

OPERATING AND MAINTENANCE INSTRUCTIONS/
SPARE PARTS

EDITION 01/2017

**Serving the Gas Industry
Worldwide**

Honeywell

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1. General information

1.1 General information

All persons involved with the assembly, operation and/or maintenance of the gas mixer HON 985B -140/65-ZW-N-NI must attentively read and understand these operating and maintenance instructions in their entirety.

Inspection and maintenance intervals depend mostly on the operating conditions at the respective system. Amongst other factors, the device used and the corresponding gas composition, and the existing gas contamination as well as any accumulating condensates must be taken into account. There are no general rules or recommendations for intervals. Therefore, it is advisable to include the devices in the gas engine maintenance intervals.

Note

If operational irregularities are discovered during the operation or during a functional test, unplanned maintenance work on the mixer is required. This must be performed as soon as possible after the discovery of the deviation in operating behaviour.

During maintenance, components must be cleaned and then checked thoroughly. This is necessary even if there have not been any unusual observations during operation and/or functional testing. The check must include in particular seals, all moving parts such as the transmission thread and Venturi insert. Any and all defective parts must be replaced with new ones. The same applies to O rings removed during disassembly.



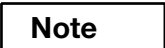
Do not use any spare/wear parts and/or oils & lubricants not specifically recommended in the Honeywell operating and maintenance instructions. In the event spare/wear parts and/or lubricants & oils other than those specifically recommended are used, Honeywell shall not be held liable for any defects and consecutive damages attributable to such use of illegal parts, lubricants, oils etc.

Some parts in the lists and drawings are marked with a letter "W". We recommend to always have a reserve of those parts in stock for maintenance purposes.

Those spare parts are put together in another separate list at the end of the spare parts list.

1.2 Safety information

In this manual, safety information is highlighted by means of the following signal words and eye catchers

Eye catcher	Used for:
	Danger to life and limb
	Danger of damage to property and/or the environment
	Important additional information

1.3 Applications and features

- **Applications**

- Variable mixing of air and fuel gas for gas engines (e.g. for λ -control, electronic spark control, combustion-chamber temperature control)
- Mixing gases for operating gas motors with multiple types of fuel gas (e.g. sewage gas, secondary operation with natural gas)
- In general, mixing all sorts of gases (e.g. boosting low calorific-value gases like waste dump gas)
- Applicable for natural gas, sewage gas, dump gas, mine gas, propane, butane and neutral gases

- **Features**

- Simple construction
- Instantaneous carburetion (Venturi effect)
- Adjustable fuel-gas mixing gap provides for flexible mixing ratios
- Fine adjustment of mixing ratios possible
- Sensitive stepper motors provide for precise adjustment of mixing gap
- Turbulent mixing (homogenization)

1.4 Structure and mode of operation

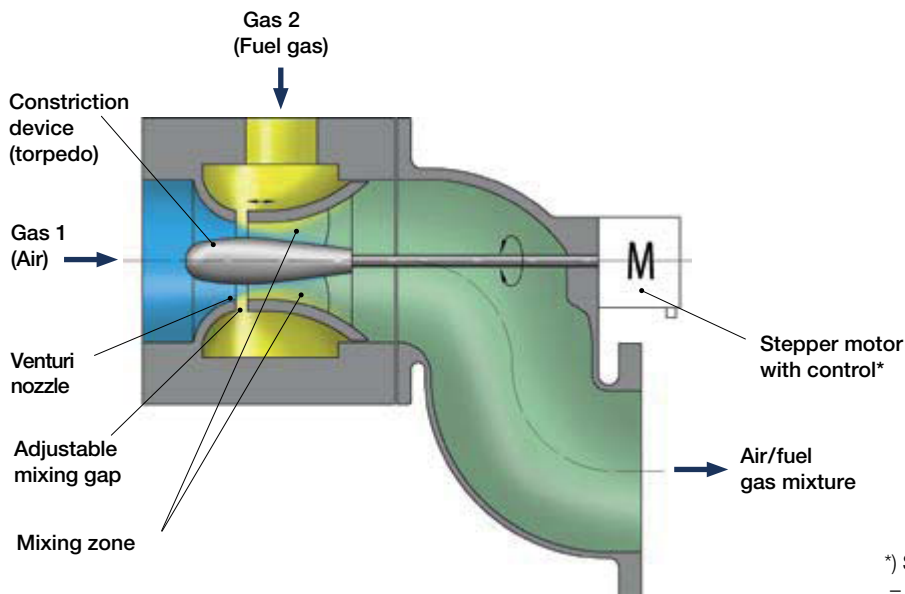
This gas mixer has been designed on the principle of the Venturi effect. There is a gas-pressure control system that brings gas 2 (fuel gas) flowing in through an upstream gas pressure control section to the same pressure as gas 1 (air). With the reduction of the cross-section, there is an acceleration of gas 1 (air) flowing in. Acceleration means the pressure of the gas goes down. The result is a pressure difference at the mixing gap. The pressure difference and the mixing gap, as adjusted, make sure that gas 2 (fuel gas) is mixed with gas 1 (air) proportionally (Venturi effect).

