

1. TECHNICAL SPECIFICATIONS & OPERATION MANUAL



The GAV solenoid operated gas admission valve is designed for use on four-cycle turbo-charged engines to govern the required amount of fuel admitted into the inlet port of the cylinder head depending on engine speed and load.

To govern the required amount of gas by means of the GAV, the INCON electronic control system must be used for the valve control.

The engine load and speed are governed by the amount of gas admitted into the inlet port which is proportional to the duration of the GAV valve opening.

The GAV valve must assure rapid valve opening and closing (a fast response to the control signal) together with reliable valve opening for the whole requested period of time.

Consequently, the GAV valve features short travel, the moving valve plate is opened by the solenoid force and closed by the spring force together with gas pressure. The design provides a complete seal in the closed position of the valve.

Caution: The GAV valve must not be used as a shut off valve. To serve this purpose, an independent shut off gas valve must be installed.

Technical Specifications:

Operating voltage	150 VDC
Cross-sectional area of flow	700 sq.mm
Lift	0.9 mm
Working medium	Gaseous fuel (natural gas etc.)
Switching frequency	12.5 Hz max.
Response (assumes the use of an INCON control)	
- time to full open	0.003 s max.
- time to full closed	0.003 s max.
Ambient temperature (permanently)	-40..... +100 °C
Ambient temperature (short-term)	125 °C max.
Protection class	IP 64
Classification for use in atmospheres:	Non-explosive atmosphere
Max. gas supply pressure	500kPa (5 bar)
Max. Air manifold pressure	300kPa (3 bar)
Max. gas pressure difference	200kPa (2 bar)
Max. Backfire pressure	50kPa (0.5 bar)
Inlet gas temperature	60 °C max.
Solenoid core resistance	38.4 Ω +/- 5%

*Solutions for combustion engines,
that work right from the beginning.*

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2. INSTALLATION, OPERATION, MAINTENANCE

The GAV valve installation

1. The GAV valve Installation, Operation and Maintenance Manual must be read carefully prior to installation.
2. The GAV valve can be mounted on the manifold in any position.
3. Make sure that the O-ring at the valve inlet and outlet is clean and properly located.
4. Evenly and gradually tighten the M8 mounting screws to max. torque (20 Nm). Use a lock-washer in accordance with DIN 137 A.
5. The solenoid operated valve is controlled by a cable with a square section of 1.5mm². The mating connector type DIN 43650 comes along with the valve.
6. The gas inlet hole is recommended to be equipped with a flexible hose (mounted through an adapter) to avoid unnecessary stress affecting the valve body. Mount and tighten the flexible hose on the adaptor prior to its installation on the valve.
7. After installation, all joints which can be dismantled (including the inlet and outlet flange), must be checked for gas leaks e.g. by means of a foam-forming agent.

MAINTENANCE, TROUBLESHOOTING

Provided that good gas filtration, in accordance with the technical parameters has been assured, the valve does not need any maintenance.

Should any valve defect be found (leakage, failure to function etc.) the valve has to be replaced. Don't repair a valve without the appropriate service instruction and the necessary knowledge.

Should leakage exceed allowed limits, the valve is disassembled (as instructed) so that sealing surfaces of the valve can be checked and cleaned. After assembly, the valve closing tightness test is repeated and evaluated.

Caution:

The valve seat can be cleaned on the contact surface by lapping or sand paper on a flat plane. The moving plate should never be cleaned by lapping or sand paper.

Within the warranty period, repairs of the valve may be carried out by the valve manufacturer only.

RECOMMENDED MAINTENANCE INTERVALS

2000 hours of operation

Operational check of all valve joints which may be dismantled for leakage, including inlet and outlet flange: the valve is mounted on the engine and the check is made by means of a gas leakage detector or foam-forming agent.

3000 hours of operation

Valve leakage check and valve closing tightness check in accordance with instructions.

