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Quench Valve

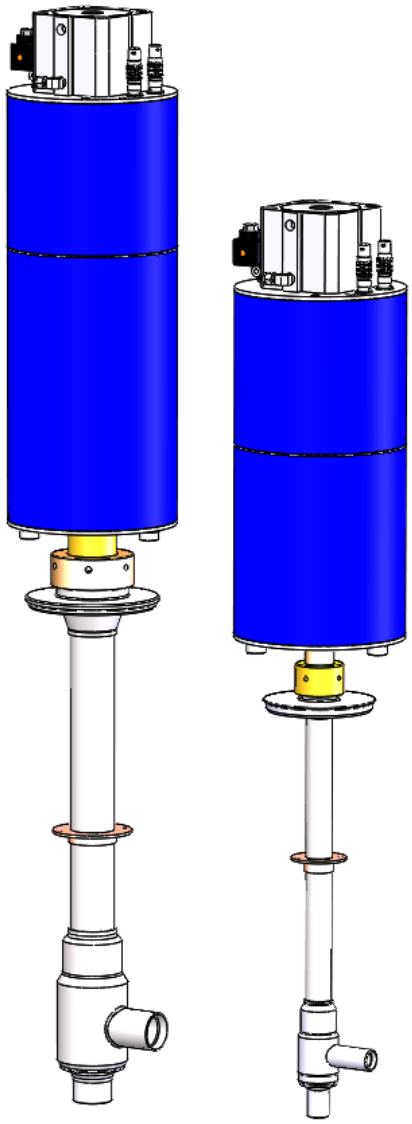
PKS-TEV DN20/PN25 D-Po

PKS-TEV DN40/PN25 D-Po

Version: 1.0, 16.11.2016

PKS-TEV DN20/PN25 D-Po
Valve-no. 20150178
Set-Pressure 20bar(g)

PKS-TEV DN40/PN25 D-Po
Valve-no. 20150069 & 20160003
Set-Pressure 20bar(g)



Installation, Operation and Maintenance manual

Document No. C-0055

www.weka-ag.ch

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1 Introduction

This installation, operation and maintenance manual applies for the WEKA Quench Valves of the types PKS-TEV DN20/PN25 D-Po and PKS-TEV DN40/PN25 D-Po

It contains important information about

- Handling and installation of the valves
- Operating the valves
- Mounting and dismounting the valves
- Instructions to change the sealing to the outside
- Instructions to change the Valve head

Please consider the following points before starting work:

- All valves leave our factory in a flawless condition and successfully tested. To maintain this condition valves may only be installed and operated as described by the manufacturer.
- For safe operation of the valves a proper transport and storage as well as professional assembly and especially a high degree of cleanliness must be ensured.
- The valves have to be mounted in vertical position.
- A modification of valves may only be done by trained and experienced personnel who are familiar with the product. “Trained and experienced people” refers to individuals who are able to judge the work they are assigned to and recognize possible dangers due to their special training, their knowledge and experience as well as their knowledge of the relevant standards.
- Dismounting and assembling of the valves has always to be done in a dirt- and dust-free room.
- Before dismounting a valve make sure that both the system and the actuator are not under pressure any more, unless otherwise specified.
- The storage of dismounted valve parts has to be done in a clean ambience wrapped in a plastic bag. Slightest impurities can cause leakage or even malfunction of the valve.
- As a general principle all interactions may only be carried out on non-pressurised equipment and all electrical currents must be switched off.
  Should urgent work or actions in emergency has to be done on valve parts in operation any manipulation may only be carried out after explicit agreement with the manufacturer or/and trained operator.

Additional and required information can be found on the drawings of the corresponding products, provided within the documentation of the valves and submitted with valve delivery.

For technical inquiries or ordering of spare parts, please always indicate the drawing number of the corresponding valve.

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2 Cleanliness

All valves have been assembled and tested in dust-free environments and testing areas. Furthermore prior to delivery valves are properly cleaned and fulfil the standard according to *ISO 23208-2005 Cryogenic vessels – Cleanliness for cryogenic service*. All components in direct contact with the fluid are free of oil, grease as well as other impurities.

For maintenance and repair work on valves be sure to seal the threaded part of the valve body with a plastic cap or leak-proof plastic bag and adhesive tape after disassembly of the valve insert. This will protect the valve body from contamination.

Equally the connectors of the seat body should remain covered with yellow caps as long as possible preventing any contamination from entering the valve body.

The disassembled complete upper part must also be protected from dust and damage by repacking it into the original plastic tubes and placing it in the original transport packaging. If not available, store it carefully in some other protected area. Slightest impurities can cause leakage or even malfunction of the valve.

We highly recommend inspecting the valve seat and trim for contamination and possible damage each time the insert is removed. In case of doubt exchange these components.

Be sure to protect the valve body from swarf, small chippings or other contaminations during welding actions. A work canvas should be built around the welding facility or the welding should take place in a separate area.
Particle inclusions during welding can lead to premature corrosion of the welded seam or even faulty bonding of welded parts. This can impair the functional capability of the entire facility.

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3 Warning symbols

Safety advices and warnings are shown in this manual to prevent danger to life, health of users and maintenance staff and to prevent material damage. They are highlighted with warning symbols (pictograms). The used symbols have the following meanings:

Danger: Death, severe injury and/or significant material damage **will** be the consequence, if the appropriate precautions are not taken.