For optimal effectiveness, a torpedo designed for maximum flow rates of the gas mixture is integrated in the device. The downstream flow edges of the torpedo support the turbulent mixing of the two types of gases (homogenization). For a more precise adjustment of the mixing ratio λ -control, for instance, there are sensitive electronic control loops and motors that can adjust the gap according to operational requirements.

Mixture of air/fuel gas

not rich enough	too rich
increase mixing gap	reduce mixing gap

HON 985B - 140/65-ZW-N-NI



*) Stepper motor control, e.g. for
 - λ -control
 - Control of cylinder temperature
 - Electronic spark control

Fig 1: Functional principle

2. Specific operating instructions

2.1 High frequency radiation exposure (comment on application at gas engine)

Note

Possible high frequency radiation exposure (e.g. from the coil and its cable) must be observed with regard to the proper response from the proximity sensors and stepper motor. Cables must be laid separately.

2.2 Stepper motor control card

A stepper motor control card is not included in the scope of delivery. When choosing a stepper motor control card, the following data on the stepper motor and the limit sensors should be taken into account.

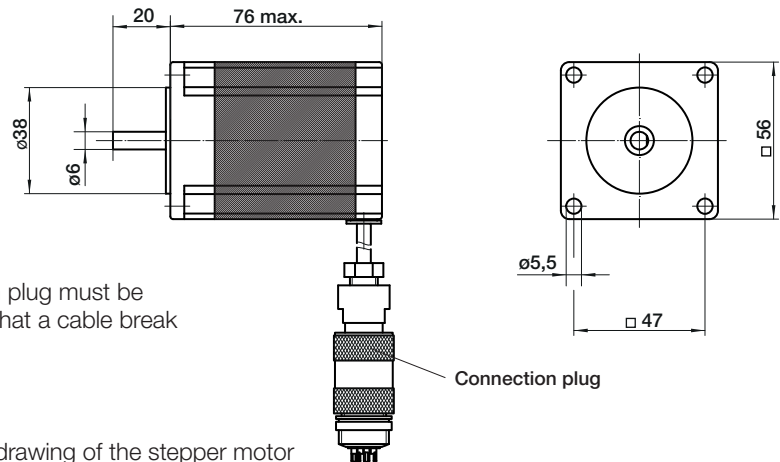
3. Technical data

3.1 Technical features of the mixer

Table 1: Technical features of the mixer

Max. permissible pressure load PS	0.5 bar
Mixing ratio Qn air/ Qn fuel gas	3.5 : 1 to 25 : 1
Material	Body: Aluminium alloy Internal parts: Al alloy/steel Seals: NBR
Max. operating and environmental temperature	-10 °C to +80 °C
SEP design in accordance with PED	

3.2 Dimensions and technical features of the stepper motor



Caution

Cable and connection plug must be fastened properly so that a cable break does not occur.

