

Bettis BHH Series

Hydraulic Double-Acting Balanced Rotary Actuator 90° Quarter-Turn



Table of Contents

Section 1: Overview

1.1	Description and General Information.....	1
1.2	Torque Performance	2

Section 2: Safety

2.1	Warning Levels used in Manuals	4
-----	--------------------------------------	---

Section 3: Installation

3.1	Storage and Transport.....	6
3.1.1	Storage before Installation	6
3.1.2	Transport and Storage	6
3.1.3	Dispatch	6
3.1.4	Handling after Installation and prior to Service Operation.....	7
3.2	Commissioning.....	7
3.3	Placing the BHH	7
3.4	Service Area	7
3.5	Mounting Directions of Actuators on Butterfly Valves.....	8
3.6	Flange and Stem on Butterfly Valves.....	9
3.7	Examples of different Installations of BHH on Valves.....	9
3.8	Choice of Hydraulic Oil.....	11
3.8.1	Viscosity / Temperature Coefficient	11
3.8.2	Selection Diagram.....	12

Section 4: BHH Mounting

4.1	BHH Mounted on Valve - ISO 5211	13
4.1.1	Preparations before Mounting.....	13
4.2	BHH Mounting on Butterfly Valve	13
4.3	BHH Mounting on Ball Valve.....	15

Section 5: Adjusting the Valve Disc

5.1	Adjustment Procedure	16
5.1.1	Standard Opening / Closing Time for Butterfly Valves	17
5.1.2	Adjustment of Butterfly Valve “a” - measurement (mm)	18
5.1.3	Opening and Closing Time for LPUM on Actuator	19
5.1.4	Opening and Closing Time for LPU on Actuator	19

Section 6: Mounting 90° Turn Set (Indication Plate)

Section 7: Flushing Instruction

7.1	Flushing Procedure	22
7.1.1	Flushing Unit	23
7.1.2	Flushing with Nitrogen	23
7.1.3	Flushing with Oil.....	23

Section 8: Operating

8.1	Operating Restriction.....	24
8.2	Turning Direction in Relation to “A” and “B”	24
8.3	Emergency Operation of BHH Actuators	25
8.3.1	Opening by Emergency Operation Key BHH 125 to BHH 500	25
8.3.2	Operating by Portable Hand Pump BHH 125 to BHH 32000.....	26
8.3.3	Operating by Directed Mounted Hand Pump.....	27
8.3.4	Operating by Portable Hand Pump Submerged Actuator.....	27

Section 9: Service and Maintenance

Section 10: BHH Dismounting

10.1	BHH Mounted on Butterfly Valve	29
10.1.1	Preparations before Dismounting.....	29

Section 11: BHH Re-mounting

11.1	Preparations of Seals before Mounting	32
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Section 12: Valve Traveling Time Adjustment

12.1	Operating Time for Valve Open/Closed	38
12.1.1	Valve Operating Time Table for Rotary Actuator (Quarter-Turn).....	39

Section 13: Troubleshooting

Section 14: Spare Parts BHH 125

14.1 Parts, Spare and Material List for BHH 125.....	42
--	----

Section 15: Spare Parts BHH 250

15.1 Parts, Spare and Material List for BHH 250.....	45
--	----

Section 16: Spare Parts BHH 500

16.1 Parts, Spare and Material List for BHH 500.....	48
--	----

Section 17: Spare Parts BHH 1000

17.1 Parts, Spare and Material List for BHH 1000.....	51
---	----

Section 18: Spare Parts BHH 2000

18.1 Parts, Spare and Material List for BHH 2000.....	54
---	----

Section 19: Spare Parts BHH 4000

19.1 Parts, Spare and Material List for BHH 4000.....	57
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Section 20: Spare Parts BHH 8000

20.1 Parts, Spare and Material List for BHH 8000.....	60
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Section 21: Spare Parts BHH 16000

21.1 Parts, Spare and Material List for BHH 16000.....	64
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Section 22: Spare Parts BHH 32000

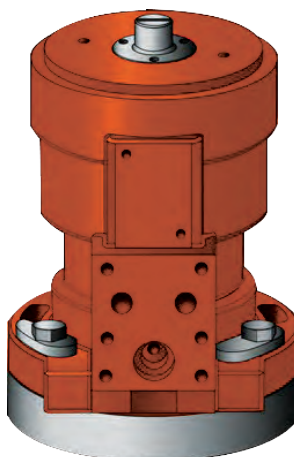
22.1 Parts, Spare and Material List for BHH 32000.....	68
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Appendix

Section 1: Overview

1.1 Description and General Information

Figure 1



Bettis BHH series includes several balanced rotary actuators used for operation of quarter-turn valve. The actuator is prepared for mounting of control equipment with several different functions and combinations. For more information see our product data sheets or contact our sales representative directly.

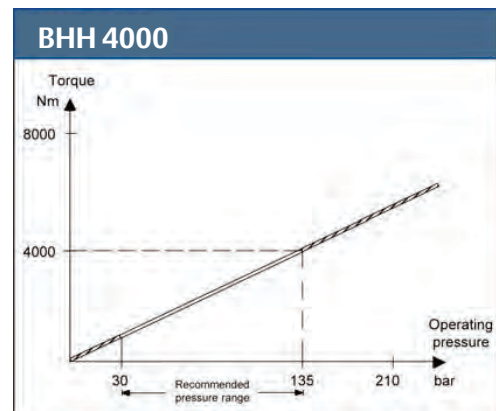
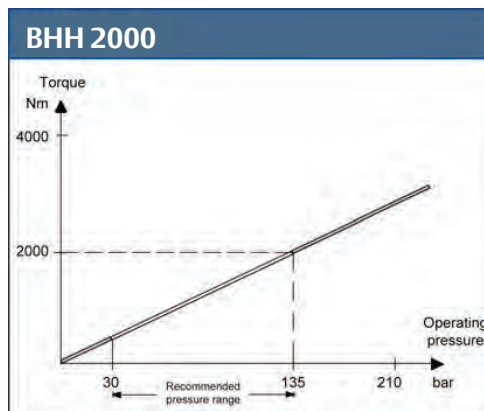
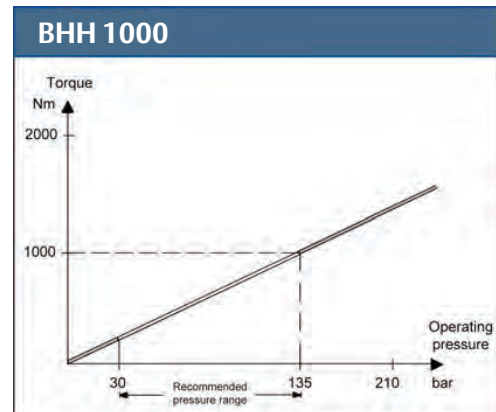
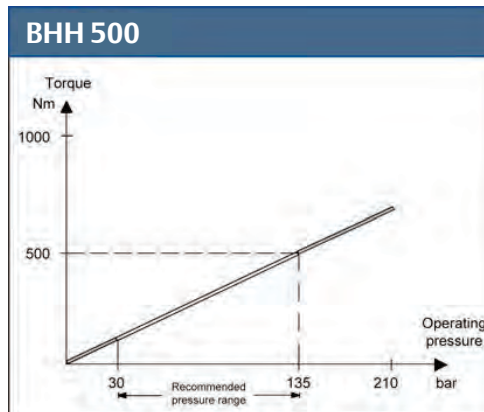
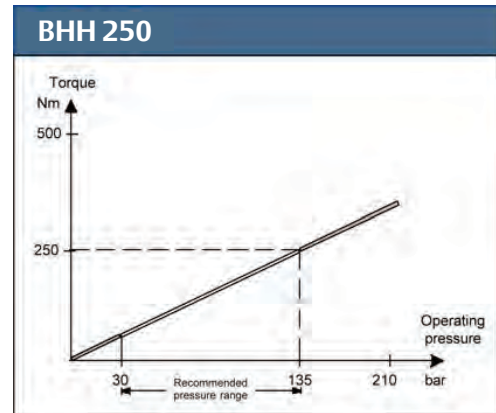
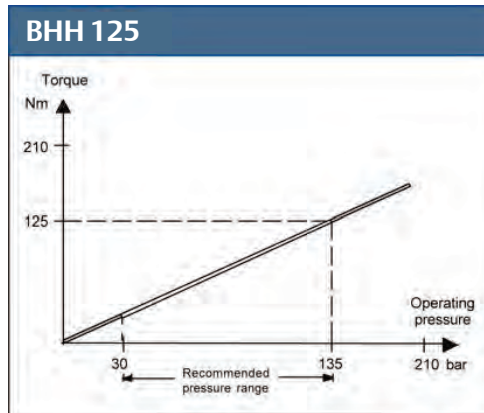
Long service life and functional reliability of hydraulic systems and their components are dependent on correct handling, installation, maintenance and repair to ensure fault-free operation. Instructions directly attached to the equipments (e.g. nominal pressure) must be observed. The system must not be operated over the permissible operating range. For detailed information, please refer to the final specifications to be submitted.

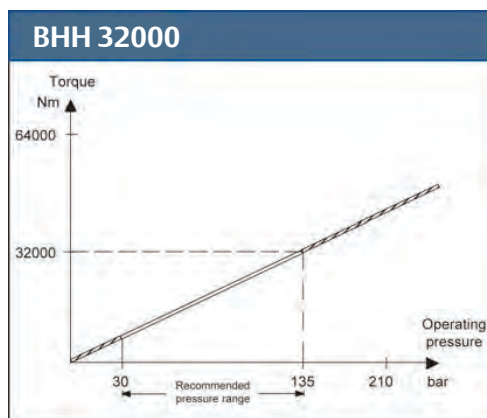
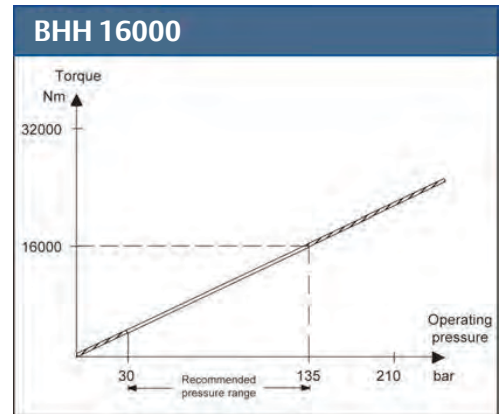
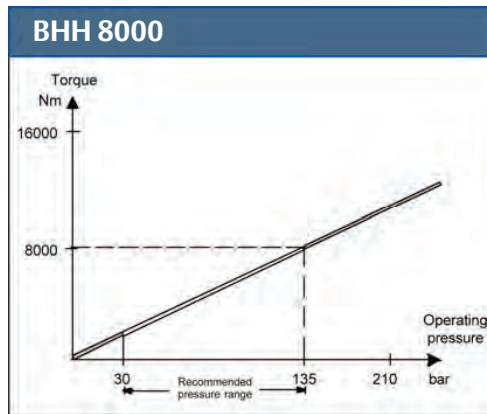
The customer is responsible for ensuring that these instructions are read and fully understood. For personnel safety and safety of the equipment please read the Section 2 for Safety.

NOTE:

For technical data please refer to Product Data Sheets.

1.2 Torque Performance





Section 2: Safety

2.1 Warning Levels used in Manuals

The following warning levels are used in the documentation of Bettis for the safety of people and equipment.

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in property damage.

NOTE:

Indicates important information regarding the product.

WARNING

All personnel that handles Bettis actuators shall take part of and understand the following information prior to handling the system. See warnings on following page.

⚠ WARNING

Failure to follow safe installation and service guidelines could result in death or serious injury.

- Make sure only qualified personnel perform the installation or service.
- Do not perform any service other than those contained in this manual unless you are qualified and authorized to do so.
- Always observe local environmental, safety, and health regulations.
- Use only certified instruments and tools appropriate for the area classification.
- Use the equipment only as specified in this manual. Failure to do so may impair the protection provided by the equipment.
- Use only spare parts from Marine Tank Management. Any replacement with non-recognized spare parts can jeopardize the intrinsic safety and the function of the product.

⚠ WARNING

High voltage that may be present on leads could cause electrical shock.

- Avoid contact with live leads and terminals.
- Before working on any electrical units, the wiring has to be disconnected and circuits de-energized.
- Disconnect power to any electrical unit you are to replace.

⚠ WARNING

Avoid shearing forces and tension on pipelines and components. Piping must be strong enough to carry the actuator weight.

- Always follow safety guidelines when handling heavy equipment. The weight of the equipment is noted on the drawings.
- Do not lift the actuator with valve using the lifting eye installed on the actuator top part. Use proper lifting facilities and transport equipment.

⚠ CAUTION

Flushing through Bettis components are not allowed.

- All Bettis components are cleaned before shipment and do not need flushing.
- Some components will be damaged if system flushing is performed and others are not possible to flush.
- Piping system must be flushed before Bettis components are connected.

Section 3: Installation

Pre-Installation Considerations

At delivery each component is separately packed for water and dust protection so any precaution must be kept to reduce the risk of getting dust, water and foreign matters entering the components.

All Bettis equipments have been flushed to NAS 1638/10 and plugged and function tested before leaving Bettis.

Equipments ready for use, such as power units, control cabinets, actuators etc. do not require flushing prior to putting into service.

3.1 Storage and Transport

3.1.1 Storage before Installation

The system equipment must be stored under shelter in their original shipping boxes with protection for rain, preferable in dry indoor place, not directly exposed to wind, rain, sand, dirt, etc. The equipments with packing should be kept from the possibility of physical damage and protected against environmental dust. Moist conditions should be avoided. The equipments should be stored in an easily accessible place where they can be easily brought out for rigging work.

3.1.2 Transport and Storage

Use proper lifting facilities and transportation equipment.

In case of lifting, take care not to damage the painting. Scratches or damage of a coated area can cause galvanic corrosion. If scratched repair before equipment is finally installed. The valves shall be storage and transported in a way to avoid damage on the valve rubber; e.g. an actuator on valve must not make full contact with the rubber ring on another valve. By transport, storage and dispatch of actuators type FO, the disc (which in this case is open) must be protected and packed so damage on the disc will be avoided.

3.1.3 Dispatch

All valves shall be 2 – 5 mm open at dispatch to avoid that the disc is sticking in the rubber. However, this does not apply to spring closed valves.

⚠ CAUTION

Transit and shipment of actuators type FO (Fail Open) must always be done without hydraulic pressure. This means that the valve in this case is open. Have your attention on this when handling FO actuators.

3.1.4 Handling after Installation and prior to Service Operation

After installation the equipment should be covered with strong heat shrinkable plastic cover, as thoroughly as possible with using humidity absorbers inside the plastic cover. Be careful to protect the coated and plastic surfaces, and particularly avoid hard and sharp items in contact with the equipment. Secure the equipment to prevent it from tipping over. Check the equipment regularly, especially for damages on the shrinkable plastic cover and also check the condition of the humidity absorbers.

3.2 Commissioning

In conjunction with maintenance, commissioning is very crucial for the service life and functional safety of the hydraulic system.

Checking for the most common faults can minimize faults during commissioning. The most common faults are:

- The fluid reservoir was not checked.
- The unfiltered operating fluid was used.
- System components were not bled of air.
- Hydraulic actuator was not bled (seal damage!)
- Limit switches were adjusted too close.
- Hysteresis of the pressure switch was not taken into account during setting up.
- Hydraulic pump was not filled with pressure fluid before commissioning.

3.3 Placing the BHH

When deciding where to place the BHH there are several aspects to consider before actually mounting the BHH. Type of valve and environment are some of the main aspects. Following descriptions are instructions and guidelines to be considered in the placing and pre-installation procedures.

NOTE:

The piping must be strong enough to bear the actuator weight!
Do not use force, to minimize shearing forces and tension on pipelines and components!

CAUTION

DO NOT hold up the whole set actuator with valve using the lifting eye installed to the actuator top part!

Please refer to the handling means of the valve manufacturer.