Warning: Death, severe injury and/or significant material damage **may** be the consequence, if the appropriate precautions are not taken.

Caution: Light injury and/or material damage **may** be the consequence, if the appropriate precautions are not taken.

Note: Important information about the product itself and the way how to handle it.

4 Safety advices

The valves have been exclusively designed for the use according to the specification in our order confirmation and to the valve drawings. Any other than the specified use is not allowed. The customer is liable for all damages which are the result of an inappropriate use. Unauthorized changes, as well as the use of non original WEKA spare parts exclude any responsibility of WEKA for the caused damages. Any change applied to the assembly is done at the user's own risk.
Installation, maintenance and repair operations may only be done by qualified personnel. Inside a valve there could be very high pressure. Disassembly and maintenance have to be done following strictly the safety instructions.
The following instructions have to be observed before any maintenance operations are started:

- Depressurize the valve body
- Exclude the possibility of initiation by a third party

5 Qualified personnel

The steps described in this manual may only be carried out by persons familiar with the product. If you feel unsure, please contact the manufacturer for the corresponding instructions or training.

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6 Application

The safety valves (DN20 and DN40) are a specific application in ITER (Fusion Reactor) and a self-contained development project. The safety valves secure the magnetic cryostats against overpressure in the case of magnetic quenches and are used exclusively for cryogenic helium (8-10 K). They are designed in such a way that dangerous overpressure can escape without the system pressure fully relax.

The mechanism is designed for repeated triggering.

Technical specifications:

Set-pressure:	20 bar (g) +/- 0.5 bar
Opening pressure:	21-22 bar (g)
Closing pressure :	> 6 bar (a)
Operating temp. Range:	8 - 10 K
Medium:	He

6.1 Main Function

The normal operating pressure of the system is 6 bar(a). Therefore the valves must be tight at 6 bar(a). The tightness is provided by a welded steel housing and a soft sealing head. Due to the flexibility of the sealing head, deviations from tolerances or axial deviations can be absorbed and the tightness and be guaranteed.
If there is overpressure in the system, the valves must start opening at 20 bar(g) (set pressure). The response is set by means of a spring in the drive. Therefore this is a spring-loaded safety valve.

6.2 Secondary Function

Switches:
Two position switches generate binary signals about the opening state of the quench valves. This signal can be analysed by the ITER control station.

Pneumatic-Actuator & PIEZO-Valve

The valves can actively be opened with a reciprocating pneumatic actuator which can be activated by a signal. The PIEZO valve and the pneumatic actuator form one unit. The PIEZO valve is powered by 24V DC. The activation signal of the PIEZO valve is provided by the ITER control station.

The piston rod is always extended in the normal state. When the PIEZO valve is activated the piston rod will retract. As long as the PIEZO valve is actuated, the piston rod remains in the retracted position. The insert is pulled then upwards by a mechanical stop as soon as the piston rod moves into the retracted position. The force created by the air pressure in the pneumatic actuator is greater than the spring force and opens the valve.

If the PIEZO valve is deactivated it interrupts the compressed air supply. The pressure quickly drops in the pneumatic actuator, the piston rod moves back due to the spring force and the valve closes normally.

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7 Marking of Quench Valves

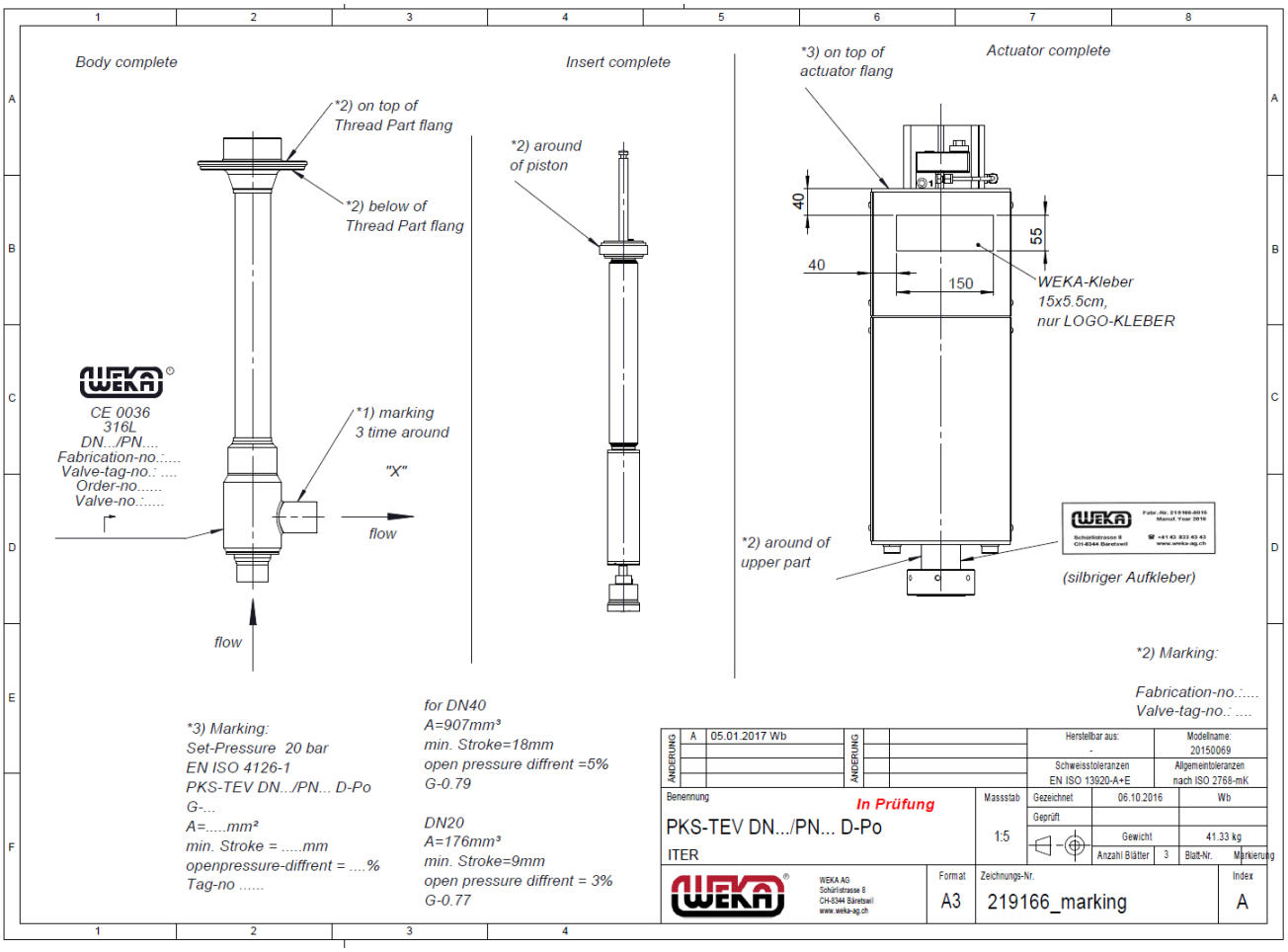
The company WEKA AG sends all valves disassembled. Every part (valve body, insert and actuator) is marked with a TAG-no.