6000 hours of operation

Valve O-rings replacement.
Cage assembly replacement
Lower valve plate replacement

Recommended Replacement Parts

O-ring set (positions 14 and 15)
Cage assembly (position 2,3,4 and 5)
Lower valve plate (position 6)

Accessories supplied with the valve

O-Ring: 46 X 2 (Pos. 14)
O-Ring: 64.77 X 2.62 (Pos. 15)
Mating Connector: EC 1120, DIN 43650

Packaging, Transport, Storage

The solenoid operated valve is packed in a polyethylene bag. In transit and storage, the packed product must be protected against mechanical damage.

If possible, valves should be stored indoor and protected against weather and other effects to avoid their contamination, damage and deterioration.

Warranty

The manufacturer provides a Warranty for the purchased GAV valves which expires upon the earliest of 12 months from delivery or 2000 hours of operation.

Data for Delivery

The order has to specify:

The number of units. Valve type (preliminary consultation with the manufacturer is advisable).

For accessories, the replacement parts order should include a position in accordance with an outline drawing and parts list and if you need replacement parts for the valve purchased, specify the valve serial number.

TESTING

Valve closing tightness test

1. The valve is checked under conditions and with equipment corresponding with its operation.
2. The test substance is filtrated (5 micrometer) air with 2 bar pressure.
3. The testing equipment consists of the test substance source (air with filtration of 5 micrometers) and 2 bar pressure and connecting piping (DN 10 mm) with a pressure gauge for measuring the valve inlet pressure.
4. Criteria of allowed GAV valve closing tightness: Opening of the valve plate not before 0.5 bar.

Leakage test

For a leakage test, an air pressure source with the highest working pressure (2 bar) will be used. The test substance supply will be connected to the inlet part of the valve.

Leakage will be considered as satisfactory if within 3 minutes no measurable or visible (foam-forming agent) leakage is detected, which is equal to zero pressure drop once the inlet pressure ball valve is closed.

Supporting Documents

- Declaration of Conformity
- Dimensional drawing
- Section drawing and parts list
- Valve Test Record Sheet with attached graph on valve travel measurement related to time (functional test)
- GAV 40 valve Disassembly and Assembly Instructions (for replacement of main parts)

Prepared by: Daniel Huegli & Bernhard Suter

Date: November 29.2006



DECLARATION OF CONFORMITY

Manufacturers Name Huegli Tech AG (Ltd.)
Manufacturers Address Murgenthalstrasse 30, CH-4900 Langenthal
Model Name/Number Gas admission valves, GAV – 20, GAV – 40

Product Description and Function:

The GAV solenoid-operated gas admission valve is designed for use on four-cycle supercharged gas engines to govern the required amount of fuel admitted into the inlet runner of the cylinder head depending on engine speed and load. The product is intended for use in non-explosive atmospheres. The solenoid operated gas admission valve must not be used as a stop valve (safety valve).

