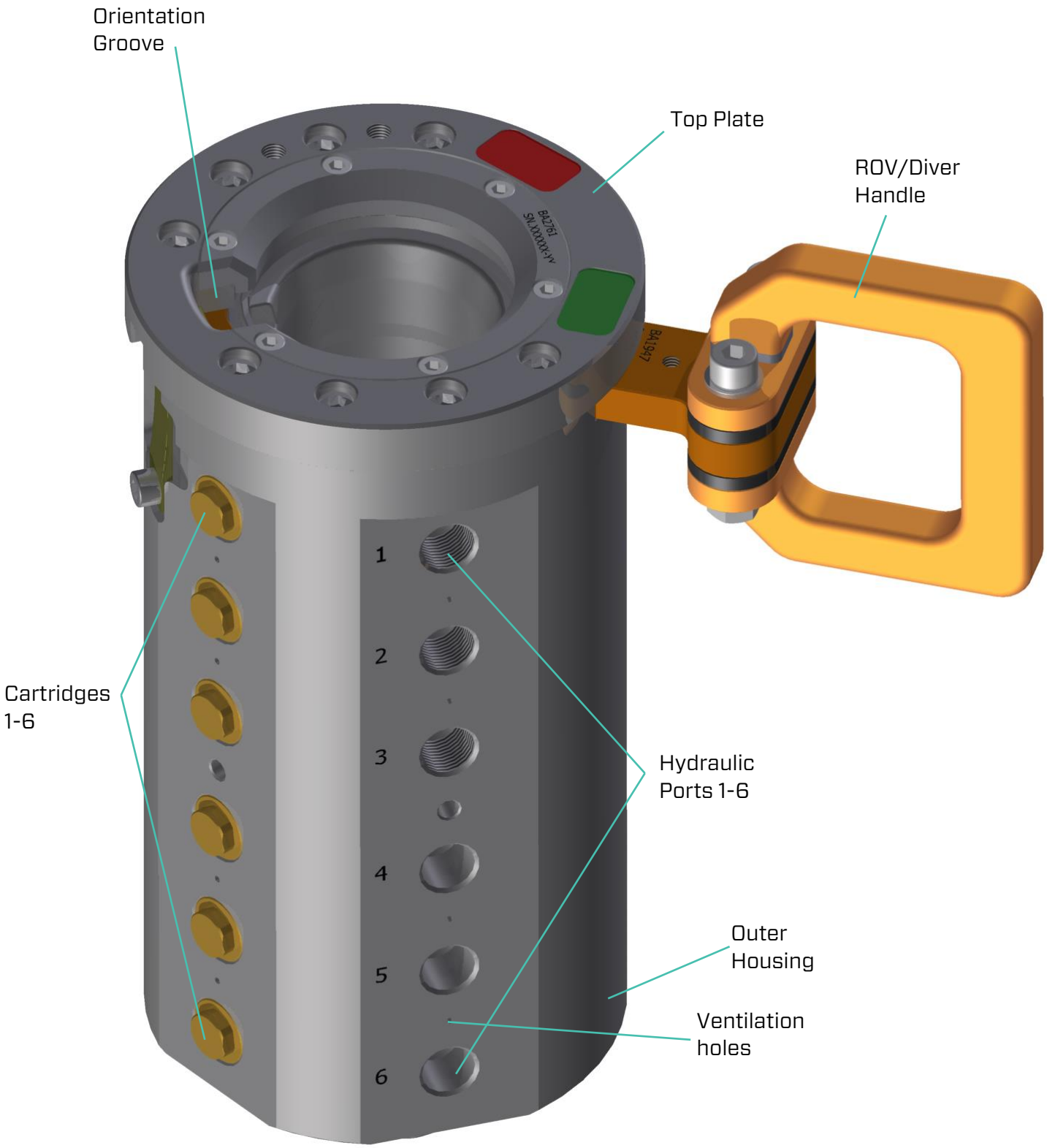


Figure 7 Valve Stab Receptacle

Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

2.1.2.1. Outer Housing

The Outer Housing includes the hydraulic ports, interface for installation (securing interface) and interface for seal cartridges as further described in following sections. All Valve Stab™ receptacle seals are placed inside the Outer Housing.

2.1.2.2.Center Core

The Inner Center Core rotates inside the Outer Housing thus opening and closing the hydraulic ports. It is constructed by corrosion resistant hardened high strength alloy to reduce wear and improve lifetime.

2.1.2.3.Seal Cartridges

Similar as for the male Valve Stab™, the Seal Cartridges contains the Spherical Cores Seals which seals towards the Inner Centre Core.

2.1.2.4.Double seal version

As for the stab the receptacle also has double seals between the different ports.
The double seal version has 2 seals and a ventilated cavity between each port, thus making it completely impossible to achieve any bleeding between them. The cavity in between the ports have each several ventilation holes offset from each other so that fluid trapped inside will escape when receptacle is brought topside.

2.1.2.5.ROV/Diver Handle

The ROV handle operates the Valve Stab™ Open/Close function. It is to be rotated 65 degrees in order to operate the Valve Stab™.

Operate ROV Handle Clockwise (green area)

- The Valve Stab™ valve functions are CLOSED and the stab can be inserted or retracted from the receptacle

Operate ROV Handle Counter Clockwise (red area, “Hot”)

- The Valve Stab™ valve functions are OPEN and the stab is LOCKED in position into the receptacle.

NOTE: The Valve Stab™ must be correct and fully inserted into the Valve Stab™ Receptacle in order to OPEN the Valve Stab™ valve functions.

2.1.2.6.Internal seals

Valve Stab™ receptacle internal seals are not shown on above figure. The seals are placed on the inner side of the outer housing.

Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

2.1.2.7. Bracket/ securing interface

The Bracket Securing interface is used to securing the Receptacle onto the ROV or subsea equipment. See product assembly drawings for interface details.

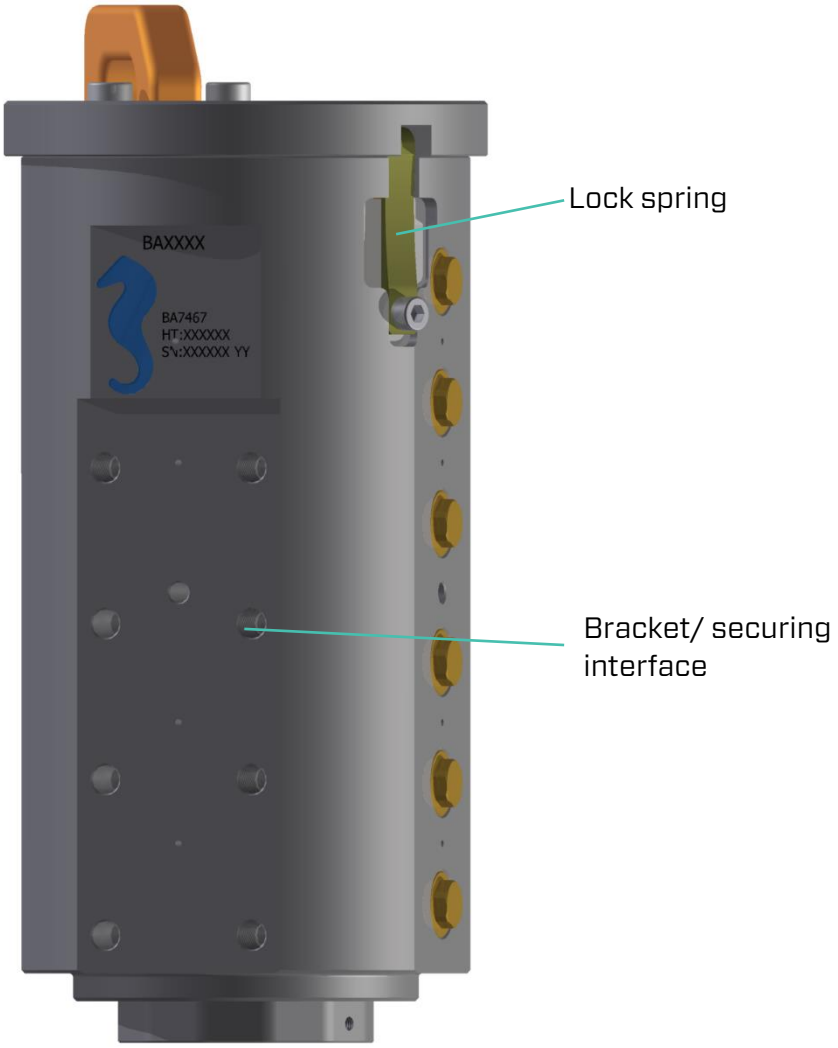


Figure 8 Bracket Securing Interface

2.1.2.8. Orientation Groove

The Orientation Groove in the Receptacle ensures correct orientation of the Valve Stab™ when inserting into the receptacle. When the Valve Stab™ is fully inserted into the Receptacle, the Valve Stab™ Guide Bracket activates a Lock Spring in the Orientation Groove thus allowing for operation of the Valve Stab™ and Receptacle Valve Mechanism.

Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

2.1.2.9.Hydraulic Ports Receptacle

The hydraulic interface on this receptacle is 3/8" BSP. Other interfaces are also available.

2.1.2.10. Receptacle Top Plate

The Receptacle Top Plate is bolted onto the Receptacle outer housing. It includes the Orientation Groove and color marking for Valve Stab™ Valve position.

2.1.2.11. Special cartridge

A special cartridge with no seal against the ball valve is available. If one port needs to always be open to sea, this can replace one of the original cartridges. One example is when landing High Pressure Cap to avoid pressure lock.

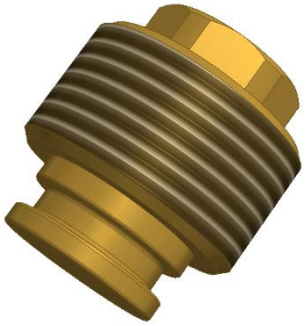


Figure 9 Special cartridge

Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

2.1.2.12. Valve Stab mate/unmate Handle

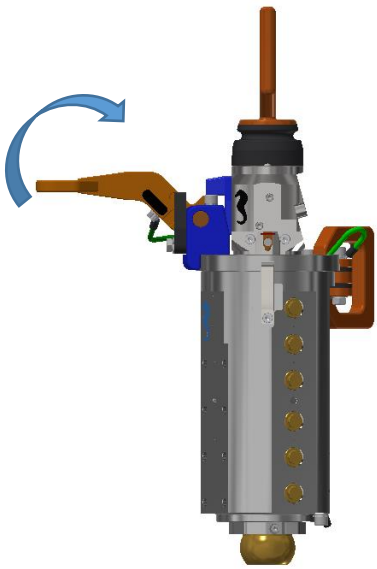
Optional Valve Stab mate/unmate handle can be fitted to the Valve Stab Receptacle, to assist ROV/personal to fully mate/unmate the Valve Stab with Receptacle.

Force required to fully insert the stab is approximately 100kg, the handle acts like a lever and can be operated by personnel without mechanical assistance (approx. 30kg).