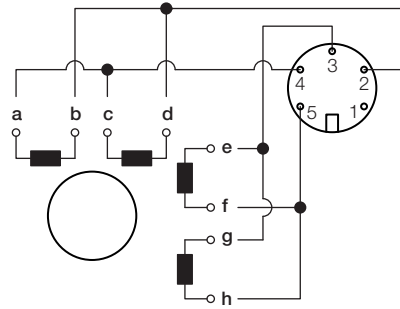
Fig 2: Dimensional drawing of the stepper motor

Table 2: Technical features of the stepper motor

Design	hybrid stepper motor
Coil type	bipolar, parallel switching
Rotor moment of inertia	480 gcm ²
Holding torque	1.7 Nm
Full steps per shaft rotation	200
Step angle (full step)	1.8°
Resistance per coil	4.4 W
Max. current per phase	1.4 A
Min. control voltage	24 V
Inductivity per coil	19 mH
Length of the electrical supply line	approx. 0.3 m
Electrical connection	5-pin round plug and socket

Note

A socket compatible with the stepper motor is included in the delivery.



Colours of the wires

- a - blue/white
- b - blue
- c - red
- d - red/white
- e - green
- f - green/white
- g - black/white
- h - black

Fig 3: Connection diagram of the stepper motor

3.3 Technical features of the proximity sensor (limit switch) for Venturi position

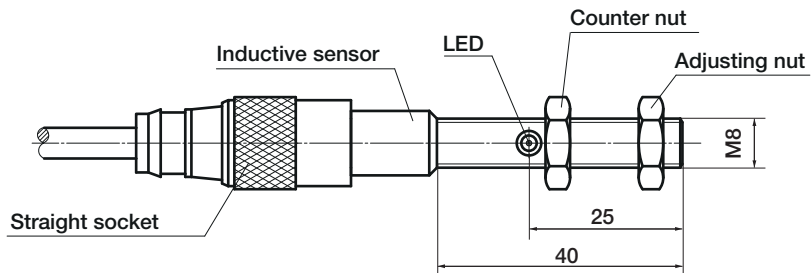


Fig 4: Proximity sensor

Table 3: Technical features of the proximity sensor

Connection	V1 device plug
Operating voltage	10–60 VDC
Ripple	≤ 10 %
Switching frequency	500 Hz
Operating current	100 mA
Idling power consumption	15mA
Output marking	ppn opener (positive switched)
Active surface free	operating voltage – (max. 3 V at 100 mA)
Active surface covered	≤ 0.3 V
Interference voltage (permissible voltage peaks)	max. 1000 V/10 ms
Internal resistance	10 kOhm
Switching status LED	yellow light when active surface is free
Adjusting and counter nut	SW 13

Note

A socket compatible with the proximity sensor is included in the delivery.

