Supplementary operating instructions

for Sigma series pumps: with hygienic pump head

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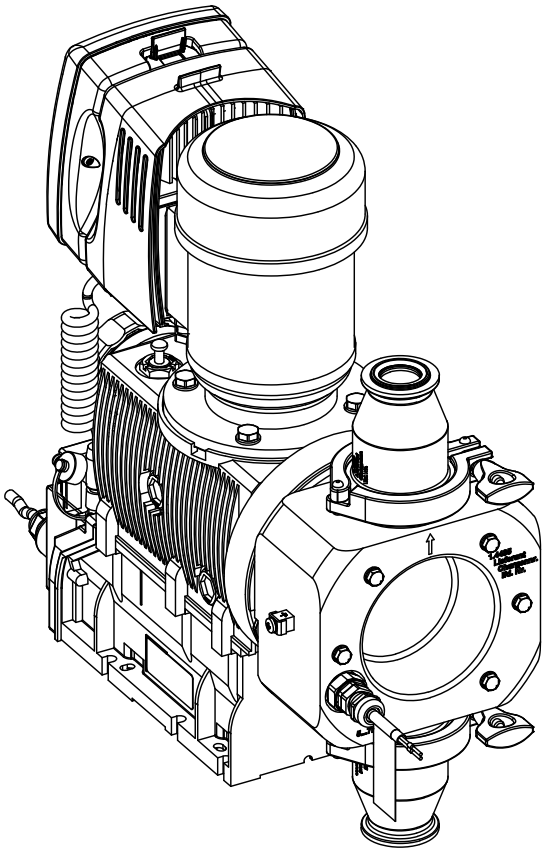

Target group: trained qualified personnel

These supplementary instructions and the operating instructions for the metering pump are required for safe, correct and proper operation.

Should these supplementary operating instructions and the operating instructions for the metering pump contradict each other, the information in these supplementary operating instructions will take precedence.

Please carefully read these operating instructions before use. · Do not discard.
The operator shall be liable for any damage caused by installation or operating errors.
The latest version of the operating instructions are available on our homepage.

Part no. 986047

Version: BA SI 110 03/23 EN

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1 Function

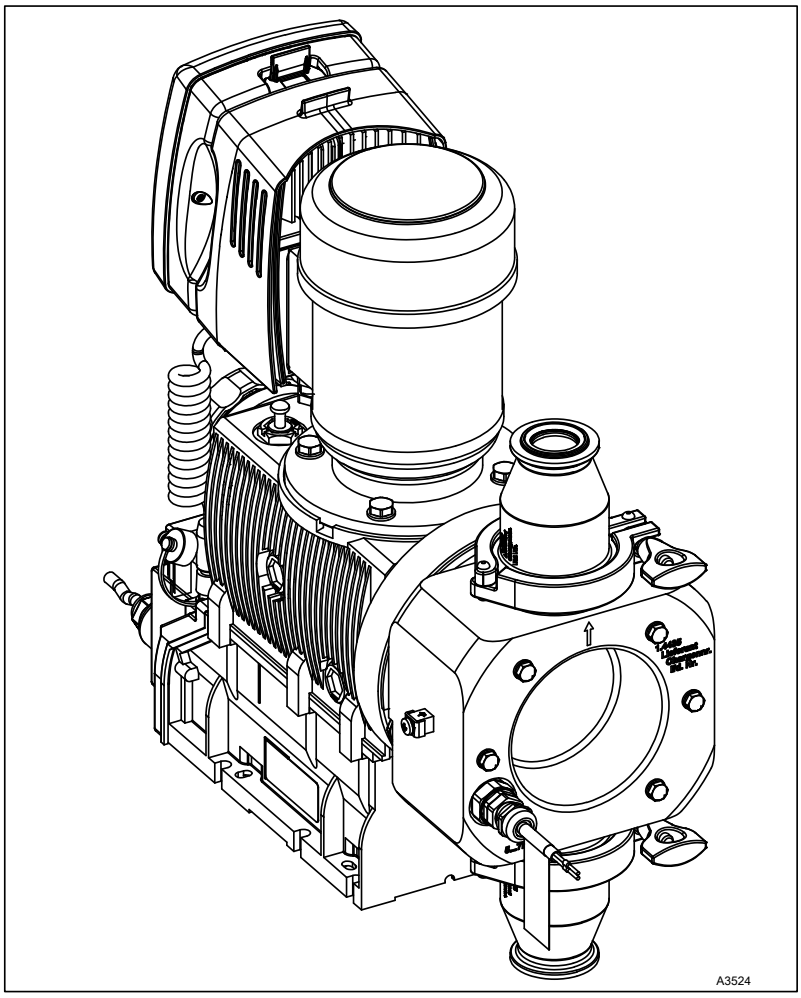


Fig. 1: Sigma with hygienic pump head

Information on the pump:

- The pump is a diaphragm pump.
- The pump is intended to meter liquid food products or additives in closed food processes.
- The materials and components intended to come into contact with food products comply with the “Hygienic Design” and Regulation (EC) No 1935/2004.