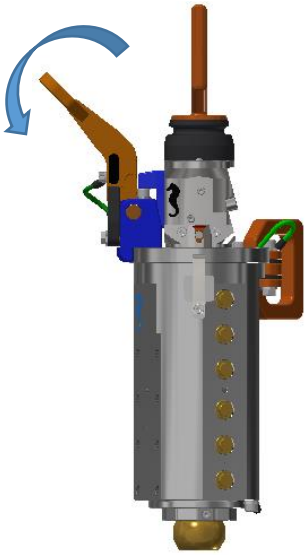
When using ROV to operate the handle be careful not to use excessive force or motion. Check alignment between the key on receptacle and valve stab prior to operation.

Note: when unmating, make sure the valve stab system is closed before removing the valve stab

Mate:



Unmate:



Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

2.1.3. Optional Gear Operated Receptacle

An alternative receptacle that utilize a gear to operate the valve function is available. The receptacle is designed to be operated with max 200Nm torque.

The gear is operated by using a D-Handle with square interface (BB2873) see Figure 3.

For operation, see chapter 6.

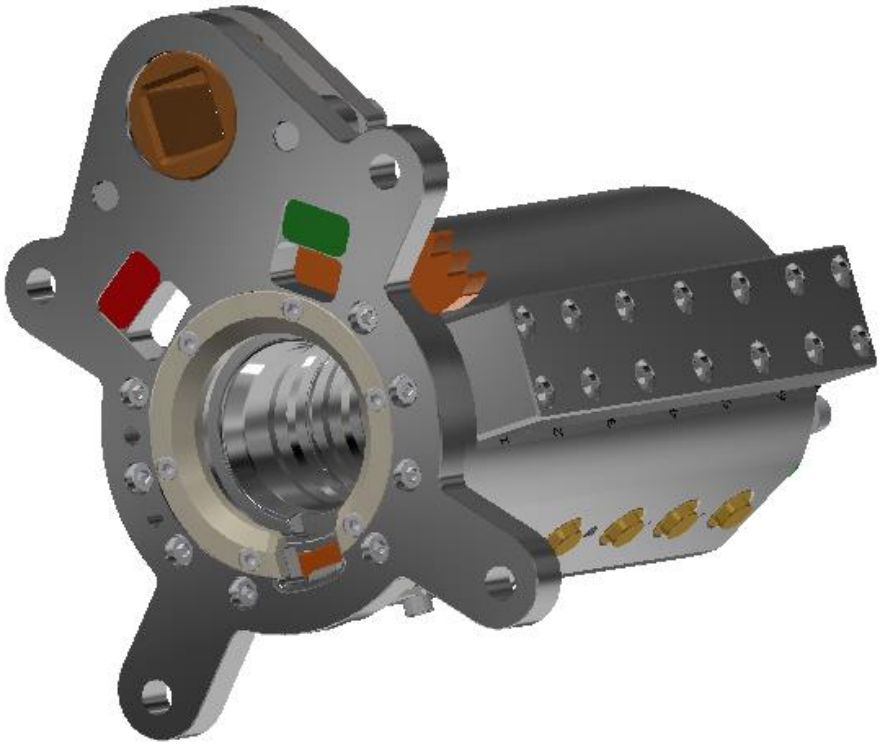


Figure 2: Gear operated receptacle

Figure 3: D-handle with square interface

Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

2.1.4. Protection Stab

The protection stab is meant to be inserted into the Receptacle whenever the Valve Stab isn't. It protects the seal areas against growth and scratches. Protection stab is ventilated and therefore will not hold any pressure. It is made from material PEHD and Super Duplex, this makes it very durable. There is no lock function on this stab, it's held in place by friction alone. When used it is simply stabbed into the receptacle or extracted. The valve function in receptacle cannot be operated even if the Protection Stab is inserted.

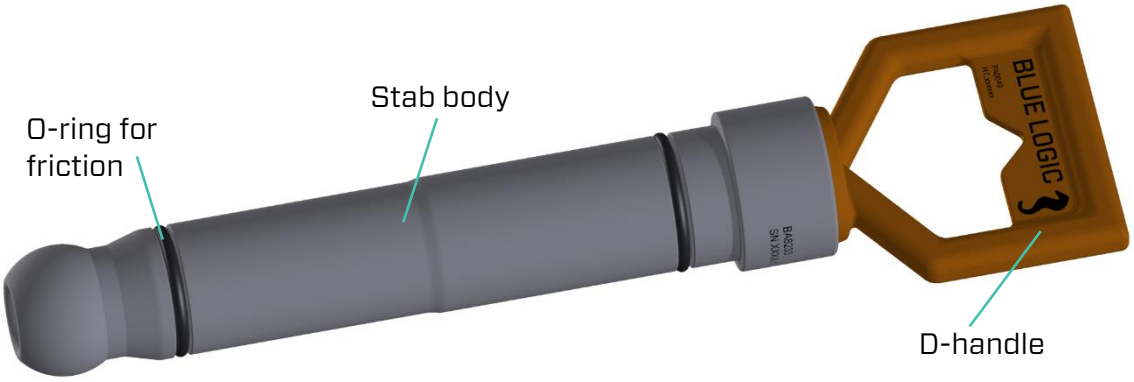


Figure 10 Protection Stab

2.1.5. Parking Receptacle

Parking receptacle is normally mounted close to Valve Stab Receptacle, it is used to park Valve Stab whenever it is not stabbed into Valve Stab Receptacle. When Stab is placed in Parking receptacle it is protected against growth and other physical stresses that may damage stab or seals. The lock function is not activated on Valve Stab, simply insert and/or extract. For information regarding bolting interface; see product drawing.

Figure 11 Parking Receptacle

Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

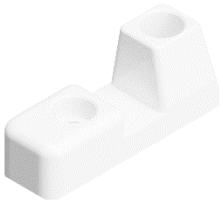
2.1.6. Valve Stab Locking Keys

To prevent misconnections and assure proper connection a color-coded keys are available. Equal colored key and lock will lock together insuring proper connection. It is physically impossible to mate keys and locks of different color.

Blue key

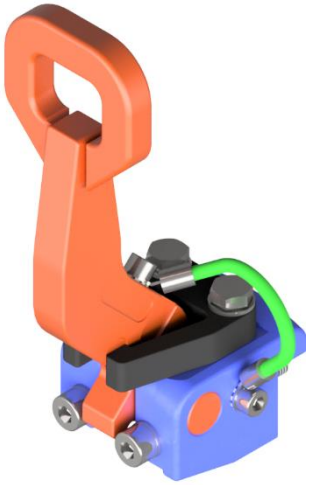
Metallic key

White key



Universal key

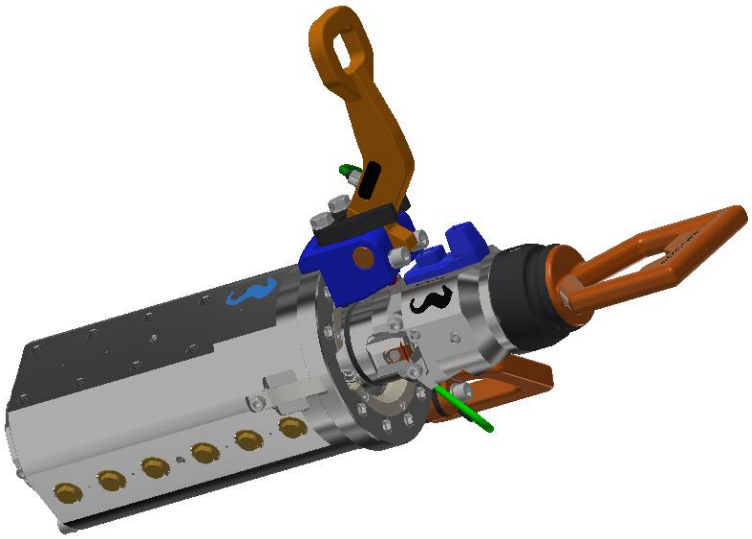
Blue Lock



Metallic Lock

White Lock

All Locks can lock onto the universal key



Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

2.2. OPTIONAL CONNECTION FLUSHING SYSTEM

One of the unique features with the Valve Stab™ System is the ability to perform a 100% clean subsea multiport connection. The Ø55mm Valve Stab™ design results in only 7ml entrapped volume for each port during connection. This cavity volume can be flushed prior to opening the Valve Stab™ ports. There are different ways of performing this flushing process depending on the Stab/Receptacle configuration. Blue Logic has developed optional special equipment to effectively perform this flushing process.

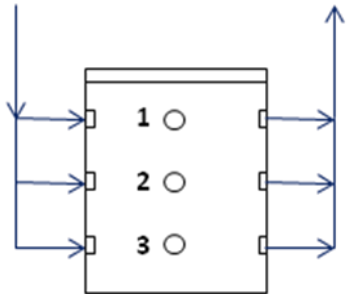


Figure 14 Alternative 1 Flushing principle

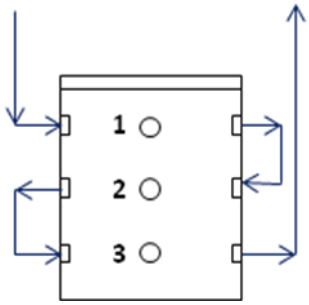


Figure 15 Alternative 2 Flushing principle

In general, the flushing shall be performed by flushing through the receptacle flushing ports prior to operation of the Valve Stab™ function.

2.2.1.1. Flushing using Hydraulic Supply Directly from ROV

This alternative is most relevant when the Receptacle is installed on the ROV. By use of the ROV hydraulic system, a dirty work package or the Blue Logic special designed Flushing Unit, clean fluid is flushed through the receptacle and stab cavities after the stab is inserted into the receptacle, but before the Valve mechanism is opened. In general, flushing according to Alternative 1 should be performed by use of the Blue Logic special designed Flushing Unit to ensure that all stab ports are flushed equally. If a standard Dirty Valve pack or the ROV hydraulic system is used directly for flushing, Alternative 2 as shown on above figure 6 is recommended.

2.2.1.2.Flushing using Blue Logic Valve Stab™ Flushing Unit

The special designed Blue Logic Flushing Unit is designed for easy and effective flushing of the Valve Stab™ cavities prior to opening the Valve Stab™ Valve Function. The unit consist of 3 relatively small pistons which are connected to the Valve Stab™ flushing ports through a manifold system including check valves. By operating the unit, fluid is flushed through each cavity volume respectively. The Flushing Unit can be connected to a remote reservoir or a small local reservoir on the Flushing Unit.

The Flushing unit can be operated hydraulic or mechanically by Diver or the ROV manipulator.

Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

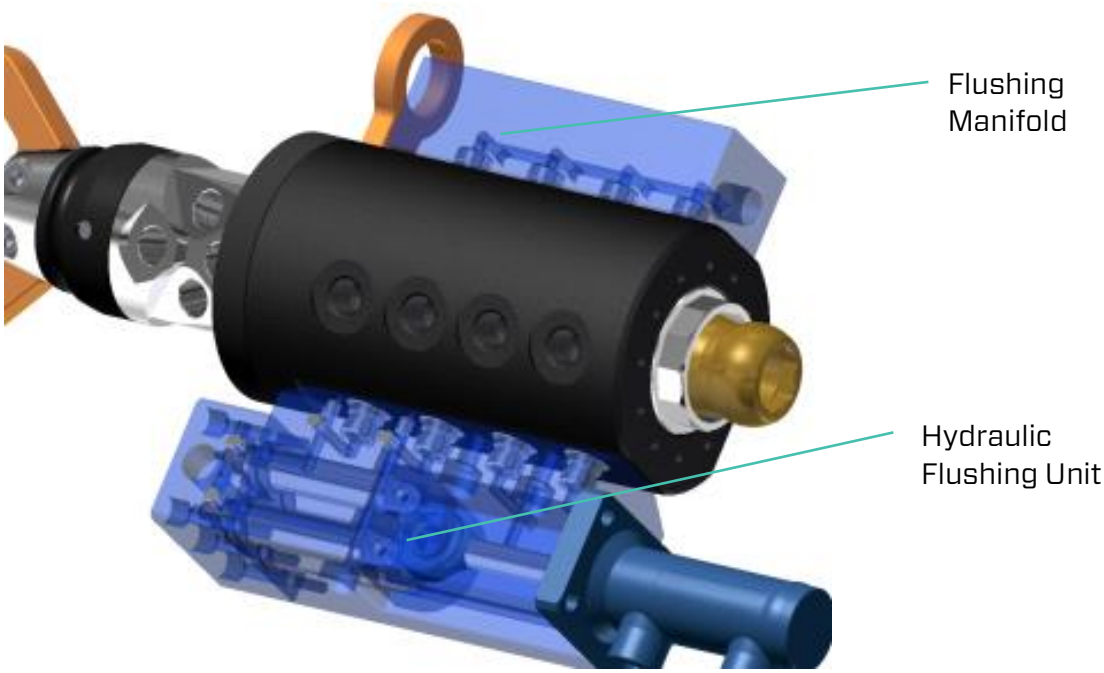


Figure 16 Hydraulic operated Valve Stab™ Cavity Flushing Unit, principle drawing

2.2.1.3.Flushing of cavity using Valve Stab™ flushing lines

In configurations where the receptacle is placed on the module, structure or tool, flushing of Valve Stab™ cavities will require supply of flushing fluid. Blue Logic has designed a system for flushing of Valve Stab™ cavities on such "remote" receptacles through dedicated hydraulic ports in the stab system. Please contact Blue Logic for further details.

Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

2.3. OPTIONAL WEAK LINK

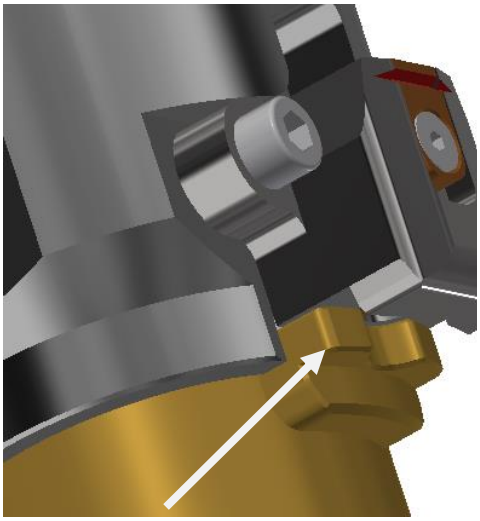
A weak link ring can be bolted to the receptacle top plate. The weak link ring is made in a polymer material designed to fail at pulling forces of approximately 300kg.

Once the Valve Stab has been mated with the receptacle, the system can be set in the opened position. By setting the system in the opened position, he Valve Stab guide bracket will rotate under the weak link ring.

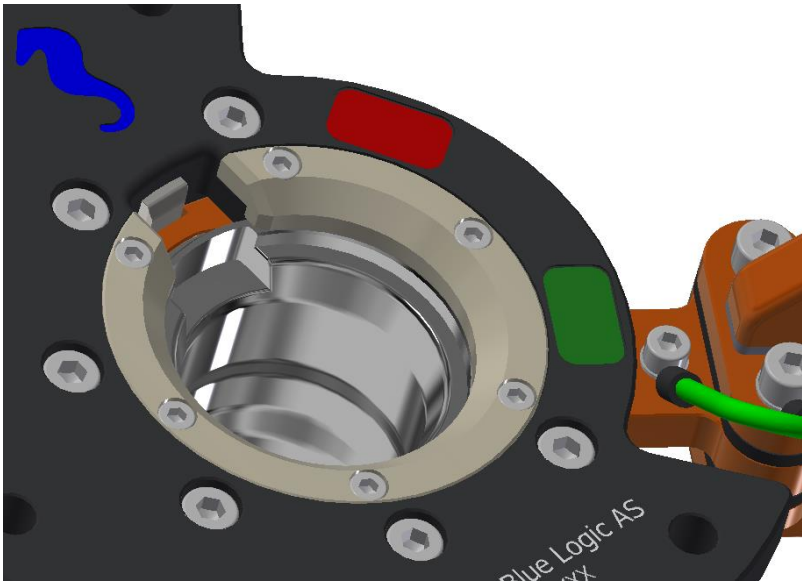
Should the Valve Stab experience excessive pulling forces, the guide bracket will pull the weak link off the receptacle.

If the Valve Stab and weak link are pulled off, the receptacle/stab will leak fluids to the surroundings.

The receptacle must be recovered to the surface and the weak link must be replaced to be able to operate the receptacle again.



Guide Bracket



Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

2.4. VALVE STAB VENT HOLE FLUSHING UNITS

For long-term storage, it is recommended to thoroughly flush the inside of a valve stab and receptacle using the Vent Hole Flushing Units.

See chapter 8 for detailed procedure.

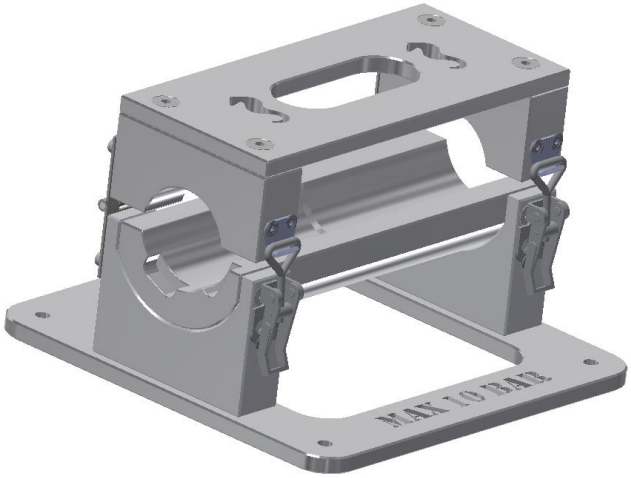


Figure 4: Vent Hole Flushing Unit for Valve Stab

Figure 5: Vent Hole Flushing Unit for Receptacle

Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

3. INSTALLATION

Caution!
ValveStabs and Receptacles cannot be interchanged, i.e. stab and receptacle must have same number of ports. Risk of injuries and or damage to equipment if mating stab and receptacle with different number of ports.

3.1. RECEPTACLE

In general, Blue Logic recommend installing a Valve Stab™ Receptacle both on the supplier (typical the ROV/ROT) and on the consumer (tool, structure etc). This allows for using separate hydraulic jumpers which can easily be replaced subsea in case of damages without the need for recovery of ROV or tools. This ability is achieved due to the excellent flow performance in the system.

3.1.1. Mechanical installation

The Receptacle shall be bolted onto the ROV/structure/tool directly by use of the integrated installation interface as described in above Section 2.1.2.7. Blue Logic recommends installing the receptacle vertically. This will ease guidance of the stab. Any debris or dirt will then fall through the receptacle.

Note:
If dedicated CP (cathodic protection) system is present, ensure that the receptacle is correctly earthed and connected to this. Use separate cable if required.

3.1.2. Hydraulic installation

The hydraulic functions shall be connected to the Receptacle hydraulic ports by use of hoses or piping. Suitable protection plate or similar system for hoses is recommended

3.2. STAB

3.2.1. Hydraulic connection

Default hydraulic connection to the receptacle represented by standard hydraulic BSP fittings. Recommended seal system is Dowty rings. Other hydraulic interfaces available upon request. For information regarding actual interface for your specific equipment, reference is made to supplied drawings.

It is recommended to use hose protection system/wrapping on the hose bundle or umbilical solution. Hose strain relief wire can be connected to the dedicated M6 threads by use of a standard eye bolt.

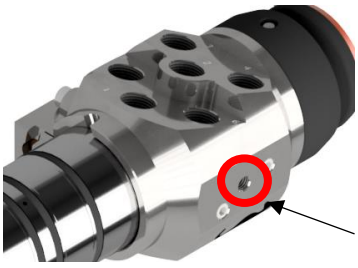


Figure 6, M6 threaded hole for strain relief wire.

Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

4. PREPARATION FOR USE

4.1. ONSHORE PREPARATIONS

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:

4.1.1. Mobilisation Check List

No.	Description	Chk/Verified
01	Inspect Stab and receptacle visual	
02	Inspect coated surfaces for damages, touch up as required.	
03	Inspect Stab Hydraulic Port Seal areas for damage	
04	Inspect Receptacle Hydraulic port seal areas for damage	
05	Inspect Receptacle seal areas undamaged without scratches	
06	Inspect Stab Guide Bracket undamaged	
07	Inspect Receptacle Orientation groove and verify functionality of the guide/orientation system.	
08	Verify that the stab and receptacle Valve function cannot be operated prior to mating. Mate Stab and receptacle.	
09	Verify lock indicator in Stab is aligned	
10	Verify that the Valve Stab™ valve function can be operated when connected.	
11	Insert and operate both Stab and receptacle system. Verify smooth and correct movement of Valve function.	
12	Verify Correct packing and documentation in the transport box. The transport box should include as a minimum Valve Stab™ system Operation and Maintenance Manual	

Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

5. OPERATION

5.1. PRE DIVE CHECK

Prior to dive, the Valve Stab™ System should be inspected and function tested.

5.1.1. Stab Pre Dive Check List

No.	Description	Chk/Verified
01	Perform a visual inspection - Seals - Seal Areas - Fittings - Hoses - ROV Handle - Flex Joint - Guide Bracket - Hose Tension Relief - Hose conditions, pressure rating, lengths and hose protection	
02	Check correct function for rotation-lock. Verify that the lock-pin moves smoothly, and spring-return is intact. Rinse and lubricate if required.	
03	Verify that the Valve Stab™ is closed and cannot be opened prior to insertion into receptacle	
04	Insert the Valve Stab™ into a Valve Stab™ receptacle, ensure smooth movement and observe friction force.	
05	Open the Valve Stab™ System through the ROV/Diver handle.	
06	Close Valve Stab™ and disconnect from receptacle.	
07	Inspect Seals and seal areas.	