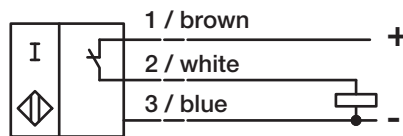


Fig 5: Proximity sensor connection diagram

3.4 Dimensional drawing HON 985B-140/65-ZW-N-NI

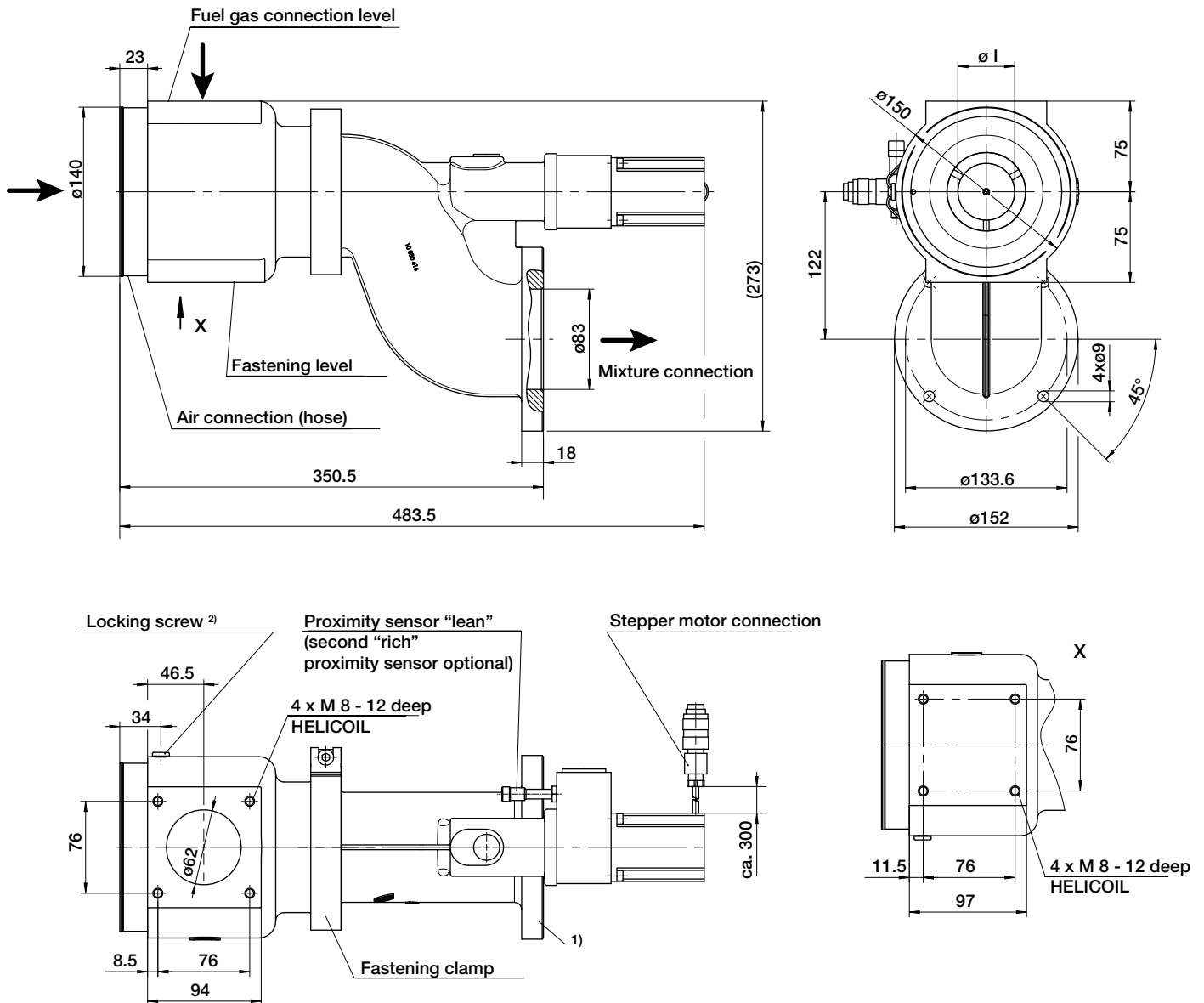


Fig 6: Dimensional drawing

➔ Flow direction

Ø 1 Variable torpedo diameter (see spare parts list)

1) Induction elbow can be installed at any angle position in relation to the fastening level

2) Pressure measurement M10 x 1 connection possibility

4. Specific maintenance instructions



Do not carry out maintenance unless the system is safely de-energised and depressurised.

4.1 Intervals for maintenance purposes

The intervals between maintenance tasks depend largely on the operating conditions of the device. Please observe chapter **1.1. General Information**.

Note

If operational irregularities are discovered during the operation or during a functional test, unplanned maintenance work on the mixer is required. This must be performed as soon as possible after the discovery of the deviation in operating behaviour.

4.2 Tightening torques M_A

Screws and nuts without a specification of the tightening torques are normally tightened according to the commonly available tables for screw dimensions and qualities using an appropriate tool. Parts with a specified tightening torque (see spare parts drawing) are to be tightened to the specified value with a torque wrench (see table).

Table 4: Tightening torques M_A

Item. no.	214	217	218
Tightening torque in Nm	8	12	20

4.3 Lubricants

All O-rings which are replaced (**1.1 General information**) must be lubricated with silicone grease before installation after the device maintenance.



Observe the notes regarding lubricants in chapter **1.1 General information**.

Table 5: Lubricants

Components	Lubricants	HON part no.
All O-rings	Silicone grease	27081
All fastening screws	Assembly paste	27091
Transmission thread on the motor spindle	Slip agent	27704

4.4 Adhesives

The parts to be glued must be completely clean, dry and free of grease. Specifications for adhesive connections can be found in the spare parts drawing and the following maintenance instructions.

