

INSTRUCTION MANUAL

DUAL HYDRAULIC BOOSTER - STAINLESS STEEL HC2DHW



MINIMUM SIZE – MAXIMUM POWER

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1.1 - Safety precautions - IMPORTANT -

Although the miniBOOSTER hydraulic intensifier has been designed with operator safety in mind, it still requires the operator to be vigilant upon use.

Therefore, it should be observed that the below mentioned safety instructions are followed. Contact miniBOOSTER or your local miniBOOSTER distributor in case of any doubt.



Read all instructions, warnings and cautions carefully. Follow all safety precautions to avoid personal injury or property damage during system operation. miniBOOSTER cannot be held responsible for damage or injury resulting from unsafe use, lack of maintenance or incorrect product and/or system operation. Contact your miniBOOSTER distributor if in doubt as to the safety precautions and operations.



Eye protection must be worn while unpacking, installing, repairing and initial start-up of this miniBOOSTER product.



Gloves must be worn while unpacking, installing, repairing and initial start-up of this miniBOOSTER product.



The hydraulic system should always be de-pressurised before any couplings are disconnected. Check the integrity of connections before applying any hydraulic pressure.



Do not apply any hydraulic pressure to non-connected fittings.



Do not unscrew any nipples, couplings or fittings being under any hydraulic pressure.



Avoid sharp bends and kinks when routing hydraulic hoses.



Never exceed the maximum working pressure of the hydraulic system.



If the hydraulic system is under pressure **DO NOT STAND IN LINE** with any fittings, connections or other moving parts i.e. piston-rods and/or any other parts mechanically or hydraulically connected to the hydraulic system.



All hoses, couplings and fittings connected to the hydraulic system, including the miniBOOSTER, must be kept clean and free from debris and contamination at all times. Follow all instructions provided in this manual whenever installing, running and/or repairing the miniBOOSTER.

This instruction does not override any local safety regulations or relevant hazardous, regulations, which must always take precedence.

Never exceed the specified maximum pressure ranges, temperatures and flows.

Never put the component into operation until the machine, into which it is assembled, complies with all relevant directives and regulations in EU and EFTA.

miniBOOSTER® A/S cannot be held responsible for damage or injury resulting from unsafe use of the product, lack of maintenance, or incorrect product and system application.

If you have any doubts about precautions or applications, contact your local distributor, the manufacturer or visit www.minibooster.com

1.2 - Warranty

Never attempt to disassemble the booster or any other component from the system where it is not specifically described to do so. Any attempt will void the warranty if no consulting has taken place with miniBOOSTER.

DECLARATION OF CONFORMITY

We the manufacturer:

miniBOOSTER Hydraulics A/S
Fynsgade 3
DK 6400 Sønderborg
DENMARK

Declare that:

Hydraulic Intensifiers all types, variants and accessories are designed and manufactured in accordance with the below directives.

2006/42/EC Machinery Safety Directive
97/93/EC Pressure Equipment Directive where required (Max HPXVol >10,000)

The manufacturer miniBOOSTER® is ISO 9001 certified by Bureau Veritas (Certificate number DNKFRC10000046A). Each hydraulic intensifier has an identifiable serial number, stamped into its metal body. Year of manufacture and intensification factor are stamped into the metal body too. All technical documentation is drafted in accordance with the term "sound engineering practice" and in accordance with all of the processes and test procedures described in miniBOOSTER®'s process guides. All intensifiers are individually pressure tested prior to the EOL-approval.

1.3 - Serial number and identification plate location

Each individual miniBOOSTER HC2DHW can be identified by a unique serial number and its type code, which is stamped on the two flats at the H1 end of the miniBOOSTER housing.

The type number and the serial number are required when ordering spare parts (new seals) or repairs of the miniBOOSTER HC2DHW.



The example specifies:

HC2DHW-6.6-A-1HH	Booster model
03-18-151	Serial number (week-year-number)

Nomenclature:

HC2DHW	Booster model
6.6	$i = 6.6 : 1$
A	No dump valve
1	BSPP ports (IN and R)
HH	Seal system

1.4 - Material certificate

All body parts of the miniBOOSTER HC2DHW are marked with a material specification number, which provides materials traceability.

A material certificate verifies the origin batch numbers, the compositions and the test results of the materials used for the individual body parts. It is possible to order the certificates for the miniBOOSTER HC2DHW on request.



1.5 - Product description

The miniBOOSTER HC2DHW is a single media, dual acting hydraulic intensifier.

The intensifier is available in several different intensification ratios to provide a wide range of flow and pressure capacities. It is manufactured of stainless steel and permitting operation with several different mediums (including corrosive mediums) at a wide range of intensifying ratios.

The booster automatically compensates for the consumption of the media to maintain the HP set-point.