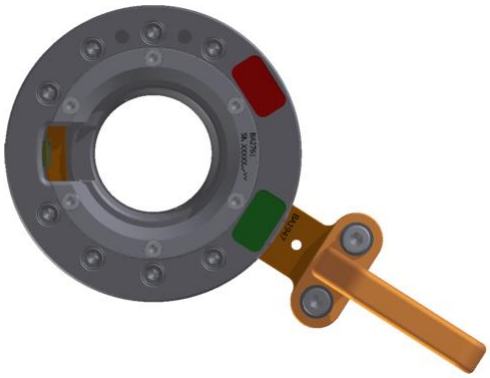
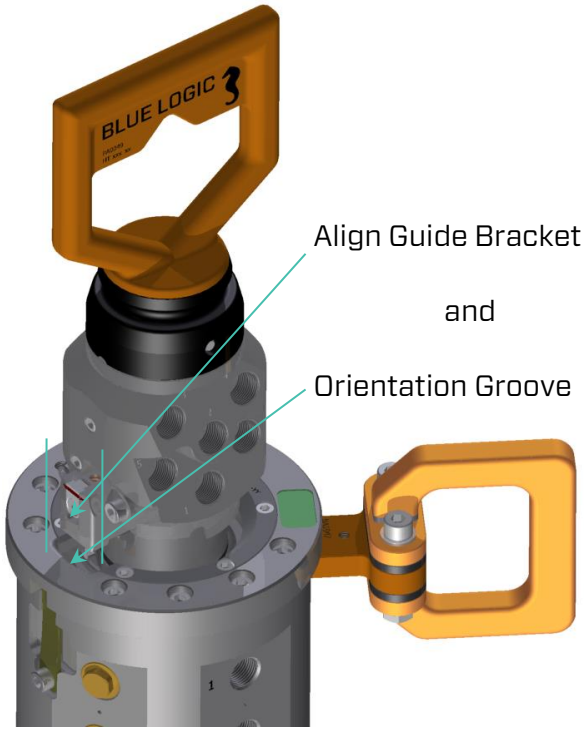
Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

5.1.2. Receptacle Pre Dive Check List

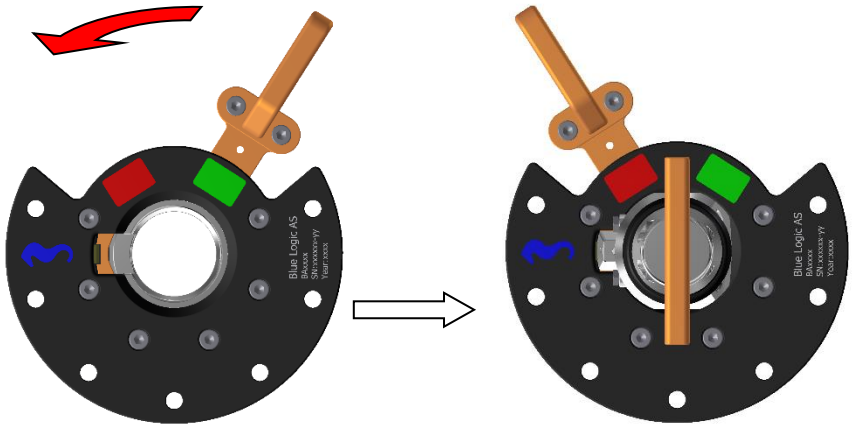
No.	Description	Chk/Verified
01	Visual inspect receptacle internal surface finish and entrance area.	
02	Verify access for ROV and stab into receptacle	
03	Inspect all hoses, piping and fittings for leakage. Pay special attention to seal system.	
04	Verify that the Receptacle valve function cannot be operated when the Male stab is not inserted into the receptacle.	
05	Insert a Valve Stab™ into the receptacle. Verify correct installation and access.	
06	Open the Valve Stab™ and receptacle valve function by use of the ROV/Diver Handle.	
07	Close Valve function and disconnect Valve Stab™ from receptacle	
08	Perform a visual inspection of the receptacle.	

Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

5.2. SUBSEA CONNECTION

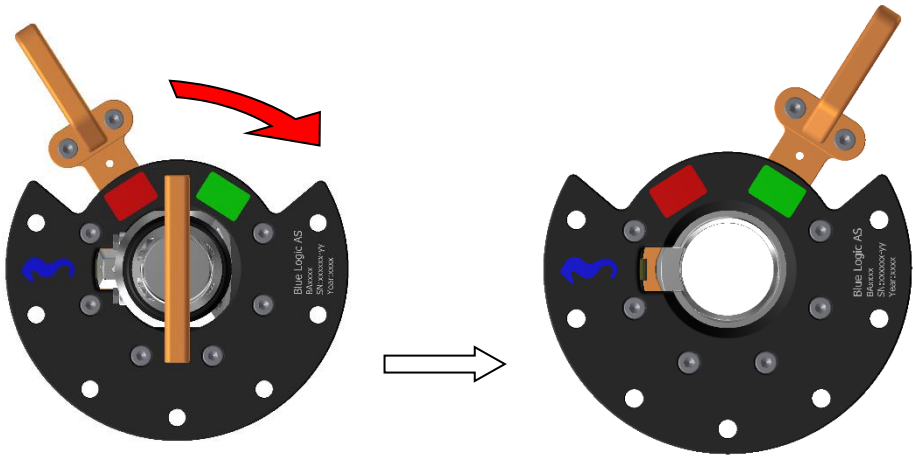
No.	Description	Chk/Verified
01	Visually inspect Valve Stab™ Receptacle prior to subsea connection. Verify ROV/ Diver access and general condition of the Valve Stab™ Receptacle in front of, and behind the panel.	
02	Inspect Valve Stab™ ROV/Diver handle. Verify that the Valve Stab™ position is Closed (Green Area) as indicated on figure. 	
03	Start inserting Valve Stab™ (use a "loose" grip if possible, align stab into receptacle and gentle slide stab down. Rotate Valve Stab™ in order to align Stab Guide Bracket and Receptacle orientation groove. When correctly aligned, push the stab down and fully into the Receptacle. The red lines on the indicator should align completely 	

Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

No.	Description	Chk/Verified
	Note; for last push it is normally easier to just push on the top of the D-handle to avoid other forces (bending and rotating forces)	
04	Fully insert the Valve Stab™ into the Receptacle. Ensure correct engagement of Guide Bracket/Orientation Groove.	
05	Operate Receptacle ROV/Diver handle from CLOSED (Green Position) COUNTERCLOCKWISE to OPEN position stab system.  Closed Position (Stab free for insertion) Open Position (Stab locked into receptacle) Note: It is always recommended to open or close without pressure and flow over the Valve Stab™ system	
06	Verify hydraulic ports open and inspect Receptacle/ Stab for leakages. Operate desired hydraulic functions.	

Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

5.3. SUBSEA DISCONNECTION

No.	Description	Chk/Verified
01	Visually inspect Valve Stab™ Receptacle prior to subsea disconnection. Verify ROV/ Diver access and general condition of the Valve Stab™ Receptacle in front of, and behind the panel.	
02	Close the Valve Stab™ System Valve function by operating the ROV/ Diver handle CLOCKWISE  Open Position (Stab Locked in Receptacle) Closed Position (Stab free for removal) Note: It is always recommended to open or close without pressure and flow over the Valve Stab™ system	
03	Pull the Valve Stab™ out from the receptacle. Verify no leakages and perform a visual inspection.	
04	Continue with operation	

Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

5.4. POST DIVE CHECK

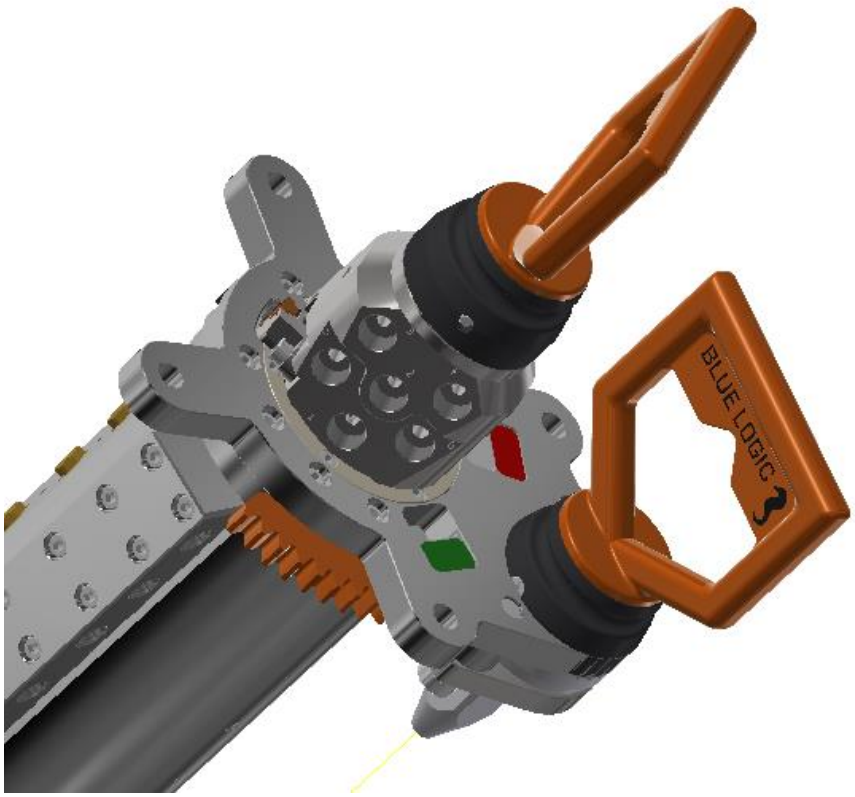
No.	Description	Chk/Verified
01	Recover Valve Stab™ equipment to deck.	
02	Perform a visual inspection Seals Seal areas ROV Handle Flex Joint Hoses and piping Fittings Surface treatment Rotation lock-pin, verify smooth movement and spring-return.	
03	Flush all equipment with fresh water, make sure to flush thru ventilation holes between ports	
04	Dry off equipment and apply protective oil prior to storage. Spray protective oil into ventilation holes between ports as well.	

Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

6. OPERATION OF GEAR OPERATED RECEPTACLE, OPTIONAL

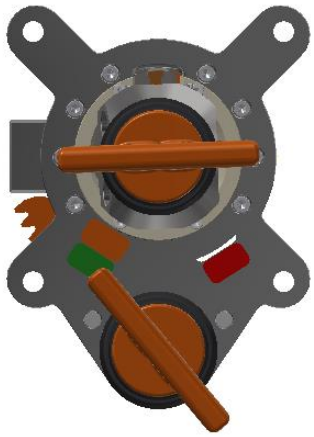
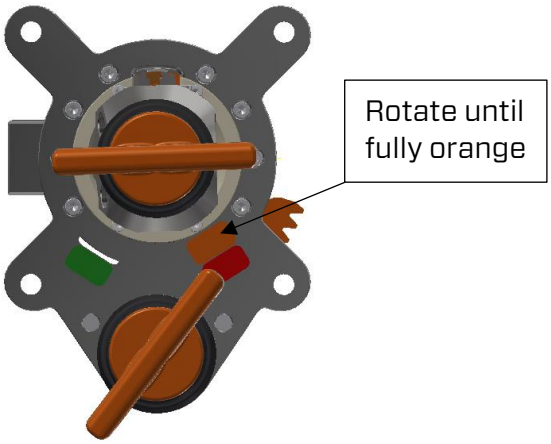
The gear-operated receptacle is in principle no different from a regular receptacle. The only difference is the use of D-handle with square interface (BB2873).

The same operating procedure described in chapter 5 also applies here.