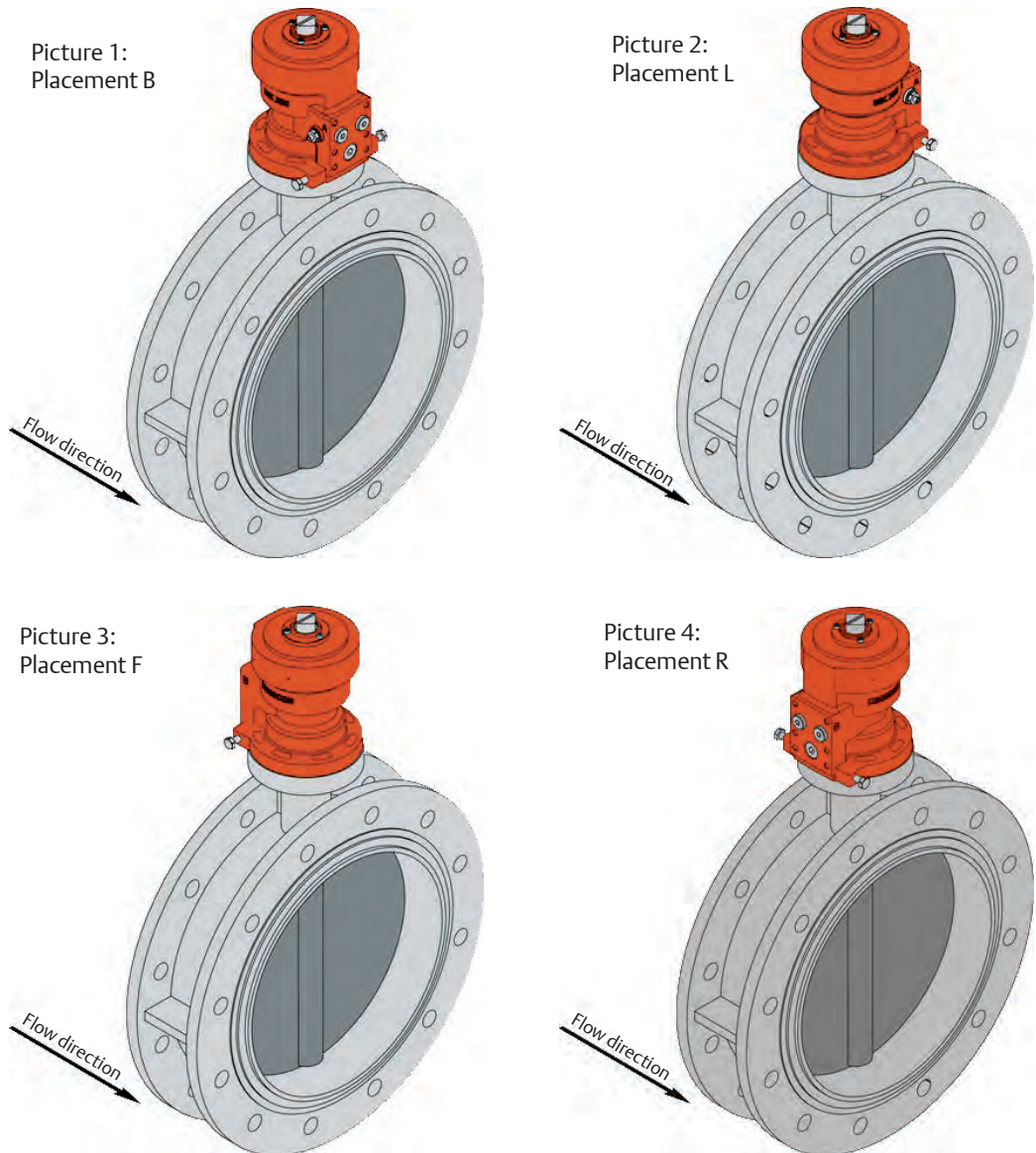
3.4 Service Area

There should be enough space around the actuators to ensure easily access and service. To be able to perform emergency operation by emergency key or hand pump there must also be enough space around the actuator enabling this operation.

3.5 Mounting Directions of Actuators on Butterfly Valves

This instruction is applicable as a general instruction for the mounting direction of actuators on valves. If any deviations from the standard (customer requirements) it must be stated at the valve list. This instruction applies for Bettis BHH actuators.

Figure 2 Examples of actuators positions on valves:
B: Behind, F: Front, L: Left and R: Right.



NOTE:

Position L and R might require a 90° Turn set (indication plate) to show correct position of the indication groove. See “Mounting 90° Turn Set (Indication Plate)” on Section 6.

3.6 Flange and Stem on Butterfly Valves

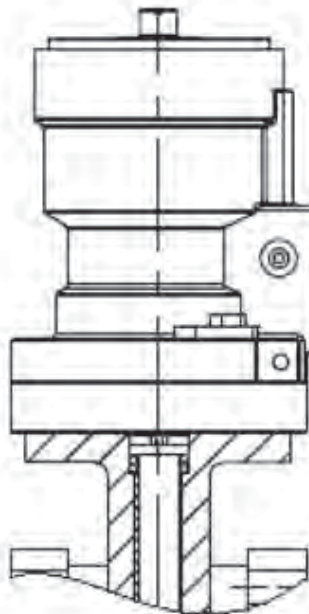
Recommended / Normally used for BHH on butterfly valves.

Table 1.

BHH Size	Flange		Stem		
	Flange ISO 5212		DIN 6885	DIN79	Intrusion
125	F05	F07	ø17	ø16	45
250	N/A	F07	ø25	ø24	50
500	F07	F10	ø35	ø30	55
1000	F10	F12	ø42	ø36	63
2000	F12	F14	ø58	ø50	75
4000	F14	F16	ø74	ø63	85
8000	F16	F25	ø95	ø80	105
16000	F25	F30	ø95	ø85	132
32000	F30	F35	ø160	N/A	160

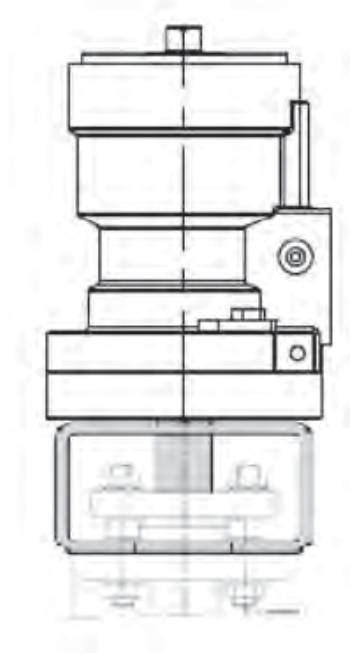
3.7 Examples of different Installations of BHH on Valves

Figure 3 Valve with “Standard” ISO5211



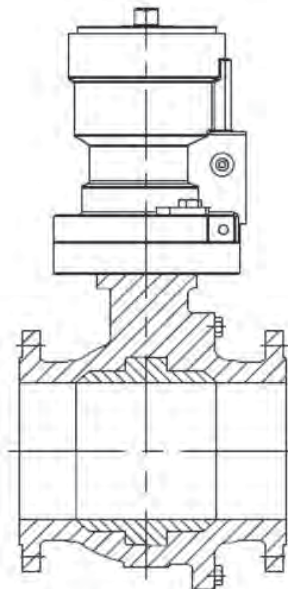
This example shows a BHH mounted on a Wouter Witzel EVFS with ISO 5211.

Figure 4 Valves with “Open Box” Section Brackets



This example shows a BHH mounted on a Wouter Witzel Dynaxe valve (can be ISO but need pack bushing if mounted submerged or open deck or in high moisture).

Figure 5 Ball Valves



Smaller ball valve sizes can be of ISO5211 pattern, but with threaded holes which requires mounting from top – this means either a special flange or an additional “box section bracket”. If the valve is with the “box section bracket” the adaption is similar to the one for High Performance valves – however the adapter may need to “extrude”.

Larger sizes ball valves can have “Standard” ISO 5211 in this case it will be similar the “standard” ISO5211.

3.8 Choice of Hydraulic Oil

Hydraulic oil provides the hydraulic working processes with energy. In Bettis BHH connection this means energy for valve motions.

The viscosity of the different kinds of oil varies according to the temperature; i.e. high temperature renders a low viscosity and vice versa. Some hydraulic oil types vary more than others. The oil viscosity is an indication of “how sluggish” the oil is. If you change the viscosity, you also change the lubricating characteristics of the oil, especially the adhesion that normally results in the well-known dilemma: **to choose suitable hydraulic oil, which means oil with suitable viscosity and temperature conditions.**

In order to decrease operating times and to reduce the power loss in pipes, elbows and various components (solenoid valves etc.), which the oil is to pass on its way to the actuator, the lowest possible viscosity is preferred, whereas the “highest possible” viscosity is preferable in order to protect pumps, solenoid valves and other movable mechanisms.

There are naturally technically and scientifically other conditions than the viscosity (e.g. the vapor pressure) which determine the lubricating characteristics of the oil and minimize the risk of pump cavitation, but based on experience a viscosity within the range 15 cSt. (min.) and 200 cSt. can comply with the above-mentioned conditions.

The choice of oil is not only a choice of viscosity, but also an evaluation of how cold and warm the oil can get during normal operation under different ambient temperatures (arctical versus tropical conditions).

The choice of oil type is customer’s responsibility as the oil is dependent on various conditions, such as pressure, temperature etc.

NOTE:

For a list of recommended brands and types of oil please see Product Data Sheet “Bettis Choice of Hydraulic Oil”.

3.8.1 Viscosity / Temperature Coefficient

The viscosity and the viscosity/temperature coefficient are of primary importance, as are the density and the pour point.

For a short time at start up, a viscosity of, $V_{\text{start}} \leq 1000 \text{ mm}^2/\text{s}$ may be permissible.

The operational limits of viscosity which must be guaranteed for full functionality of the system at 100% duty are:

$$V_{\text{operating}} = 15 - 200 \text{ mm}^2/\text{s}$$

For maximum efficiency and economy, the limits of viscosity are:

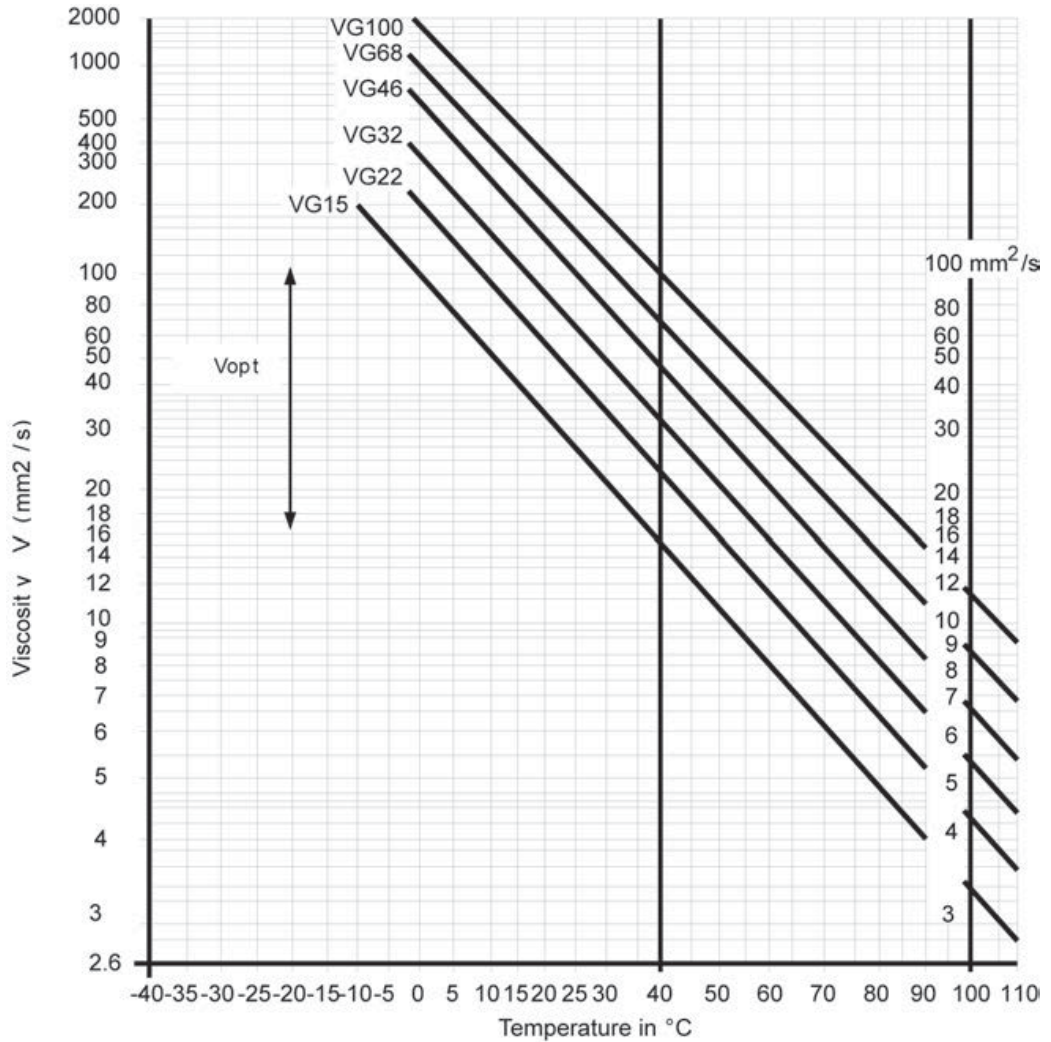
$$V_{\text{operating}} = 16 - 80 \text{ mm}^2/\text{s}$$

Incomplete lubrication (and associated friction and wear) starts to occur at:

$$V_{\text{min}} \geq 10 \text{ mm}^2/\text{s}$$

3.8.2 Selection Diagram

Figure 6



Selection of the viscosity grade is made on the basis of starting viscosity with ambient temperature (consider pour point where necessary) and optimum operating viscosity according to system and operating data. In case of operation for a long time at temperatures exceeding 70 °C, the oil will be broken down and thus lose its lubricating properties. In order to guarantee a long service life for the installation, a good and reliable filtration is necessary.

Section 4: BHH Mounting

4.1 BHH Mounted on Valve - ISO 5211

4.1.1 Preparations before Mounting

All O-rings and X-rings are laid in hydraulic oil before mounting.

Mounting of seals must be carried out in clean environment (no burrs, nicks and chips).

All O-rings / X-rings are replaced at service.

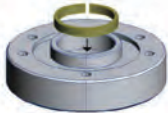

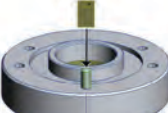

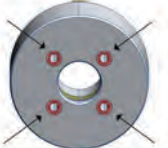
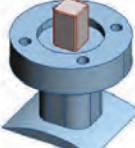
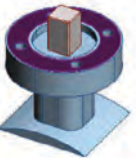
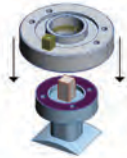
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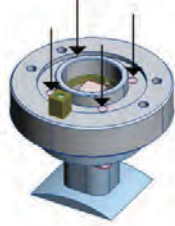
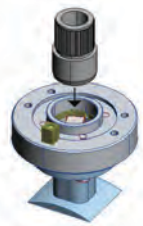
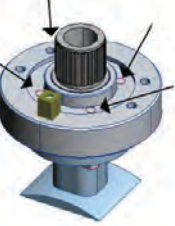
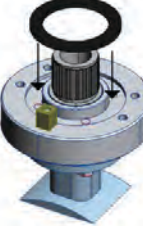



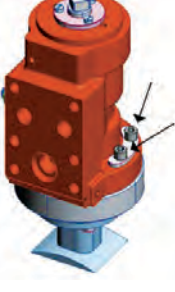

For placement and ID no., see assembly drawing.

⚠ CAUTION

At assembly of actuator on valve be aware to leave space enough for the adaptor between actuator and valve. This means that the actuator by itself can fall down on the intermediate flange, before tightening.

4.2 BHH Mounting on Butterfly Valve

Mounting BHH on Valve	
<p>1. Mount the bearing to fit the flange insert.</p> 	<p>2. Mount the pin.</p> 
<p>3. Mount the angle bearing.</p> 	<p>4. Clean the flange bottom.</p> 
<p>5. Mount the friction elements.</p> 	<p>6. Clean the valve flange.</p> 
<p>7. Apply fluid sealing.</p> 	<p>8. Mount the actuator flange.</p> 

Mounting BHH on Valve	
9. Mount the screws. Do not tighten. 	10. Mount the adapter. 
11. Tighten the screws. 	12. Mount the seal. 
13. Mount the actuator. 	14. Mount the banana washers and screws. Do not tighten. 
15. Adjust the butterfly valve disc. See "Adjusting the Valve Disc" on Section 5. 	16. Tighten the screw. 
17. Test the valve for tightness. 	

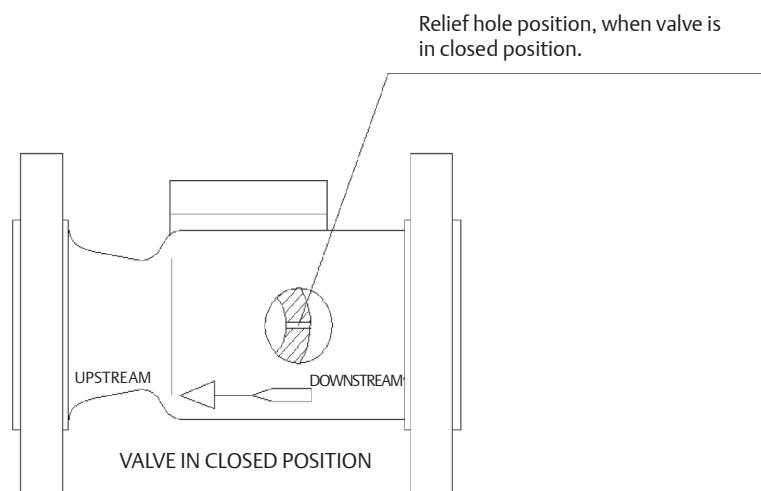
NOTE:

If using butterfly valves with vulcanized rubber please follow the instruction for "Adjusting the Valve Disc" on Section 5.