In order to ensure the safety valves work correctly the three parts must be assembled correctly. It is important to note that for one valve all parts have the same Tag-no.

The flow direction is also marked. The safety valves must be installed in the correct direction of the flow.

It is not allowed to remove or change the type plates or the markings.

The following picture shows the position of the markings and the Tag-no.



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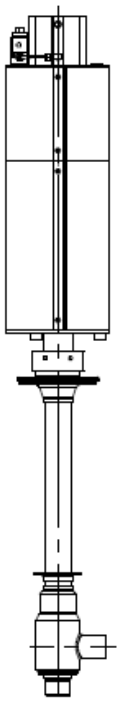
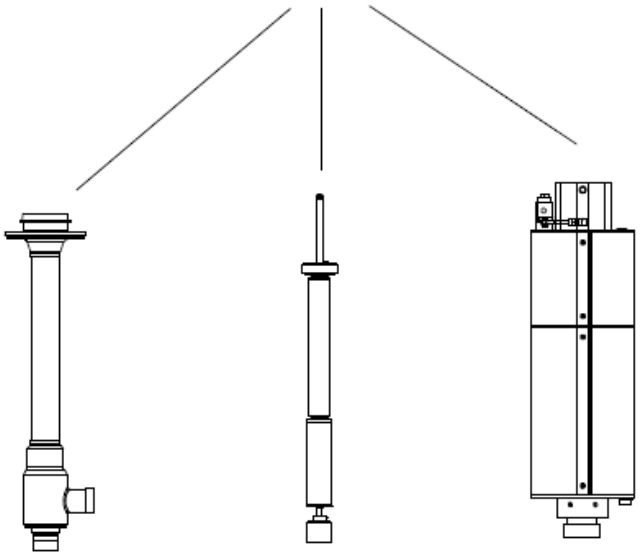
8 Parts overview

The following pictures give an overview of the Quench Valve parts for both types, PKS-TEV DN20/PN25 D-Po and PKS-TEV DN40/PN25 D-Po. Both valve types have the same general design.

Quench valve complete



WEKA AG will send Quench valves in three parts (disassembled)