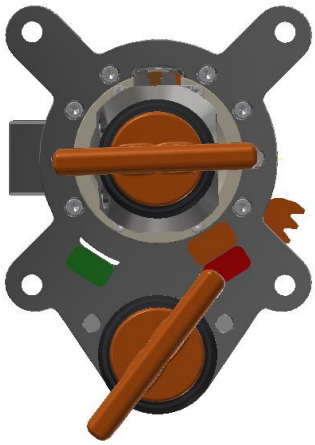
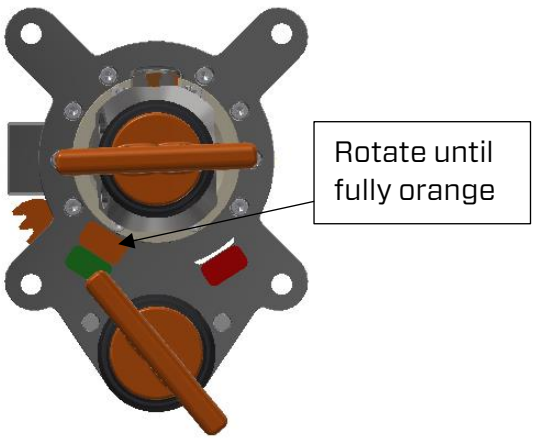


Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

6.1. SUBSEA CONNECTION

<table>
<tr><td colspan="2">Rotate receptacle D-handle from CLOSED (Green Position) clockwise to OPEN position stab system. Rotate until area above red mark is fully orange</td></tr>
<tr><td>  </td><td> 
</td></tr>
<tr><td>Closed Position
(Stab free for removal)</td><td>Open Position
(Stab Locked in Receptacle)</td></tr>
<tr><td colspan="2">Note: It is always recommended to open or close without pressure and flow over the Valve Stab™ system</td></tr>
</table>

6.2. SUBSEA DISCONNECTION

<table>
<tr><td colspan="2">Close the Valve Stab™ System Valve function by operating the D-handle counter clockwise. Rotate until area above green mark is fully orange</td></tr>
<tr><td>  </td><td> 
</td></tr>
<tr><td>Open Position
(Stab Locked in Receptacle)</td><td>Closed Position
(Stab free for removal)</td></tr>
<tr><td colspan="2">Note: It is always recommended to open or close without pressure and flow over the Valve Stab™ system</td></tr>
</table>

Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

7. MAINTENANCE

7.1. GENERAL

The Valve Stab™ system is a robust Subsea connection system with few critical moving parts. If moving parts is not filled with salt and sand/ dirt particles but cleaned and lubricated, the only parts which will need to be routinely replaced is the seal system.

There are however a few important inspections points which shall be performed routinely in order to guarantee problem free use and operation of the Valve Stab™ System.

- MOB/Demob inspection and control
- Daily inspection during offshore operations
- Weekly routinely inspection during offshore operations
- Yearly inspection and Maintenance

It is highly recommended to return the Valve Stab™ System to Blue Logic for a yearly inspection and maintenance to ensure minimum 20years of problem free use. By offshore operations we mean the time it is in use, not when it is stored. Yearly maintenance only required if the equipment has been in operation.

If, for any reason, returning the equipment to Blue Logic is not feasible, Blue Logic can provide training of technical personnel to handle the maintenance. Maintenance shall only be carried out by personnel with documented training.

Note:
Please note that the warranty is only valid if maintenance is carried out by Blue Logic.

For MOB/demob, please see above Section 4.1.1
For Daily inspection during offshore operations, please see above Section 5.1 for pre-dive activities and Section 5.4 for post dive.

Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

7.2. WEEKLY MAINTENANCE

No.	Description	Chk/Verified
01	Perform a visual inspection of Stab and receptacle. Inspect Surface treatment and verify no corrosion issues. Special attention should be to the following: - Seals - Seal areas - ROV Handle - Flex Joint - Hoses and piping - Fittings - Surface treatment - Stab Guide Bracket - Receptacle Orientation Groove	
02	Insert the Valve Stab™ into receptacle. Verify correct engagement of orientation groove, guide bracket and lock Indicator	
03	Operate the Valve Stab™ valve function by use of the ROV/Diver handle. Verify smooth movement	
04	Close the Valve Stab™ valve function, verify smooth movement	
05	Pull the Valve Stab™ out of the receptacle and verify that the valve function cannot be operated on either the Receptacle or Stab	
06	Ensure protective oil applied and no water/moisture entrapped on critical parts.	
07	Store in dedicated aluminium transport box.	

7.3. MONTHLY MAINTENANCE

No special activities are required on a monthly basis. If the Valve Stab™ system has been extensively used and repeatedly exposed to dirt and aggressive fluids, all Stabber and receptacle seals should be inspected and replaced if required.

Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

7.4. YEARLY MAINTENANCE

It is recommended to return the equipment to Blue Logic for full inspection, maintenance, and testing. In addition to the below listed actions, the cartridge seals will be disassembled and inspected, and cartridge seals replaced.

No.	Description	Chk/Verified
01	Inspect all external and internal Valve Stab™ Seals. Replace if required.	
02	Inspect all external and internal Receptacle Seals. Replace if required.	
03	Check all mechanical functions, verify smooth operations. Inspect for scratches and general wear, lubricate all moving parts.	
04	Function test Stab and Receptacle and perform a full leakage test.	

Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

7.5. SEAL REPLACEMENT

If replacement of cartridge seals for stab/receptacle is found required, the equipment must be returned to Blue Logic Service Department for replacement.

Replacement of the outer seals for the stab is feasible to perform in-field as described in the below section.

7.5.1. Main Outer Seal (Stab)

Sequence for replacement of the Main Outer Stab Seals:

No.	Description	Chk/Verified
01	Remove old seals by use of a sharp knife. Cut the seals but be very carefully not to damage seal surfaces.	
02	Heat the new seals to 80-100 degrees using hot water.	
03	Stretch the new seals gently by hand. Slide the seals over the outer stab body. Use water or oil to lubricate.	

As an option, a dedicated Seal Replacement Tool is available. Please contact Blue Logic for further details.

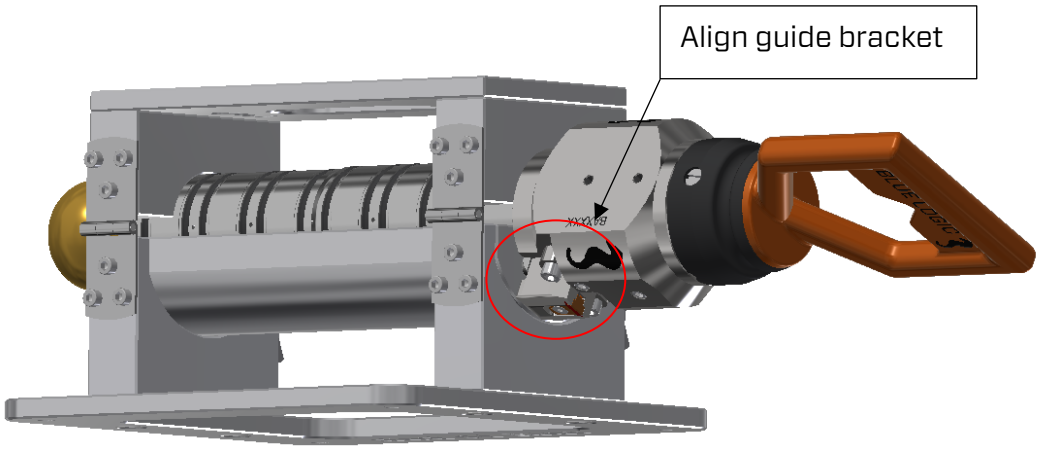
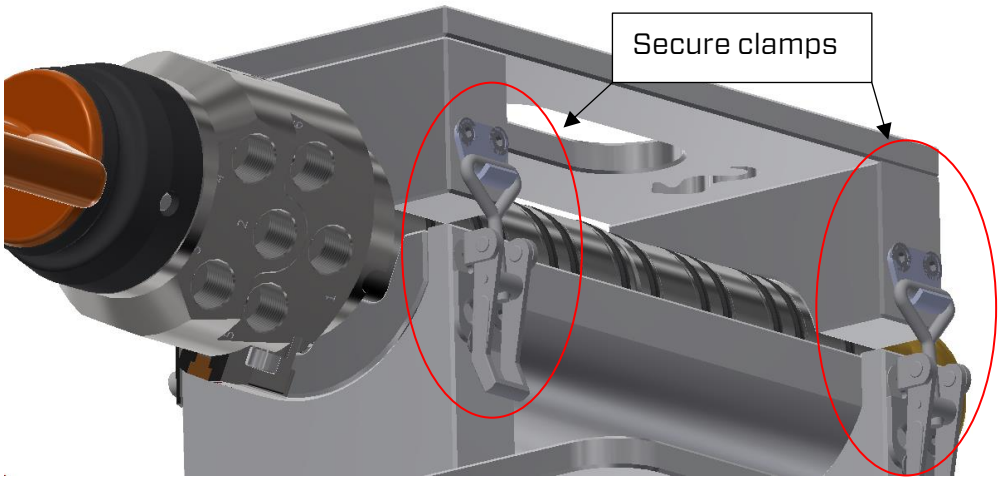
7.5.2. Seal replacement (receptacle)

During normal use, the seal spherical core seals do not need to be replaced. They will be inspected and replaced if required during the recommended yearly service.

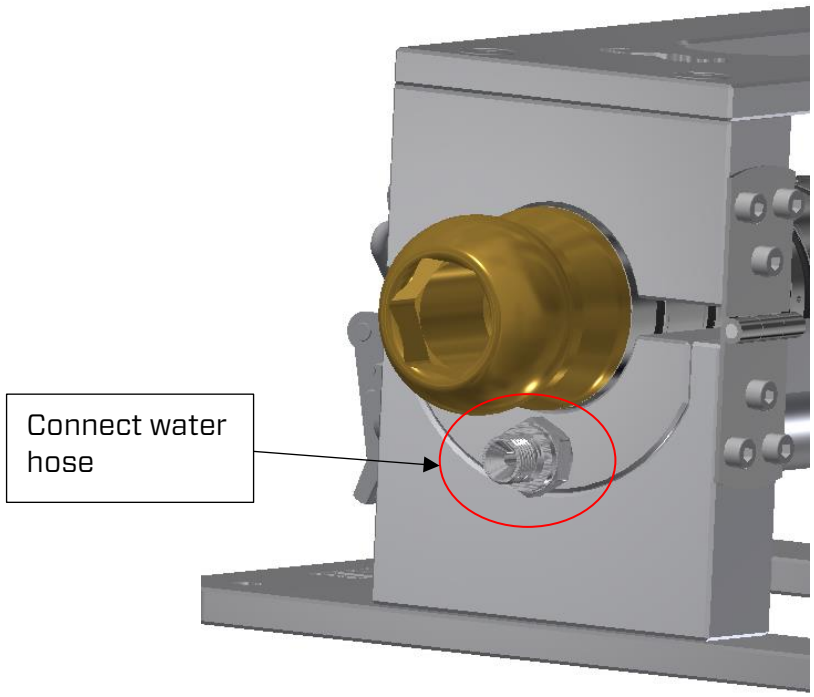
Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