4.3 BHH Mounting on Ball Valve

1. The ball is turned into the position where the bore in ball and housing are in line.
2. The actuator is turned into fully open position.
3. The adapter is mounted on the valve stem.
4. The actuator is mounted on the valve, so that the indicator groove is following the valve bore best possible. The screw is tightened loosely against the banana washer.
5. Check that there is no gap between actuator and adaption flange.
6. Check that there is no gap between adaption flange and valve flange.
7. It has to be assured that there is proper contact in sealing area and around bolt areas.
8. The backlash between adapter and stem is absorbed by turning the actuator counter-clockwise and then tighten the adjusting screws.
9. Tighten all screws and operate the actuator about 10 times into closed and afterwards into open position to check that the stem does not seize. (Throttle speed!)
10. Check that the bore of the ball is in line with the bore of the housing.
11. If not so, the adjusting screws are adjusted until the bores are in line.
12. The adjustment shall always be completed with operation as under item 5 and afterwards a final check.
13. If it is doubtful whether the valve has sufficient covering in closed position, this can be checked as follows: The valve is operated into intermediate position, and the ball is greased close to the closing edge.
14. The valve is turned into closed position and then back into intermediate position. The distance, where the grease is scraped off, should be 2 - 3 mm. If it is shorter, please contact Emerson.
15. The screw is tightened against the banana washer, and the adjusting screws are tightened.

Figure 7



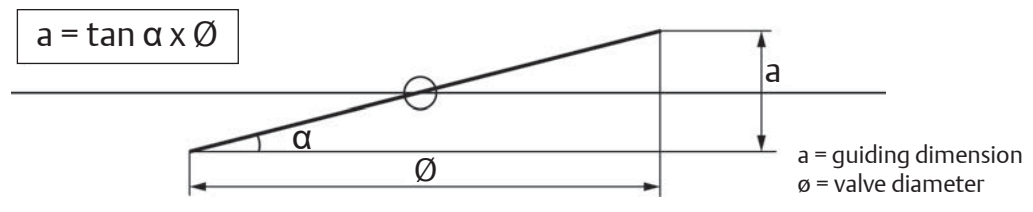
Section 5: Adjusting the Valve Disc

This instruction is applicable in connection with the mounting of actuators on butterfly valves with vulcanized rubber.

Guiding Dimensions and Criteria

The disc is adjusted according to the following guiding dimensions:

Figure 8



If possible, the guiding dimension "a" shall be observed, but a deviation of +0 to -25 % can be accepted.

5.1 Adjustment Procedure

The adjustment criteria for the valve disc can be found in the "Guiding Dimensions and Criteria".

1. The actuator is mounted on the valve, so that the indicator groove follows the disc. The nut/counter-nut is loosely tightened.
2. Check that there is no gap between actuator and adaption flange. It has to be assured that there is proper contact in sealing area and around bolt areas.
3. The rubber seat on the valve is soaped with water containing toilet soap.
4. The hydraulic pressure is increased to the actuator test pressure, and the stop screws/end stop is tightened.
5. The disc is opened (speed is throttled).
6. Nut/counter-nut is tightened.
7. The disc is opened and closed at 2/3 of the hydraulic working pressure of the actuator.
8. If the disc is askew, please contact Emerson.
9. After adjustment, the valve shall be opened, so that the disc is clear of the rubber.

5.1.1 Standard Opening / Closing Time for Butterfly Valves

Table 2.

Valve diameter (mm)	Open / closing time (s)
50	3 - 6
100	7 - 10
150	11 - 14
200	15 - 18
250	19 - 22
300	23 - 26
350	27 - 30
400	31 - 35
450	35 - 40
500	36 - 42
550	43 - 50
600	47 - 55
650	51 - 60
700	55 - 65
750	60 - 70
800	63 - 75

NOTE:

Actuators with LPU or LPUM might not correlate to the time stated in the table then use the Table 4 on Section 5.1.3 and Table 5 on Section 5.1.4.

5.1.2 Adjustment of Butterfly Valve “a” - measurement (mm)

Table 3.

\emptyset	The working pressure (also named system pressure, water pressure or differential pressure (Dp) over the disc) - see valve list (if the working pressure is not known – the setting for 0 - 6 bar is used)			
(mm)	over 0 – 6 bar	over 6 - 10 bar	over 10 - 16 bar	WORLD-VALVE 0 – 16 bar
50	3	2	1	2
65	3	2	1	2
80	4	3	1	2
100	5	3	2	2
125	7	4	2	4
150	8	5	3	4
175	9	6	3	4
200	10	7	3	4
250	13	9	4	5
300	16	10	5	5
350	18	12	6	5
400	21	14	7	5
450	24	16	8	8
500	26	17	9	8
600	31	21	10	8
700	37	24	12	10
800	42	28	14	10
1000	52	35	17	10
	$\alpha = 3^\circ$ (tan $\alpha = 0,052$)	$\alpha = 2^\circ$ (tan $\alpha = 0,035$)	$\alpha = 1^\circ$ (tan $\alpha = 0,017$)	

5.1.3 Opening and Closing Time for LPUM on Actuator

See Table 4 below for standard opening and closing times for LPUM on actuator.

Table 4.

Actuator Type	Standard opening time in second for LPUM-S or Standard opening and closing time in second for LPUM-D	Standard closing time in second for LPUM-S with ø0.4 mm blend	Closing time in second for LPUM-S with ø0.3 mm blend (only used in special cases)
BHH/F125	7 - 11	2 - 4	8
BHH/F250	11 - 20	4 - 7	15
BHH/F500	24 - 36	8 - 12	30

5.1.4 Opening and Closing Time for LPU on Actuator

See Table 5 below for possible opening and closing times for LPU on actuator.

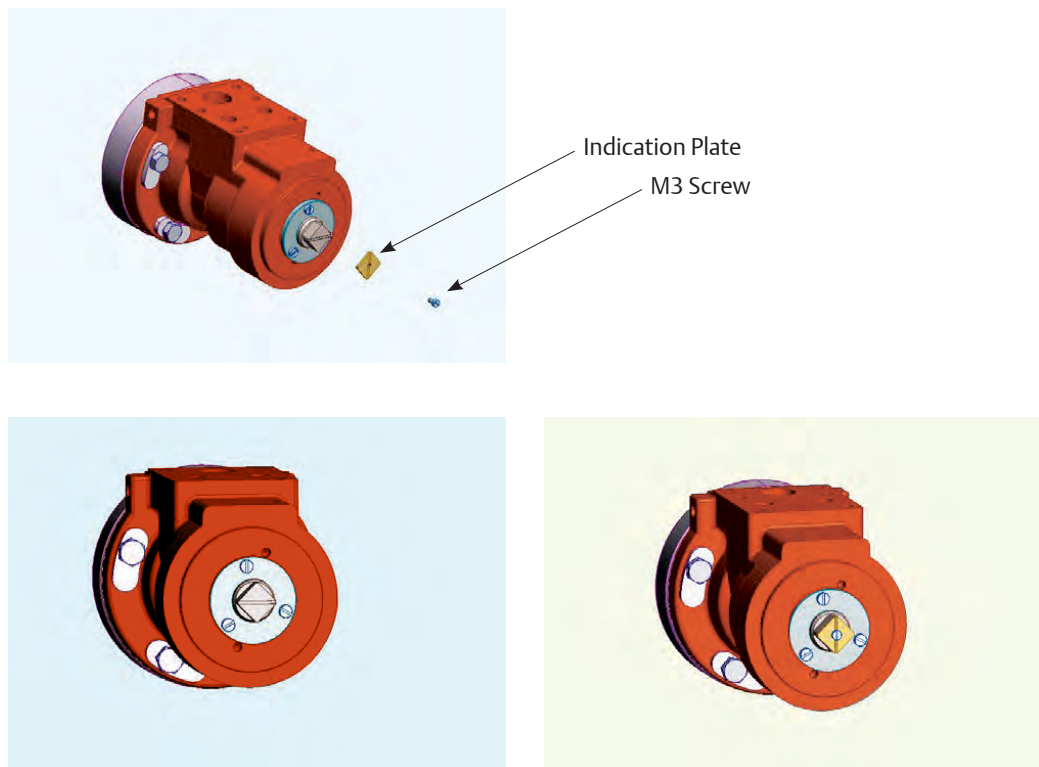
Table 5.

Actuator type	Open / closing times for LPU-D
BHH 125	2 – 7
BHH 250	3 – 12
BHH 500	6 – 25
BHH 1000	13 – 52
BHH 2000	24 – 96
BHH 4000	48 – 192
BHH 8000	96 – 384
BHH 16000	186 – 744








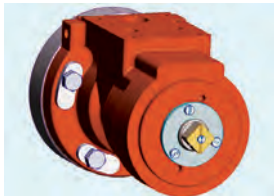
Section 6: Mounting 90° Turn Set (Indication Plate)

The purpose of the 90° indicator Turn Set is to turn the position groove in the position shaft 90°. It is used when the BHH/BHHF actuator is oriented so that the original indicator groove would indicate opposite of the correct.

Figure 9



BHH without indicator part (left) and BHH with indicator part turned 90 (right).

Mounting of 90° Indicator Turn Set	
<p>1. Start with placing the drill in the hole in the jig as shown in the picture. The hole functions as presetting of the drilling length.</p> 	<p>2. Place the drill socket on the drill as shown on the picture. The drill socket must be as closely as possible to the jig when it is tightened.</p> 
<p>3. The jig is mounted on the actuator.</p> 	<p>4. Drill until the socket reaches the jig. (Depth of the hole 7.5 mm)</p> 
<p>5. The thread expander is mounted in the hole in the shaft.</p> 	<p>6. Place the enclosed pin in the hole of the expander. Knock the pin slightly to fix the thread expander.</p> 
<p>7. Thread expander mounted in shaft.</p> 	<p>8. The indicator is placed on the position shaft, so that tongue and groove fit, and the M3 screw is mounted.</p> 

NOTE:

Actuators manufactured from 2015 and forward are delivered with M3-tread in shaft end.

Section 7: Flushing Instruction

This instruction describes the guidelines that must be followed in order to assure that a system is flushed to a degree that complies with the cleanliness class required by Emerson in order to assure that the system components will work satisfactorily.

⚠ CAUTION

Flushing through Bettis components are not allowed!

All Bettis components are cleaned before shipment and therefore they do not require flushing. Some types of components will be damaged if system flushing is done through these components and other components will make flushing impossible because flushing cannot be done through them.

7.1 Flushing Procedure

Piping system must be flushed before it is connected to Bettis components. In the event that this is not possible, all Bettis components must be by-passed during flushing.

Each individual customer (yard) is free to choose which flushing method that is preferred to use, as long as one of the internationally recognized flushing standards is used.

⚠ CAUTION

Do not flush through Bettis equipment!
Flushing through Bettis equipment might damage parts of the equipment and induce withdrawal of the Guarantee!

7.1.1 Flushing Unit

A separate flushing unit with its own flushing oil must be used for the flushing.

The purpose for this is:

1. To check that A and B are mounted correctly on the connection block.
2. To remove particles, where it is difficult to flush, from the pipes, e.g. in tanks and similar. This especially applies to sand, after sandblasting.

7.1.2 Flushing with Nitrogen

Flushing with nitrogen is carried out at approx. 20 - 25 bar for about 1/2 - 1 minute, dependent on the pipe length.

7.1.3 Flushing with Oil

Start the flushing unit and at return of the oil, shut off the return pipe with the ball valve. Then carry out a pressure test on the pipes. (System pressure 1.5 - if not otherwise stated).

During pressure test possible leakages can be detected. Hereafter flushing can be carried out, taking the following factors into consideration: flow in l/min., viscosity in cSt., pipe length, inside pipe diameter. The stated factors can be read from the attached list.

Oil samples can periodically be taken of the return pipe at the flushing unit, and thus a time schedule on the flushing time according to given pipe lengths can quickly be made. If the oil sample can be approved according to supplier's specification, the pipe connections at actuator and manifold can be re-established.

Repeat the procedure on all units connected to the hydraulic system.

Reference

See Instruction SI 0001-5E04; "Flushing, Remote Valve Control System" attached to the Appendix part in this manual.

Section 8: Operating

8.1 Operating Restriction

Please observe specific rules and demands from the classification societies and authorities concerning operating pressure and temperature range.

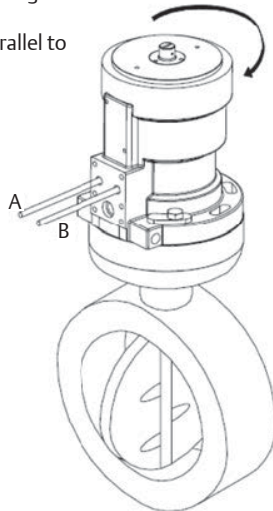
(Example - ABS: Max. operating pressure = 20% of burst pressure).

For extreme cycle speeds, loads and lifetime expectations please consult manufacturer.

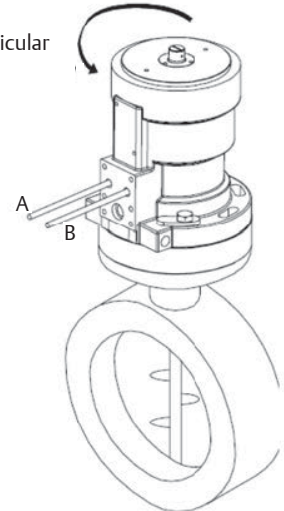
8.2 Turning Direction in Relation to “A” and “B”

Figure 10

Pressure on “A” -
Indicator slot is moving clockwise -
Valve closed and
indicator slot is parallel to
mounting area.



Pressure on “B” -
Indicator slot is moving counter clockwise -
Valve open and
indicator slot is perpendicular
to the mounting area.



8.3 Emergency Operation of BHH Actuators

Oil pressure loss necessitates emergency operation of the actuator. The emergency operation can be carried out by hand pump for all BHH models and alternatively by key/adjustable spanner for BHH 125 to BHH 500.





NOTE:

Emergency operation by means of hand pump unit is solely allowed at 0 bar hydraulic in port A and B.

NOTE:

Stationary hand pumps are also available in different types for emergency operation.

8.3.1 Opening by Emergency Operation Key BHH 125 to BHH 500

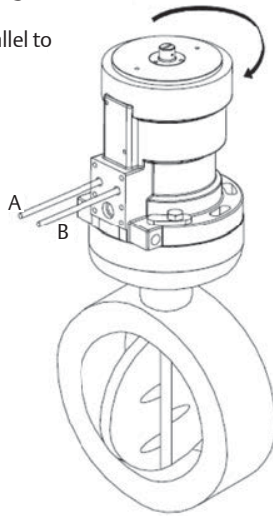
Emergency operation of double acting actuator with key	
Actuators that can be opened by emergency operation actuator: BHH 125 - BHH 500	
1. Open the crossover valve by turning counter clockwise.	
	
2. Use the emergency operation key on the actuator.	
	
3. Open crossover valve at the actuator and turn the key counter clockwise to open valve and clockwise to close valve.	4. After emergency operation by key the crossover valve is closed.

8.3.2 Operating by Portable Hand Pump BHH 125 to BHH 32000

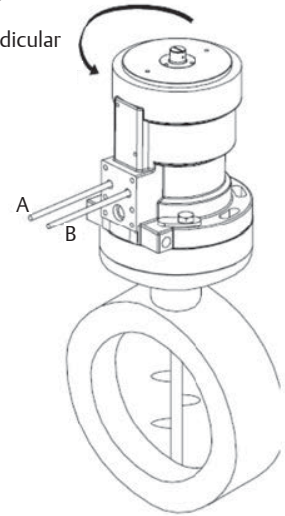
1. Connect the hoses, via quick connections, A to port A and B to port B.
2. Select on the hand pump whether to operate towards open or closed.
3. Pump with the hand pump until the required position is reached.

Figure 11

Pressure on "A" -
Indicator slot is moving clockwise -
Valve closed and
indicator slot is parallel to
mounting area.



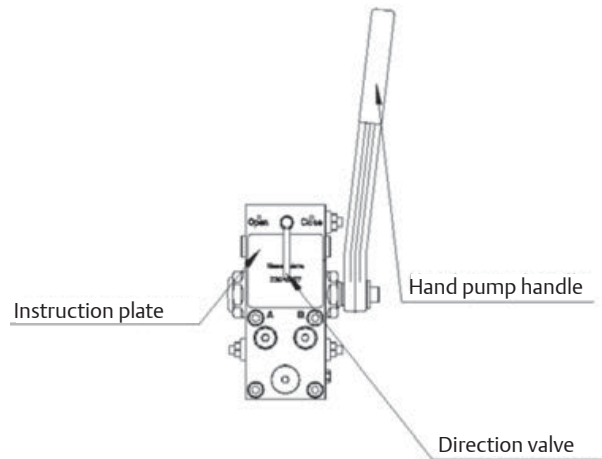
Pressure on "B" -
Indicator slot is moving counter clockwise -
Valve open and
indicator slot is perpendicular
to the mounting area.