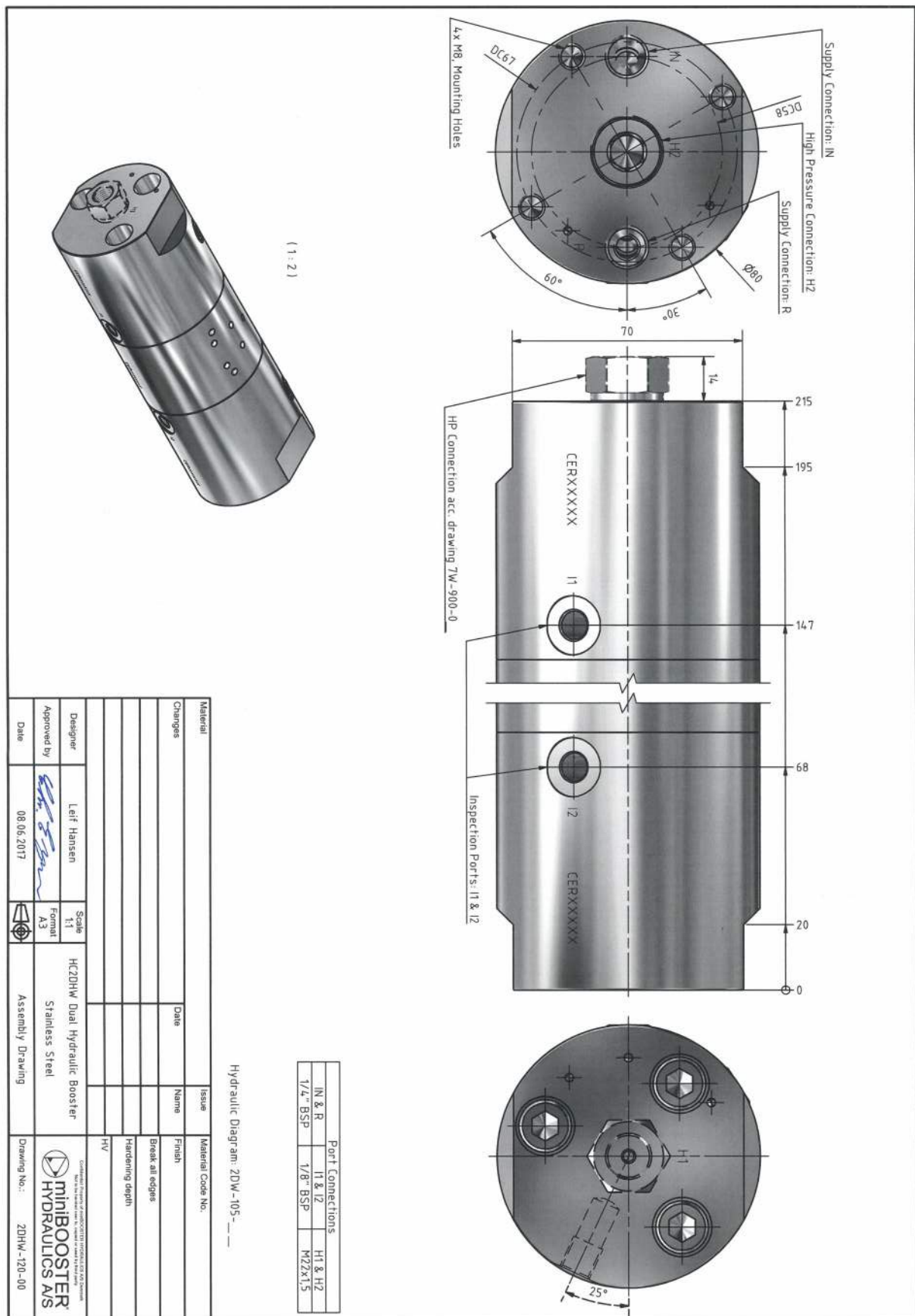
Adjusting the inlet pressure will in direct correlation to the outlet pressure relative to the intensification factor.

The miniBOOSTER is internally controlled by a build-in bistable valve assembly, which ensures a continuous flow of pressure-intensified outlet flow.

