PVC-Injectors

with non-return diaphragm or ball check valve for VGB-103 and VGA-113 gas dosing systems

545-3030/-1; 545-3037/-17; 545-4030/-1; 545-4037/-17;
545-6030/-1; 545-6037/-17; 545-8030/-1; 545-8037/-17;
545-10030/-1; 545-10037/-17

545-1095-1/-2/-3; 545-2095-1/-2/-3; 545-4095-1/-2/-3
545-3099/-1; 545-4099/-1

CONTENTS

Warning

Prior to installation, read these installation and operating instructions. Installation and operation must comply with local regulations and accepted codes of good practice.

1. General

1.1 Structure of the documentation

The documentation for Grundfos Alldos PVC injectors consists of:

- The information document "Operation and safety of chlorine systems":
  - General safety instructions for dealing with chlorine
  - Technical data
  - Commissioning and operating instructions
  - Device-specific safety instructions
  - Instructions on maintenance, servicing and repair
- and the installation and operating instructions (this document):

If you require further information or if any problems arise that are not discussed in sufficient detail in this document, please contact Grundfos Alldos directly for the necessary information.

1.2 Guarantee

The guarantee period lasts 12 months from the date of delivery by Grundfos Alldos.

A guarantee claim in the sense of our general conditions of sale and delivery can only be recognised if:

- The device is used according to the information in these operating instructions,
- The device is not opened or handled incorrectly in any manner,
- Repairs are only carried out by authorised and qualified personnel,
- Only original spare parts are used for repairs,
- Only components approved by Grundfos Alldos are used throughout the entire gas dosing system,

Typical parts subject to wear are excluded from the guarantee, e.g.

- Seals, O-rings,
- The injector nozzle, as its degree of wear depends heavily on local water quality

2. Safety information

Warning

Read the Grundfos Alldos information document "Operation and safety of chlorine systems" before commissioning.

2.1 Application of the device

Grundfos Alldos PVC injectors are used to inject Cl_2, NH_3, SO_2 and CO_2 gas into water in water treatment systems within the framework of the applications described in these operating instructions.

The media that may be used with each model are specified on the type plate.

Warning

Other applications are considered as non-approved, and are not permissible. Grundfos Alldos accepts no liability for any damage resulting from incorrect use.

2.2 Obligations of the operator

The operator of the system is responsible for

- Complying with the following regulations:
  - Regulation for the prevention of accidents, chlorination of water (GUV 8.15)
  - Regulation for the prevention of accidents, pressure vessel (GUV 2.6)
  - Regulation for the prevention of accidents, gases (GUV 9.9)
  - Ordinance on workplaces (ArbStättV)
  - Ordinance on hazardous industrial substances (ArbStättV)
  - If required, compliance with additional country-specific regulations
- Training of operating personnel
- Provision of mandatory protective gear (information document "Operation and safety of chlorine systems")
- Arranging regular maintenance.

3. Technical data

Criteria for the selection of an injector are

- Suction power
- Counterpressure
- Motive water pressure (admission pressure)

Values for the injectors described here can be found in the dimensioning tables.

3.1 General data

Dosing medium	Cl_2 or NH_3, SO_2, CO_2
Motive water pressure	See dimensioning tables, section 9
Counterpressure	See dimensioning tables, section 9
Permitted motive water temperature	+5°C to +30°C
Permitted ambient temperature	+5°C to +40°C

3.2 Connection data

3.2.1 Motive water connection (input, output)

Injector	Motive water (input, output)
545-...-1 or ...-17	DN 25
545-...-2 or ...-27	3/4" tube(3/4" NPT)
545-...-3 or ...-37	1" tube (1" NPT)
545-...	$1^1/_4$" tube ($1^1/_4$"NPT)

3.2.2 Gas connection index no.

Index no.	Version
A001	For PE tube 8x11
A002	For PE tube 10x14
A003	For PE tube 12x16
A004	For PVC pipe DN10
A005	For PVC pipe DN15

3.3 Suction power

Injector	Maximum suction power				Gas connection	Gas dosing system
	Cl_2	NH_3	SO_2	CO_2		
545-1095-1/-2/-3	Up to 0.5 kg/h	---	---	---	A001	VGB 103
545-2095-1/-2/-3	Up to 1.0 kg/h	---	---	---	A001	VGB 103
545-4095-1/-2/-3	Up to 2.0 kg/h	---	---	---	A001	VGB 103
545-3030 /-1	Up to 4.0 kg/h	---	---	---	*	VGA 113
545-3037	---	Up to 3.5 kg/h	Up to 4 kg/h	Up to 1.5 kg/h	*	VGB 103, VGA 113
545-3037-17	---	Up to 3.5 kg/h	Up to 4 kg/h	Up to 1.5 kg/h	A001	VGB 103, VGA 113
545-4030 /-1	Up to 6.0 kg/h	---	---	---	*	VGA 113
545-4037	---	Up to 4.0 kg/h	Up to 6.0 kg/h	Up to 2.0 kg/h	*	VGB 103, VGA 113
545-4037 /-17	---	Up to 4.0 kg/h	Up to 6.0 kg/h	Up to 2.0 kg/h	A001	VGB 103, VGA 113
545-3099 /-1	Up to 4.0 kg/h	---	---	---	A001	VGB 103
545-4099 /-1)	Up to 4.0 kg/h	---	---	---	A001	VGB 103
545-6030/-1	Up to 6.0 kg/h	---	---	---	*	VGA 113
545-6037/-17	---	Up to 5.0 kg/h	Up to 8.0 kg/h	Up to 2.5 kg/h	*	VGA 113
545-8030/-1	Up to 8.0 kg/h	---	---	---	*	VGA 113
545-8037/-17	---	Up to 6.0 kg/h	Up to 10.0 kg/h	Up to 3.0 kg/h	*	VGA 113
545-10030/-1	Up to 10 kg/h	---	---	---	*	VGA 113
545-10037/-17	---	Up to 6.0 kg/h	Up to 10.0 kg/h	Up to 3.5 kg/h	*	VGA 113