8.3.3 Operating by Directed Mounted Hand Pump

1. Turn direction valve to “OPEN” or “CLOSE”.
2. Operate hand pump.
3. The valve will be stay in position until operated with hand pump again or by remote control.

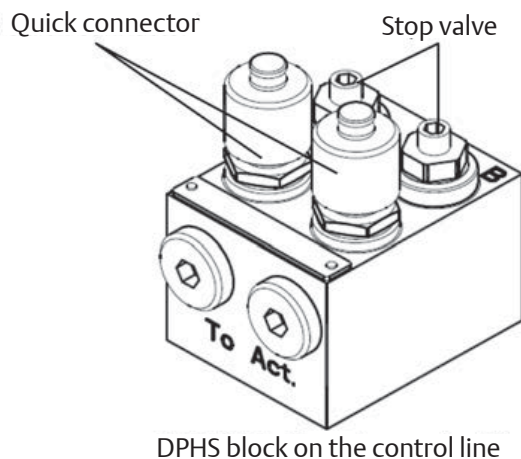
Figure 12



8.3.4 Operating by Portable Hand Pump Submerged Actuator

1. Close the stop valves.
2. Connect the hoses, via quick connections, A to port A and B to port B.
3. Select on the hand pump whether to operate towards open or closed.
4. Pump with the hand pump until the required position is reached.
5. After operation, open the stop valves.

Figure 13



Section 9: Service and Maintenance

The BHH actuator requires little to no maintenance during its life cycle time.

Section 10: BHH Dismounting

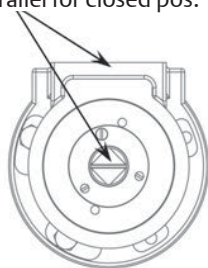
10.1 BHH Mounted on Butterfly Valve

10.1.1 Preparations before Dismounting

Before disassembly the actuator has to be emptied from the oil. This is done by turning the actuator a few times into open and closed positions. On small BHH sizes a key is used and on large actuators compressed air is used for turning the actuator. Before disassembly the actuator is turned into closed position, i.e. the groove on the shaft has to be parallel to the port surface as shown in the pictures below.

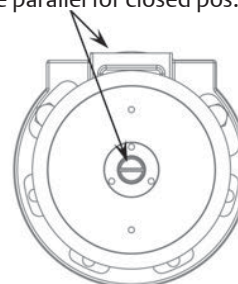
Figure 14

Shall be parallel for closed pos.

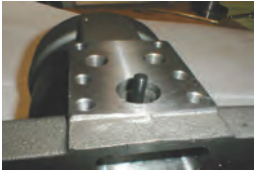
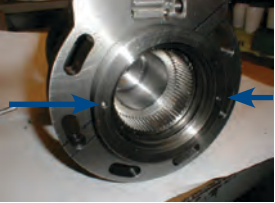











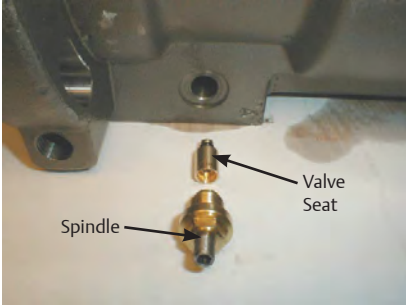
BHH 125 - BHH 500 are operated by key.

Shall be parallel for closed pos.



BHH 1000 - BHH 32000 are operated by compressed air.

Dismounting BHH	
<p>1. Prepare the actuator as stated in "Preparations before Dismounting" on Section 10.1.1.</p>	<p>2. Dismount the yoke.</p> 
<p>3. Dismount the bottom cover. Use special tools or 2 pins fitting the holes in the bottom part. Turn counter-clockwise to loosen the bottom part.</p> 	<p>4. The spline shaft including the thrust gage is dismantled.</p> 
<p>5. The spline shaft is dismantled by knocking the position shaft with a nylon hammer. The spline shaft and the housing are to be marked.</p> 	<p>6. The spline shaft is dismantled.</p> 
<p>7. For BHH 1000 to 32000 there might be a spline connection to be removed as well. Otherwise remove screws or Seeger ring (locking ring).</p> 	<p>8. The top part is dismantled. Use special tools or 2 pins fitting the holes in the top part. Turn clockwise to loosen the top part.</p> 
<p>9. Remove the top part to be able to replace the O-ring.</p> 	<p>10. Dismount the piston. The piston can be dismantled with special tools or by knocking the bottom with a cylindrical pipe.</p> 




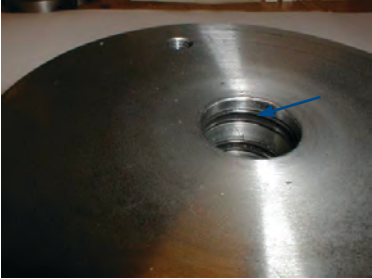
Dismounting BHH	
<p>11. Turn the piston counter-clockwise.</p> 	<p>12. Knock in the indicated area to dismount the piston.</p> 
<p>13. The piston is dismounted.</p> 	<p>14. Dismount the cross-over valve.</p> 
<p>15. The spindle shall be tightened for the valve seat to be drawn out at dismounting.</p> <p>Note: If the valve seat does not come out the first time, the housing is mounted again and the spindle is tightened whereupon the housing is unscrewed together with the valve seat.</p> 	

Section 11: BHH Re-mounting





See assembly drawing and parts list for identification number.

11.1 Preparations of Seals before Mounting






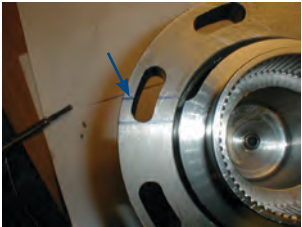
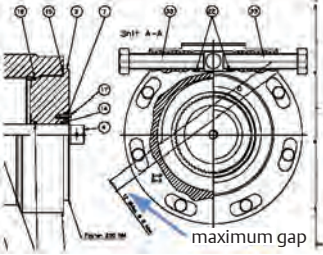

All O-rings and X-rings are laid in hydraulic oil before mounting.
Mounting of seals must be carried out in clean environment (no burrs, nicks and chips).
All O-rings / X-rings are replaced at service.

Mounting of Seals	
1. Mount O-ring on position shaft.	
	
Mounting of Seals on Piston	
1. The outer X-rings are mounted on the piston.	2. Mount the lower inner X-ring.
	
3. Mount the upper inner X-ring.	
	

Mounting of Seals	
Mounting of Seals on Top Part	
<p>1. The inner X-ring is mounted in the top part.</p> 	<p>2. The outer O-ring is mounted on the top part.</p> 
<p>3. The O-ring is mounted on the top part.</p> 	<p>4. Top part cover is mounted and screws are tightened. Screws in top cover are tightened with 2 Nm.</p> 
Mounting of Seals in Bottom Cover and Housing	
<p>1. Mount the X-ring in bottom part.</p> 	<p>2. Mount the X-ring in housing.</p> 
Mounting of Cross-over Valve in Actuator Housing	
<p>1. The valve seat is lubricated with a sufficient amount of oil on the O-ring before mounting.</p> 	<p>2. Mount the valve seat with a mounting tool sized to fit the smallest hole not to damage the seat.</p> 
<p>3. The seat is pushed to stop.</p> 	<p>4. The Stop valve is mounted in the housing by means of a 13 mm key (20 Nm). The spindle must be unscrewed before mounting the valve.</p> 
<p>5. The spindle is screwed in (3 Nm) to close between port A & B.</p> 	

Mounting of Piston in Actuator Housing	
<p>1. Mount according to disassembly marks. Piston is mounted and turned until the helical spline is in mesh. The piston is turned clockwise.</p> 	<p>2. Mounting tools are used for pressing home the piston. The piston can possibly be knocked in with a cylindrical pipe, but the helical spline must then be in mesh before knocking.</p> 
<p>3. Piston in bottom position.</p> 	<p>4. The top part is mounted by turning counter clockwise (tightening torque stated on the assembly drawing).</p> 

Mounting of Spline Shaft and Positioning Shaft	
<p>1. The serrated lock washer is mounted in the positioning shaft (can possibly be fixated with a drop of Loctite). Note: Always use a new lock washer.</p> 	<p>2. The positioning shaft is mounted in the spline shaft according to the disassembly marks. New parts have to be positioned according to the assembly drawing. The shaft must be pressed home in the spline shaft before being screwed together.</p> 
<p>3. Screw is wetted with Loctite 542 and mounted.</p> 	<p>4. See tightening torque on assembly drawing.</p> 
<p>5. The shaft cam is lubricated with a thin layer of grease.</p> 	

Mounting of Spline Shaft and Positioning Shaft	
Specific Information for B1 version	
<p>The B1 version actuators have been equipped with a spline connection in BHH 1000 to BHH 16000. BHH 125 to 500 are assembled with screws and BHH 1000 to 16000 are assembled with locking ring.</p>	
<p>6. The new spline connection (B1):</p> 	<p>7. The larger actuators are locked with a seeger ring.</p> 
<p>8. Positioning shaft, mounted in splined shaft ready for Seeger ring mounting.</p> 	<p>9. The positioning shaft is mounted in the splined shaft and then the seeger ring is mounted.</p> 
Assembled spline and positioning shaft are positioned in the housing with the piston pressed home	
<p>10. The housing is marked, see dimensions on assembly drawing. If the housing is marked at disassembly, the marks are used for assembly.</p> 	<p>11. Spline shaft is mounted. The top of the cam is turned to the maximum line, then turn counterclockwise until the splines are in mesh and the shaft is pushed into place (keep within MINIMUM dimensions - see drawings).</p> 
	<p>12. Splined shaft placed in housing.</p> 

Greasing of Thrust Gage

The quantity of grease needed is stated on the assembly drawing.
The bearing is greased on each side with half of the described quantity.

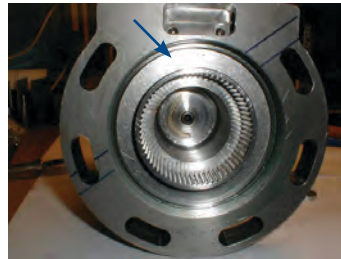
1. Firstly the inner thrust washer is mounted.



2. The Thrust gage is mounted with the greased side downwards and the other side is greased with the remaining grease.

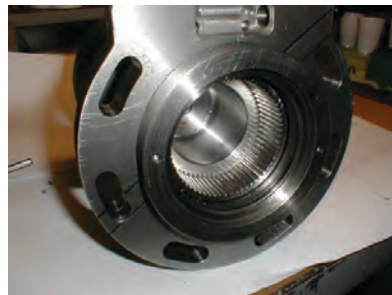


3. The last thrust bearing is mounted.

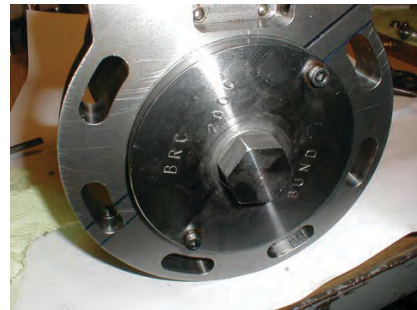


Mounting of Bottom Part and Cover

1. Mount the bottom cover part, turn clockwise.



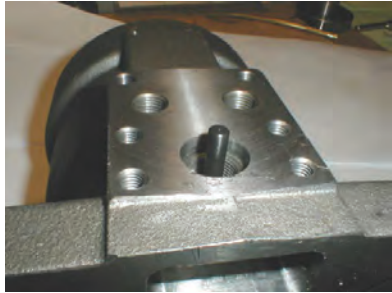
2. The bottom cover is tightened with special tools.
Tightening torque is stated on drawing.
If special tools are not available, pins fitting into the holes are to be used.



3. When the bottom cover has been tightened, it must be positioned below the actuator housing. This is check with a straightedge.

Mounting of Yoke

1. Yoke must easily fit into the hole.



2. Mount the Yoke.



Final Test

1. The assembled actuator shall be able to operate with air, approx. 3 bar. Check that it is operating 90°.



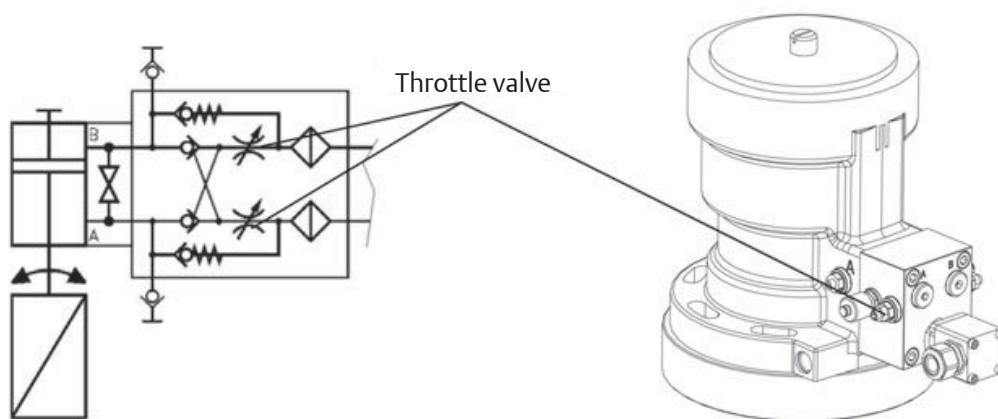
2. Finally, the actuator shall be tested hydraulically.

Section 12: Valve Traveling Time Adjustment

Lack of de-airing can cause indication errors e.g. delays in feedback and furthermore cause an unsteady operation sequence. In order to prevent these phenomena, first of all a perfect de-airing must be carried out according to manufacturer and yard recommendations.

To get exact adjustment, the control of valve speed should be carried out by the throttle valve of actuator. The throttle valve allows regulation of flow in any directions ("A" or "B"). Counter-clockwise makes the speed faster, or vice-versa. Use a 4 mm Allen key.

Figure 15



12.1 Operating Time for Valve Open/Closed

Following table shows the traveling time of opening and closing of hydraulic remote controlled valve, which has to be kept for protecting the valve from bad effect caused by quick opening and closing the valve.

Quick closing valve and the valve which is necessary to be quick acting by special circumstance and rule requirement shall be excluded in these valve open/shut time instruction. It's general that remotely operated valves should be operated in settled ranges of times. But the valve operating time is influenced by, the length of piping, oil characteristic and actual ambient temperature around sailing area. This concludes that operating time might vary with different temperature variations.

12.1.1 Valve Operating Time Table for Rotary Actuator (Quarter-Turn)

Table 6.

Valve Size		Recommended operating time (seconds)	Valve Size		Recommended operating time (seconds)
A	B		A	B	
≤100A (4")		< 10	550	22	22 - 66
125	5	5 - 15	600	24	24 - 72
150	6	6 - 18	650	26	26 - 78
200	8	8 - 24	700	28	28 - 84
250	10	10 - 30	750	30	30 - 90
300	12	12 - 36	800	32	32 - 96
350	14	14 - 42	850	34	34 - 102
400	16	16 - 48	900	36	36 - 108
450	18	18 - 54	1000	40	40 - 120
500	20	20 - 60	> 1000 (40")		> 120

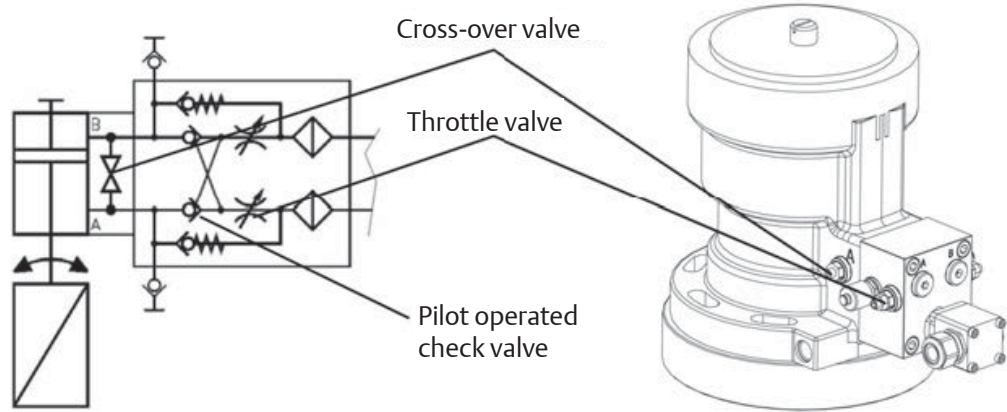
1. The operating time recommended in this table is made based on 1 to 3 seconds per inch (not minimum or maximum time, this mean variable tolerances) under normal ambient temperature.

NOTE:

When the operating time is set at the actual ambient temperature, it may not correlate with the set time in the table due to the viscosity characteristics at different temperatures.