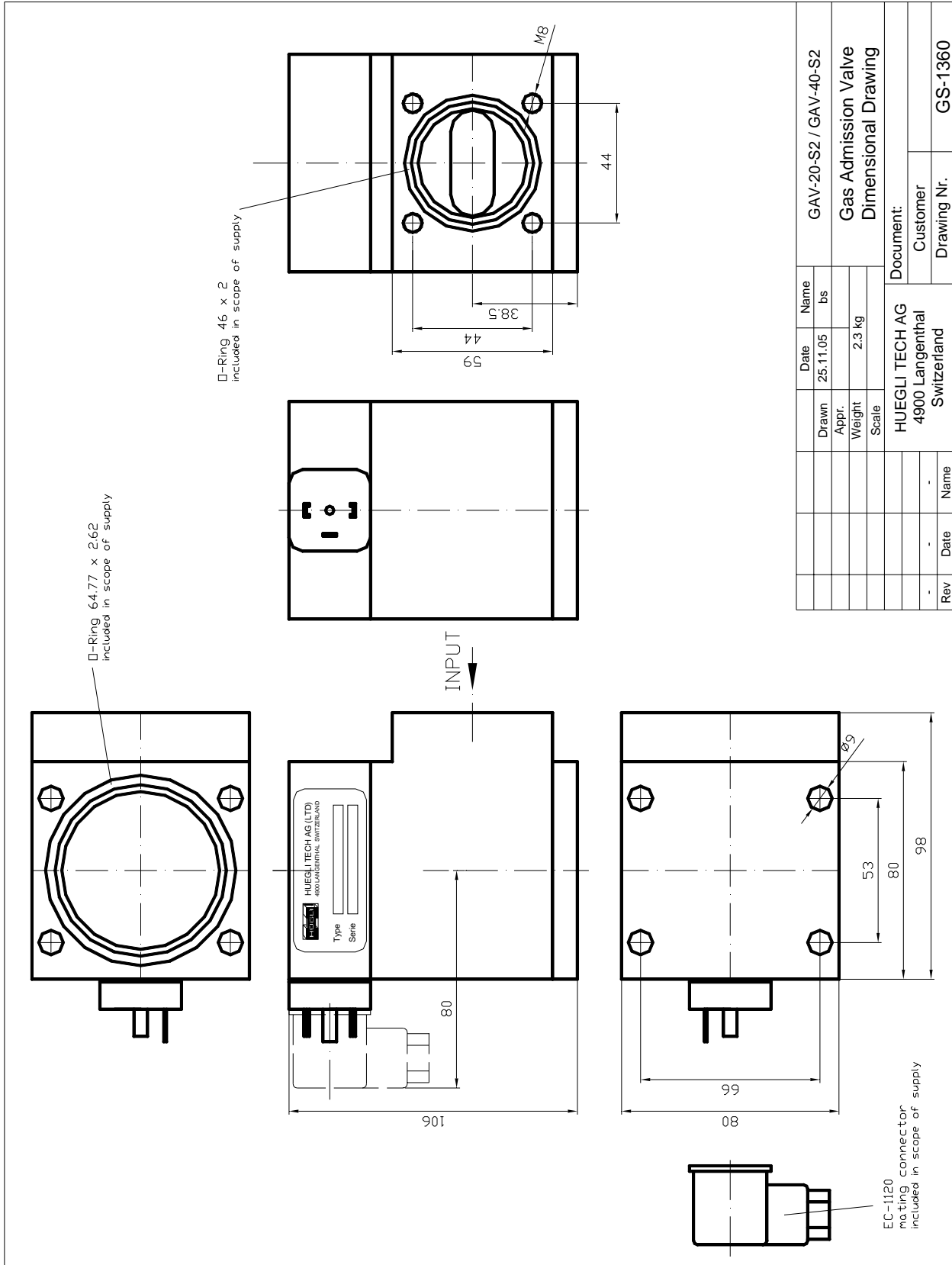
We hereby declare and confirm that

- A. The specified product is safe under conditions of its ordinary and intended use (as described in its Operation Manual) and actions have been taken to assure conformity of all launched products with technical specifications, basic relevant regulatory requirements and requirements of technical regulations specified in Section B.
- B. The characteristics of the product meet all applicable technical requirements set out in:
 1. 94/9/EC Council directive of March 1994 on the approximation of the laws of the member states concerning equipment and protective systems intended for use in potentially explosive atmospheres
 2. 73/23/EEC council directive of February 1973 on the harmonization of the laws of the member states relating to electrical equipment designed for use within certain voltage limits.
 3. EN 60204-1: Safety of machinery – Electrical equipment of machines EN 60204-1
 4. EN 61010-1: Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements
 5. EN50028: Electrical apparatus pro potentially explosive atmospheres Part 8

We, the undersigned, hereby declare that the equipment specified above conforms to the above directive(s).