7.6. VENT HOLE FLUSHING UNIT PROCEDURE

7.6.1. Vent Hole Flushing Unit (Stab)

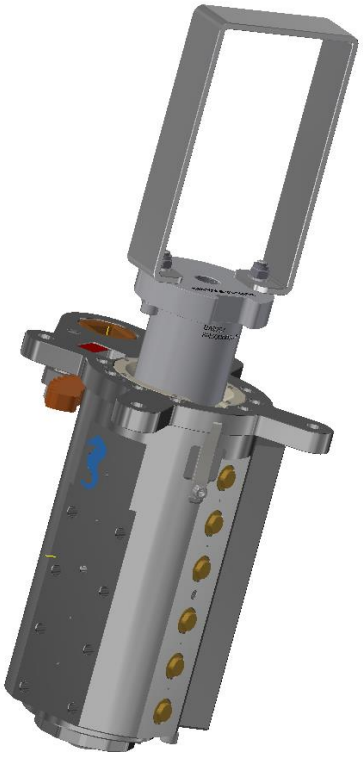
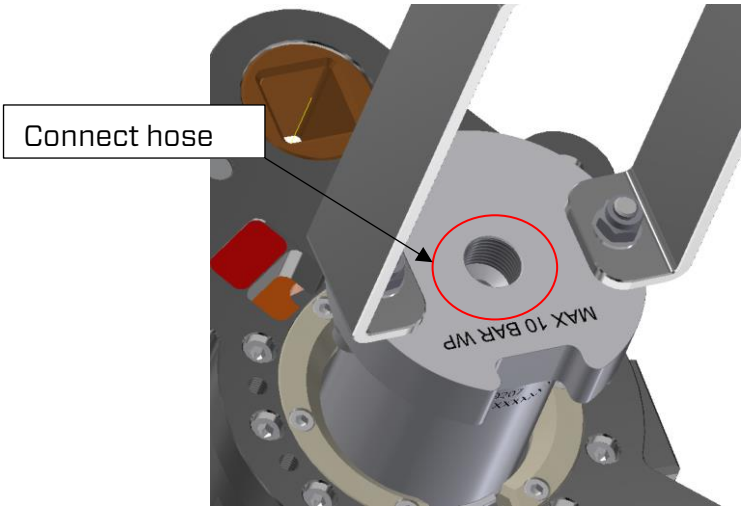
No.	Description
1	Place Valve Stab inside the flushing unit, carful to align the guide bracket in corresponding groove. 
2	Apply clamps to secure the valve stab 

Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

3	Connect water hose to BPS fitting (1/4" BSP Male x 1/4" BSP Male Fitting) 
4	Start flushing with water for 3-5min (max 10 bar)
5	Blow with air
7	Disconnect Valve Stab from Venting Hole Unit and let dry
6	Apply WD40 or equivalent to each vent hole on Valve Stab
7	Store Valve Stab in a dry environment

Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

7.6.2. Vent Hole Flushing Unit (Receptacle)

No.	Description
1	Stab the Venting Hole Flushing Unit into a receptacle 
2	Connect water hose to top of Venting Unit using BSP fitting (G1/2-14) 
3	Start flushing with water for 3-5min (max 10 bar)
4	Blow with air

Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

No.	Description
5	Disconnect Venting Hole Unit from receptacle and let dry
6	Apply WD40 or equivalent to each vent hole on receptacle
7	Store Valve Stab in a dry environment

Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

8. STORAGE AND TRANSPORT

8.1. STORAGE

No.	Description	Chk/Verified
01	Visual inspect the Hot Stab for damages and wear.	
02	Ensure correct post dive sequence followed (see above sections)	
03	Apply preservation oil and secure in storage box.	

Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

8.2. TRANSPORT

No special precautions are needed for transport. However, the following should be verified:

Correct packing; preferably by use of aluminium 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

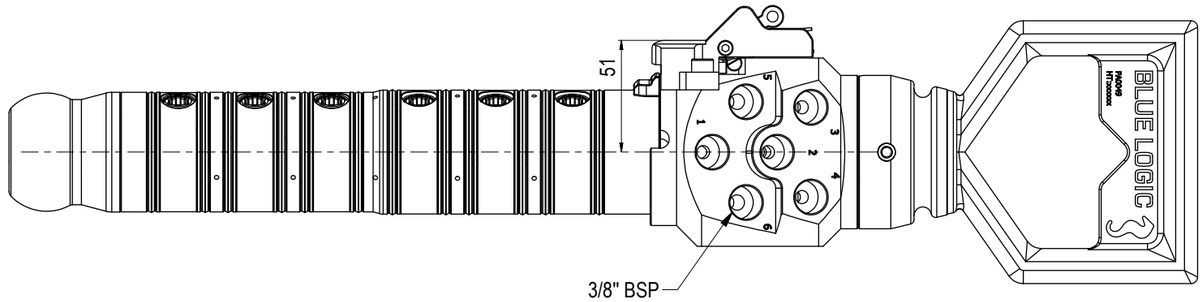
Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission

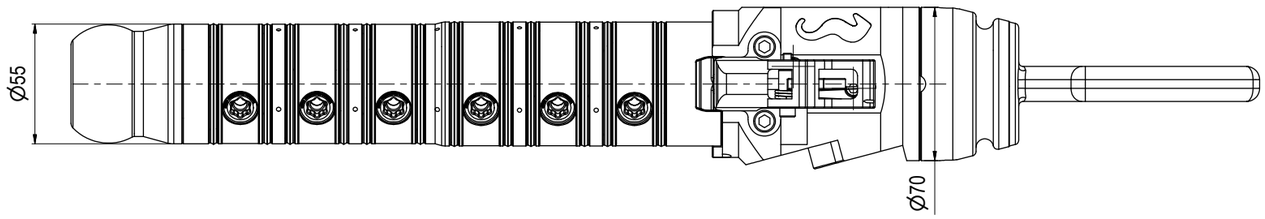
APPENDIX 1 SYSTEM DRAWINGS

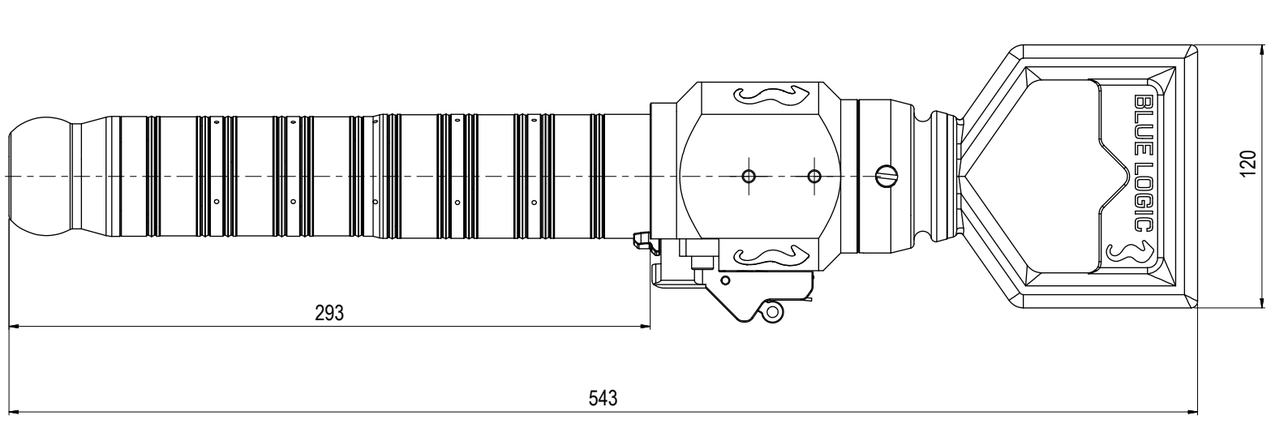
For complete program, please visit:
https://e-sea.bluelogic.no/main.aspx?page=articlelist&bgid=9003&gid=42&storemode=e-sea

ID	Drawing No.	Drawing Title
1	BA7469	Ø55/Ø57 HP VSTAB 10K LONG-TERM BSP 3/8''
2	BA8232	Ø55/Ø57 HP PROT VSTAB VENTED LONG-TERM FOR
3	BA7466	Ø55/Ø57 HP VSTAB REC 10K LONG-TERM BSP 3/8''
4	BA8230	Ø55/Ø57 HP VSTAB PARK REC VENTED INTERV

Copyright© Blue Logic AS
Not to be reproduced or transferred to others without written permission







NOTE: 1
DESIGN CODE:
NS-EN 13445:2009 / ISO 13628-8

NOTE: 2
TECHNICAL CLASSIFICATION:

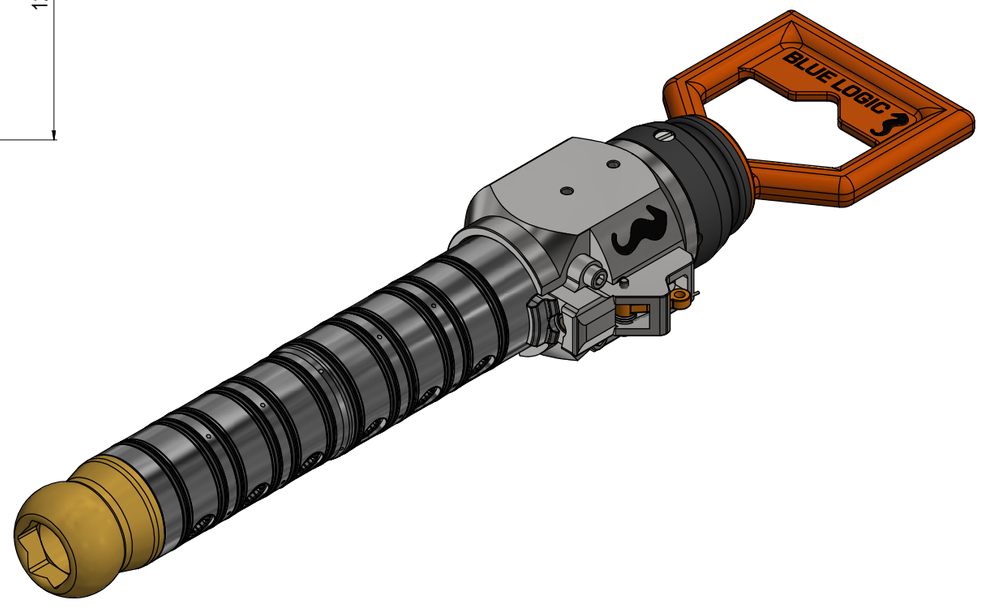
Article Type:	003-Valve Stabs
Main Group:	3.07. Ø55/Ø57-Valvestab
Intermediate Group:	3.42.01. Stab
Sub Group:	3.42.102.6. Hexa

NOTE: 3
INTERFACE INFORMATION:

Pressure Rating Bar:	690
Material:	Long-term
Weight:	9,2 kg
Volume:	1,25 dm^3
Surface Area:	3501 cm^2
Hydraulic:	3/8" BSP
Mechanical:	D-Handle
Electrical:	N/A
Com. & Protocol:	N/A

NOTE: 4
ADDITIONAL INFORMATION:
Male Valve Stab with 6 individual hydraulic lines. Designed for short term submersion in intervention applications.
This valve stab can be equipped with a key system and can only be inserted and mated with a receptacle with similar key.
The Valve Stab hydraulic connection system is a pressure balanced hydraulic connector system with integrated ball valves in all ports on both the male and female side. Can be connected and disconnected with full system pressure, water ingress and pollution to sea during connection and disconnection is negligible.
For more information - request usermanual 600142-TD-0001.