valve body *Insert* *Actuator*

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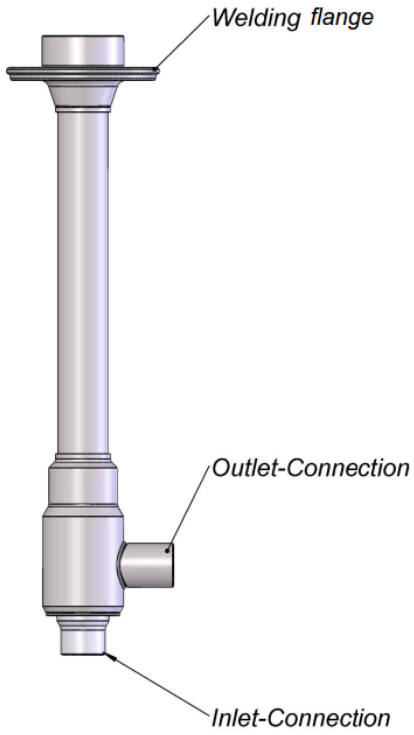
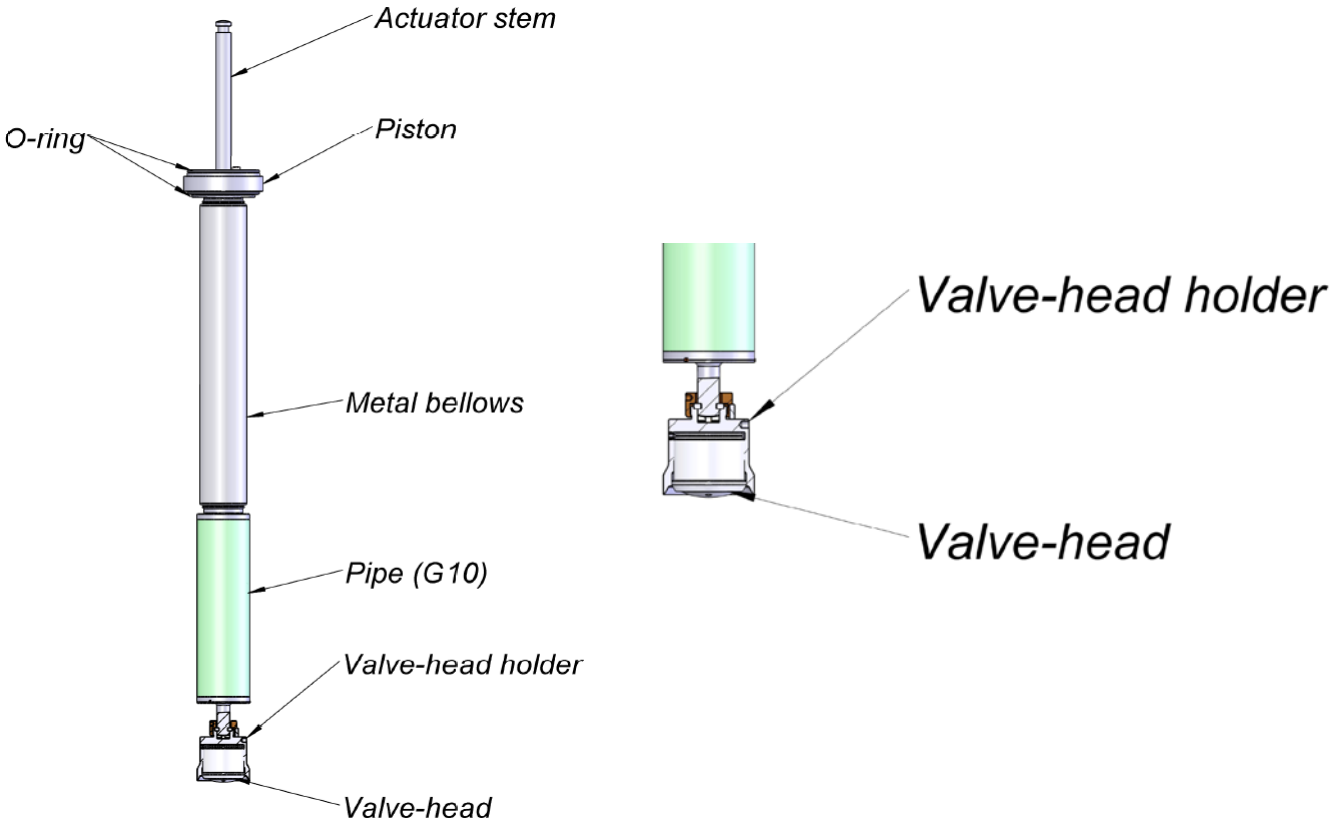
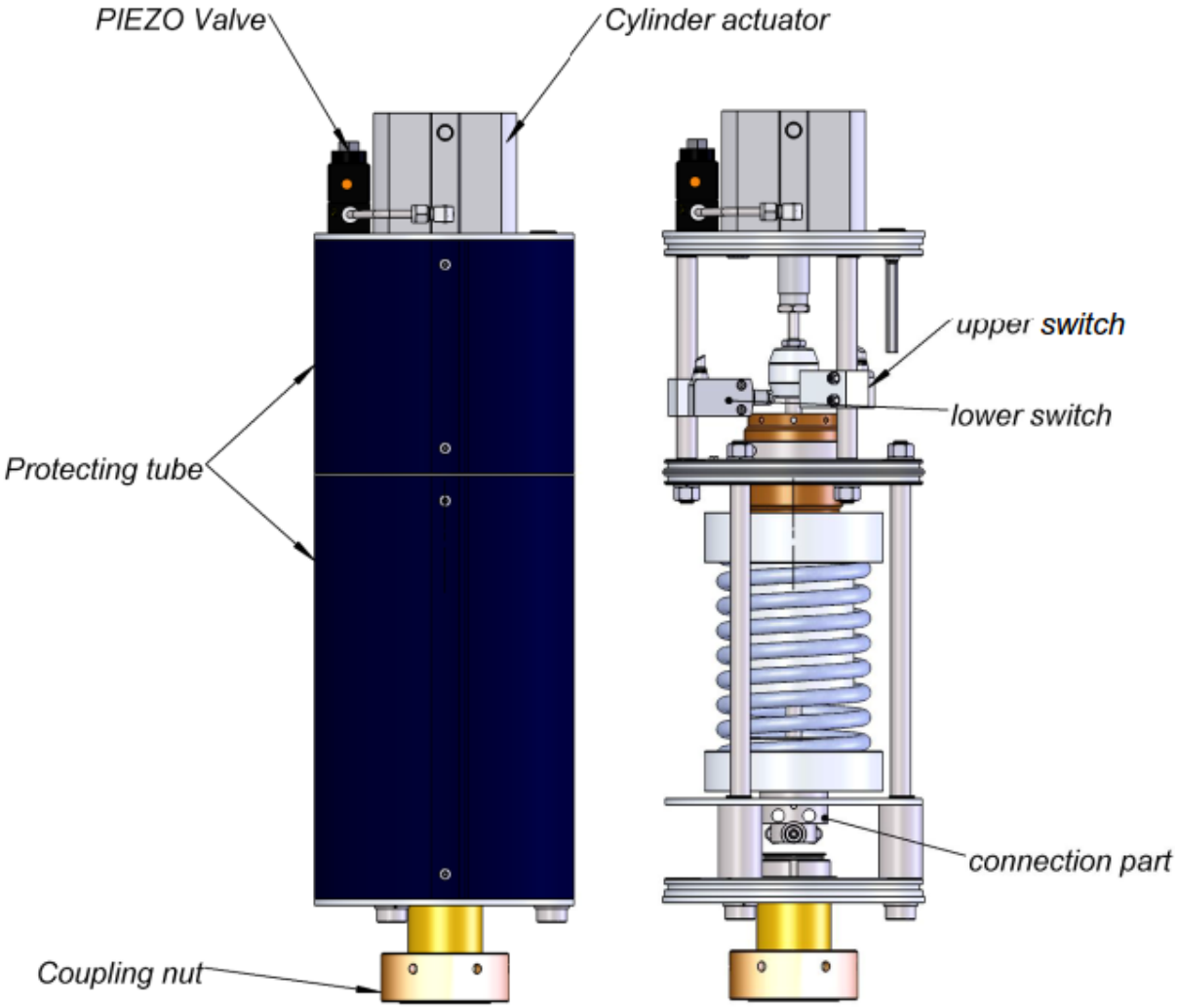
8.1 Valve Body