Manufacturer
Full name Daniel Huegli
Position President
Place CH-4900 Langenthal, Switzerland
Date 1. November 2006

DIMENSIONAL DRAWING



Drawn	Date	Name	GAV-20-S2 / GAV-40-S2
Appr.	25.11.05	bs	
Weight	2.3 kg		Gas Admission Valve Dimensional Drawing
Scale			
Rev	Date	Name	Document: Customer Drawing Nr. GS-1360
-	-	-	
HUEGLI TECH AG 4900 Langenthal Switzerland			

SECTION DRAWING AND PARTS LIST

ITEM POS.	QTY. ANZ.	DESIGNATION BENENNUNG
1	1	Valve housing
2	1	Armature
3	1	Cage
4	1	Spring
5	1	Disk
6	1	Valve plate
7	1	Screw M6X20
8	1	Lower valve disk
9	1	Closing flange
10	1	O-Ring 66X2
12	1	O-Ring 68X2
13	1	O-Ring 62X2
14	1	O-Ring 46X2
15	1	O-Ring 64.77X2.62
16	1	Pin 2.5X5 BN1 208
17	4	Allen screw M5X16 BN3
18	8	Lock-washer M5 BN782
19	1	Gasket
20	1	Connector socket
21	4	Screw M3X10 BN330
22	1	Valve top with coil
23	4	Allen screw M5X35 BN3

Rev	Date	Name
-	-	-

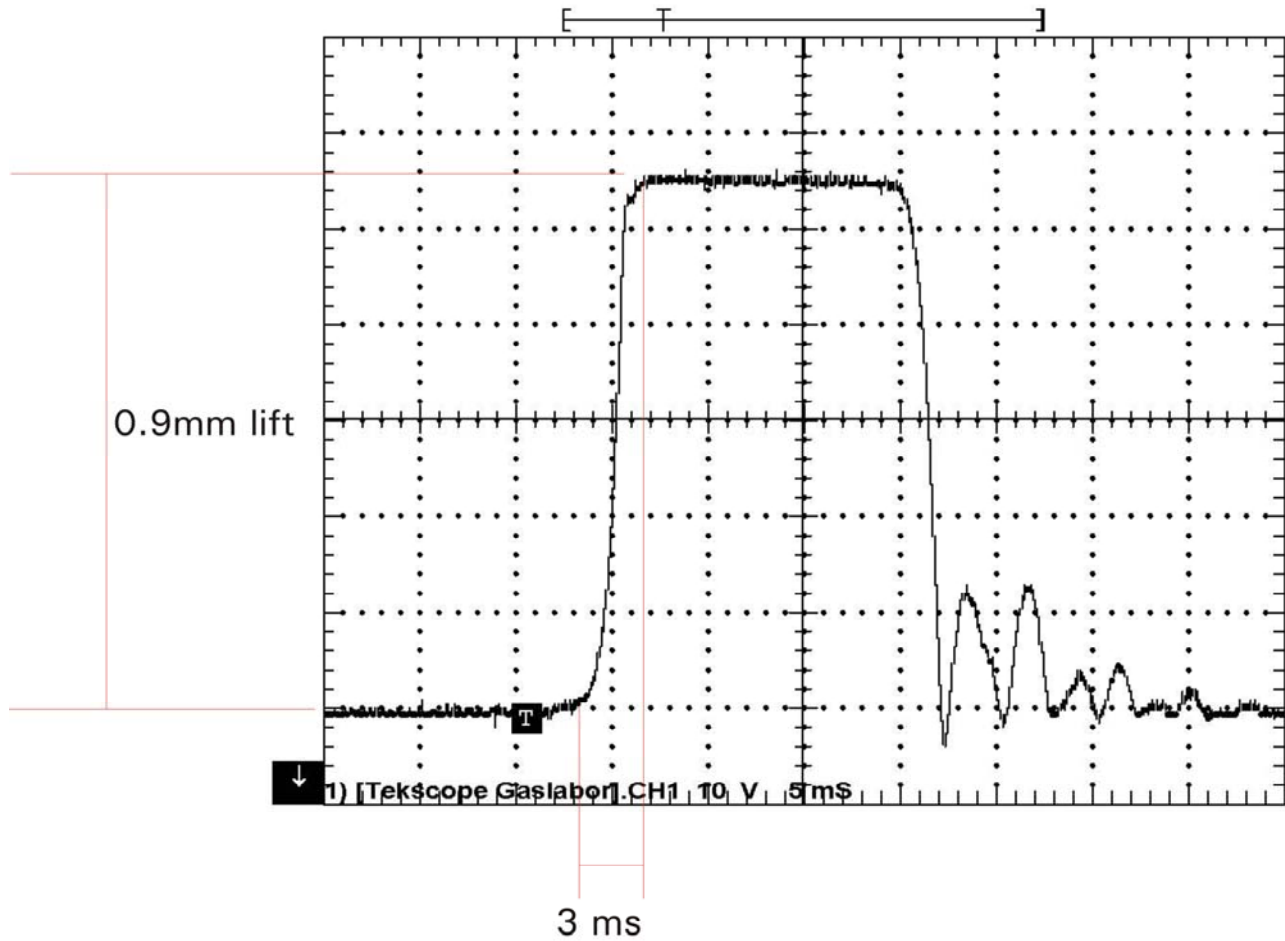
Drawn	Date	Name
Appr.	01.11.06	kzj
Weight		
Scale		