NOTE: 5
SPAREPARTS:
http://e-sea.bluelogic.no/main.aspx?page=article&artno=BB1053



Rev.	Date	Reason for issue	Revision change	Made	Chk'd	Appr.
22	9.10.2023	9-IFU (Issued for Use)		WTJ	LGH	WTJ
21	12.9.2023	9-IFU (Issued for Use)		WTJ	LGH	WTJ
20	31.5.2023	9-IFU (Issued for Use)		WTJ	LGH	WTJ
19	30.11.2022	9-IFU (Issued for Use)		WTJ	TAN	WTJ

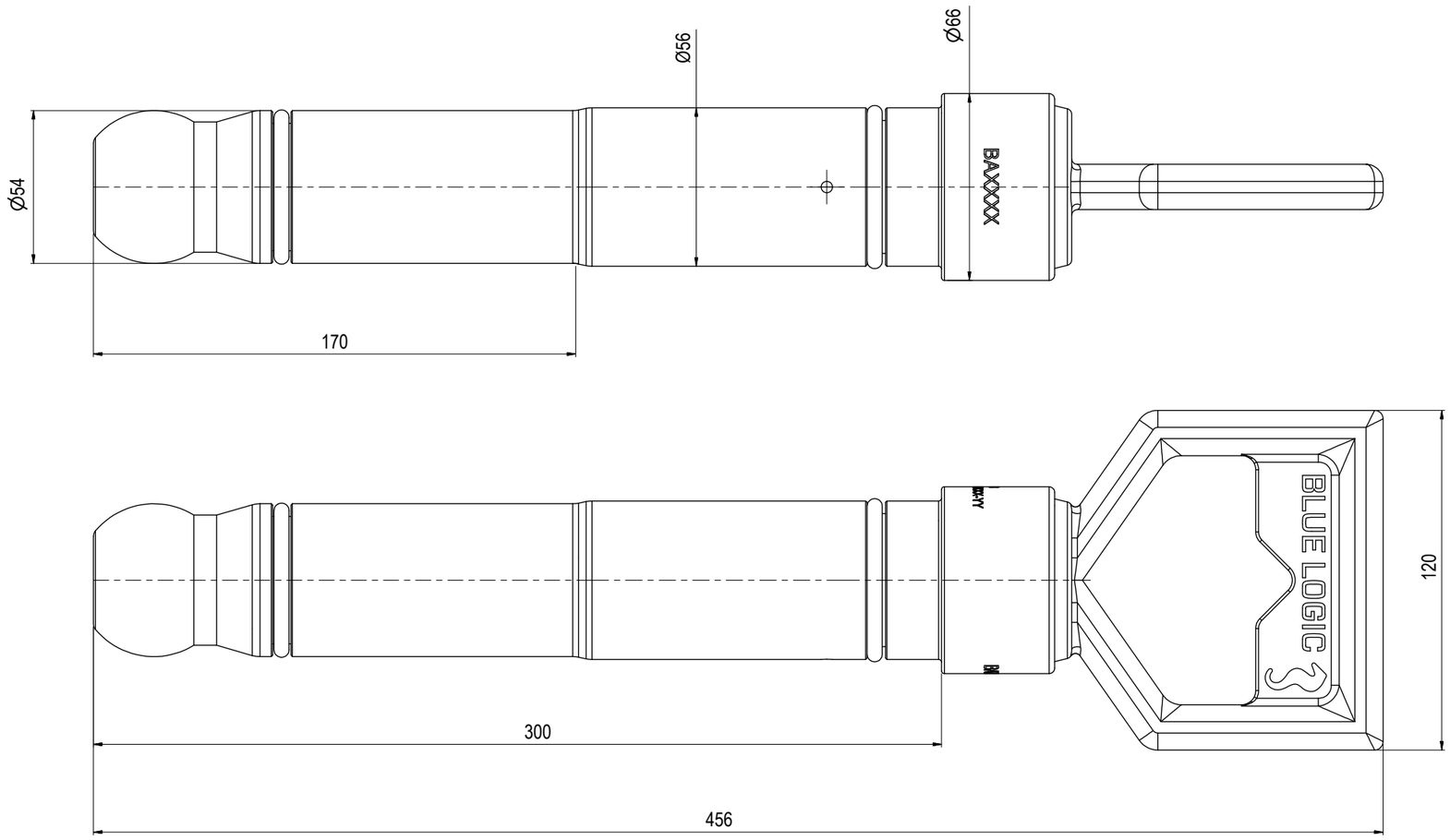
BLUE LOGIC

Dwg Scale: NTS
Dwg Proj:
Dwg Format: A3

Drawing title: Ø55/Ø57 HP VStab 10K Long-term BSP 3/8" Double Seal

Drawing number: BA7469

Rev. 22



NOTE: 1
DESIGN CODE:
N/A

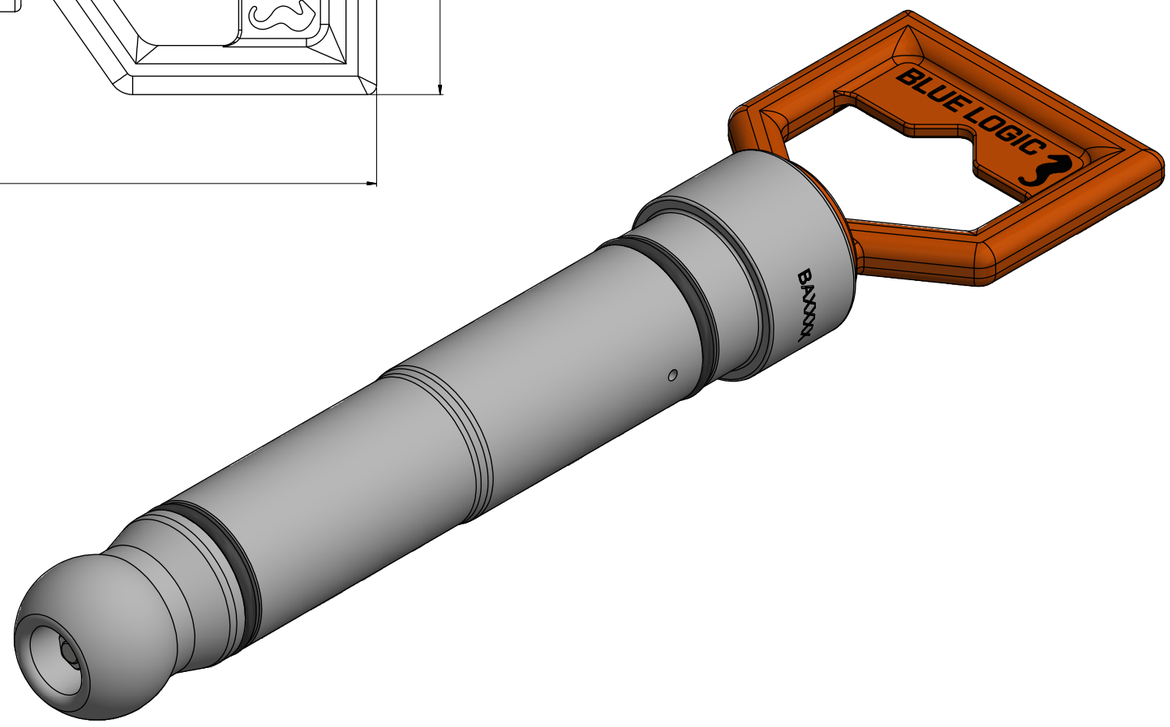
NOTE: 2
TECHNICAL CLASSIFICATION:

Article Type:	003-Valve Stabs
Main Group:	3.07. Ø55/Ø57-Valvestab
Intermediate Group:	3.42.01. Stab
Sub Group:	3.42.102.6. Hexa

NOTE: 3
INTERFACE INFORMATION:

Pressure Rating Bar:	Vented
Material:	Long-term
Weight:	1,9 kg
Volume:	0,9 dm^3
Surface Area:	1347 cm^2
Hydraulic:	N/A
Mechanical:	D-Handle
Electrical:	N/A
Com. & Protocol:	N/A

NOTE: 4
ADDITIONAL INFORMATION:
Protection Stab for Ø55/Ø57 HP (hexa port) VStab Receptacle.
Non pressure retaining, ventilated to sea thru Ø4mm.
Designed for Long-term submersion.



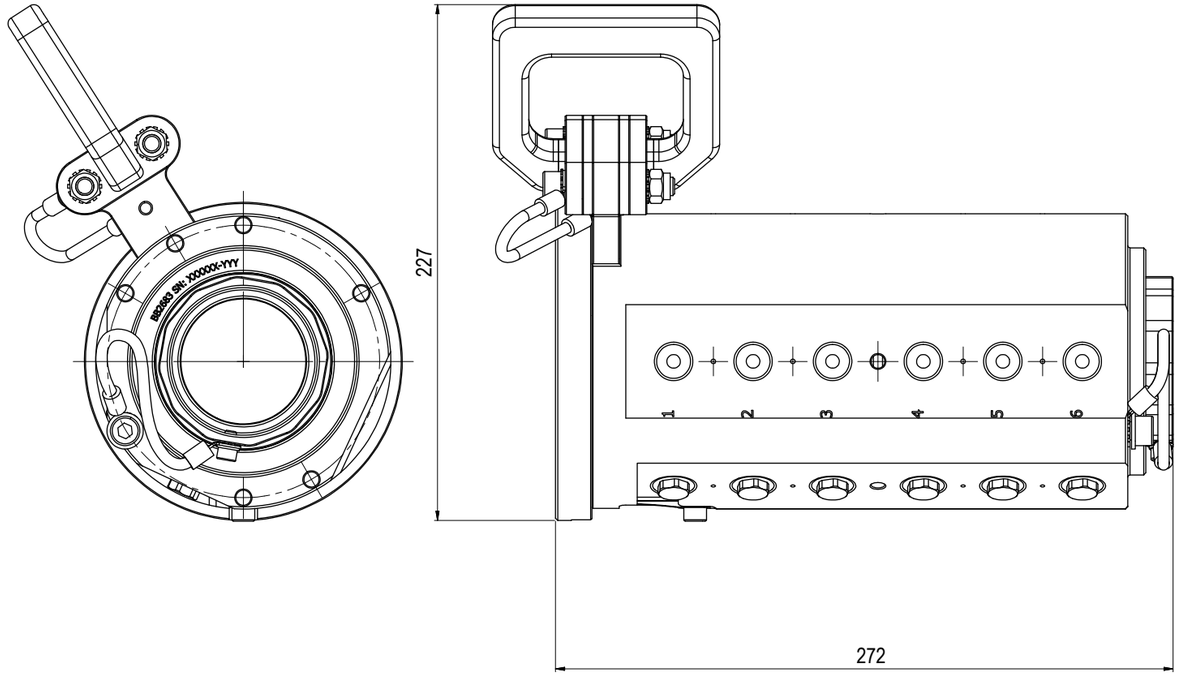
Rev.	Date	Reason for issue	Revision change	Made	Chk'd	Appr.
04	27.8.2021	9-IFU (Issued for Use)		WTJ	HNJ	WTJ
03	21.3.2018	9-IFU (Issued for Use)		WTJ	HNJ	WTJ
02	14.12.2017	9-IFU (Issued for Use)		WTJ	HNJ	LAE
01	25.2.2016	2-IFT (Issued for Tender)		WTJ	LGH	WTJ