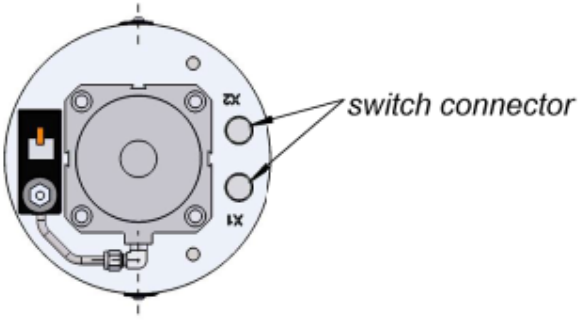


8.2 Insert



8.3 Actuator


PIEZO Valve
Cylinder actuator
upper switch
lower switch
Protecting tube
connection part
Coupling nut


switch connector
X2
X1

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9 Required tools and auxiliary material

The following tools and auxiliary material are required for valve maintenance:

Straightness Control Gauge DN20 (WEKA part No. 45611)
Straightness Control Gauge DN40 (WEKA part No. 45603)
Hook wrench for DN20 (WEKA part No. 83629)
Hook wrench for DN40 (WEKA part No. 82080)
T-type allen key (WEKA part No. 88351)
Tube key 12/13 (WEKA part No. 88352)
Ring key 15 (WEKA part No. 88353)
Allen key (2mm)
Cleaning alcohol
Clean and lint-free cloth
Special tool for valve head DN20 (WEKA part No. 2641)
Special tool for valve head DN40 (WEKA part No. 2642)

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10 Installation

10.1 General

Never weld the valve body in the piping system while the insert is assembled!
WEKA recommends the following procedure to install the valve body.

10.2 Welding procedure

Welding procedure acc. to the instruction below or acc. Welding drawing (20150178_Welding, 20160003_welding, 20150069_welding)

1. The valve is disassembled for welding (only valve body)
2. Insert the valve housing from above into the pipe from the vacuum jacket / feeder
3. Spot weld the welding flange into the feeder tube
4. Carefully measure and prepare the pipes which will be conneced to the Quench Valves inlet and outlet
5. First weld the “inlet pipe”
6. Secondly weld “outlet pipe”
7. Insert the straightness control gauge into the Quench Valve body to confirm that the body is straight indeed
8. Attach the thermal intercept straps
9. Fully weld in the flange to the CTB tube
10. Clean all welding parts to prevent damage (inside and outside of the pipes / feeder)

NOTE:

Make sure to mount the valve in the correct direction. Flow direction is indicated by an arrow on the valve body.
During the welding the weld ends should be kept as cold as possible (by means of cooling water, wet cloth or cooling paste). If too much heat is being introduced in the valve, this could deform the valve body.
After welding and cooling down, the valve body and the piping should be deeply cleaned, rinsed and dried.

10.3 Electrical and pneumatic connections

For the electrical connections, the pneumatic connections and the required compressed air check the drawings delivered with the valve.

Connect the air tube for compressed air to the PIEZO-Valve
Connect the cable for the PIEZO valve and for both switch connectors to the control centre.