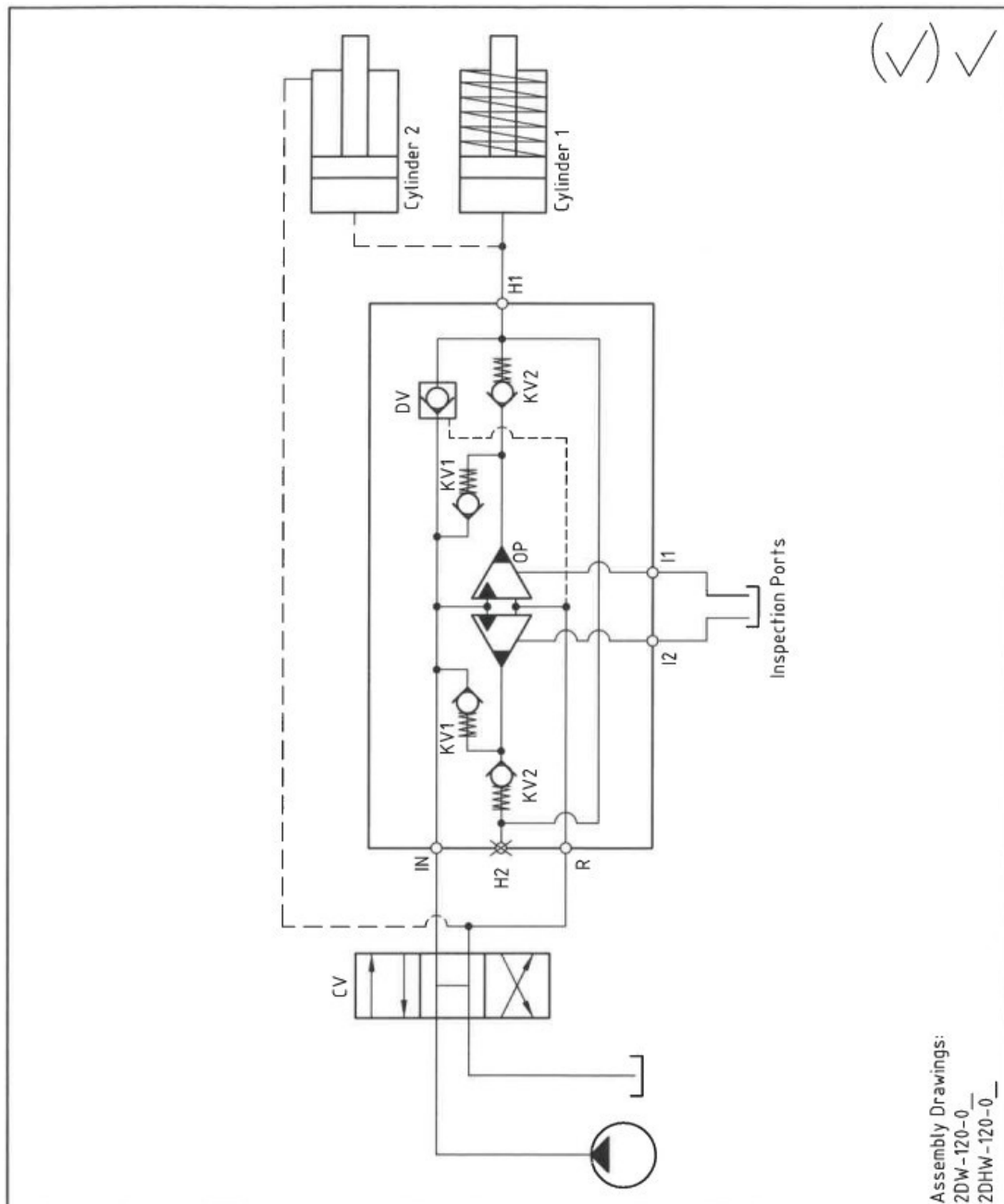
The miniBOOSTER HC2DHW is supplied with the following process connections: 1/4" BSPP thread for the inlet and return line and a M22x1,5 thread for various HP adapters.

The miniBOOSTER HC2DHW is designed with a double seal system for best possible sealing. The inspection connections for the seals are BSPP 1/8".

1.6 - Assembly drawing



1.7 - Function diagram



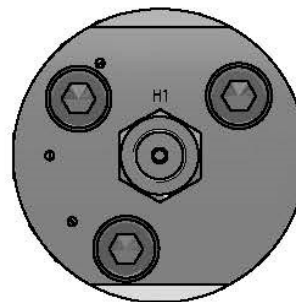
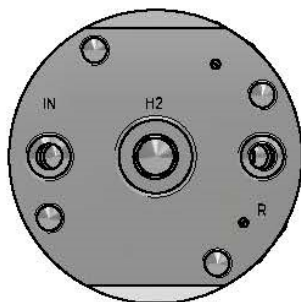
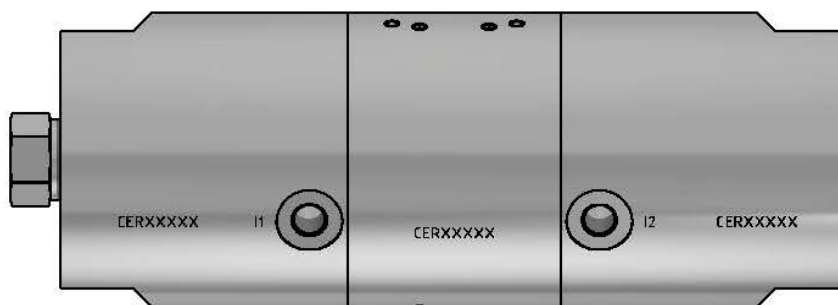
Number	Designation	Material	Dimension		Issue		Matr. code No.			
Changes		Date	Name	Ext. dim.-, Int. dim.+ , Distance:±					Surface	
Ass. draw. No. added		11.05.2017	L.H.							
				Meas.-range	0-6	6-30	30-100	100-300	300-1000	Break all edges
				2 dec. .00	0.05	0.10	0.15	0.20	0.30	Hardening depth
				1 dec. .0	0.10	0.20	0.30	0.50	0.80	
				No dec.	0.30	0.50	0.80	1.20	2.00	HV
Replace		Scale	HC2D(H)W Funktionsdiagram							Confidential: Property of miniBOOSTER, HYDRAULICS A/S Denmark Not to be handed over to, copied or used by third party.  miniBOOSTER® HYDRAULICS A/S
Designer	Leif Hansen		HC2D(H)W Function Diagram							
Konf.			HC2D(H)W Funktionsdiagramm							
Approv.										
Date	02.10.2012									
No.: 2DW-105-02										

1.8 - Connections

The miniBOOSTER HC2DHW is supplied with 6 threaded connections

All connections are clearly marked/stamped into the body of the miniBOOSTER to be easily identified.

IN	Inlet
R	Return
H1	High pressure outlet
H2	Optional high pressure outlet
I1	Inspection port (when seals have become worn or defective!)
I2	Inspection port (when seals have become worn or defective!)