* optional: A002, A003, A004, A005

3.4 Dimensions

3.4.1 Injectors up to 2.0 kg/h Cl_2 - ball check

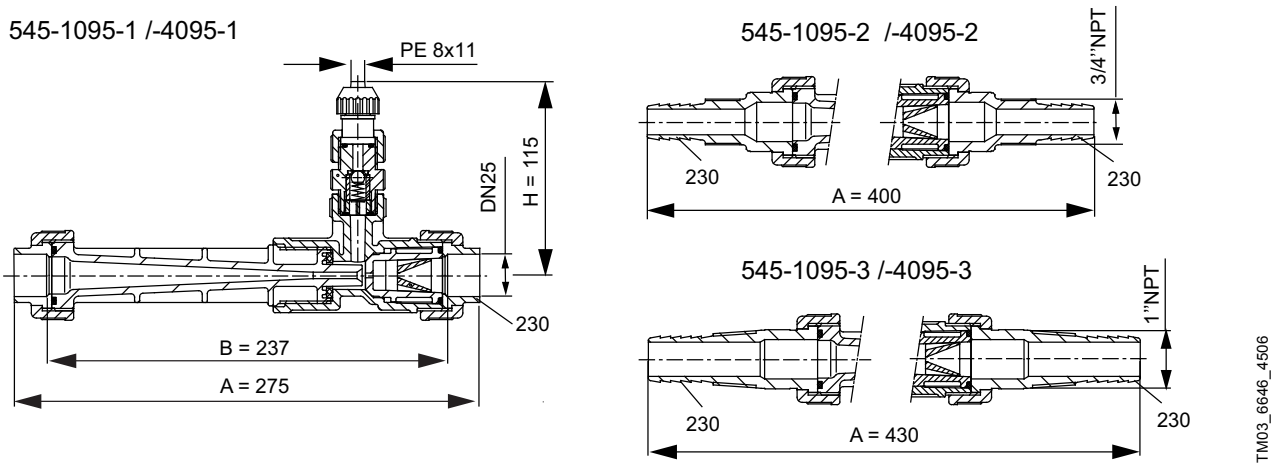

fig. 1 Dimensional drawings, 545-1095-1 to 545-4095-3 injectors

A	Overall length
B	Fitting distance
H	Height

Injector	A (mm)	B (mm)	H (mm)
545-1095-1	275	237	115
545-1095-2	400	237	115
545-1095-3	430	237	115

Injector	A (mm)	B (mm)	H (mm)
545-2095-1	275	237	115
545-2095-2	400	237	115
545-2095-3	430	237	115
545-4095-1	275	237	115
545-4095-2	400	237	115
545-4095-3	430	237	115