Table 6: Adhesives

No.	Adhesive connections	HON part no.
1	Torpedo	28396
2	Pin	26690

5. Maintenance

With the description of the individual maintenance steps, the same position numbers are used here for the identification of the component as can be found in the spare parts drawing (page 12) and the spare parts list (page 13). In order to enable simple, easy maintenance work, we recommend following the sequence of the individual steps. The device must be dismantled from the plant prior to maintenance work.

5.1 Dismantling the proximity sensors



Before dismantling the drive unit of the mixer and beginning with the maintenance work, the proximity sensors (208) should be removed from the device in order to prevent damage. Prior to the dismantling, the sensors should be disconnected from the power source. Unscrew the cable sockets (209) from the initiators. Loosen the counter nuts of the proximity sensors and unscrew the sensors from the adapter.

5.2 Dismantling the drive unit

Remove the plug (206) and loosen the connection between the adjustable coupling (207) and pin (204) by partially unscrewing the threaded pin (Figure 7).

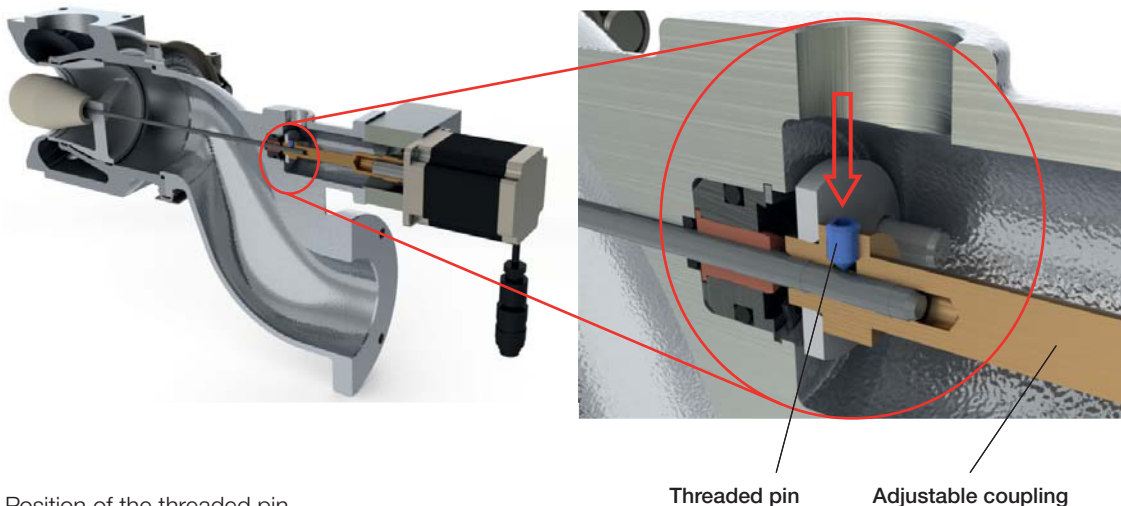


Fig 7: Position of the threaded pin

Then remove the plug (211), loosen the cylinder screw (212) and remove it with the bush (213). Then the four cylinder screws (214) can be loosened and the stepper motor (215) with adjustable coupling unit (207) can be removed from the induction elbow (223) (Fig. 8)

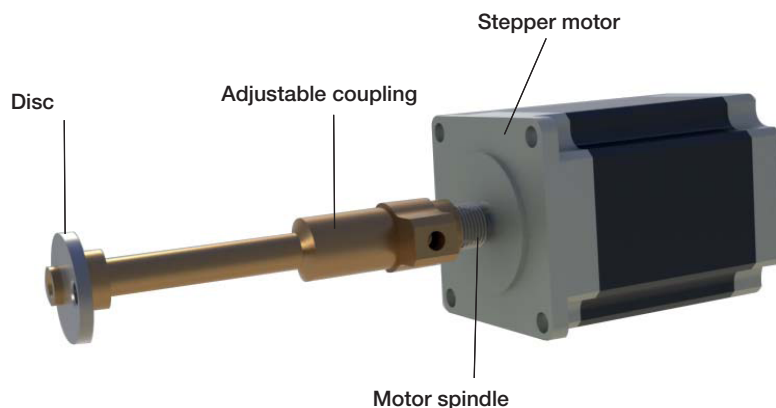


Fig 8: Stepper motor with adjustable coupling

The adjustable coupling (207) is screwed onto the motor spindle; it can be removed by rotating the spindle. Clean the parts and check the condition of the transmission thread (inside and outside thread). Let the cleaned parts dry off. The adjustable coupling (207) and the disc are adhered to one another at their end. Check that the adhesive connection is firmly seated.