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10.4 Bringing into operation

Before bringing new plants into operation and particularly after repairs, the complete pipe arrangement with all valves in open position must be flushed to remove all dangerous particles, like chips or welding pearls.
Open and close the valve several times to check their performance.

11 Operation

11.1 General

In order to ensure a long life of the valves, the following points are important:

- Loose parts have to be retightened
- Do not use any auxiliary tools to operate manual shut-off valves
- The valves must not be blocked (only with WEKA Blocking device system)
- If fluid exits, the operation must be stopped and the manufacturer has to be contacted
- If the valve is iced, the operation must be stopped and the manufacturer has to be contacted

11.2 Operation of the Active Mode

To actively operate the valve, apply the corresponding input signal to the control element (PIEZO-valve) of the valve.

Make sure to supply compressed air according to the pneumatic scheme on the valve drawings.

12 Maintenance

The valve components are designed to be mostly maintenance free. Optimum selection of material composition limits wear and tear to an absolute minimum.

Make sure to keep the system clean during operation.
Especially valves under infrequent operation or where access is difficult have to be inspected carefully to make sure they work properly.
Recommended spare parts are listed in the valve drawing and can usually be delivered within a few days. Nevertheless, WEKA recommends to keep a seal set consisting of seat seal, dynamic safety seal, static seal, static safety seal and dynamic spring loaded seal (see drawings) on stock.

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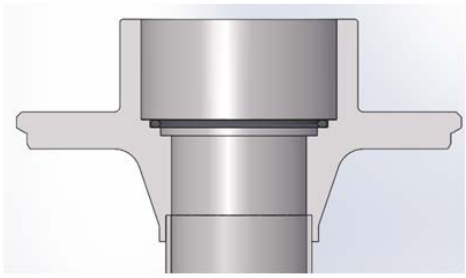
12.1 Assembly

If still mounted, remove all protection parts on valve body, insert or actuator.

The assembly of the insert has to be done very carefully and a high degree of cleanliness is essential!

Step	Picture	Description
1		Clean the valve body inside very carefully with a clean, lint-free cloth and cleaning alcohol. Put the first o-ring inside of the valve body. (O-rings are packed in the insert box.)
2		Insert the insert into the valve body
3		Mount the second o-ring on insert

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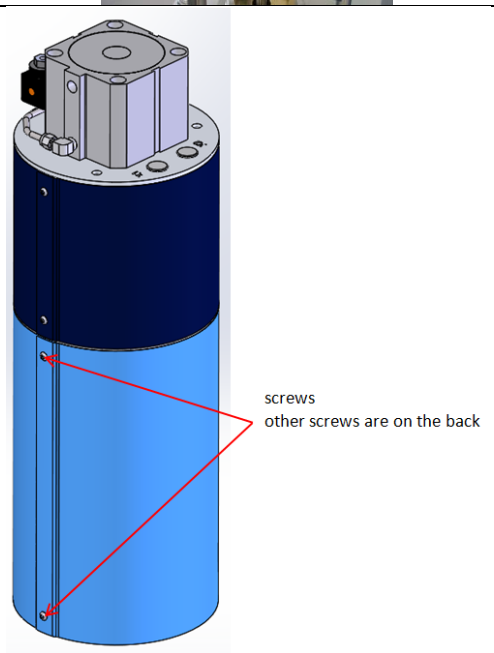
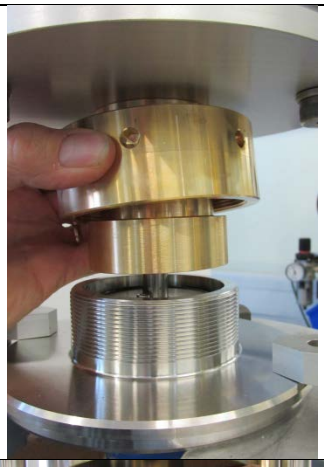
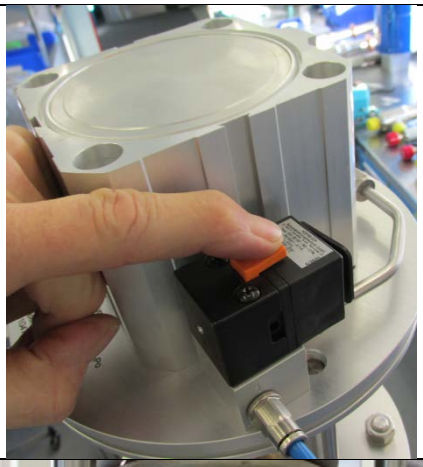
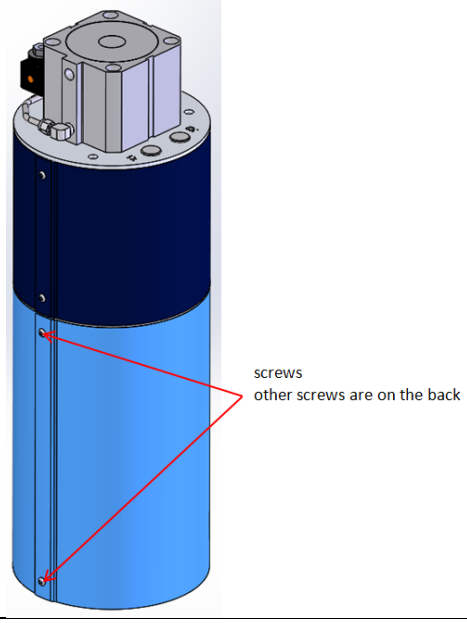
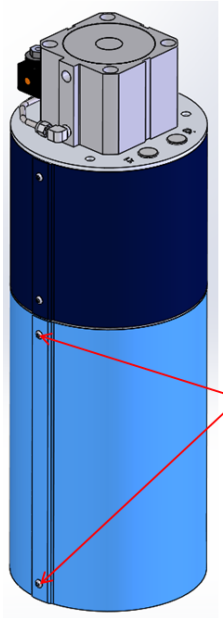
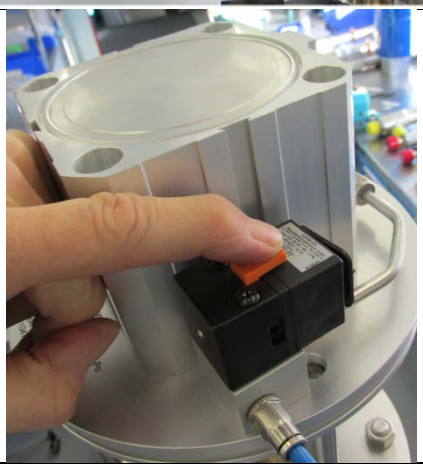
4		Mount 2 ring screws on the pneumatic actuator. (They serve as anchor points for the crane)
5		Remove the lower protection tube by unscrewing the 4 screws.
6		Carefully move the drive unit over the insert. Plug the actuator carefully over the actuator stem.