3.4.2 Injectors up to 4.0 kg/h Cl_2 - ball check

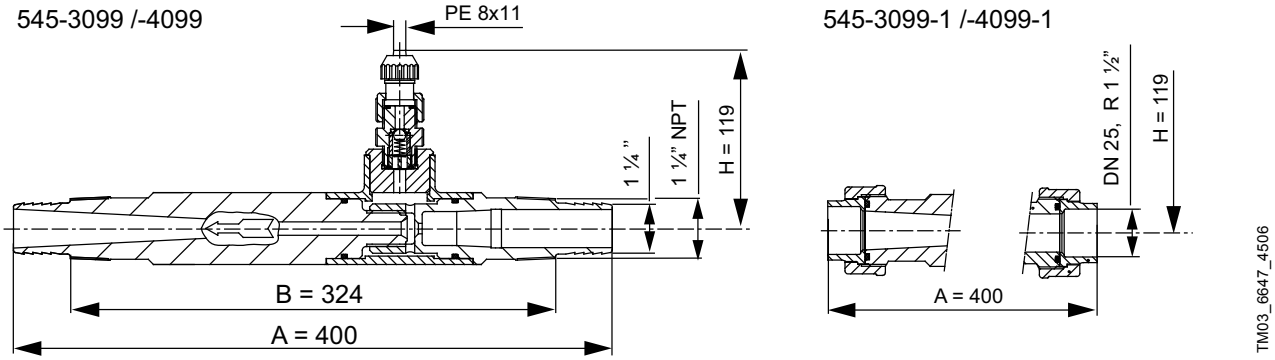

fig. 2 Dimensional drawings, 545-3099 to 545-4099 injectors

Injector	A (mm)	B (mm)	H (mm)
545-3099	400	324	119
545-3099-1	400	324	119

Injector	A (mm)	B (mm)	H (mm)
545-4099	400	324	119
545-4099-1	400	324	119

3.4.3 Injectors up to 4.0 kg/h Cl_2 - diaphragm non-return

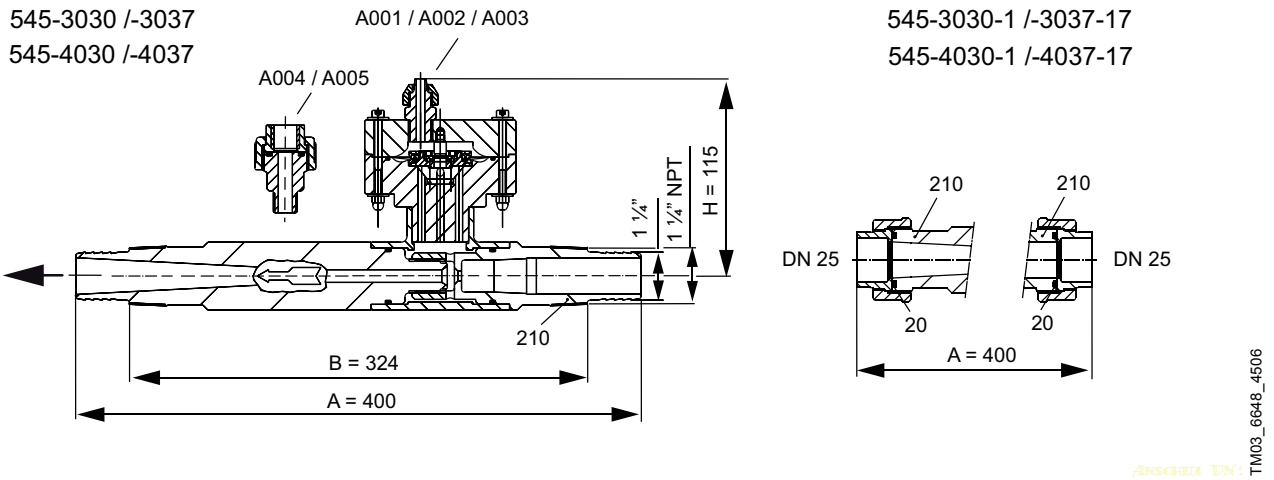

fig. 3 545-3030 to 545-4037 injectors

Injector	A (mm)	B mm)	H (mm)
545-3030	400	324	115
545-3030-1	400	324	115
545-3037	400	324	115
545-3037-17	400	324	115
545-4030	400	324	115
545-4030-1	400	324	115
545-4037	400	324	115
545-4037-17	400	324	115

3.4.4 Injectors up to 10.0 kg/h Cl_2, up to 6.0 kg/h NH_3, up to 10.0 kg/h SO_2, up to 3.5 kg/h CO_2 - diaphragm non-return

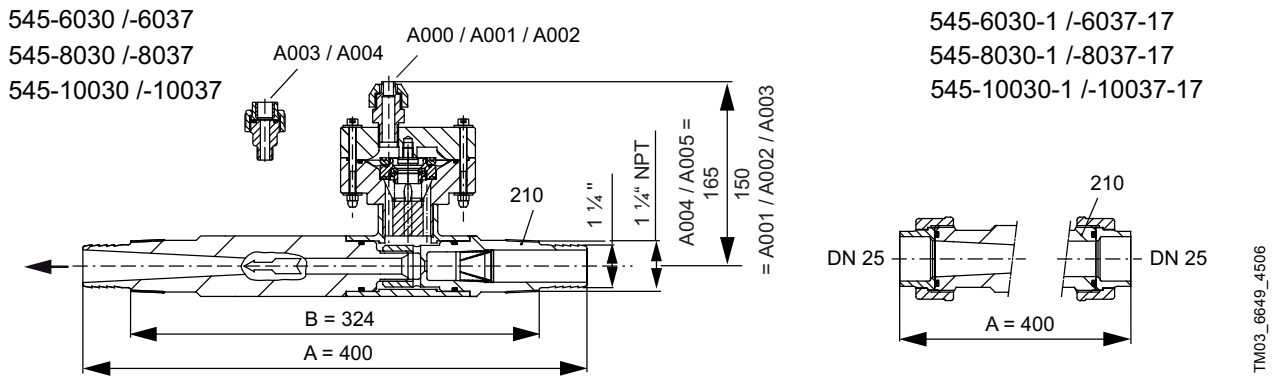

fig. 4 545-6030 to 545-10037 injectors

Injector	A (mm)	B (mm)	H (mm)
545-6030	400	324	H
545-6030-1	400	324	H
545-6037	400	324	H
545-6037-17	400	324	H
545-8030	400	324	H
545-8030-1	400	324	H

Injector	A (mm)	B (mm)	H (mm)
545-8037	400	324	H
545-8037-17	400	324	H
545-10030	400	324	H
545-10030-1	400	324	H
545-10037	400	324	H
545-10037-17	400	324	H

4. Installation

4.1 Transport and storage

- Transport the unit carefully. Never throw it.
- Store in a cool, dry location.

4.2 Unpacking

- Note when unpacking:
  - Do not allow moisture to enter the gas connection.
  - Do not allow foreign bodies to enter the connections.
- Assemble as soon as possible following unpacking.

4.3 Assembly

4.3.1 Assembly requirements

Caution ***Keep the solution outlet from the injector to the injection unit as short as possible.***

Caution ***Only use sand-free, fresh water; if necessary connect a dirt trap to the water apparatus.***

Caution ***Ensure sufficient motive water and motive water pressure (admission pressure). Fit pressure booster pump if necessary.***

Note ***To avoid a drop in output: Observe the prescribed line cross-sections.***

Observe the line cross-sections and lengths for the gas supply.

4.3.2 Fitting the injector

Caution ***Observe flow direction (arrow sticker).***

- Fit the injector to the wall or other suitable location using the fixing material supplied.

Caution ***Fit and connect the injector so it is not subjected to strain.***

- Connect the motive water line (3),
- Connect the gas solution line (6),
- Connect the (1) gas supply, see *6.1.2 Components*

5. Commissioning

5.1 Preparations for commissioning

Caution

For commissioning, all components of the entire system must be ready for operation.

Observe the operating instructions for the other components.

5.2 Checks before commissioning

Check the tightness of the whole system before commissioning.

Warning

Only check for tightness when the entire system is ready for operation.

Risk of gas leak.

Observe the operating instructions for the other components.

5.2.1 Checking the gas solution line for tightness

Warning

System must be switched off. All tank valves must be closed.