5.3 Dismantling the Venturi insert

Loosen the cylinder screw on the profile clip (217) and remove it. Disconnect the body (201) together with the Venturi insert and pin (204) from the induction elbow.



The parts should be carefully separated from one another in order to prevent damage to the pin by bending, etc.

Now the Venturi insert/pin/torpedo unit (Figure 9) can be pulled out of the mixer body.



Fig 9: Venturi insert/pin/torpedo unit

All parts of this unit are adhered to one another and may not be separated from one another. If the parts can be easily separated by hand, the assembly must be repaired (adhered) or replaced. Clean and dry off the parts.

5.4 Replacing the guide belts

Remove and dispose of the old guide belts (221 and 222). Clean the sliding surfaces on the Venturi insert and groove for the belts with adjacent surfaces and allow to dry. Fit new guide belts.



The guide belts and sliding surfaces may not be lubricated. Lubrication of the parts can negatively influence the operating behaviour of the devices.

5.5 Installing the Venturi insert

Move the body up to the vertical position with the connection side facing the induction elbow. Slide the Venturi insert with the small diameter forward into the body and check the ease of movement of the insert. The resistance may be too great when sliding the insert due to production tolerances. In this case, the guide belts must be adjusted by removing a thin layer. In the process, it must be ensured that the Venturi insert does not slip through under its own weight. If this should occur, the play between the insert and the belts is too great.

5.6 Mounting the induction elbow

After the adaptation of the guide belts the body is mounted together with the induction elbow (223). The body remains vertically aligned. Prior to mounting the induction elbow, make sure that the O-ring (203) is not twisted out of the centring collar. Carefully place the elbow on the mixer body so that the pin goes in through the hole in the induction elbow (Figure 7) provided for this purpose. Place the profile clip on the angles of the two flanges (on the housing and the induction elbow) and connect the two parts in the correct spatial arrangement by tightening the cylinder screw.

5.7 Mounting the drive unit

Before fitting the stepper motor and adjustable coupling, spray the threaded spindle on the stepper motor with slip agent (Table 5). Then rotate the coupling onto the spindle and adjust the distance to the motor flange (see Figure 10).



Observe the adjustment measurement!

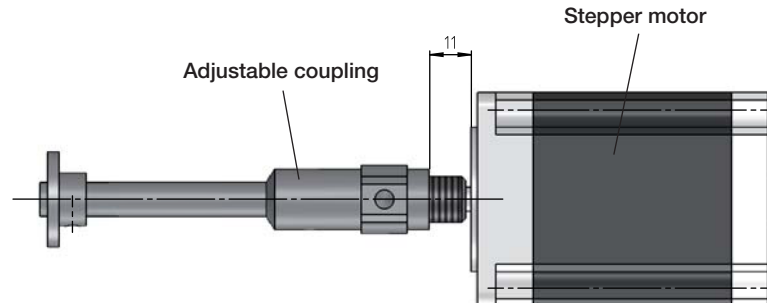


Fig 10: Adjustable coupling – stepper motor flange adjustment measurement

Slide the Venturi insert into the upright body until its mechanical stop and fit the adapter (210). Then mount the stepper motor with the adjustable coupling. In the process, make sure that the cylinder pin (205) goes through the hole in the disc (Fig. 8) and the pin runs in the coupling. Fasten the stepper motor with adapter by tightening the four cylinder screws (214) on the induction elbow. Tighten the threaded pin (Figure 7) and insert the plug (206).

5.8 Adjusting the proximity sensors (limit switches)

Before adjusting the sensors, first screw in the cylinder screw (212) hand-tight into the threaded hole in the adjustable coupling (spare parts drawing) with the sleeve (213) fitted in the threaded hole provided for this purpose.