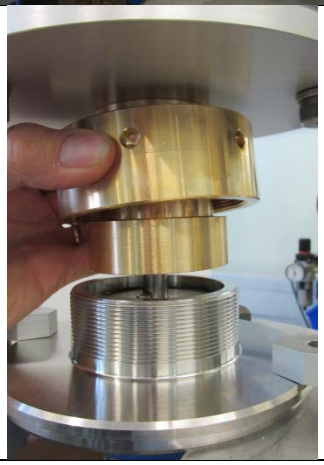
7		Lift the union nut. Move the Actuator down so that the upper part is centred in valve housing.
8		Tighten the union nut with the hook wrench Use only slight hits with a hammer to close the ring.
9		Remove the 2 ring screws from the pneumatic actuator.
10		Remove the bag with screws and nuts. **Attention: Do not remove the wooden blocks yet.**

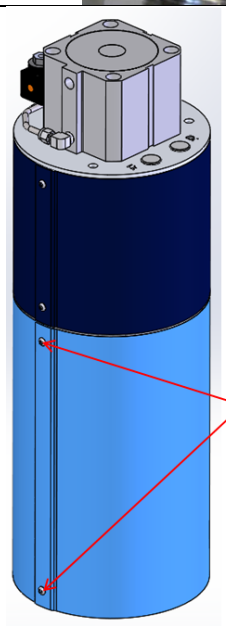
11		Connect the air supply to the PIEZO valve. Min. air pressure 3 bar(g) Max. air pressure 6 bar(g) By pressing the PIEZO valves orange button, the pneumatic actuator will open the Quench Valve manually (if the air is supplied). **Attention: Do not press the orange button until the next step is carried out!**
12		Remove all wooden blocks from the actuator. Activate the orange button to lift the spring. **Attention: Actuator will close fast!!** **Keep your hands away! Danger of bruises! Never grasp between the spring!** **Wooden blocks are needed again for disassembly. Do not throw away**
13		Connection part of actuator will drive over the actuator stem With tool: T-type allen key (WEKA part No. 88351) Tube key 12/13 (WEKA part No. 88352) Ring key 15 (WEKA part No. 88353) Screw all 3 thread pins with the washer and the nut into the thread in the connection part. Three times!
14		Mount the lower protection tube by assembling 4 screws.

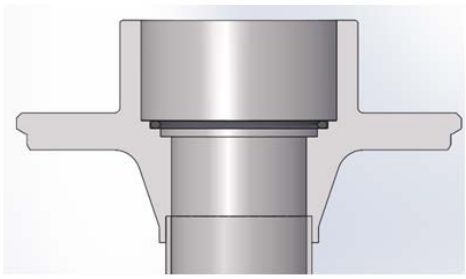
12.2 Disassembly

Pay attention on the all spare parts when releasing the parts. Put them into a plastic bag.

Step	Picture	Description
1		Remove the lower protection tube by unscrewing 4 screws.
2		With tool: T-type allen key (WEKA part No. 88351) Tube key 12/13 (WEKA part No. 88352) Ring key 15 (WEKA part No. 88353) Unscrew all 3 thread pins with the washers and the nuts out of the threads in the connection part. Three times!
3		Connect the air supply to the PIEZO valve. Min. air pressure 3 bar(g) Max. air pressure 6 bar(g) By pressing the PIEZO valves orange button, the pneumatic actuator will open the Quench Valve manually (if the air is supplied). **Attention: Do not press the orange button until the next step is carried out!**

4		Add all wooden blocks under the spring carrier.  **Attention: Actuator will close quickly! Keep your hands away! Danger of bruises! Never grasp between the spring!** After the wooden blocks are mounted the orange button can be released Remove the air supply from the PIEZO-valve.
5		Mount 2 ring screws on the pneumatic actuator. (They serve as anchor points for the crane)
6		Unscrew the union nut with the hook wrench.
7		Lift the union nut. Lift the actuator carefully with the crane.