- Loosen the union nut on the gas connection
- Disconnect the gas supply
- Open the motive water valve
- Open the injection unit isolating valve
- Switch on the motive water pump

If water escapes from between the motive water pump (3) and the injection unit (9): Leak in the line.

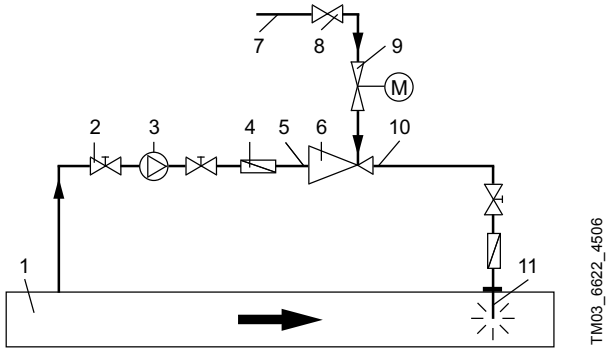

fig. 5 System diagram

1	Supply line
2	Isolating valve
3	Motive water pump
4	Check-back valve
5	Motive water input injector
6	Injector
7	Gas supply
8	Safety pressure relief valve
9	Gas dosing system
10	Gas solution line (motive water output injector)
11	Injection unit

- Switch off the motive water pump
- Close the motive water valve
- Close the injection unit isolating valve
- Repair the leak
- Repeat check for tightness.

If no water escapes: Line is watertight.

- Reconnect the gas supply

5.2.2 Checking the diaphragm non-return

- Loosen the union nut on the gas connection
- Disconnect the gas supply
- Open the motive water valve
- Open the injection unit isolating valve
- Switch on the motive water pump
- Briefly shut the injection unit isolating valve

If water escapes from the gas connection: Faulty diaphragm non-return.

- Switch off the motive water pump
- Close the motive water valve
- Repair the diaphragm non-return (section 7, maintenance).
- Repeat check.

If no water escapes: Diaphragm non-return is in working order.

Reconnect the gas supply

5.2.3 Checking the operation of the injector

- Loosen the union nut on the gas connection
- Disconnect the gas supply
- Open the motive water valve
- Open the injection unit isolating valve
- Switch on the motive water pump
- Place your thumb over the gas connection

If the injector does not suck:

- Check the admission pressure (water quantity)
- Check the counterpressure
- Check the line lengths and cross-sections
- See section *6.3 Possible errors*

If the error cannot be rectified:

- Contact the Grundfos Alldos service centre

If suction can clearly be felt: Injector is in working order.

6. Operation

6.1 Unit description

6.1.1 How it operates

By reducing the line cross-section with the aid of a nozzle, the motive water is accelerated and creates a low pressure. This low pressure sucks in the gas. This gas is then agitated by the diffuser and is mixed with the motive water in the downstream mixing section to produce process water.

6.1.2 Components

- Nozzle (4)
  - Accelerates the motive water flow and creates a low pressure
- Diffuser with mixing section (5)
  - Mixes motive water with gas
- Body with diaphragm and ball check (2)
  - The diaphragm non-return prevents water from entering gas-conveying parts of the device
- Gas supply connection (1)
- Motive water connection - input (3)
- Gas solution line connection = motive water output (6)

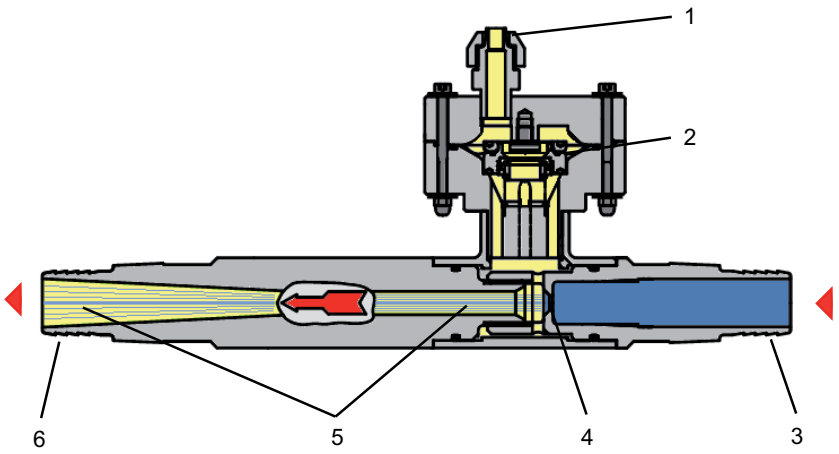

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fig. 6 Injector operating diagram

6.2 Operation

Note

The device is passive. All settings must be made on other parts of the system. Observe the operating instructions for other components.

6.3 Possible errors

Error Cause		Remedy
Maximum dosing flow is not achieved despite correctly selected injector.	Swirl unit in the nozzle damaged or not present.	Insert new swirl unit
	Counterpressure on the injector is too high (solution outlet too long or line cross-section too small).	Bring the injector closer to the injection unit, observe the line cross-sections
	Motive water pressure or quantity not correctly set.	Check the settings using the dimensioning table
	Dynamic pressure on the injector too low due to line loss.	Check length and cross-section of motive water and solution line, use the least possible number of elbows.
	Process water temperature higher than 30 °C.	Adjust process water temperature to approx. 20 - 25 °C
	The dynamic pressure created in the injector is too low due to faulty gas supply.	Replace the gas supply

7. Maintenance

Warning
The whole system must be turned off before carrying out any cleaning or maintenance work.
Risk of gas leak.

Warning
Before recommissioning carry out check for tightness.
Risk of gas leak.

7.1 Intervals for cleaning and maintenance

Component	Normal use Admission pressure up to 6 bar, Drinking water quality motive water	Heavy use Admission pressure up to 6 bar, Poor motive water quality
Upstream dirt trap	Every 12 weeks	Every 8 weeks
Nozzle sets	Every 12 weeks	Every 8 weeks
Diaphragm non-return	Every 6 months	Every 6 months

- Additional cleaning and maintenance in the event of faults.