Adjust a mixing gap of $0.5^{+0.1}$ mm by moving the stepper motor. An adjustment of 0.5 mm takes place with a control frequency of 20 Hz in full step operation in 5 seconds.

Note

With a change to the control frequency by a factor K, the adjusting time changes by the factor $1/K$.

With a change to the step precision by a factor $1/F$, the adjusting time changes by the factor F.

With an adjustment of both parameters, factors F and $1/K$ are multiplied.

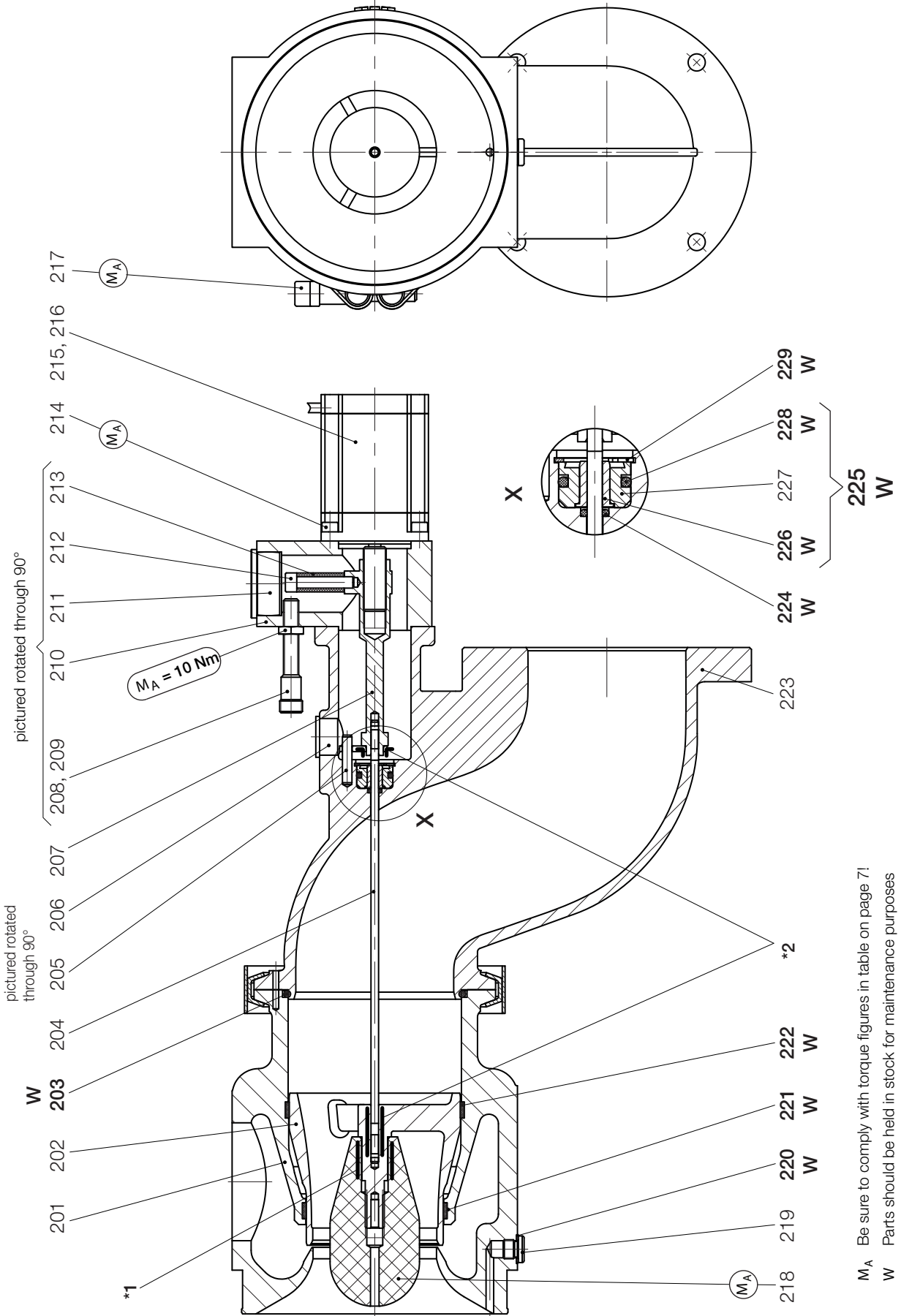
Adjust the switching point of the "lean" position by screwing in the proximity sensor (208). Screw in the proximity sensor until the LED on the sensor goes out. Then lock the sensor in its position by tightening the counter nut. Observe the tightening torque according to the spare parts drawing.