Document:	
HUEGLI TECH AG 4900 Langenthal Switzerland	Customer Drawing Nr. GS-1492

GAV-40-S2

General Assembly

VALVE TEST RECORD SHEET WITH ATTACHED GRAPH ON VALVE TRAVEL MEASUREMENT RELATED TO TIME (FUNCTIONAL TEST)



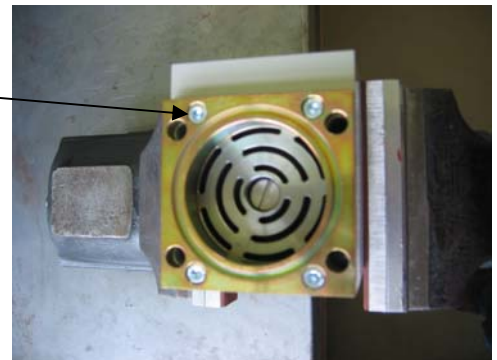
Service Manual for GAV valves

Tools required: Allen key Nr. 4; Screwdriver Nr. 7 and Loctite 743 blue

Clamp the GAV on the coil side in a vice. Hand tighten the vice



Remove the 4 allen screws holding the end flange



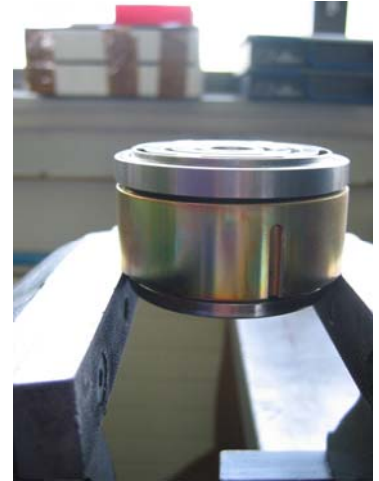
Rotate the end flange until it can be removed



After removing the end flange, open the vice and turn the GAV upside down until the assembled cage falls out.
Note: **Don't drop the cage from a too high altitude, since it could damage the rubber valve plate.**



Clamp the cage in to the vice between the anker plate.
Note: **Don't overtorque the vice as the anker plate could suffer damage. It is recommended to use soft vice clamps.**



Unscrew the centre screw until the rubber plate can be removed.



Disassemble the complete cage. Make sure all parts are cleaned before inspection. Use non aggressive petrol for cleaning the parts.



Inspect the rubber valve plate. On top see a used plate, which still can be used. Below see a new valve plate. Important is to watch out for cracks and tear in the rubber surface. However, small holes which are not larger than 0.5mm and are not located on the sealing ring-marks do not affect the operation.



Plate which was in operation. The 6 visible rings mark the sealing plate. As long as these have no infringement, the valve plate still meets specification.