Note ***Local circumstances (poor water quality, extreme pressure conditions) may shorten the maintenance intervals.***

7.2 Cleaning the nozzle

Deposits prevent the injector from creating the required low pressure, leading to drop in output.

- Recommended cleaning agent: Hydrochloric acid

Warning
Observe the regulations when using hydrochloric acid.

Caution ***Do not use sharp objects for cleaning.***

- Disconnect the gas supply.
- Loosen the water line (on injectors with a tube connection: loosen the tube) and remove the injector.
- Unscrew the nozzle.
  - Leave the swirl unit in the nozzle.
- Clean the nozzle with hydrochloric acid.
- Reassemble and fit the injector in the reverse order.

7.3 Diaphragm non-return

Caution ***Regular checks are necessary due to wear to the piston, seat and diaphragm(s). The checks must be carried out approx. twice a year.***

7.3.1 Checking the closing mechanism.

- Close the adjustment valve on the dosing system.
- Loosen the union nut.
- Disconnect the gas supply.
- Briefly close the isolating valve behind the injector several times.
  - If no water escapes: Diaphragm non-return is in working order.
  - If water escapes:

Replace piston (120, see fig. 10) and seat (060, see fig. 10).

- Open the isolating valve.
- Connect the gas supply.
- Set the adjustment valve on the dosing system to the required dosing flow.

Changing the piston

Caution ***Do not use tools when screwing in the piston. If the piston surface is damaged, the closing mechanism may not work.***

- Shut down the system.
- Close the isolating valve behind the injector
- Loosen the cap nut.
- Unscrew the cheese head screw.
- Remove the upper part (pos. 090, see fig. 10).
- Unscrew the piston (pos. 120, see fig. 10).
- Screw in a new piston (by hand)
  - If necessary, replace the O-ring (pos. 160, see fig. 10).
- Push the diaphragm disc (pos. 170, see fig.7) (with diaphragm, seat, screw part and O-rings) onto the piston
  - Turn the diaphragm disc so that the holes line up with the drill holes in the upper part
  - Do not lose the spring (pos. 040, see fig.7).
- Fit the upper part and diaphragm disc
- Slightly tighten the screws diagonally

7.3.2 Change the seat and diaphragm

- Shut down the system
- Close the isolating valve behind the injector
- Loosen the cap nut.
- Unscrew the cheese head screw.
- Remove the upper part (pos. 090, see fig. 10).

Changing the diaphragm

- Unscrew the diaphragm ring (pos. 080, see fig. 7).
- Check the O-ring (pos. 070, see fig.7).
  - Replace the O-ring if necessary
- Remove the diaphragm (pos. 130, see fig.7).
- Insert the new diaphragm

Caution ***Observe mounting position.***

- Firmly tighten the diaphragm ring (pos. 080, see fig.7).

Changing the pos. **seat**

- Unscrew the screw part (050, see fig.7).
- Remove seat (pos. 060, see fig. 10) and O-ring
- Insert new seat and O-ring

Caution ***Observe mounting position.***

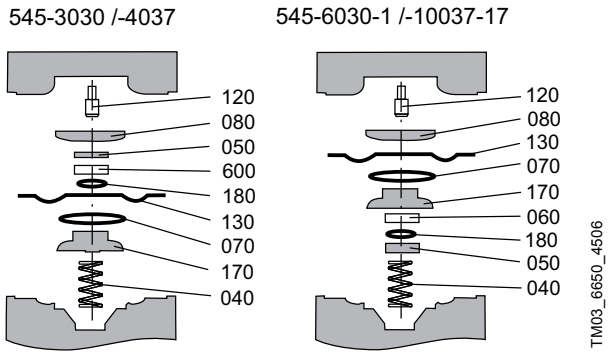

fig. 7 Change the seat and diaphragm.

- Tighten the diaphragm ring so that the seat can be pushed firmly yet smoothly over the piston.

7.3.3 Checking the spring

The spring is plastic-coated to protect against corrosive gases.

Caution ***Replace the spring if the coating is damaged.***

7.3.4 Assembling the diaphragm non-return

- Push the complete diaphragm disc (pos. 170, see fig.7) (with diaphragm, seat, screw part and O-rings) onto the piston.

Caution ***Observe mounting position.***

- Turn the diaphragm disc so that the holes line up with the drill holes in the upper part
- Insert spring
- Fit the upper part and diaphragm disc
- Insert cheese head screws and slightly tighten diagonally
- Check the closing mechanism

If water escapes:

- Tighten the diaphragm ring a bit more
- Repeat this until no water escapes.

7.4 Ball check

7.4.1 Closing mechanism

- Close the adjustment valve on the dosing head.
- Disconnect the gas supply.
- Briefly close the isolating valve behind the injector several times.

If no water escapes: Ball check is in working order.

- If water escapes: Replace valve seat (pos. 5 see fig. 8)
- Open the isolating valve.
- Connect the gas supply.
- Set the adjustment valve on the dosing system to the required dosing flow.

7.4.2 Changing the valve seat and ball.

- Shut down the system.
- Close the isolating valve behind the injector.
- Remove the union piece (pos. 100, see fig. 11).
- Unscrew the ball check (pos. 090, see fig. 11).

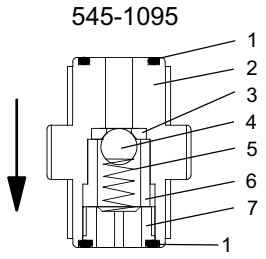

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fig. 8 Changing the valve seat and ball.

Changing the seat and ball.