If the device is equipped with two sensors, the switching point for the "rich" position is adjusted first (max. mixing gap width). For this purpose, increase the mixing gap an additional 4 mm from the "lean" switching point by moving the stepper motor (total gap width $4.5^{+0.1}$ mm). In full step operation the additional adjustment at a 40 Hz step frequency takes place in 20 seconds. Observe the notice above.

The adjustment of the screw-in position of the proximity sensor, "rich" switching point, takes place analogously to the adjustment of the "lean" switching point. Then lock the sensor in place here as well by tightening the counter nut.

6 Spare parts

6.1 Spare parts drawing HON 985B -140/ 65-ZW-N-NI



MA Be sure to comply with torque figures in table on page 7!

W Parts should be held in stock for maintenance purposes

* Adhesive connection (in accordance with table 6)

6.2 Spare parts list HON 985B - 140/65-ZW-N-NI

Item no.	Denomination	Number	W	Material	Part no.
201	Body	1		GLM	10030419
202	Venturi insert	1		GLM	10030411
203	O-Ring	1	W	KG	21205
204	Shaft centre section	1		NSt	10023369
205	Cylinder pin	1		St	17277
206	Plug	1		K	26068
207	Adjustable coupling	1		NSt/St	10031297
208	Proximity sensor	1(2)		NSt	24122
209	Socket	1		K	24123
210	Adapter	1		LM	10031293
211	Plug	1		K	101210
212	Cylinder screw	1		St	10120
213	Bush	1		NSt	10031296
214	Cylinder screw	4		St	101221
215	Stepper motor	1		LM/Bz	10031346
216	Socket	1		K	24107
217	Profile clip	1		NSt	28227
218	Torpedo, optional:				
218	Torpedo Ø 25	1		K	10031571
218	Torpedo Ø 32	1		K	10031570
218	Torpedo Ø 38	1		K	10030989
218	Torpedo Ø 42	1		K	10031569
219	Locking screw	1		St	10547
220	Sealing ring	1	W	LM	18572
221	Guide belt	1	W	K	10030415
222	Guide belt	1	W	K	10030414
223	Induction elbow	1		GLM	10030417
224	O-Ring	1	W	KG	21342
225	Complete guide, comprised of Pos. 226 to 228	1		LM/Bz ...	10030011
226	Guide	1	W	LM/Bz	10030009
227	Guide holder	1		LM	10030010
228	O-Ring	1	W	KG	20321
229	Locking ring	1	W	FSt	19202

W Parts should be held in stock for maintenance purposes

German abbreviations stand for the following materials:

St ... Steel	LM ... Light metal	GMs ... Cast brass
NSt ... Stainless steel	Ms ... Brass	GZn ... Cast zinc
FSt ... Spring steel	GS ... Cast steel	AlBz ... Aluminium bronze
NFSt ... Stainless spring steel	GGG ... Spheroidal graphite cast iron	K ... Plastic
Bz ... Bronze	GBz ... Cast bronze	KG ... Gummy synthetic materials
Cu ... Copper	GLM ... Cast light metal	SSt ... Foamed materials

6.3 Parts for maintenance purposes

Item no.	Denomination	Number	Part no.
203	O-Ring	1	21205
220	Sealing ring	1	18572
221	Guide belt	1	10030415
222	Guide belt	1	10030414
224	O-Ring	1	21342
225	Complete guide, comprised of Pos. 226 to 228	1	10030011
226	Guide	1	10030009
228	O-Ring	1	20321
229	Locking ring	1	19202
-	Silicone grease	1	27081
-	Assembly paste	1	27091
-	Slip agent	1	27704
-	Adhesive 1	1	28396
-	Adhesive 2	1	26690

For More Information

To learn more about Honeywell's
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