1.9 - Technical specifications

Model	HC2DHW	
Weight	8 kg / 17.6 lbs	
Pressure ranges		
Inlet	IN	20 - 207 bar / 290 - 3,000 psi
Outlet	H1 and H2	0 - 1,380 bar / 20,000 psi
Return	R	As low as possible.
Flow ranges		
Inlet	IN	0 - 14 l/min / 3.7 gpm
Outlet	H1 and H2	0 - 5 l/min / 1.3 gpm
Temperature ranges		
Media oil	-40°C to +70°C / -40°F to +158°F	
Media water	+3°C to +50°C / +37°F to +122°F	
Stroke ranges		
Continuous	> 5 minutes from 1 to maximum 500 strokes/minute	
Intermittent	< 5 minutes from 1 to maximum 600 strokes/minute	
Materials of construction		
Body	316L stainless steel	
Pistons	Coated stainless steel	
Check valves	316L stainless steel	
Static seals standard	Nitrile NBR (other seal systems available as option)	
Dynamic LP and HP seals standard	H-ECOPUR (other seal systems available as option)	
Connections		
IN and R	1/4" BSPP	
I1 and I2	1/8" BSPP	
H1 and H	M22 x 1.5 (see section 2.1 for available HP adapters)	
Fluids		
Media 1	Recognized hydraulic fluids, freshwater	



For other mediums such as methanol etc. please contact your miniBOOSTER® distributor.

Filtration recommendations:

		0-140 BAR (0-2,000 psi)		141-207 BAR (2,000-3,000 psi)	
Media		ISO 4406 Scale number	Micron rating	ISO 4406 Scale number	Micron ratings
Oil	≥ 5 cSt	19/17/14	10	18/16/13	5
Freshwater	≤ 5 cSt	18/16/13	5	17/15/12	3



Mediums not filtered in accordance with the recommendations given in this chapter may cause severe damage to HC2DHW.

2.1 - Connection adapters

miniBOOSTER offers a wide program of adapters enabling the HC2DHW to be installed into most hydraulic systems. For further information, please contact your local miniBOOSTER distributor, or visit www.minibooster.com

List of available connection adapters:

M22x1,5 HP adapters (for HC2DHW / HC2DW / HC2D2W / HC7W)		
Ordering Code	HP Connection (female)	Max. Pressure
7W-432	9/16-18 UNF	2000 bar / 29,000 psi
7W-433	1/4" BSPP	2000 bar / 29,000 psi
7W-436	M16x1,5	2000 bar / 29,000 psi
7W-444	1/2" BSPP	2000 bar / 29,000 psi

2.2 - Seal kit

Complete seal kits are available for the miniBOOSTER HC2DHW. Seals should be replaced whenever fluid is leaking from connection I1 or I2 (more than 8 drops/min) or as part of a routine maintenance procedure. A seal kit contains a complete set of seals and an assembly drawing of the seal assembly.



Intensification factor	Item number HH type	Item number HP type
4.0	SEALKIT-2DHW-4.0HH	SEALKIT-2DHW-4.0HP
5.0	SEALKIT-2DHW-5.0HH	SEALKIT-2DHW-5.0HP
6.6	SEALKIT-2DHW-6.6HH	SEALKIT-2DHW-6.6HP
9.0	SEALKIT-2DHW-9.0HH	SEALKIT-2DHW-9.0HP
13.0	SEALKIT-2DHW-13.0HH	SEALKIT-2DHW-13.0HP

2.3 - Bolt kit

Complete bolts kits, containing special bolts and washers, are available for the miniBOOSTER HC2DHW.



Body bolts part number. [HC2DW-BOLTKIT](#)



Recommendation! Replace old bolts and washers with new ones whenever seals are changed.

2.4 - Tool kit

A complete tool kit, including all the needed tools required to change the seals at routine maintenance, is available for the miniBOOSTER HC2DHW.



Tool kit part number. [HC2DW-TOOLKIT](#)

Note! The tool kit includes customised tools, which are only available from miniBOOSTER.

3.1 - Introduction

The miniBOOSTER HC2DHW intensifier has been designed and is manufactured to provide reliable service over a range of demanding applications. The intensifier does not require special maintenance.

As noted earlier, to provide extended service life, ensure that the unit is operated within specifications and, in particular, fluid quality. Please refer to section 1.9 Technical Specifications for additional information.

The miniBOOSTER HC2DHW is designed with field serviceable seals. In the event of a seal failure, the following procedure should be followed closely. For repairs other than seal replacement, it is recommended the intensifier be returned to the factory.

3.2 - Preparation

The miniBOOSTER should only remain unplugged and disassembled in a very clean and tidy workshop environment. No particles larger than 10 Micron should possibly be allowed to enter the miniBOOSTER HC2DHW in any way.