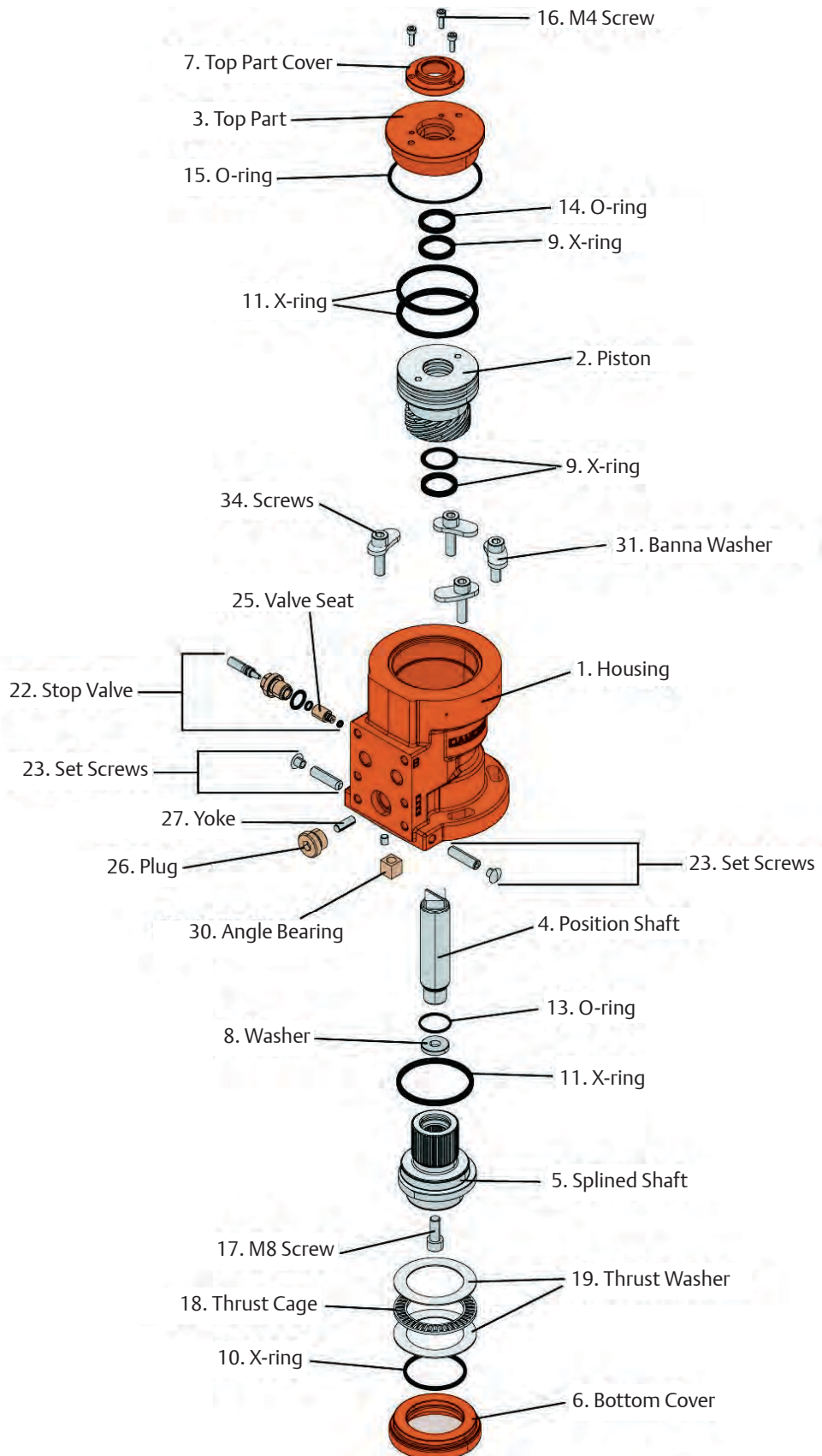
Section 13: Troubleshooting

Figure 16



If fault	Then check
Actuator (valve) is not operating.	Power unit.
	Solenoid valve in solenoid valve cabinet.
	Throttle valve on the actuator.
	Cross-over valve on the actuator (it is normally closed). Check pressure at actuator by mean of quick connectors.
Actuator (valve) does not keep the last order position.	Pilot operated check valve on the actuator.
Actuator (valve) traveling time is too fast or too slow.	Pilot operated check valve on the actuator. Note: When the operating time is set at the actual ambient temperature, it may fluctuate with the operating viscosity which is changeable according to operating temperature.
Actuator (valve) is not fully closed.	That the power unit keeps 135 bar.
	Cross-over valve on the actuator.
	Butterfly valve.

Section 14: Spare Parts BHH 125



14.1 Parts, Spare and Material List for BHH 125

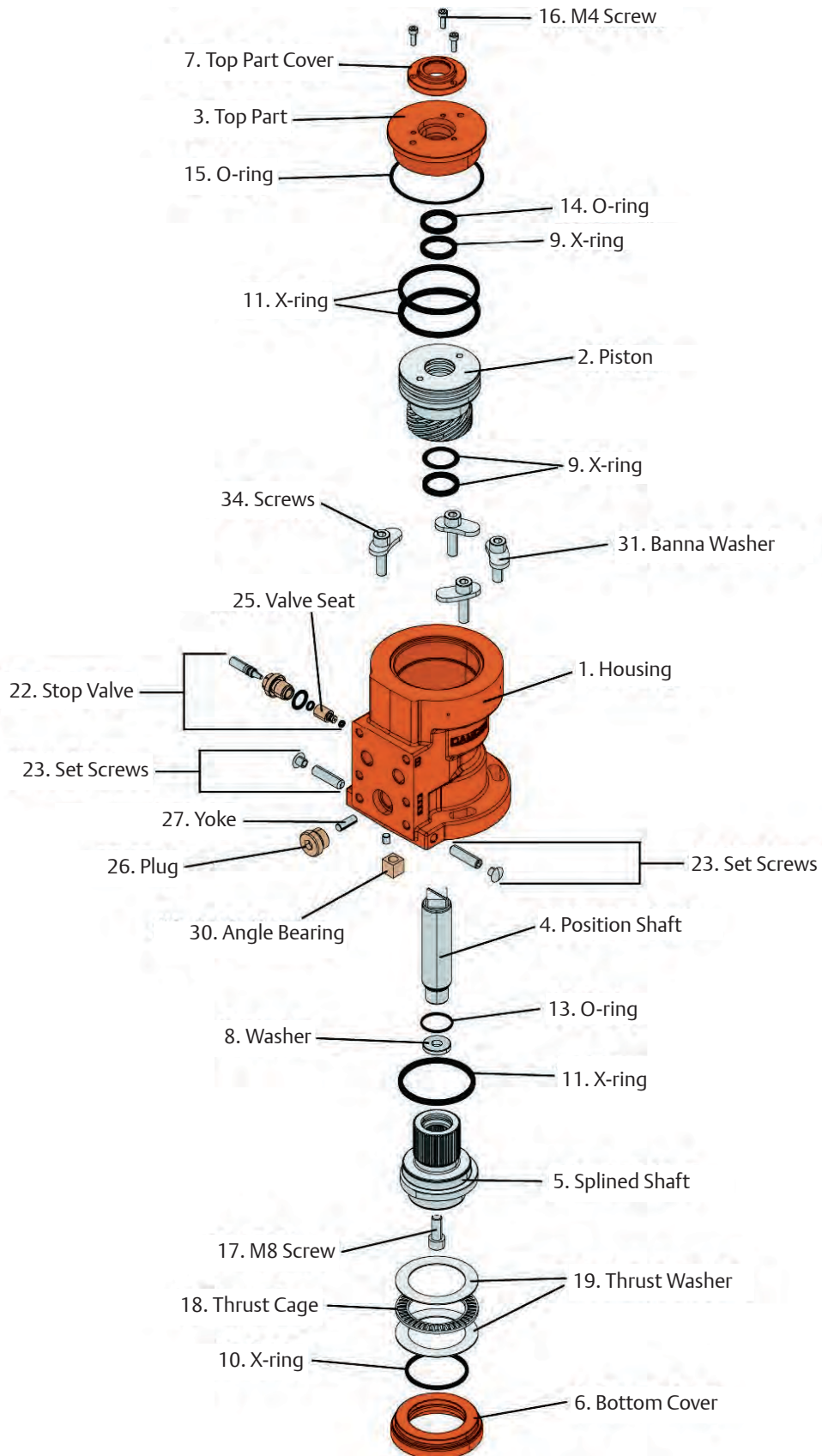
PARTS-, SPARE & MATERIAL LIST				Emerson Automation Solutions Actuation Technologies	
Component: type & version ACTUATOR BRC 125 B1				19200 Northwest Freeway Houston TX 77065 USA T +1 281 477 4100	
Material no.: 160N1097					
Alt.: 1					
Notes: All items with stated material number can be purchased as spare parts. When ordering spare parts: please state material number.				Page 1 of 2	
Document numbers referred to: 160N9050					
Posnr	Material	Description/ Compound	CTM No.	Quantity	Unit
0001		HOUSING BRC 125		1,000	PC
0002		PISTON BRC 125		1,000	PC
0003	160N0625	TOP PART BRC 125		1,000	PC
0004	160N0781	POS.SHAFT BRC 125 B1		1,000	PC
0005	160N0782	Splined shaft BRC 125 B1		1,000	PC
0006	160N0628	Bottom cover BRC 125		1,000	PC
0007	160N0840	TOP PART COVER-BRC 125 + BRCP		1,000	PC
0008	160N0632	WASHER BRC 125		1,000	PC
0009		X-RING Ø18,72X2,62		3,000	PC
0010		X-RING Ø36.17*2.62		1,000	PC
0011		X-RING Ø42.52*2.62		1,000	PC
0012		X-RING Ø45.69*2.62		2,000	PC
0013		O-RING Ø18,1X1,6		1,000	PC
0014		O-RING Ø18,72X2,62		1,000	PC
0015		O-RING Ø56,82X2,62		1,000	PC
0016	251-1529	SCREW M4X12		3,000	PC
0017	251-0081	SCREW M6X16		1,000	PC
0018	390-0007	THRUST CAGE D35		1,000	PC

Printed 12.08.2015

PARTS-, SPARE & MATERIAL LIST			Emerson Automation Solutions Actuation Technologies		
Component: type & version ACTUATOR BRC 125 B1			19200 Northwest Freeway Houston TX 77065 USA T +1 281 477 4100		
Material no.: 160N1097					
Alt.: 1					
			Page 2 of 2		
Refnr	Material	Description/ Compound	CTM No.	Quantity	Unmsr
0019	390-0107	THRUST WASHER D35		2,000	PC
0020		SEALING PLUG 5/4,3X5,5		1,000	PC
0022	160G2280	STOP VALVE D4		1,000	PC
0023		NAME PLATE FOR BRC 125 B1 160N1097		1,000	PC
0024		RIVET D1,9X5		2,000	PC
0025	160N1049	VALVE SEAT		1,000	PC
0026	160G5044	PLUG 3/8 INCH WG		1,000	PC
0027	160B4500	YOKE F. DPI BRC 125 - 250, L=18,0		1,000	PC
	160N1082	PAINT PLUG 1/4 INCH F.BRC		2,000	PC
SPARE	----->	160N1259 Set of seals for BRC 125 POS. 9,10,11,12,13,14,15,25,33.		1,000	PC
INFO	----->	160N1169 COMMON PART 125 POS. 30,31,32,33,34,35,36.		1,000	PC
INFO	----->	160N1193 COMMON PART BRC/F 125 STAINLESS Pos. 30, 31, 32, 33, 34, 35, 36		1,000	PC
INFO	----->	INSTRUCTION 160R2174-2176-2178		1,000	PC

Printed 12.08.2015

Section 15: Spare Parts BHH 250



15.1 Parts, Spare and Material List for BHH 250

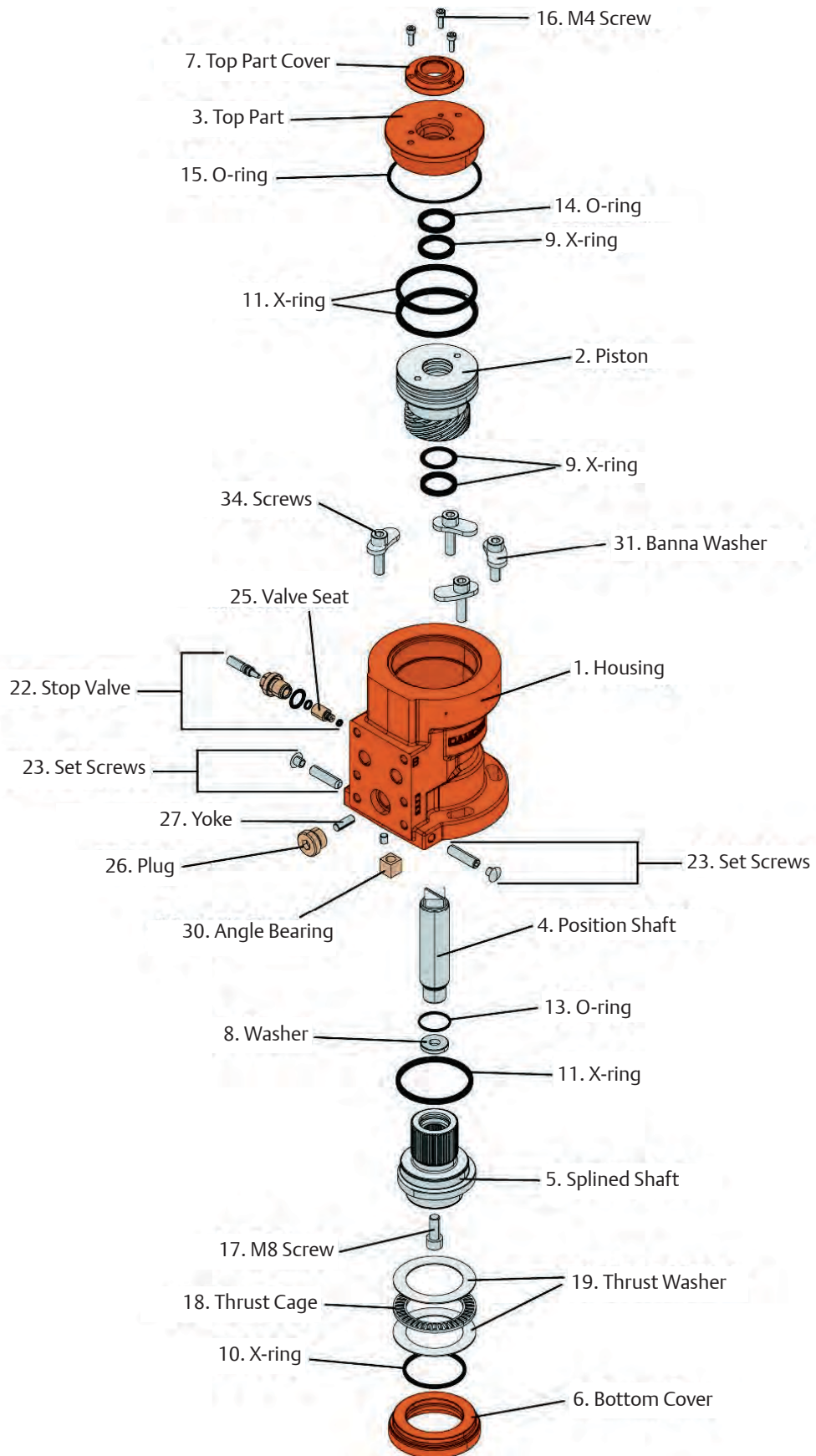
PARTS-, SPARE & MATERIAL LIST				Emerson Automation Solutions Actuation Technologies	
Component: type & version ACTUATOR BRC 250 B1				19200 Northwest Freeway Houston TX 77065 USA T +1 281 477 4100	
Material no.: 160N1098					
Alt.: 1					
Notes: All items with stated material number can be purchased as spare parts. When ordering spare parts: please state material number.				Page 1 of 2	
Document numbers referred to: 160N9046					
Posnr	Material	Description/ Compound	CTM No.	Quantity	Unit
0001		HOUSING BRC 250		1,000	PC
0002		PISTON BRC 250		1,000	PC
0003	160N0551	TOP PART BRC 250		1,000	PC
0004	160N0783	POS.SHAFT BRC 250 B1		1,000	PC
0005	160N0784	Splined shaft BRC 250 B1		1,000	PC
0006	160N0557	Bottom cover BRC 250		1,000	PC
0007	160N0841	TOP PART COVER BRC 250		1,000	PC
0008	160N0559	WASHER BRC 250		1,000	PC
0009		X-RING Ø23,39X3,53		3,000	PC
0010		X-RING Ø45.69*2.62		1,000	PC
0011		X-RING Ø56,75*3,53		3,000	PC
0013		O-RING Ø23,52X1,78		1,000	PC
0014		O-RING Ø23,4X3,53		1,000	PC
0015		O-RING Ø69,52*2.62		1,000	PC
0016	251-1529	SCREW M4X12		3,000	PC
0017	251-0103	SCREW M8X20		1,000	PC
0018	390-0009	THRUST CAGE D45		1,000	PC
0019	390-0109	THRUST WASHER D45		2,000	PC