New valve plate which has never been in use. No ring markings can be seen.

In order to make sure the lower valve plate is cleaned properly, use a lapping disk or a very fine sand paper. In case sand paper is used, the grit number has to be between 280-320. Use a flat even surface without any bumps. Smoothly push the lower valve plate up and down with the sealing surface facing the sand paper. Repeat the movement until the surface of the valve is clean. It is important that **only a few tenth of a millimetre of the peak radius shape** are cleaned in order to seal properly.

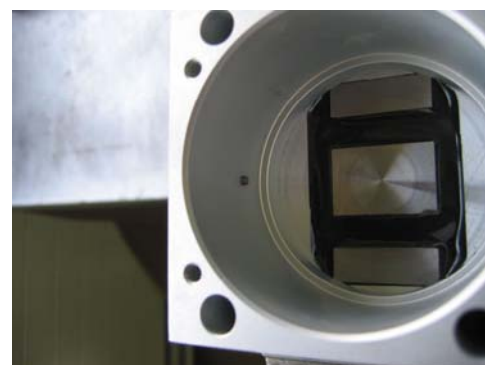


IMPORTANT NOTE: After lapping or using a sand paper, clean the lower valve plate thoroughly and assure that there are no particulates left over from the sand paper.

Assemble the complete cage. Loctite shall be used on the rubber plate screw, Loctite Nr. 743 blue. Tighten the rubber plate. Therefore use a large screwdriver Nr.7 and tighten firmly.



Before inserting the cage in to the valve body, ensure the inside of the valve is cleaned and no particulates remain on the coil surface.



Then insert the cage assembly. There is only one direction to insert the cage since inside the valve housing a pin is located, which has to match to the cage slit. Slide the cage in to the valve. If it does not go all the way down, it is possible to twist the cage by hand from the gas inlet side until the cage slides in to the valve completely.



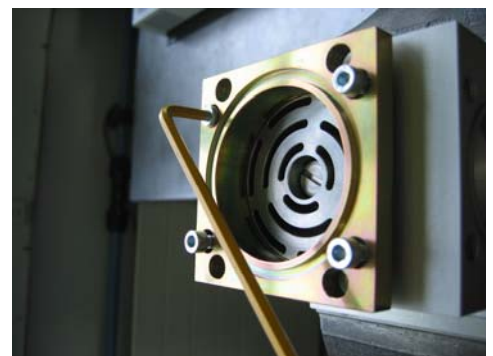
Insert the valve end plate.



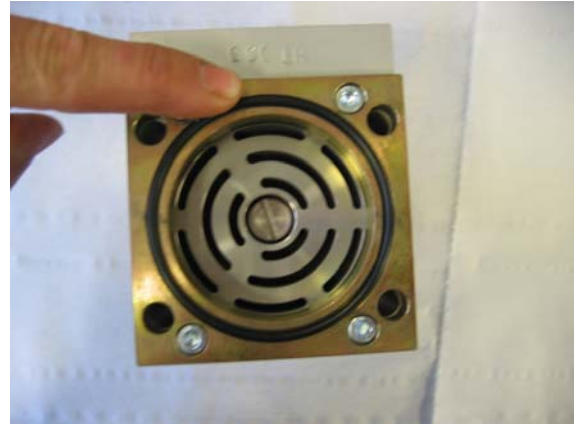
Before the end flange is mounted, make sure that the 2 O-rings are properly installed. Make sure that the O-rings are in good shape, otherwise replace them. It is recommended to use a fingertip of grease to smoothen the O-rings.



Tighten the end flange with an allen key Nr. 4, torque, 7.5NM.



Before mounting the valve on to the engine, be assured that the O-Ring facing the engine is in good shape and has no infringement. Also use a finger tip of grease to smoothen the O-ring.



Mounting the valve on the engine block, make sure that the mounting surface is cleaned before positioning the valve. The 4 M8 nuts are tightened with 20 NM each.