BLUE LOGIC 3

Dwg Scale: NTS
Dwg Proj:
Dwg Format: A3

Drawing title: Ø55/Ø57 HP Prot VStab Vented Long-term for Double Seal

Drawing number: BA8232
Rev. 04



NOTE: 1
DESIGN CODE:
NS-EN 13445:2009 / ISO13628-8

NOTE: 2
TECHNICAL CLASSIFICATION:

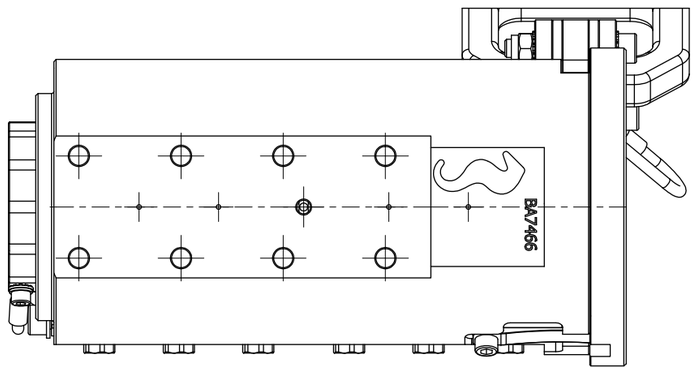
Article Type:	003-Valve Stabs
Main Group:	3.07. Ø55/Ø57-Valvestab
Intermediate Group:	3.42.02. Receptacle
Sub Group:	3.42.103.6. Hexa

NOTE: 3
INTERFACE INFORMATION:

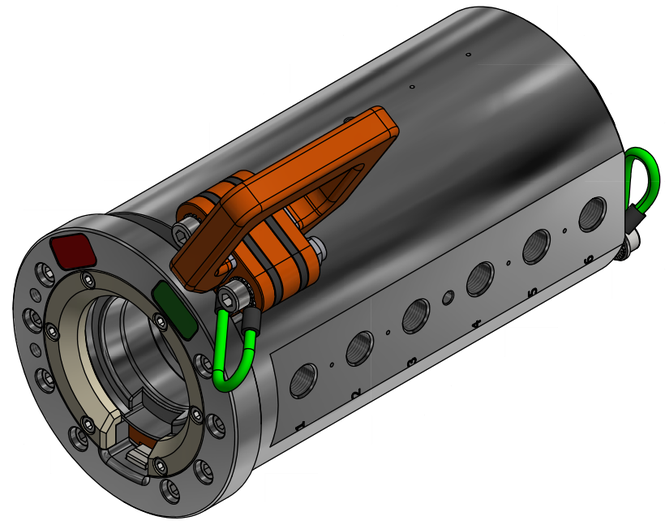
Pressure Rating Bar:	690
Material:	Long-term
Weight:	20,6 kg
Volume:	2,68 dm^3
Surface Area:	5576 cm^2
Hydraulic:	3/8" BSP
Mechanical:	8xM10 (45x45x45)
Electrical:	N/A
Com. & Protocol:	N/A

NOTE: 4
ADDITIONAL INFORMATION:
Valve Stab Receptacle with 6 individual hydraulic lines for Long-term submersion, when connected to external CP system.
When stab is inserted and valves opened (red position) a weak link system ensures that the stab can be pulled out in an emergency situation, emergency release force approx. 3kN.
ROV Handle in green position: All valves closed, stab free to mate or remove.
ROV Handle in red position: All valves open, stab locked into receptacle.
For more information - request usermanual 600142-TD-0001.

NOTE: 5
SPAREPARTS:
http://e-sea.bluelogic.no/main.aspx?page=article&artno=BB1053



VIEW A-A
(MOUNTING INTERFACE)



Rev.	Date	Reason for issue	Revision change	Made	Chk'd	Appr.
21	9.10.2023	9-IFU (Issued for Use)		WTJ	LGH	WTJ
20	12.9.2023	9-IFU (Issued for Use)		WTJ	LGH	WTJ
19	30.1.2023	9-IFU (Issued for Use)		WTJ	HNJ	WTJ
18	21.4.2021	9-IFU (Issued for Use)		WTJ	HNJ	WTJ

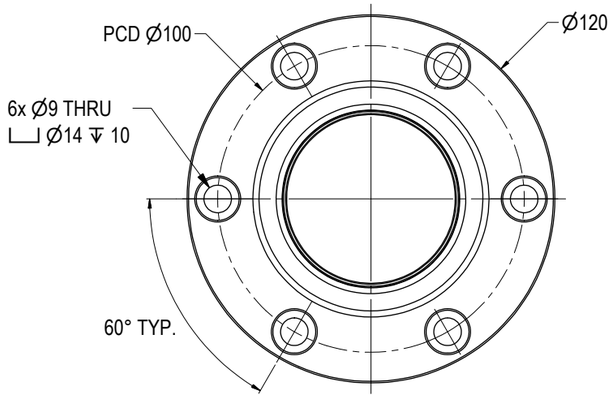
BLUE LOGIC

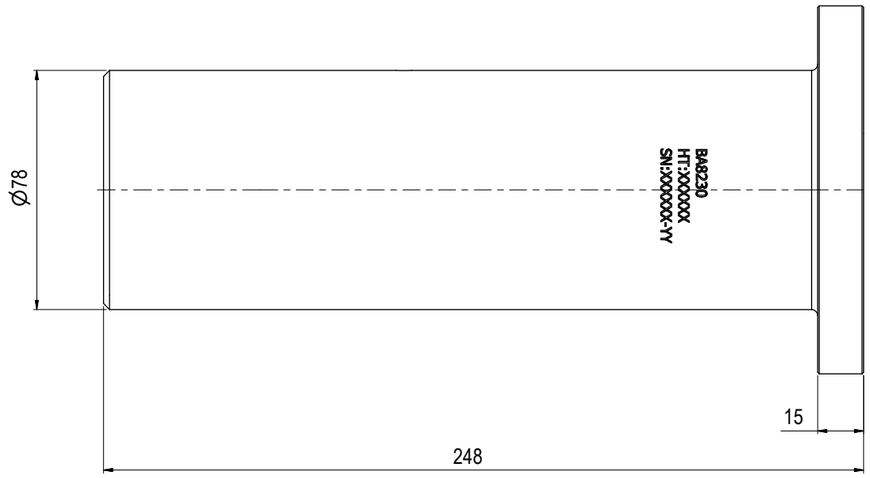
Dwg Scale: NTS
Dwg Proj:
Dwg Format: A3

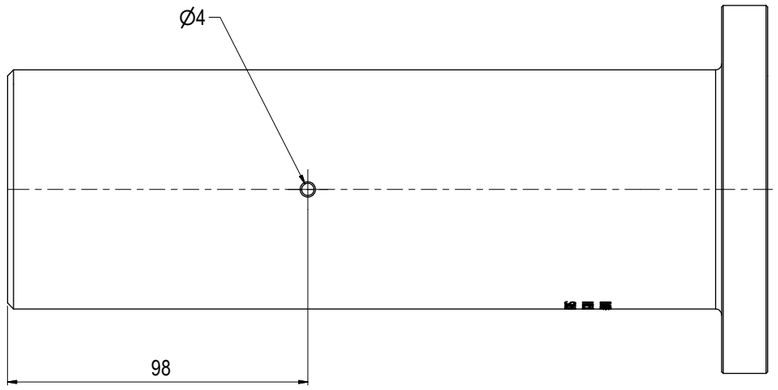
Drawing title: Ø55/Ø57 HP VStab Rec 10k Long-term BSP 3/8" Double Seal

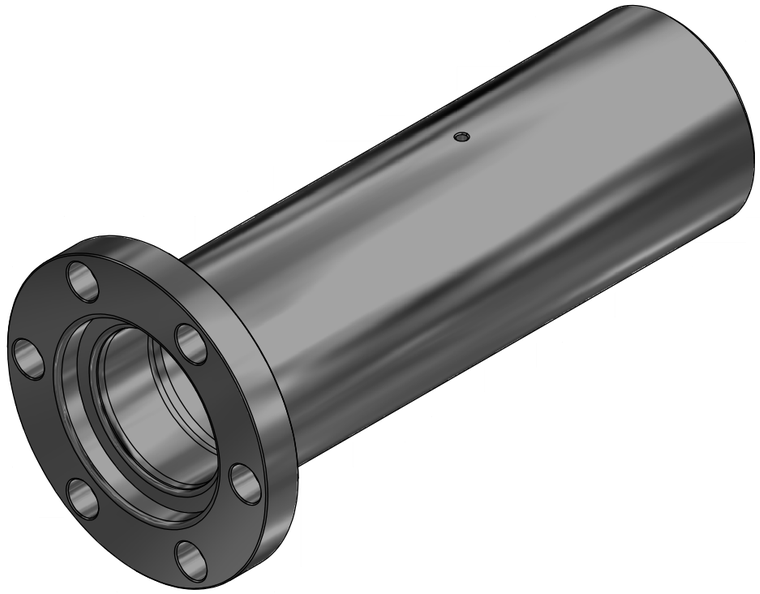
Drawing number: BA7466

Rev. 21









NOTE: 1
DESIGN CODE:
ISO 13628-8

NOTE: 2
TECHNICAL CLASSIFICATION:

Article Type:	003-Valve Stabs
Main Group:	3.07. Dual Bore-Valvestab
Intermediate Group:	3.42.2. Receptacle
Sub Group:	3.42.103.6. Hexa

NOTE: 3
INTERFACE INFORMATION:

Pressure Rating Bar:	Vented
Material:	AISI 316L
Weight:	4,7 kg
Volume:	0,6 dm^3
Surface Area:	1276 cm^2
Hydraulic:	N/A
Mechanical:	6xØ9 @PCD Ø100
Electrical:	N/A
Com. & Protocol:	N/A

NOTE: 4
ADDITIONAL INFORMATION:
Parking Receptacle for male Ø55/Ø57 VStabs.
Ventilated to sea thru Ø4mm.

Rev.	Date	Reason for issue	Revision change	Made	Chk'd	Appr.
02	21.2.2019	9-IFU (Issued for Use)		WTJ	LGH	WTJ
01	14.12.2017	9-IFU (Issued for Use)		WTJ	HNJ	LAE

BLUE LOGIC 3

Dwg Scale: NTS
Dwg Proj:
Dwg Format: A3

Drawing title: Ø55/Ø57 HP VStab Park Rec Vented Interv

Drawing number: BA8230

Rev. 02