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PARTS-, SPARE & MATERIAL LIST				Emerson Automation Solutions Actuation Technologies	
Component: type & version ACTUATOR BRC 250 B1				19200 Northwest Freeway Houston TX 77065 USA T +1 281 477 4100	
Material no.: 160N1098					
Alt.: 1					
				Page 2 of 2	
Refnr	Material	Description/ Compound	CTM No.	Quantity	Unmør
0021		SEALING PLUG D6/5.3X6.5		1,000	PC
0022	160G2280	STOP VALVE D4		1,000	PC
0023		NAME PLATE FOR BRC 250 B1 160N1098		1,000	PC
0024		RIVET D1,9X5		2,000	PC
0025	160N1049	VALVE SEAT		1,000	PC
0026	160G5044	PLUG 3/8 INCH WG		1,000	PC
0027	160B4500	YOKE F. DPI BRC 125 - 250, L=18,0		1,000	PC
	160N1082	PAINT PLUG 1/4 INCH F.BRC		2,000	PC
SPARE	----->	160N1260, SET OF SEALS FOR BRC 250 POS. 9,10,11,13,14,15,25,33.		1,000	PC
INFO	----->	160N1170 COMMON PART BRC 250 POS. 30,31,32,33,34,35,36.		1,000	PC
INFO	----->	160N1194 COMMON PARTS BRC 250 STAINLESS POS. 30,31,32,33,34,35,36.		1,000	PC

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Section 16: Spare Parts BHH 500



16.1 Parts, Spare and Material List for BHH 500

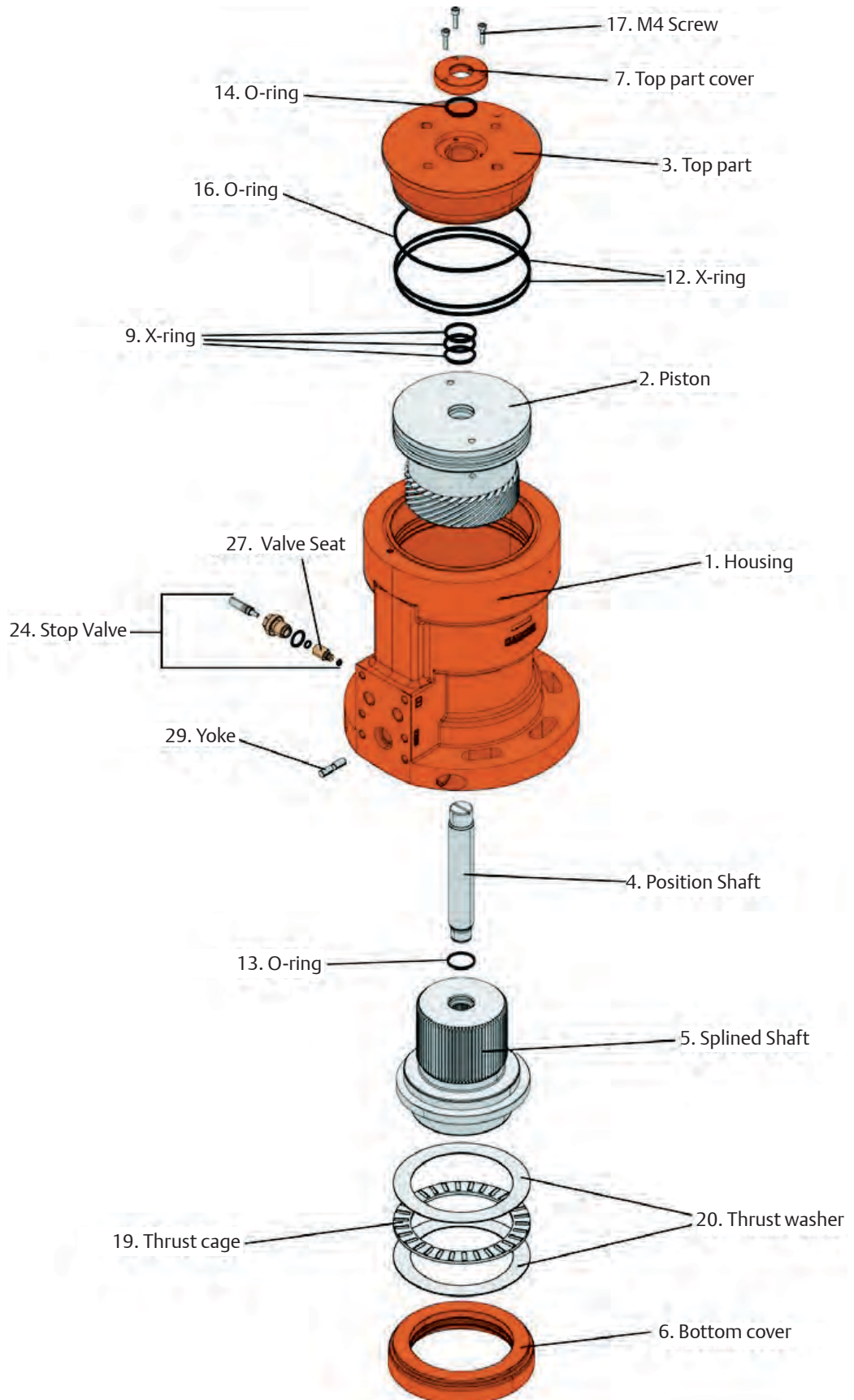
PARTS-, SPARE & MATERIAL LIST				Emerson Automation Solutions Actuation Technologies	
Component: type & version ACTUATOR BRC 500 B1				19200 Northwest Freeway Houston TX 77065 USA T +1 281 477 4100	
Material no.: 160N1099					
Alt.: 1					
Notes: All items with stated material number can be purchased as spare parts. When ordering spare parts: please state material number.				Page 1 of 2	
Document numbers referred to: 160N9047					
Posnr	Material	Description/ Compound	CTM No.	Quantity	Unit
0001		HOUSING BRC 500		1,000	PC
0002		PISTON BRC 500		1,000	PC
0003	160N0583	TOP PART BRC 500		1,000	PC
0004	160N0785	POS.SHAFT BRC 500 B1		1,000	PC
0005	160N0786	Splined shaft BRC 500 B1		1,000	PC
0007	160N0842	TOP PART COVER BRC 500		1,000	PC
0008	160N0596	WASHER BRC 500		1,000	PC
0009		X-RING Ø31,34X3,53		3,000	PC
0010		X-RING Ø55,25*2,62		1,000	PC
0011		X-RING Ø63.09*3.53		1,000	PC
0012		X-RING Ø75.79*3.53		2,000	PC
0013		O-RING Ø30.3*2.4		1,000	PC
0014		O-RING Ø31,34X3,53		1,000	PC
0015		O-RING Ø88,57X2,62		1,000	PC
0016	251-1529	SCREW M4X12		3,000	PC
0017	251-0106	SCREW M8X30		1,000	PC
0018	390-0011	THRUST CAGE D55		1,000	PC
0019	390-0111	THRUST WASHER D55		2,000	PC

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PARTS-, SPARE & MATERIAL LIST				Emerson Automation Solutions Actuation Technologies	
Component: type & version ACTUATOR BRC 500 B1			19200 Northwest Freeway Houston TX 77065 USA T +1 281 477 4100		
Material no.: 160N1099					
Alt.: 1					
				Page 2 of 2	
Refnr	Material	Description/ Compound	CTM No.	Quantity	Unmsr
0021		SEALING PLUG D6/5.3X6.5		1,000	PC
0022	160G2280	STOP VALVE D4		1,000	PC
0023		NAME PLATE FOR BRC 500 B1 160N1099		1,000	PC
0024		RIVET D1,9X5		2,000	PC
0025	160N1049	VALVE SEAT		1,000	PC
0026	160G5044	PLUG 3/8 INCH WG		1,000	PC
0027	160B4501	YOKE F. DPI BRC 500, L=24,50		1,000	PC
	160N1082	PAINT PLUG 1/4 INCH F.BRC		2,000	PC
SPARE	----->	160N1261, SET SEALS FOR BRC 500 B1 POS.9,10,11,12,13,14,15,25,33.		1,000	PC
INFO	----->	160N1171 COMMON PART BRC 500 POS.30,31,32,33,34,35,36.		1,000	PC
INFO	----->	160N1195 COMMON PARTS BRC 500 STAINLESS POS.30,31,32,33,34,35,36.		1,000	PC

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Section 17: Spare Parts BHH 1000



17.1 Parts, Spare and Material List for BHH 1000

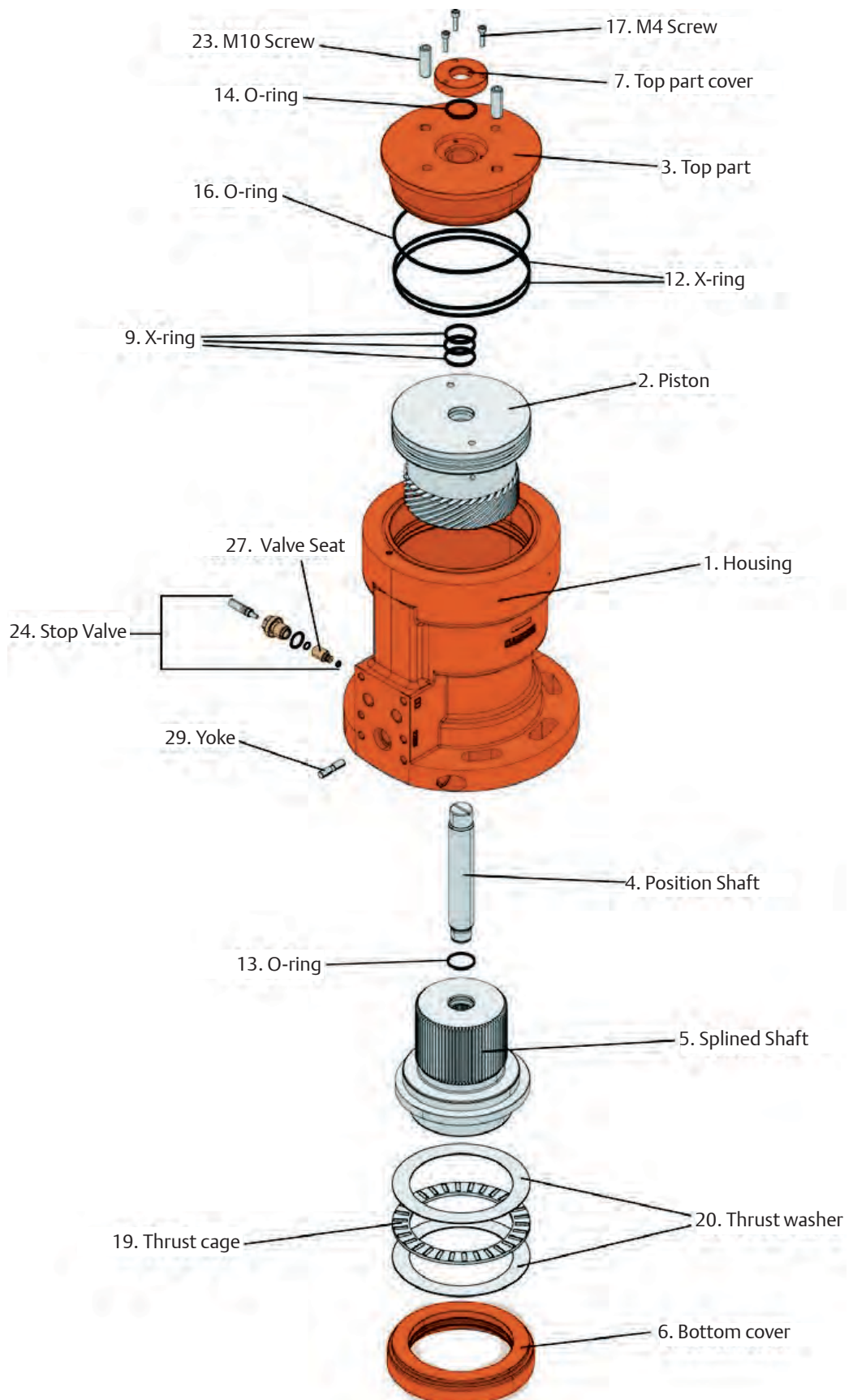
PARTS-, SPARE & MATERIAL LIST				Emerson Automation Solutions Actuation Technologies	
Component: type & version ACTUATOR BRC 1000 B1				19200 Northwest Freeway Houston TX 77065 USA T +1 281 477 4100	
Material no.: 160N1100					
Alt.: 1					
Notes: All items with stated material number can be purchased as spare parts. When ordering spare parts: please state material number.				Page 1 of 2	
Document numbers referred to: 160N9048					
Posnr	Material	Description/ Compound	CTM No.	Quantity	Unit
0001		HOUSING BRC 1000		1,000	PC
0002		PISTON BRC 1000		1,000	PC
0003	160N0601	TOP PART BRC 1000		1,000	PC
0004	160N0787	POS.SHAFT BRC 1000 B1		1,000	PC
0005	160N0788	Splined shaft BRC 1000 B1		1,000	PC
0006	160N0605	Bottom cover BRC 1000		1,000	PC
0007	160N0843	TOP PART COVER BRC 1000-32000		1,000	PC
0009		X-RING Ø21,82X3,53		3,000	PC
0010		X-RING Ø71,12*2.62		1,000	PC
0011		X-RING Ø82,14*3.53		1,000	PC
0012		X-RING Ø91,67*3.53		2,000	PC
0013		O-RING Ø22,3X2,4		1,000	PC
0014		O-RING Ø21,82*3,53		1,000	PC
0015		O-RING Ø114,02*1.78		1,000	PC
0016		O-RING Ø94,92*2,62		1,000	PC
0017	251-1531	SCREW M4X16		3,000	PC
0018	267-0014	SNAP RING EXTERNAL Ø17		1,000	PC
0019	390-0014	THRUST CAGE D70		1,000	PC
0020	390-0114	THRUST WASHER D70		2,000	PC

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PARTS-, SPARE & MATERIAL LIST				Emerson Automation Solutions Actuation Technologies	
Component: type & version ACTUATOR BRC 1000 B1				19200 Northwest Freeway Houston TX 77065 USA T +1 281 477 4100	
Material no.: 160N1100					
Alt.: 1					
				Page 2 of 2	
Refnr	Material	Description/ Compound	CTM No.	Quantity	Unmsr
0021		SEALING PLUG D6/5.3X6.5		1,000	PC
0023	160G2280	STOP VALVE D4		1,000	PC
0024		NAME PLATE FOR BRC 1000 B1 160N1100		1,000	PC
0025		RIVET D1,9X5		2,000	PC
0026	160N1049	VALVE SEAT		1,000	PC
0027	160G5044	PLUG 3/8 INCH WG		1,000	PC
0028	160B4503	YOKE F. DPI BRC 1000 - 2000 L=27,75		1,000	PC
	160N1082	PAINT PLUG 1/4 INCH F.BRC		2,000	PC
SPARE	----->	160N1262, SET OF SEAL FOR BRC 1000 POS. 9,10,11,12,13,14,15,16,26,35.		1,000	PC
INFO	----->	160N1172, COMMON PART BRC 1000 POS.32,33,34,35,36,37,38.		1,000	PC
INFO	----->	160N1196 COMMON PARTS BRC 1000 STAINLESS POS.32,33,34,35,36,37,38.		1,000	PC

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Section 18: Spare Parts BHH 2000