- Unscrew the screw part
- Remove spring (pos. 5, see fig. 8) and ball (pos. 4, see fig. 8) from the valve housing (pos. 2, see fig. 8).
- Remove the spacer (pos. 6, see fig. 8).
- Remove the seat (pos. 3 see fig. 8)
- Fit new seat.
- Insert new spacer (pos.6, see fig. 8).

Caution ***Replace the spring if it is damaged!***

- Remove ball (pos. 4, see fig. 8) and spring (pos. 5, see fig. 8) from the valve housing (pos. 3, see fig. 8).
- Screw in the screw part
- If necessary, replace the O-ring (pos. 1, see fig. 8).
- Insert the ball check in the injector.

Caution ***Observe flow direction.***

- Screw on the union piece (pos. 100, see fig. 11).
- Check the closing mechanism.

8. Spare parts

We recommend that you keep some spare parts in stock to ensure that worn parts can be replaced quickly when necessary.

8.1 Injectors up to 2.0 kg/h Cl_2

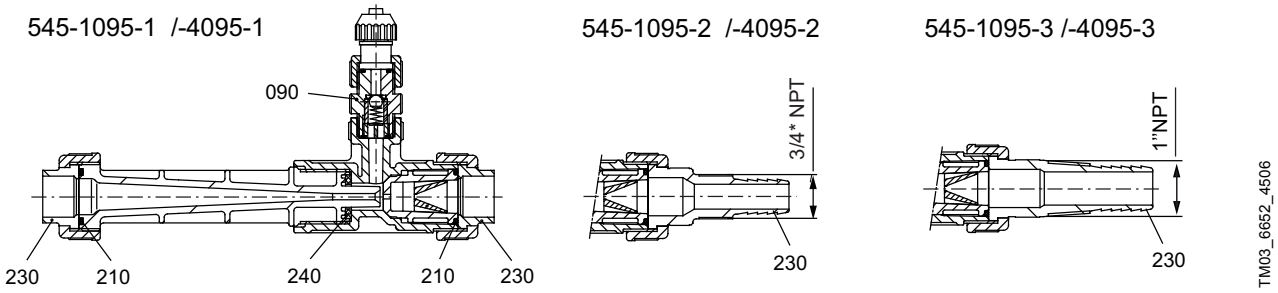

fig. 9 Assembly diagram, 545-1095 to 545-4095 injectors

The spare parts set for the medium **Cl_2** has order no. 553-1705 / 96729511. It contains the following parts:

No.	Designation	Pieces
090	Valve	1
210	O-ring (28x35)	2

No.	Designation	Pieces
240	Flat gasket	1

8.2 Injectors up to 4.0 kg/h Cl_2 - with diaphragm non-return 545-3030/-4037

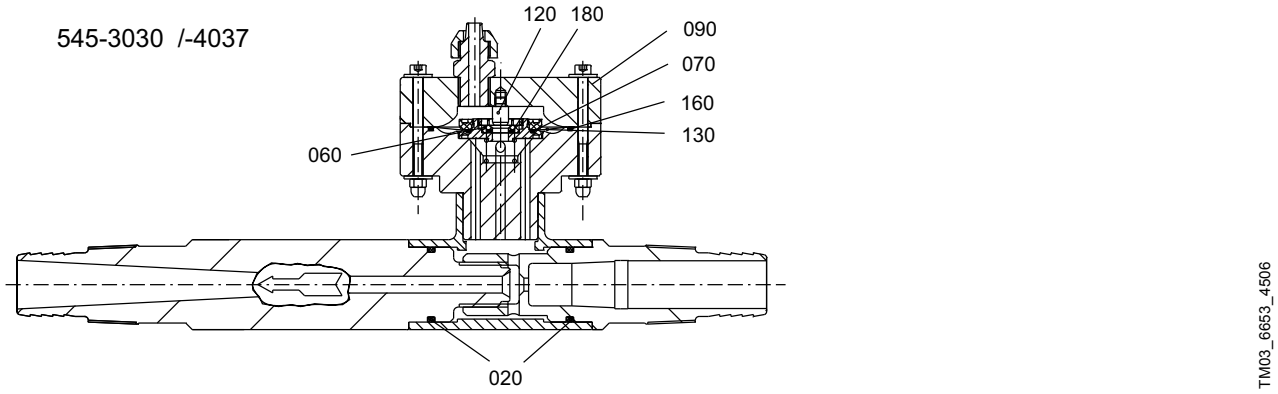

fig. 10 Assembly diagram, 545-3030/-4037 injectors

The spare parts set for the medium **Cl_2** has order no. 553-1295 / 96688795, for the medium **$NH_3/SO_2/CO_2$** the order no. is 553-1295.1/ 96729338. It contains the parts listed in the table:

No.	Designation	Pieces
020	O-ring (33x40)	2
060	Seat	1
070	O-ring (32x36)	1
120	Piston	1
130	Diaphragm	1
160	O-ring (72x77)	1
180	O-ring (9x14)	1