Ensure that a clean, flat working space is used and that the following tools and supplies are available before beginning repairs:

Tools:

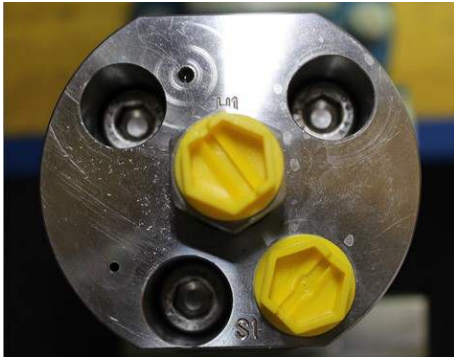
1. Bench-mounted heavy-duty vise with soft face jaws and a maximum opening of at least 70 mm / 2.75".
2. Roll of lint-free cloth or paper wipes.
3. Tube of Foodlube multi-paste (anti-seize pasta) (Rocol®).
4. Tube of silicone based O-rings grease.
5. $\frac{3}{8}$ " torque wrench, 60 Nm / 44 ft-lbs.
6. $\frac{3}{8}$ " Socket Allen Key, 6 mm
7. Adjustable face spanner, $\varnothing 2$ mm / 5/64" pin diameter.

RECOMMENDED! miniBOOSTER Tool kit, HC2DHW-TOOLKIT (see section 2.4).

Spare Parts:

1. Seal Kit (see section 2.2)
2. Bolt Kit (see section 2.3)

3.3 - Seal replacement instruction



3.3.1

Clean the exterior of the miniBOOSTER HC2DHW thoroughly before it is taken to the workshop.

(HC2D2W shown)

Make sure that the warranty void sealant is removed from all HEX bolt heads.



Follow the given instructions carefully. Failure to comply with the instructions could result in equipment damage and personal injury. The miniBOOSTER HC2DHW should only be disassembled, have the seals changed and be reassembled in one end at a time.



3.3.2.

Secure the HC2DHW vertically in a vice (IN, R and I2 facing downwards) between soft jaws and clamp it on the flat ends.

If soft jaws are not available use cloth or cardboard instead to protect the surface of the intensifier.

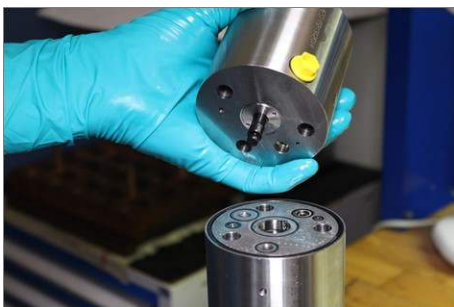
To easen the re-assembly, it is recommended to draw position lines with a marker between the middle- and the end parts.

(HC2D2W shown)



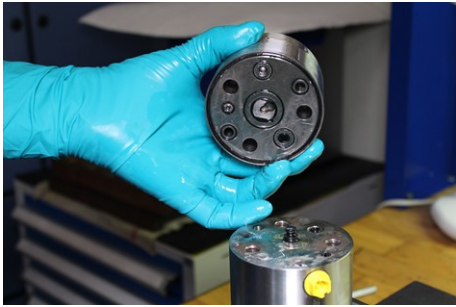
3.3.3

Loosen and remove the 3 HEX bolts.

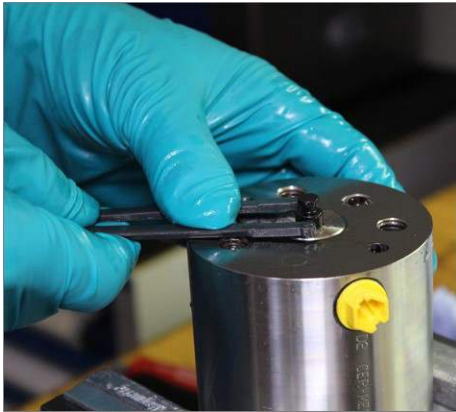


3.3.4

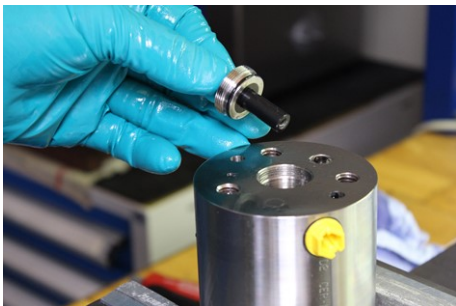
Remove the upper part.

**3.3.5**

Remove the middle part. Be careful not to drop the piston located in the middle of the part.

**3.3.6**

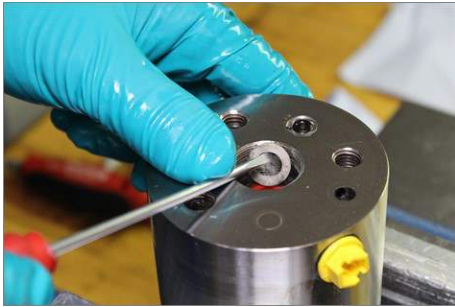
Loosen and remove the seal lock nut.



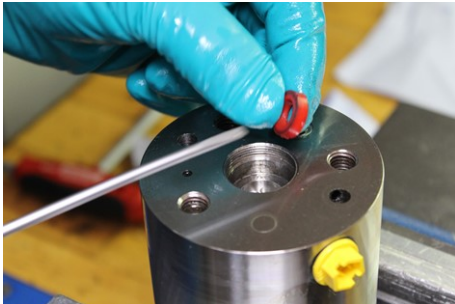
If the surface of the pistons or the piston cylinders have any visible surface imperfections, the intensifier will not operate properly. The unit should be returned to the factory for refurbishment. If reassembled with such damaged parts, the intensifier may operate with a reduced effective intensification ratio, for a while, but will generally fail after a short period of operation and may no longer be serviceable.