18.1 Parts, Spare and Material List for BHH 2000

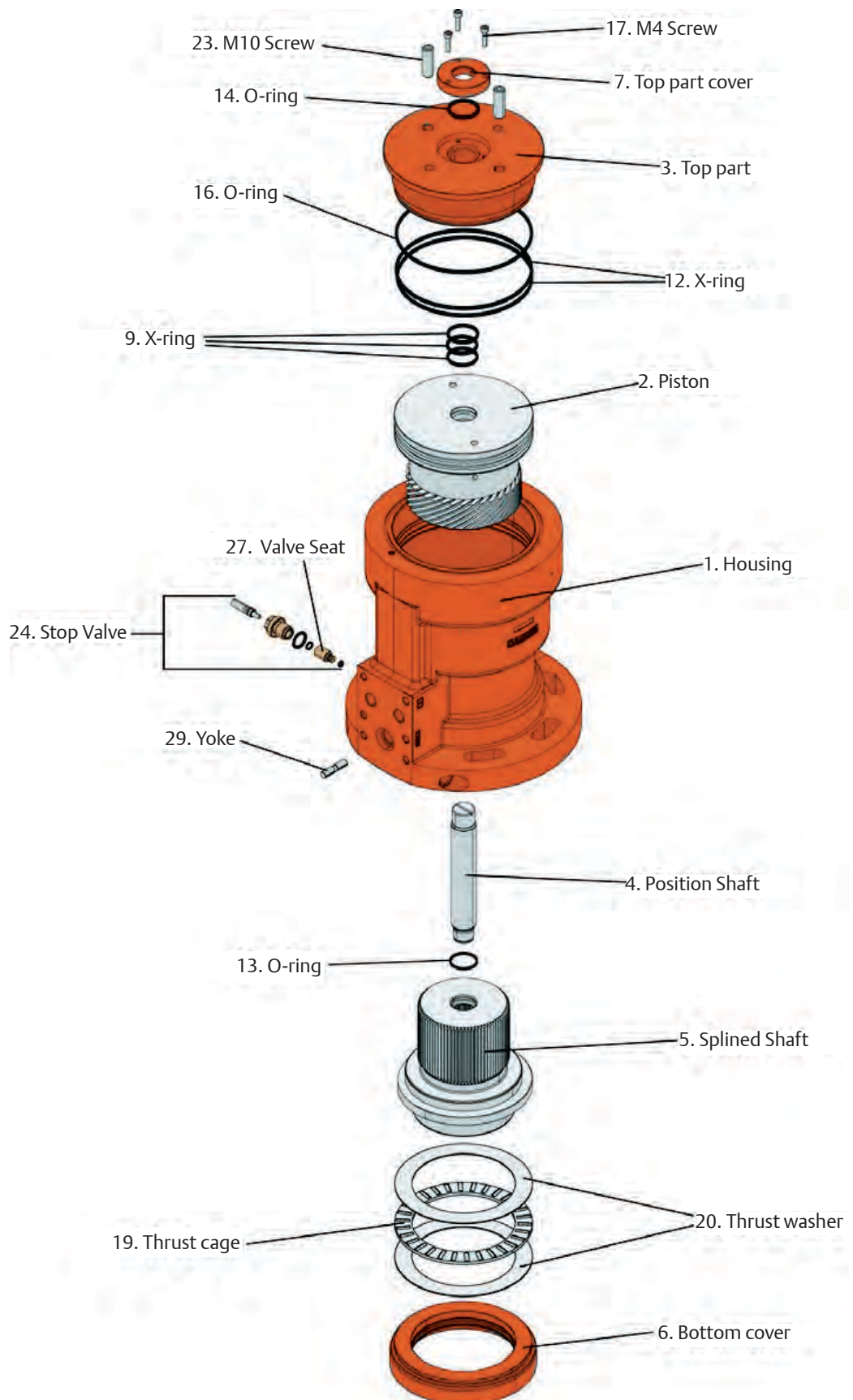
PARTS-, SPARE & MATERIAL LIST				Emerson Automation Solutions Actuation Technologies	
Component: type & version ACTUATOR BRC 2000 B1				19200 Northwest Freeway Houston TX 77065 USA T +1 281 477 4100	
Material no.: 160N1101					
Alt.: 1					
Notes: All items with stated material number can be purchased as spare parts. When ordering spare parts: please state material number.				Page 1 of 2	
Document numbers referred to: 160N9045					
Posnr	Material	Description/ Compound	CTM No.	Quantity	Unit
0001		HOUSING BRC 2000		1,000	PC
0002		Piston BRC 2000		1,000	PC
0003	160N0562	TOP PART BRC 2000		1,000	PC
0005	160N0790	Splined shaft BRC 2000 B1		1,000	PC
0006	160N0566	Bottom cover BRC 2000		1,000	PC
0007	160N0843	TOP PART COVER BRC 1000-32000		1,000	PC
0009		X-RING Ø21,82X3,53		3,000	PC
0010		X-RING Ø94,92*2,62		1,000	PC
0011		X-RING Ø104,37*3,53		1,000	PC
0012		X-RING Ø113,89*3,53		2,000	PC
0013		O-RING Ø22,3X2,4		1,000	PC
0014		O-RING Ø21,82*3,53		1,000	PC
0015		O-RING Ø133.07*1.78		1,000	PC
0016		O-RING Ø113.97*2.62		1,000	PC
0017	251-1531	SCREW M4X16		3,000	PC
0018	267-0014	SNAP RING EXTERNAL Ø17		1,000	PC
0019	390-0018	THRUST CAGE D90		1,000	PC
0020	390-0118	THRUST WASHER D90		2,000	PC
0021		SEALING PLUG D6/5.3X6.5		1,000	PC

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PARTS-, SPARE & MATERIAL LIST				Emerson Automation Solutions Actuation Technologies	
Component: type & version ACTUATOR BRC 2000 B1				19200 Northwest Freeway Houston TX 77065 USA T +1 281 477 4100	
Material no.: 160N1101					
Alt.: 1					
				Page 2 of 2	
Refnr	Material	Description/ Compound	CTM No.	Quantity	Unmsr
0023		SET SCREW/CUP POINT M10X30		2,000	PC
0024	160G2280	STOP VALVE D4		1,000	PC
0025		NAME PLATE FOR BRC 2000 B1 160N1101		1,000	PC
0026		RIVET D1,9X5		2,000	PC
0027	160N1049	VALVE SEAT		1,000	PC
0028	160G5044	PLUG 3/8 INCH WG		1,000	PC
0029	160B4503	YOKE F. DPI BRC 1000 - 2000 L=27,75		1,000	PC
	160N1082	PAINT PLUG 1/4 INCH F.BRC		2,000	PC
SPARE	----->	160N1263,SET OF SEALS FOR BRC 2000 POS. 9,10,11,12,13,14,15,16,27,35.		1,000	PC
INFO	----->	160N1173, COMMON PART BRC 2000 POS.32,33,34,35,36,37,38.		1,000	PC
INFO	----->	160N1197 COMMON PARTS BRC 2000 STAINLESS POS.32,33,34,35,36,37,38.		1,000	PC

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Section 19: Spare Parts BHH 4000



19.1 Parts, Spare and Material List for BHH 4000

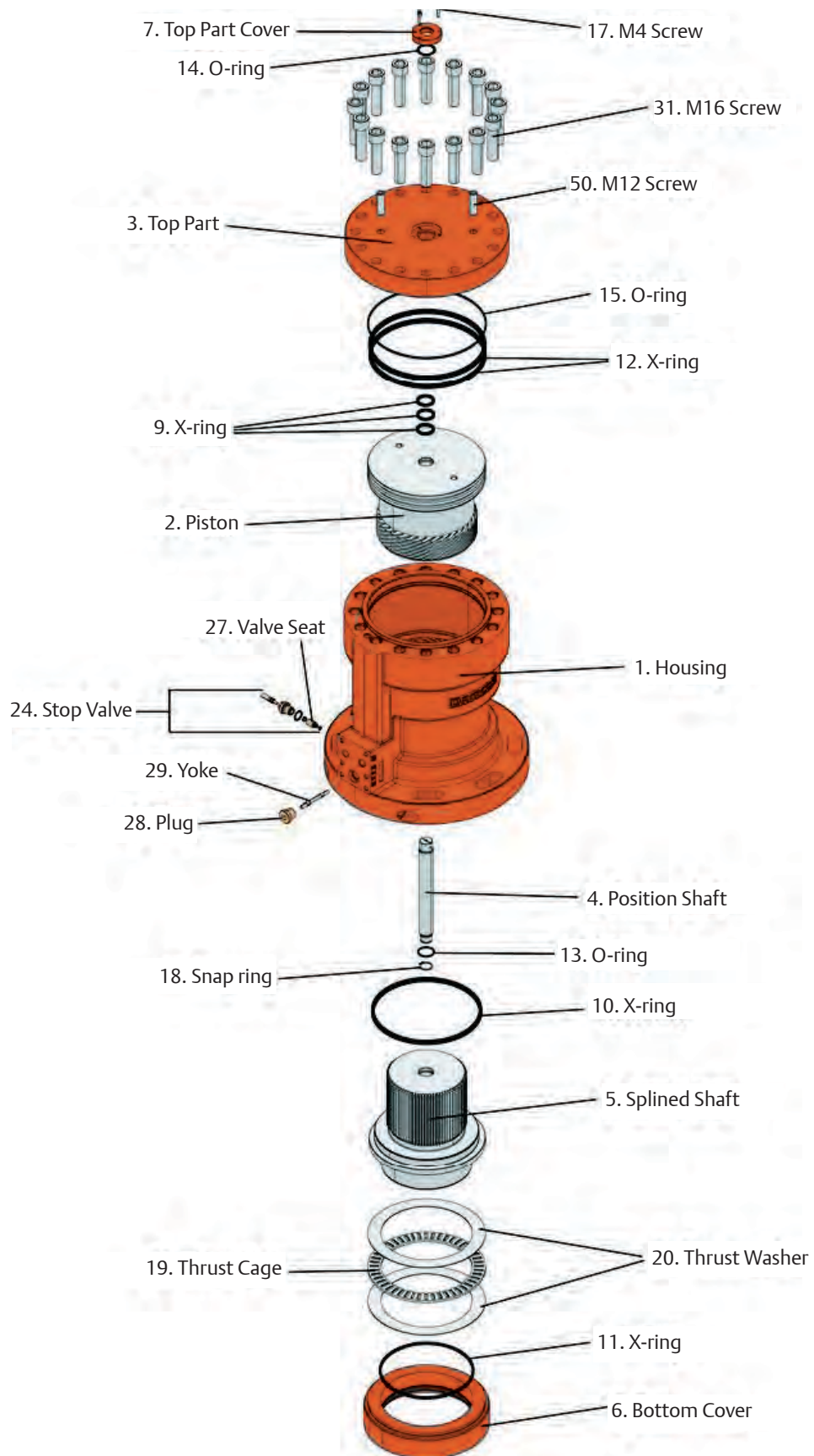
PARTS-, SPARE & MATERIAL LIST				Emerson Automation Solutions Actuation Technologies	
Component: type & version ACTUATOR BRC 4000 B1				19200 Northwest Freeway Houston TX 77065 USA T +1 281 477 4100	
Material no.: 160N1102					
Alt.: 1					
Notes: All items with stated material number can be purchased as spare parts. When ordering spare parts: please state material number.				Page 1 of 2	
Document numbers referred to: 160N9049					
Posnr	Material	Description/ Compound	CTM No.	Quantity	Unit
0001		HOUSING BRC 4000		1,000	PC
0002		PISTON BRC 4000		1,000	PC
0003	160N0613	TOP PART BRC 4000		1,000	PC
0004	160N0791	POS.SHAFT BRC 4000 B1		1,000	PC
0005	160N0792	Splined shaft BRC 4000 B1		1,000	PC
0006	160N0617	BOTTOM COVER BRC 4000		1,000	PC
0007	160N0843	TOP PART COVER BRC 1000-32000		1,000	PC
0009		X-RING Ø21,82X3,53		3,000	PC
0010		X-RING Ø110,72*3,53		1,000	PC
0011		X-RING Ø132,72*5.33		1,000	PC
0012		X-RING Ø139,07*5.33		2,000	PC
0013		O-RING Ø22,3X2,4		1,000	PC
0014		O-RING Ø21,82*3,53		1,000	PC
0015		O-RING Ø165*2		1,000	PC
0016		O-RING Ø145.72*2.62		1,000	PC
0017	251-1531	SCREW M4X16		3,000	PC
0018	267-0014	SNAP RING EXTERNAL Ø17		1,000	PC
0019	390-0020	THRUST CAGE Ø110		1,000	PC
0020	390-0120	THRUST WASHER Ø110		2,000	PC

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PARTS-, SPARE & MATERIAL LIST				Emerson Automation Solutions Actuation Technologies	
Component: type & version ACTUATOR BRC 4000 B1			19200 Northwest Freeway Houston TX 77065 USA T +1 281 477 4100		
Material no.: 160N1102					
Alt.: 1			Page 2 of 2		
Refnr	Material	Description/ Compound	CTM No.	Quantity	Unmsr
0022		SEALING PLUG Ø9/8,4x10		1,000	PC
0023		SET SCREW/CUP POINT M12X30		2,000	PC
0024	160G2280	STOP VALVE D4		1,000	PC
0025		NAME PLATE FOR BRC 4000 B1 160N1102		1,000	PC
0026		RIVET D1,9X5		2,000	PC
0027	160N1049	VALVE SEAT		1,000	PC
0028	160G5044	PLUG 3/8 INCH WG		1,000	PC
0029	160B4504	YOKE F. DPI BRC 4000 + Kx 250, L=42,50		1,000	PC
	160N1082	PAINT PLUG 1/4 INCH F.BRC		2,000	PC
SPARE	----->	160N1264, SET OF SEALS FOR BRC 4000 POS. 9,10,11,12,13,14,15,16,27.		1,000	PC
INFO	----->	160N1174, COMMON PART BRC 4000 POS. 32,33,34,35,36,37,16.		1,000	PC
INFO	----->	160N1198, COMMON PART BRC 4000 STAINLESS POS. 32,33,34,35,36,37,16.		1,000	PC

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Section 20: Spare Parts BHH 8000



20.1 Parts, Spare and Material List for BHH 8000

PARTS-, SPARE & MATERIAL LIST				Emerson Automation Solutions Actuation Technologies	
Component: type & version ACTUATOR BRC 8000 C1				19200 Northwest Freeway Houston TX 77065 USA T +1 281 477 4100	
Material no.: 160N1218					
Alt.: 1					
Notes: All items with stated material number can be purchased as spare parts. When ordering spare parts: please state material number.				Page 1 of 3	
Document numbers referred to: 160N9072					
Posnr	Material	Description/ Compound	CTM No.	Quantity	Unit
0001		HOUSING BRC 8000 C1 GGG40 (W.no.0.7040)	A05	1,000	PC
0002		PISTON BRC 8000 GGG40 (W.no.0.7040)	A10	1,000	PC
0003	160N0720	TOP PART BRC 8000 GGG40 (W.no.0.7040)	A10	1,000	PC
0004	160N0793	POS.SHAFT BRC 8000 B1 X5CrNiMo17 12 2(W.no.1.4401)	F20	1,000	PC
0005	160N0963	Splined shaft BRC 8000 C1 17MnV6 (W.no.1.5216)	B54	1,000	PC
0006	160N0721	BOTTOM COVER BRC 8000 GGG40 (W.no.0.7040)	A10	1,000	PC
0007	160N0843	TOP PART COVER BRC 1000-32000 X5CrNiMo17 13 3(W.no.1.4436)	F20	1,000	PC
0009		X-RING #21,82X3,53 PD 85	PD	3,000	PC
0010		X-RING #139,29*3,53 NBR 80	NBR	1,000	PC
0011		X-RING #164,47X6,99 PD 85	PD	1,000	PC
0012		X-RING #164,47*5.33 NBR 90	NBR	2,000	PC
0013		O-RING #22,3X2,4 NBR 70	NBR	1,000	PC
0014		O-RING #21,82*3,53 NBR 70	NBR	1,000	PC