8.3 Injectors up to 4.0 kg/h - with ball check 545-3099/-4099 and -3099-1/-4099-1

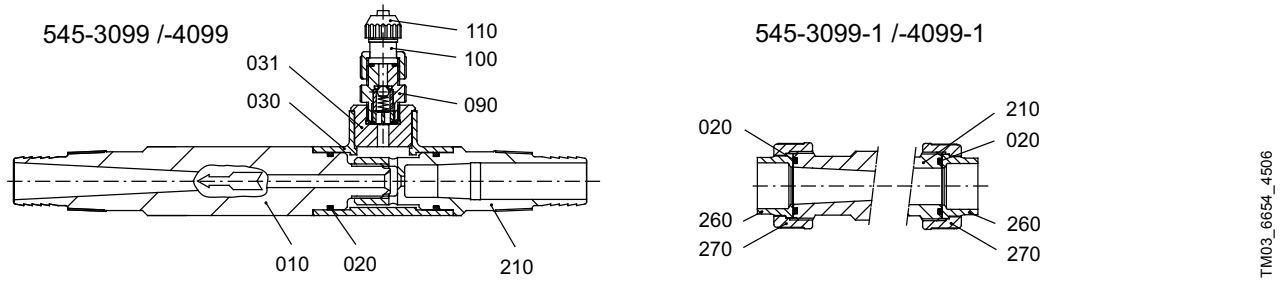

fig. 11 Assembly diagram, 545-3099/-4099 and -3099-1/-4099-1 injectors

The spare parts set for the medium **Cl_2** has order no. 553-1737 / 95701435. It contains the following parts:

No.	Designation	Pieces
020	O-ring (33x40)	4

No.	Designation	Pieces
090	Valve	1

8.4 Injectors up to 10.0 kg/h Cl_2, up to 6.0 kg/h NH_3, up to 10.0 kg/h SO_2, up to 3.5 kg/h CO_2

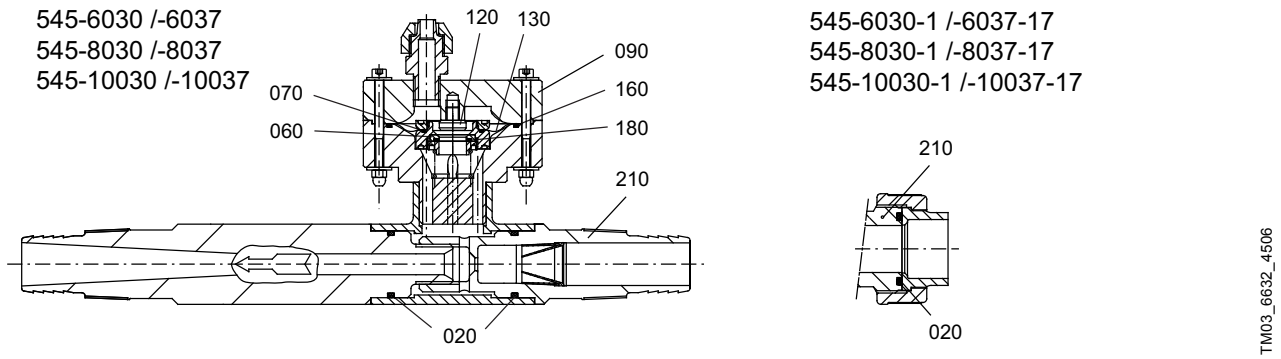

fig. 12 Assembly diagram, 545-6030 to 545-10037 injectors

The spare parts set for the medium **Cl_2** has order no. 553-1296 / 91835847, for the medium **NH_3/SO_2/CO_2** the order no. is 553-1296.1 / 96729339. It contains the parts listed in the table:

No.	Designation	Pieces
020	O-ring (33x40)	2
060	Seat	1
070	O-ring (32x36)	1
120	Piston	1
130	Diaphragm	1
160	O-ring (72x77)	1
180	O-ring (17x22)	1

9. Dimensioning tables

Criteria for the selection of an injector are

- Suction power
- Counterpressure
- Motive water pressure (admission pressure)

When dimensioning an injector, the required suction power and counterpressure is generally specified.

Other parameters such as motive water pressure and water quantity per hour can be found in the tables.

Example:

See table 9.1, injectors up to 500 g/h Cl_2 .

To achieve suction power of 500 g/h Cl_2 with a counterpressure of 2.5 bar, a motive water pressure (admission pressure) of 8 bar and a water quantity of 1020 l/h is required.

Note ***All data refers to drinking water quality motive water.***

9.1 Injectors up to 500 g/h Cl_2

Counterpressure (bar)	Motive water pressure (bar)	Water quantity (l/h)
0.5	4	750
1	5	820
1.5	6	890
2	7	960
2.5	8	1020
3	9	1080
3.5	10	1150
4	11	1200
4.5	12	1250
5	13	1300
5.5	14	1350
6	15	1400
6.5	16	1450

9.2 Injectors up to 1000 g/h Cl_2

Counterpressure (bar)	Motive water pressure (bar)	Water quantity (l/h)
0.5	4	1200
1	5	1350
1.5	6	1450
2	7	1570
2.5	8	1670
3	9	1750
3.5	10	1850
4	11	1950
4.5	12	2050
5	13	2100
5.5	14	2150
6	15	2250
6.5	16	2350

9.3 Injectors up to 2000 g/h Cl_2

Counterpressure (bar)	Motive water pressure (bar)	Water quantity (l/h)
0.5	4	2750
1	5	3050
1.5	6	3350
2	7	3550
2.5	8	3800
3	9	4000
3.5	10	4200
4	11	4450
4.5	12	4600
5	13	4750
5.5	14	4950
6	15	5150
6.5	16	5250

9.4 Injectors up to 3000 g/h Cl_2

9.4.1 Type 545-3030/ -1 and type 545-3099/ -1

Counterpressure (bar)	Motive water pressure (bar)	Water quantity (m^3/h)
0.5	4	2.5
1	5	2.7
1.5	5.5	2.9
2	6.5	3
2.5	7.5	3.3
3	8	3.4
3.5	9	3.6
4	10	3.7
4.5	11	3.9
5	12	4
5.5	13	4.1
6	14	4.2
6.5	15	4.3

9.5 Injectors up to 2500 g/h NH_3, 3000 g/h SO_2, up to 1000 g/h CO_2

9.5.1 Type 545-3037/ -17

Counterpressure (bar)	Motive water pressure (bar)	Water quantity (m^3/h)
0.5	4	2.5
1	5	2.7
1.5	5.5	2.9
2	6.5	3
2.5	7.5	3.3
3	8	3.4