**3.3.7**

Remove the seal support ring
(Note: no O-rings on this part!)

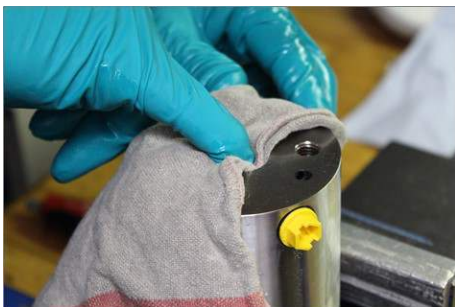
**3.3.8**

Remove the backup ring.

**3.3.9**

Remove the old seal.

Be careful not to scratch the surface where the seal is located.

**3.3.10**

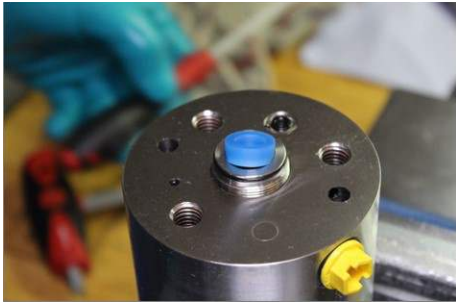
Clean off the seal bore with a lint free cloth and blow with compressed air. Also clean the seal support ring and seal lock nut.

**3.3.11**

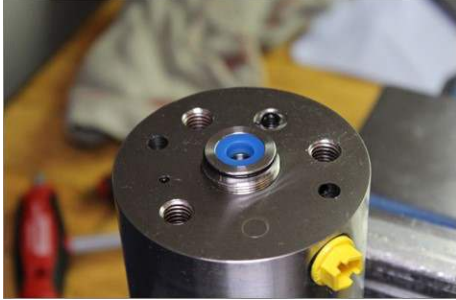
Reassemble with new seals in reverse order, in accordance to the Instructions drawing supplied with the seal kit.

**3.3.12**

Use the booster end part as a vise for the lock nut and mount it in reverse like shown on the picture.

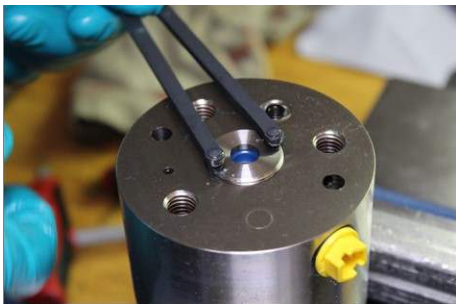
**3.3.13**

Install the new seal (blue on photo) and the new O-ring in the groove on the lock nut.

**3.3.14**

Reassemble the lock nut into the end part.

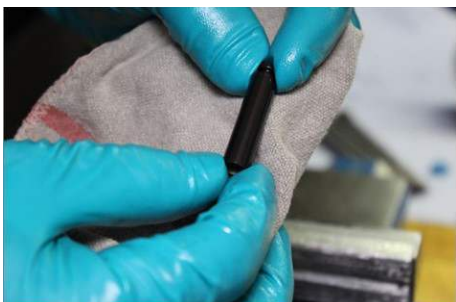
When the nut is under the surface level of the end part, DO NOT tighten it any further. DO NOT use excessive force to tighten the nut.

**3.3.15**

Checking to see that the nut is below level of the end part.



miniBOOSTER is continuously developing and improving their products. Material appearances may vary slightly from the illustrations. Please contact your distributor or the factory if you have any questions or concerns about the procedure or parts.

**3.3.16**

Inspect the piston for visual damages (scratches, wear marks).



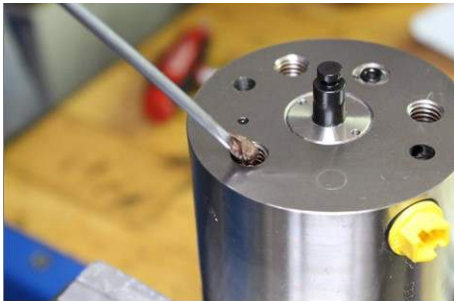
If the surface of the pistons or the piston cylinders have any visible surface imperfections, the intensifier will not operate properly. The intensifier should be returned to the factory for refurbishment. If reassembled with damaged parts, the unit may operate, with a reduced effective intensification ratio, for a while, but will generally fail after a short period of operation and may no longer be serviceable.



3.3.17

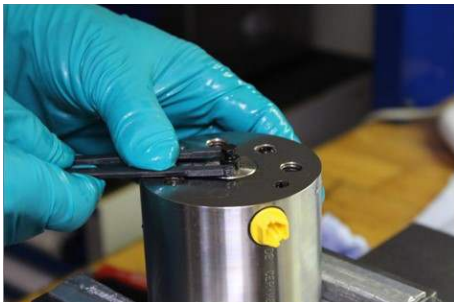
Insert the HP piston into the end part. Use a soft hammer to gently tap the piston into place. Note that the piston fits tight into the new seals.

The piston should be pushed/tapped approximately half of its length into the end part.



3.3.18

Blow out the threads of the end part and apply new anti-seize pasta.



3.3.19

Release the end part from the wise and clamp the other end part.