8		Carefully move the actuator to disassemble it from the insert stem.
9		Mount the lower protection tube by assembling 4 screws.
10		Remove the 2 ring screws from the pneumatic actuator.

11		Dismount the second o-ring from the insert.
12		Take the insert out
13		Remove the first o-ring from the inside of the valve body.

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12.3 Change o-rings

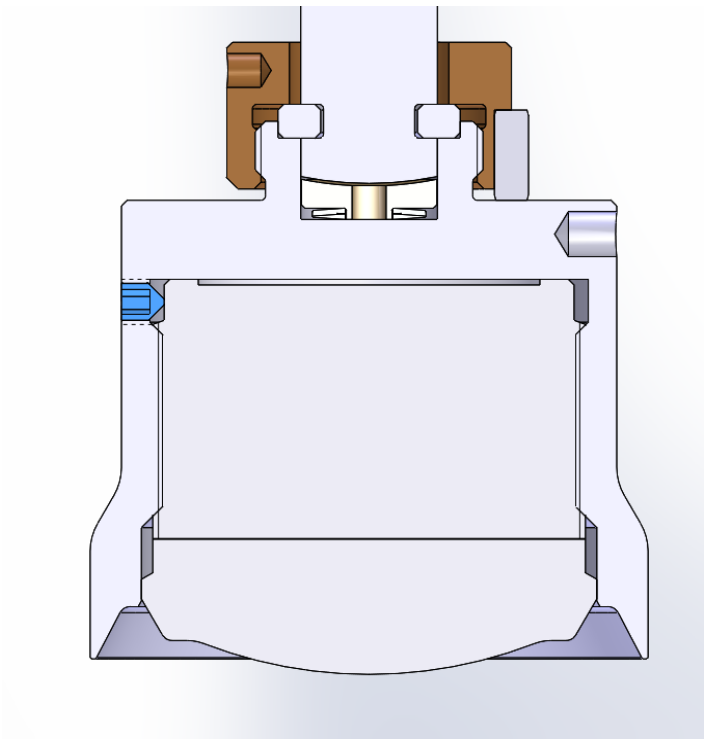
In order to change the o-rings the valve must be completely disassembled according to chapter 12.2

When mounting the valve together use the new o-ring during the corresponding assembling step.

12.4 Change Valve head

Changing the valve head has to be done very carefully! It is essential, that all surfaces (seals and metal) are absolutely clean.

1. Disassemble the valve as described in chapter 12.2
2. Unscrew the M4 thread pin with an allen key 2 mm (blue part in picture).
3. Remove the valve head with the special tool (DN20: 2641, DN40: 2642).
4. Mount the new valve head.
5. Screw the M4 thread pin with the allen key 2 mm (blue part in picture).



13 Spare parts

For spare parts please refer to the datasheet or to the customer specific drawing which was delivered with the order documentation.

In case you need an offer or you order spare parts, please make sure to provide the drawing number and the correct part number to the following address:

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Switzerland

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Fax: +41 (0)43 833 43 49
Email: info@weka-ag.ch
Web: www.weka-ag.ch

14 Declarations of conformity

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EU - KONFORMITÄTSERKLÄRUNG
EU - DECLARATION OF CONFORMITY

Wir
We

WEKA AG
Schürlistrasse 8, CH-8344 Bäretswil

(Name des Herstellers) (Manufacturers name)

erklären in alleiniger Verantwortung, dass das Produkt
declare under our sole responsibility that the product

Kryogenes Sicherheitsventil / Cryogenic safety valve

Typen / Types: **PKS-TEV DN20/PN25 D-Po**
PKS-TEV DN40/PN25 D-Po

(Bezeichnung Typ oder Modell, Los-, Chargen- oder Seriennummer, möglichst Herkunft und Stückzahl)
(Name, type or model, lot, batch or serial number, possibly sources and numbers of items)

auf das sich diese Erklärung bezieht, mit den folgenden Normen oder normativen Dokumenten übereinstimmt
to which this declaration relates is in conformity with the following standards or other normative documents

DIN EN 12516-2:2015-01
DIN EN ISO 4126-1:2013-12
DIN EN ISO 4126-7:2013-12

(Titel und/oder Nummer sowie Ausgabedatum der Normen oder der anderen normativen Dokumente)
(Title and/or number and date of issue of the standards or other normative documents)

Gemäss den Bestimmungen
Following the provisions
(falls zutreffend) (if applicable)

Richtlinie / Directive	2014/68/EU (PED)
Kategorie / Category	IV
Konformitätsbewertungsverfahren / Conformity assessment procedures	B, F
EU-Baumusterprüfbescheinigung EU type examination certificate	Z-IS-AN1-MAN-16-11-2709456-10105455
Notifizierte Stelle / Notified Body	CE0036 TÜV SÜD Industrie Service GmbH Westendstr. 199 DE - 80686 München

(Ort und Datum der Ausstellung)
(Place and date of issue)

(Name und Unterschrift des Befugten)
(Name and signature of authorized person)

Bäretswil, 13.12.2016

Robert Schäppi
(Quality Manager)

Pascal Erni
(Produkt Manager)

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