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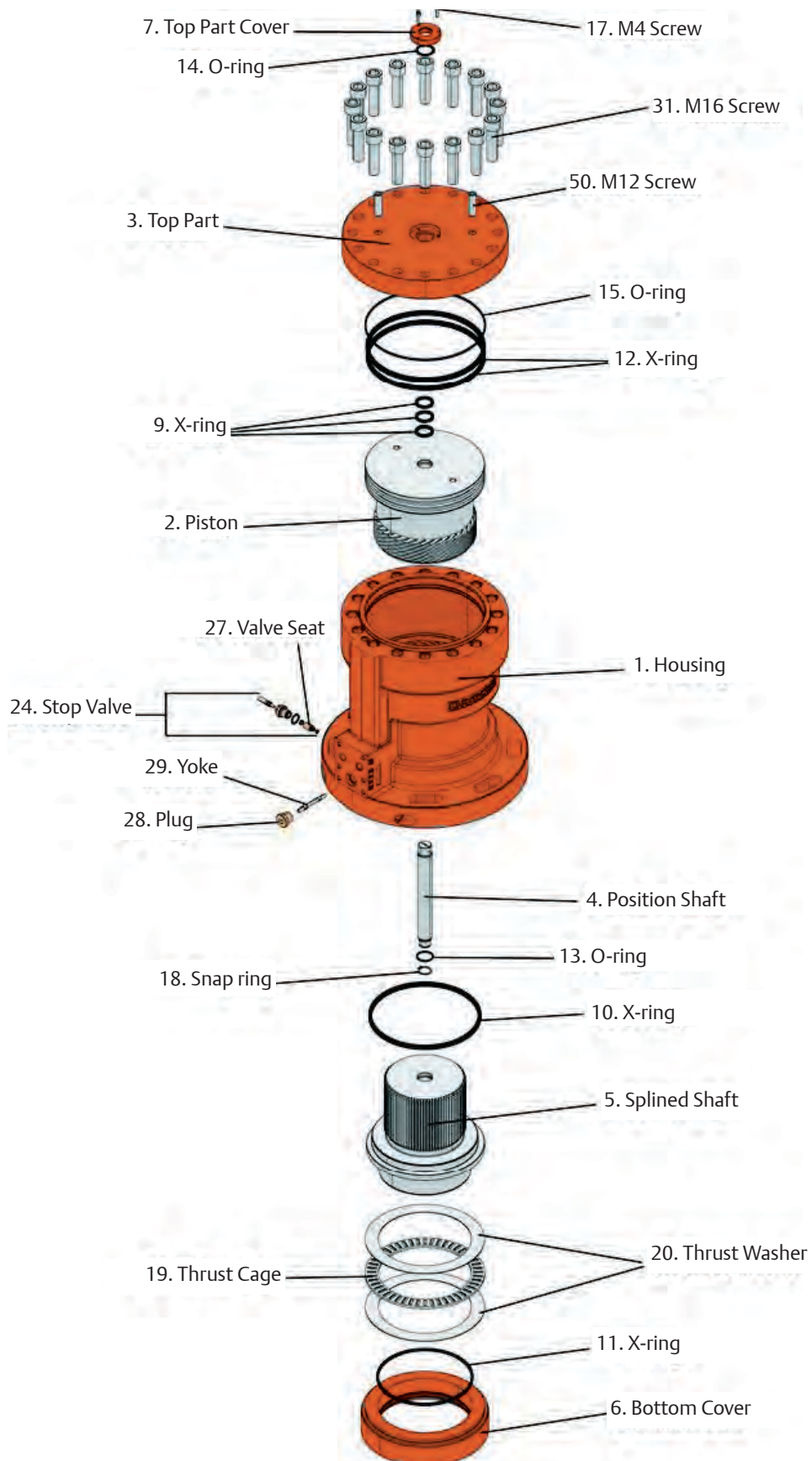
PARTS-, SPARE & MATERIAL LIST				Emerson Automation Solutions Actuation Technologies	
Component: type & version ACTUATOR BRC 8000 C1				19200 Northwest Freeway Houston TX 77065 USA T +1 281 477 4100	
Material no.: 160N1218					
Alt.: 1					
				Page 2 of 3	
Refnr	Material	Description/ Compound	CTM No.	Quantity	Unmsr
0015		O-RING #169,5X3 NBR 70	NBR	1,000	PC
0017	251-1531	SCREW M4X16 X5CrNiMo18 12 (W.no.1.4436)	7A4	3,000	PC
0018	267-0014	SNAP RING EXTERNAL #17 W.no.1.1248	Y05	1,000	PC
0019	390-0023	THRUST CAGE #140 USt.13(W.no.1.0333)	POL	1,000	PC
0020	390-0123	THRUST WASHER #140 100Cr6(W.no.1.3505)	ROL	2,000	PC
0022		SEALING PLUG #9/8, 4x10 Stainless steel/Carbon steel		1,000	PC
0023		SET SCREW/CUP POINT M12X40 X5CrNiMo17 12 2(W.no.1.4401)	7A4	2,000	PC
0024	160G2280	STOP VALVE D4		1,000	PC
0025		NAME PLATE FOR BRC 8000 B1 160N1103	F90	1,000	PC
0026		RIVET D1, 9X5	5/A4	2,000	PC
0027	160N1049	VALVE SEAT		1,000	PC
0028	160G5044	PLUG 3/8 INCH WG		1,000	PC
0029	160B4505	YOKE F. DPI BRC 8000 L = 57,5		1,000	PC
0031	251-0637	SCREW M16X60	12.9	16,000	PC

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PARTS-, SPARE & MATERIAL LIST				Emerson Automation Solutions Actuation Technologies	
Component: type & version ACTUATOR BRC 8000 C1				19200 Northwest Freeway Houston TX 77065 USA T +1 281 477 4100	
Material no.: 160N1218					
Alt.: 1					
				Page 3 of 3	
Refnr	Material	Description/ Compound	CTM No.	Quantity	Unmsr
	160N1082	PAINT PLUG 1/4 INCH F.BRC		2,000	PC
SPARE	----->	160N1265, SET OF SEALS FOR BRC 8000 POS. 9, 10, 11, 13, 14, 15, 36, 27,		1,000	PC
INFO	----->	160N1175 COMMON PART BRC 8000 POS. 32, 33, 34, 35, 36, 37, 16.		1,000	PC
INFO	----->	160N1199 COMMON PART BRC 8000 STAINLESS POS. 32, 33, 34, 35, 36, 37, 16.		1,000	PC

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Section 21: Spare Parts BHH 16000



21.1 Parts, Spare and Material List for BHH 16000

PARTS-, SPARE & MATERIAL LIST				Emerson Automation Solutions Actuation Technologies	
Component: type & version ACTUATOR BRC 16000 C1				19200 Northwest Freeway Houston TX 77065 USA T +1 281 477 4100	
Material no.: 160N1219					
Alt.: 1					
Notes: All items with stated material number can be purchased as spare parts. When ordering spare parts: please state material number.				Page 1 of 3	
Document numbers referred to: 160N9072					
Posnr	Material	Description/ Compound	CTM No.	Quantity	Unit
0001		HOUSING BRC 16000 C1 GGG40(W.no.0.7040)	A05	1,000	PC
0002		PISTON BRC 16000 A1 GGG40(W.no.0.7040)	A10	1,000	PC
0003	160N0735	TOP PART BRC 16000 GGG40(W.no.0.7040)	A10	1,000	PC
0004	160N0795	POS.SHAFT BRC 16000 B1 X5CrNiMo17 12 2(W.no.1.4401)	F20	1,000	PC
0005		Splined shaft BRC 16000 B1 17MnV6(W.no.1.5216)	54	1,000	PC
0006	160N0736	BOTTOM COVER BRC 16000 A1 GGG40(W.no.0.7040)	A10	1,000	PC
0007	160N0843	TOP PART COVER BRC 1000-32000 X5CrNiMo17 13 3(W.no.1.4436)	F20	1,000	PC
0009		X-RING #21,82X3,53 PD 85	PD	3,000	PC
0010		X-RING #164,69*3,53 NBR 80	NBR	1,000	PC
0011		X-RING #196,22X6,99 PD 85	PD	1,000	PC
0012		X-RING #206,8X6,99 PD 85	PD	2,000	PC
0013		O-RING #22,3X2,4 NBR 70	NBR	1,000	PC
0014		O-RING #21,82*3,53 NBR 70	NBR	1,000	PC

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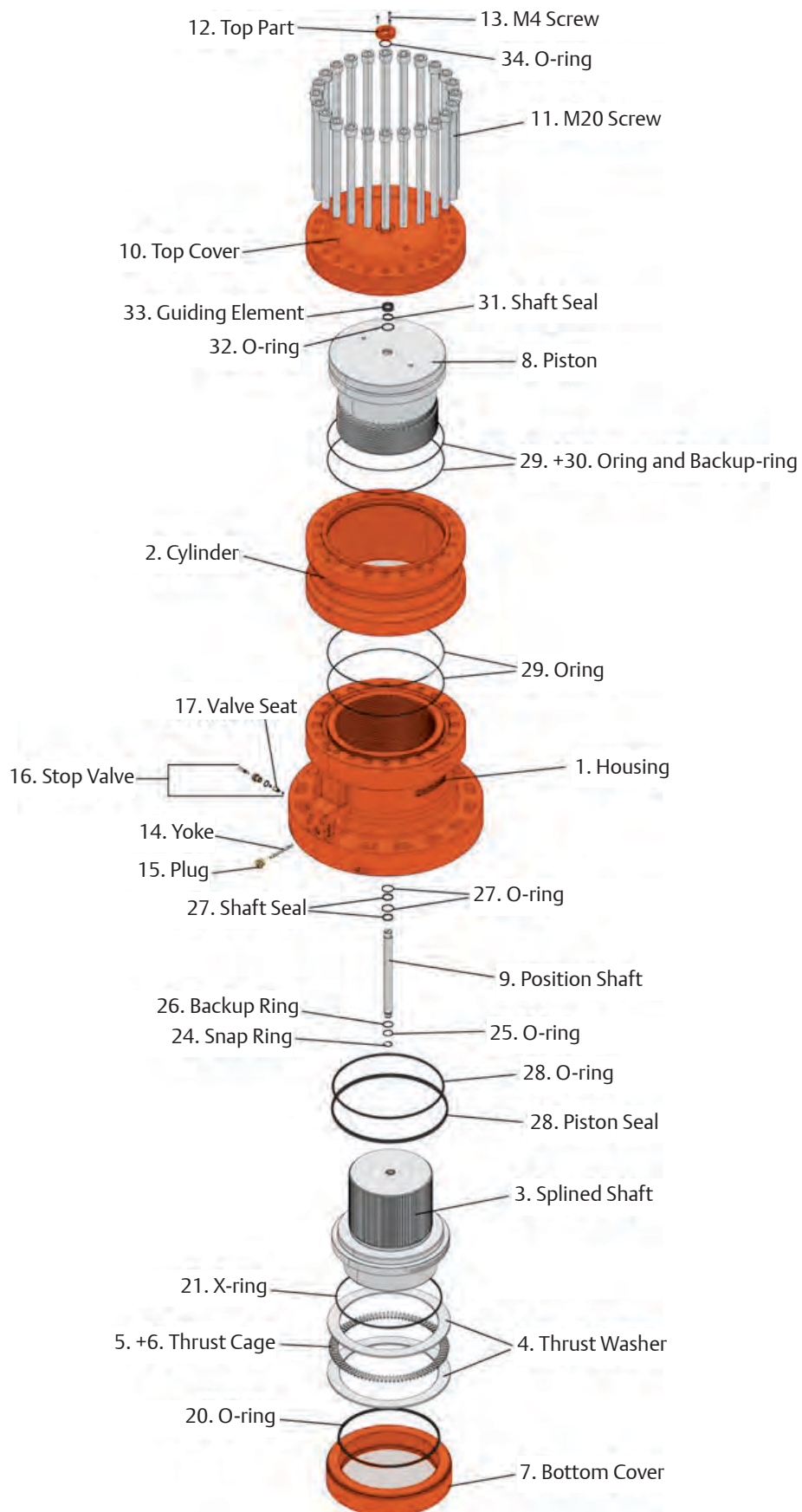
PARTS-, SPARE & MATERIAL LIST				Emerson Automation Solutions Actuation Technologies	
Component: type & version ACTUATOR BRC 16000 C1				19200 Northwest Freeway Houston TX 77065 USA T +1 281 477 4100	
Material no.: 160N1219					
Alt.: 1				Page 2 of 3	
Refnr	Material	Description/ Compound	CTM No.	Quantity	Unmsr
0015		O-RING #219,5X3 NBR 70	NBR	1,000	PC
0017	251-1531	SCREW M4X16		3,000	PC
0018	267-0014	SNAP RING EXTERNAL #17		1,000	PC
0019	390-0025	THRUST CAGE #160		1,000	PC
0020	390-0125	THRUST WASHER #160		2,000	PC
0022	208-1019	SEALING PLUG #9/8, 4x10		1,000	PC
0023	252-1696	SET SCREW/CUP POINT M16X50		2,000	PC
0024	160G2280	STOP VALVE D4		1,000	PC
0025		NAME PLATE FOR BRC 16000 B1 160N1104	F90	1,000	PC
0026	260-0412	RIVET D1, 9X5	5/A4	2,000	PC
0027	160N1049	VALVE SEAT NBR 70	NBR	1,000	PC
0028	160G5044	PLUG 3/8 INCH WG CuZn39Pb3 (W.no.2.0401)	L05	1,000	PC
0029	160B4506	YOKE F. DPI BRC 16000 L = 70,6 POM-C	P01	1,000	PC
0031	251-0637	SCREW M16X60		24,000	PC
	160N1082	PAINT PLUG 1/4 INCH F.BRC CuZn39Pb3 (W.no.2.0401)	L05	2,000	PC
SPARE	----->	160N1266, SET OF SEALS FOR BRC 16000 POS.9,10,11,13,14,15,36,27.		1,000	PC
INFO	----->	160N1176, COMMON PART BRC 16000 POS.32,33,34,35,36,37,16.		1,000	PC
INFO	----->	160N1200, COMMON PART BRC 16000 STAINLES			

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PARTS-, SPARE & MATERIAL LIST				Emerson Automation Solutions Actuation Technologies	
Component: type & version ACTUATOR BRC 16000 C1				19200 Northwest Freeway Houston TX 77065 USA T +1 281 477 4100	
Material no.: 160N1219					
Alt.: 1					
				Page 3 of 3	
Refnr	Material	Description/ Compound	CTM No.	Quantity	Unmsr
		POS. 32, 33, 34, 35, 36, 37, 16.		1,000	PC

Printed 26.09.2018

Section 22: Spare Parts BHH 32000



22.1 Parts, Spare and Material List for BHH 32000

PARTS-, SPARE & MATERIAL LIST				Emerson Automation Solutions Actuation Technologies	
Component: type & version ACTUATOR BRC 32000				19200 Northwest Freeway Houston TX 77065 USA T +1 281 477 4100	
Material no.: 160N1153					
Alt.: 1					
Notes: All items with stated material number can be purchased as spare parts. When ordering spare parts: please state material number.				Page 1 of 2	
Document numbers referred to: 160N9097					
Posnr	Material	Description/ Compound	CTM No.	Quantity	Unit
1		HOUSING BRC 32000		1,000	PC
2		Cylinder BRC 32000		1,000	PC
3	160N0877	Splined shaft BRC 32000		1,000	PC
4	160N0878	Bearing Washer BRC 32000		2,000	PC
5	160N0879	Bearing Cage BRC 32000		1,000	PC
6	271-1170	CYLINDRIC PIN Ø5X21.8		100,000	PC
7	160N0881	Bottom Cover BRC 32000		1,000	PC
8		Piston BRC 32000		1,000	PC
9	160N0883	Positon shaft BRC 32000		1,000	PC
10	160N0884	Top Cover BRC 32000		1,000	PC
11	251-0685	SCREW M20X260		24,000	PC
12	160N0843	TOP PART COVER BRC 1000-32000		1,000	PC
13	251-1531	SCREW M4X16		3,000	PC
14	160N0885	Yoke BRC 32000		1,000	PC
15		PLUG G3/8 INCH F. EO-RING, I6K		1,000	PC

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PARTS-, SPARE & MATERIAL LIST			Emerson Automation Solutions Actuation Technologies		
Component: type & version ACTUATOR BRC 32000			19200 Northwest Freeway Houston TX 77065 USA T +1 281 477 4100		
Material no.: 160N1153					
Alt.: 1					
			Page 2 of 2		
Refnr	Material	Description/ Compound	CTM No.	Quantity	Unmsr
16	160G2280	STOP VALVE D4		1,000	PC
17		VALVE SEAT		1,000	PC
20		O-RING Ø9,75X1,78		2,000	PC
21		X-RING Ø234.32X5,33		1,000	PC
22		O-RING Ø285X3		1,000	PC
23		O-RING Ø266.07X5,33		1,000	PC
23		SHAFT/ROD SEALING T40 Ø265/280.5X6,3		1,000	PC
24		SNAP RING EXTERNAL Ø17		1,000	PC
25		O-RING Ø22,3X2,4		1,000	PC
26		BACK-UP-RING Ø22/25,6X1,4		1,000	PC
27		O-RING Ø25,07X2,62		2,000	PC
27		SHAFT/ROD SEALING Ø22/29.3X3,2		2,000	PC
28		O-RING Ø253,37X6,99		1,000	PC
28		PISTON SEALING Ø280/259X8,1		1,000	PC
29		O-RING Ø274X3		2,000	PC
30		BACK-UP-RING Ø280/275.2X1,4		2,000	PC
31		SHAFT/ROD SEALING Ø22/29.3X3,2		1,000	PC
32		O-RING Ø25,07X2,62		1,000	PC
33		GUIDING ELEMENT Ø2,5/9,7		74,000	MM
34		O-RING Ø21,82*3,53		1,000	PC
36	271-2426	CYLINDRIC PIN Ø25*60		1,000	PC
37	252-1696	SET SCREW/CUP POINT M16X50		2,000	PC
50		NAME PLATE FOR BRC 32000 B1 160N1153		1,000	PC
51		RIVET D1,9X5		2,000	PC
SPARE	----->	160N1292 Seal set for BRC 32000		1,000	PC

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Appendix:

“Flushing, Remote Valve Control System”
SI0001-5E04 PDS for BHH – As ordered

World Area Configuration Centers (WACC) offer sales support, service, inventory and commissioning to our global customers. Choose the WACC or sales office nearest you:

NORTH & SOUTH AMERICA

19200 Northwest Freeway
Houston TX 77065
USA
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SP 18087-105
Brazil
T +55 15 3413 8888

ASIA PACIFIC

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#01-02 Singapore 629361
T +65 6777 8211

No. 1 Lai Yuan Road
Wuqing Development Area
Tianjin 301700
P. R. China
T +86 22 8212 3300

MIDDLE EAST & AFRICA

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Saudi Arabia
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Longmeadow Business Estate East
P.O. Box 6908 Greenstone
1616 Modderfontein Extension 5
South Africa
T +27 11 451 3700

EUROPE

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Székesfehérvár 8000
Hungary
T +36 22 53 09 50

Strada Biffi 165
29017 Fiorenzuola d'Arda (PC)
Italy
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For complete list of sales and manufacturing sites, please visit www.emerson.com/actuationtechnologieslocations or contact us at info.actuationtechnologies@emerson.com

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