Install new seals into this part by using the procedure from section 3.3.6 to 3.3.17.

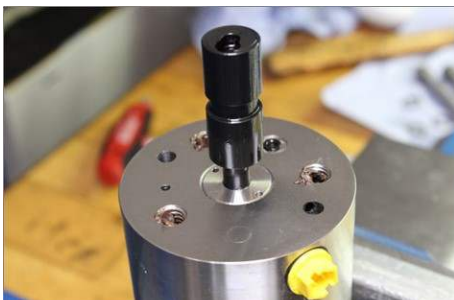
When the procedure has been carried out, continue to section 3.3.20.



3.3.20

Release the end part from the wise and re-clamp the first end part.

Ensure that the SV-valve is inserted into the bore.



3.3.21

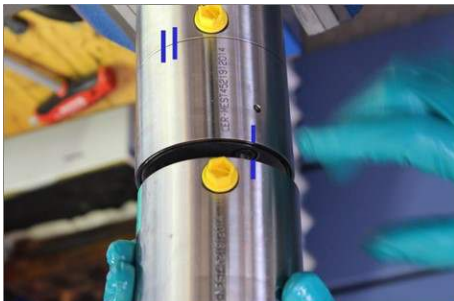
Connect the large piston to the HP piston.

**3.3.22**

Assemble the remaining new gaskets and O-rings into the middle part in accordance with the instructions drawing incorporated in the supplied seal kit.

It is recommended to grease all O-rings with a thin layer of silicone based grease. This will make them stick better into their corresponding grooves.

Slide the middle part onto the large piston.

**3.3.23**

Connect the remaining end part to the assembly.

**3.3.24**

Insert the screws and washers and align the three parts by tapping the bodies lightly.

**3.3.25**

Apply a torque of 60 Nm / 44 ft-lbs to the HEX bolts.

The seal replacement procedure is now completed.

4.1 - Installing the miniBOOSTER HC2DHW

The pressure intensifier can be installed in any position (vertical, horizontal, angled etc.)

It is recommended to connect a transparent inspection hose between the I1 and the I2 connections and the system return line, alternatively a sight glass connected to a sludge tank etc.



Either way the miniBOOSTER HC2DHW is installed, it is important that the HC2DHW is installed in accordance to the below mentioned “Preparations” and “Initial start-up” instructions.

4.2 - Preparations

Before the miniBOOSTER HC2DHW is started-up for the first time, as a new unit or as a repaired unit, it should be ensured that the:

1. Filtering recommendations (see index 1.9) do comply.
2. Fittings, piping's and hoses connected to the intensifier High pressure side (H1 or H2) are from materials, which will withstand the high pressure supplied from the HC2DHW
3. Check that the inspection connections (I1 and I2) are plugged.

4.3 - Initial start-up procedure (after preparations are carried out)

1. Slowly increase the pressure/flow supplied to the HC2DHW. Observe that the intensifier starts oscillating when the supplied pressure reaches 20 - 30 bar / 290 - 435 psi.
2. Observe that the intensifier oscillates with a steady pulsing sound, and with a stroke-rate within the specifications (see section 1.9).
3. Increase the pressure/flow observing that the pressure at the H connection increases proportionally. Ensure that the specified stroke-rate is not exceeded at any time.
4. Check that no fluid is leaking from the connections I1 and I2 (up to 8 drops /minute should be accepted)



IMPORTANT! At no time should the intensifier be operated beyond the specifications listed in Section 1.9

5.1 - Introduction

The miniBOOSTER HC2DHW intensifier has been designed and is manufactured to provide reliable service over a range of demanding applications. The intensifier does not require special maintenance, but should be kept free from dust and dirt and debris.

In case the HC2DHW should malfunction, all repairs of the product should be conducted by using miniBOOSTER original spare parts only, and the instructions provided in this manual should be strictly followed.

Before the miniBOOSTER is disconnected and sent for repair, the exterior should be thoroughly cleaned. Once the HC2DHW has been disconnected, all connection bores should immediately be plugged efficiently with plugs or tape, before the intensifier is sent to miniBOOSTER or to the miniBOOSTER distributor, since an internal contamination of the HC2DHW may obstruct the fault-finding process at the miniBOOSTER service department.