9.6 Injectors up to 3500 g/h NH_3, 4000 g/h SO_2, up to 1500 g/h CO_2

9.6.1 Type 545-3037/ -17

Counterpressure (bar)	Motive water pressure (bar)	Water quantity (m^3/h)
3.5	9	3.6
4	10	3.7
4.5	11	3.9
5	12	4
5.5	13	4.1
6	14	4.2

9.7 Injectors up to 4000 g/h Cl_2

9.7.1 Type 545-4030/ -1 and type 545-4099/ -1

Counterpressure (bar)	Motive water pressure (bar)	Water quantity (m^3/h)
0.5	4	3.4
1	5	3.7
1.5	5.5	4
2	6.5	4.2
2.5	7.5	4.5
3	8	4.7

9.7.2 Type 545-3030/ -1 and type 545-3099/ -1

Counterpressure (bar)	Motive water pressure (bar)	Water quantity (m^3/h)
3.5	9	3.6
4	10	3.7
4.5	11	3.9
5	12	4
5.5	13	4.1
6	14	4.2
6.5	15	4.3

9.8 Injectors up to 3500 g/h NH_3, up to 4000 g/h SO_2, up to 1500 g/h CO_2

9.8.1 Type 545-4037/ -17

Counterpressure (bar)	Motive water pressure (bar)	Water quantity (m^3/h)
0.5	4	3.4
1	5	3.7
1.5	5.5	4
2	6.5	4.2
2.5	7.5	4.5
3	8	4.7

9.8.2 Type 545-3037/ -17

Counterpressure (bar)	Motive water pressure (bar)	Water quantity (m^3/h)
3.5	9	3.6
4	10	3.7
4.5	11	3.9
5	12	4
5.5	13	4.1
6	14	4.2

9.9 Injectors up to 6000 g/h Cl_2

9.9.1 Type 545-6030/ -1

Counterpressure (bar)	Motive water pressure (bar)	Water quantity (m^3/h)
0.5	4	3.4
1	5	3.7
1.5	5.5	3.8
2	6.5	4.2
2.5	7.5	4.4
3	8	4.5

9.9.2 Type 545-4030/ -1

Counterpressure (bar)	Motive water pressure (bar)	Water quantity (m^3/h)
3.5	9	4.6
4	10	4.9
4.5	11	5.1
5	12	5.3
5.5	13	5.5
6	14	5.7

9.10 Injectors up to 4000 g/h NH_3, up to 6000 g/h SO_2, up to 2000 g/h CO_2

9.10.1 Type 545-6037/ -17

Counterpressure (bar)	Motive water pressure (bar)	Water quantity (m^3/h)
0.5	4	3.4
1	5	3.7
1.5	5.5	3.8
2	6.5	4.2
2.5	7.5	4.4
3	8	4.5

9.10.2 Type 545-4037/ -17

Counterpressure (bar)	Motive water pressure (bar)	Water quantity (m^3/h)
3.5	9	4.6
4	10	4.9
4.5	11	5.1
5	12	5.3
5.5	13	5.5
6	14	5.7

9.11 Injectors up to 8000 g/h Cl_2

9.11.1 Type 545-8030/ -1

Counterpressure (bar)	Motive water pressure (bar)	Water quantity (m^3/h)
0.5	4	4.2
1	5	4.7
1.5	5.5	5
2	6.5	5.3
2.5	7.5	5.6
3	8	5.8

9.11.2 Type 545-6030/ -1

Counterpressure (bar)	Motive water pressure (bar)	Water quantity (m^3/h)
3.5	9	4.7
4	10	4.9
4.5	11	5.1
5	12	5.3
5.5	13	5.5
6	14	5.7

9.12 Injectors up to 5000 g/h NH_3, up to 8000 g/h SO_2, up to 2500 g/h CO_2

9.12.1 Type 545-8037/ -17

Counterpressure (bar)	Motive water pressure (bar)	Water quantity (m^3/h)
0.5	4	4.2
1	5	4.7
1.5	5.5	5
2	6.5	5.3
2.5	7.5	5.6
3	8	5.8

9.12.2 Type 545-6037/ -17

Counterpressure (bar)	Motive water pressure (bar)	Water quantity (m^3/h)
3.5	9	4.7
4	10	4.9
4.5	11	5.1
5	12	5.3
5.5	13	5.5
6	14	5.7

9.13 Injectors up to 10 kg/h Cl_2

9.13.1 Type 545-10030

Counterpressure (bar)	Motive water pressure (bar)	Water quantity (m^3/h)
0,5	4	5.2
1	5	5.7
1.5	5.5	6
2	6.5	6.3
2.5	7.5	6.8
3	8	7.2

9.13.2 Type 545-8030/ -1

Counterpressure (bar)	Motive water pressure (bar)	Water quantity (m^3/h)
3.5	9	4.7
4	10	4.9
4.5	11	5.1
5	12	5.3
5.5	13	5.5
6	14	5.7

9.14 Injectors up to 6000 g/h NH_3, up to 10 kg/h SO_2, up to 3500 g/h CO_2

9.14.1 Type 545-10037/ -17

Counterpressure (bar)	Motive water pressure (bar)	Water quantity (m^3/h)
0.5	4	5.2
1	5	5.7
1.5	5.5	6
2	6.5	6.3
2.5	7.5	6.8
3	8	7.2

9.14.2 Type 545-8037/ -17

Counterpressure (bar)	Motive water pressure (bar)	Water quantity (m^3/h)
3.5	9	6
4	10	6.4
4.5	11	6.7
5	12	7
5.5	13	7.3
6	14	7.6

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