5.2 - Inspection

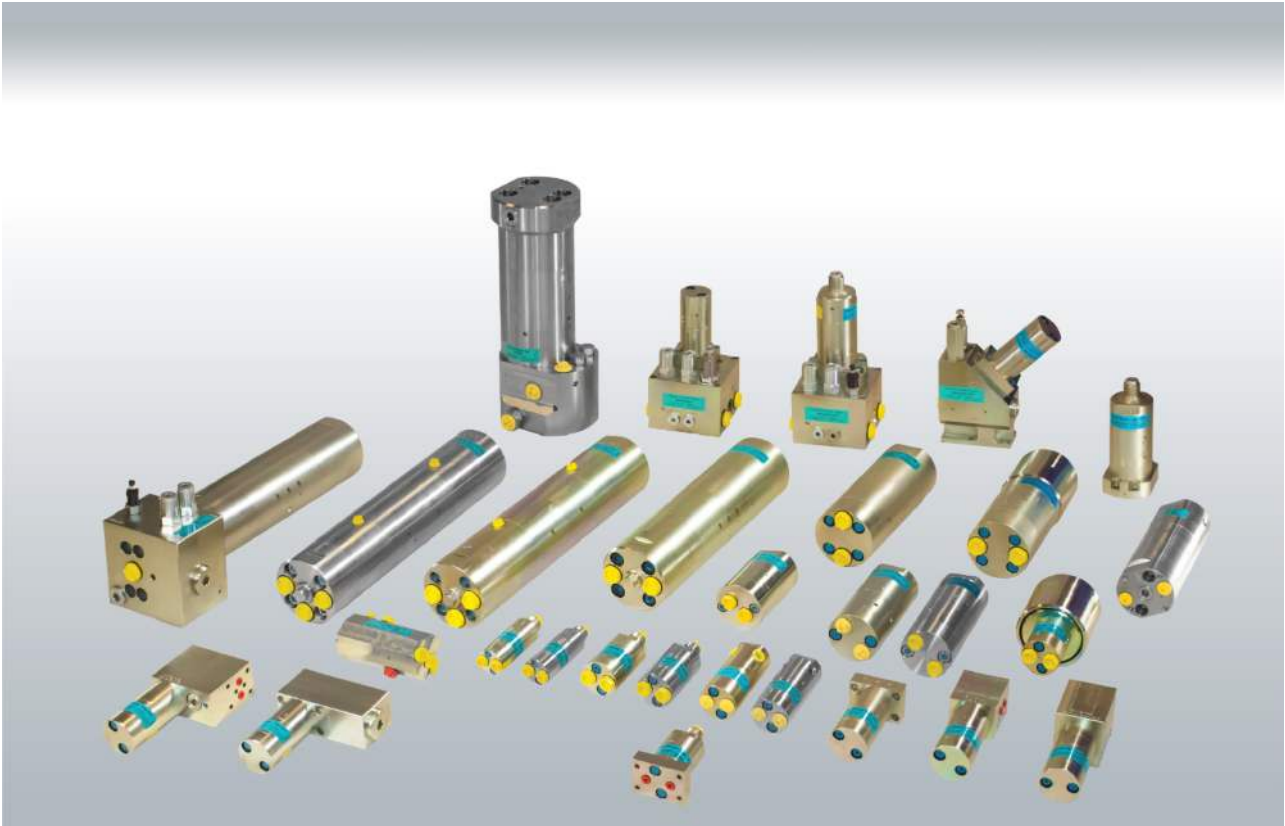
A visual inspection for media escaping from inspection holes I1 or I2 should be conducted on a regularly basis. The purpose of the inspections holes (see their routing on the function diagram) is to enable the user to visually inspect whether the internal dynamic seals of the HC2DHW have become worn or scratched for some reason, or if these are fully functional. The maximum permissible amount of media escaping from I1 or I2 is 8 (eight) drops per minute. If this amount is exceeded the HC2DHW should be repaired with new seals or returned to miniBOOSTER for repair. Any changes in the normal behavior/run of the HC2DHW, i.e. slow or difficult starting etc., should be a sensible reason for having the intensifier repaired immediately.

1. Run the booster on minimum pressure
2. Unplug the two inspection holes I1 and I2
3. Count the drops
4. Reassemble the plugs back in place.

6.1 - Troubleshooting

Symptom	Possible causes	Remedy
No pressure at H1 and H2	No supply of fluid to booster Intensifier doesn't oscillate	Establish supply
Intensifier doesn't oscillate	Port R plugged Port R pressure too high Pressure on IN < 20 bar Intensifier piston seized Intensifier cylinder seized Intensifier seals seized Bistable valve system seized Preset max HP (H1 and H2) reached	Establish a flow from R to tank Reduce pressure to max 5 bar Increase media1 pressure Return intensifier to miniBOOSTER Return intensifier to miniBOOSTER Change out the seals Return intensifier to miniBOOSTER Normal situation (intensifier stalls)
Excessive flow of media from I1 and I2	LP seals defective HP seals defective HP pistons scratched or worn	Change out the seals Change out the seals Return intensifier to miniBOOSTER
Reduced capacity of the intensifier	Defective HP seals Defective HP pistons Defective HP cylinders	Change out the seals Return intensifier to miniBOOSTER Return intensifier to miniBOOSTER
Effective intensification ratio reduced	HP seals defective HP pistons scratched or worn HP pistons seize under pressure	Change out the seals Return intensifier to miniBOOSTER Return intensifier to miniBOOSTER
Hard metallic sound from intensifier	Intensifier over speeding	Reduce pressure/flow (IN)
Intensifier over speeding consequently	Filtering recommendations do not comply Intensifier working under too warm conditions Intensifier over speeding	Ensure proper filtering of media Ensure proper cooling of intensifier Reduce speed
LP and HP seals wears rapidly	Intensifier working under too warm conditions	Ensure proper cooling of intensifier
LP and HP cylinders worn rapidly	Filtering recommendations do not comply Too high working pressures	Ensure proper filtering of media Check/reg pressures (see specs)
Intensifier overheats	Too warm mediums entered into intensifier HP pistons seizing under high pressure Warm operating environment	Check/reg temperatures (see specs) Return intensifier to miniBOOSTER Cool the intensifier with water or oil
None of the above symptoms		Consult miniBOOSTER

The only full range of hydraulic intensifying solutions



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