Take into account the resistance of the wetted materials and the ProMinent Resistance List when selecting the feed chemical - see the ProMinent Product Catalogue or visit our website.

2 Safety chapter

2.1 User qualification

WARNING!

Danger of injury with inadequately qualified personnel

The operator of the system / equipment is responsible for ensuring that the qualifications are fulfilled.

If inadequately qualified personnel work on the unit or loiter in the hazard zone of the unit, this could result in dangers that could cause serious injuries and material damage.

– All work on the unit should therefore only be conducted by qualified personnel.
– Unqualified personnel should be kept away from the hazard zone.

The pertinent accident prevention regulations, as well as all other generally acknowledged safety regulations, must be adhered to.

Training	Definition
Instructed personnel	An instructed person is deemed to be a person who has been instructed and, if required, trained in the tasks assigned to him and possible dangers that could result from improper behaviour, as well as having been instructed in the required protective equipment and protective measures.
Trained user	A trained user is a person who fulfils the requirements made of an instructed person and who has also received additional training specific to the system from the manufacturer or another authorised distribution partner.
Trained, qualified personnel	A trained, qualified employee is deemed to be a person who is able to assess the tasks assigned to him and recognize possible hazards based on his training, knowledge and experience, as well as knowledge of pertinent regulations. A trained, qualified employee must be able to perform the tasks assigned to him independently with the assistance of drawing documentation and parts lists. The assessment of a person's technical training can also be based on several years of work in the relevant field.
Electrical technician	An electrical technician is able to complete work on electrical systems and recognise and avoid possible dangers independently based on his technical training and experience as well as knowledge of pertinent standards and regulations. An electrical technician must be able to perform the tasks assigned to him independently with the assistance of drawing documentation, parts lists, terminal and circuit diagrams. The electrical technician must be specifically trained for the working environment in which the electrical technician is employed and be conversant with the relevant standards and regulations.
Service	The Service department refers to service technicians, who have received proven training and have been authorised by the manufacturer to work on the system.

2.2 Intended use

Intended use:

- The pump is intended to meter liquid food products or additives in closed food processes.
- The pump can meter the following types of liquid food products or additives:
  - Liquid food products or additives with a viscosity of up to 30,000 mPas
  - Liquid food products or additives with a temperature of - 10 °C ... 90 °C
  - Liquid food products or additives with a pH value of 2 ... 13 pH
  - Liquid food products or additives containing solids of < 0.3 mm
  - Liquid food products or additives which do not crystallise.

We can provide you with an approval for all values outside of these specifications providing this is possible after testing.

2.3 Reasonably predictable misuse

Any other application or any application beyond the use specified in ↳ *Chapter 2.2 'Intended use' on page 6* is not deemed to be correct and proper, especially the aseptic pumping of liquid food products or additives. The pump meets the requirements of hygienic processes, but not the requirements of aseptic processes.

2.4 Safety information

O-rings DIN 11864 R:

- Individual particles may be released when exposed to high thermal load. In the event of high thermal loads, shorten the maintenance intervals to rule out this release.
- Only suitable O-rings may be used for the flange connections. Only use materials that have been proved to be suitable for correct and proper use and meet the requirements for contact with food products in accordance with EC Regulation no. 1935/2004.

Flushing liquid:

- Metering pumps with hygiene pump head are fitted with tightly closing ball check valves, which is why flushing liquid collects above the valves after the CIP (cleaning in place) stage. Always use appropriate processes to remove this flushing liquid.

Extreme temperatures:

- Liquid media, ambient temperatures, and heating or cooling equipment can cause extreme temperatures at the liquid end.
- If necessary, take appropriate measures to combat this.

Rupture of the diaphragm

- In the event of a diaphragm rupture warning being triggered, securely initiate the replacement of the diaphragm as quickly as possible.
- Stop metering if this is required for your process.

2.5 Cross-contamination

Cross-contamination generally refers to the direct or indirect unwanted transfer of contamination to an object. When replacing your feed chemical or pump components etc., make sure that there is no, or could be no, hygienic risk to the process. If in doubt, clean the pump, ↳ *Chapter 8 'Notes on cleaning metering pumps with hygienic pump head' on page 14*.

2.6 Sound pressure level

The sound pressure level of the dosing heads with the pump running is < 80 dB (A) (ISO 11688-1 (11/2009)).

3 Storage and transport

Store and transport the pump in such a way that its hygienic properties are not impaired by the entrainment of feed chemicals, dirt etc. In addition, refer to Regulation (EC) no. 852/2004 governing food hygiene.

- The Sigma 2 and Sigma 3 are very top-heavy.
- Use lifting straps to move the large dosing head of the Sigma 3 (070410, 070580, 040830, 041030). Weight: approx. 32 kg

Tab. 1: Pump weights

Product range	Type	Head	Weight in kg
S1BA / S1CB	07065, 10044 and 10022	DN10	15
S2BA / S2CB	16050, 16090, 16130	DN15	21
	07120, 07220, 04350	DN25	27
S3BA / S3CB	120145, 120190, 120270, 120330	DN25	35
	070410, 070580, 040830, 041030	DN32	55

4 Types of connection for the hygienic pump head

4.1 Flange spigot

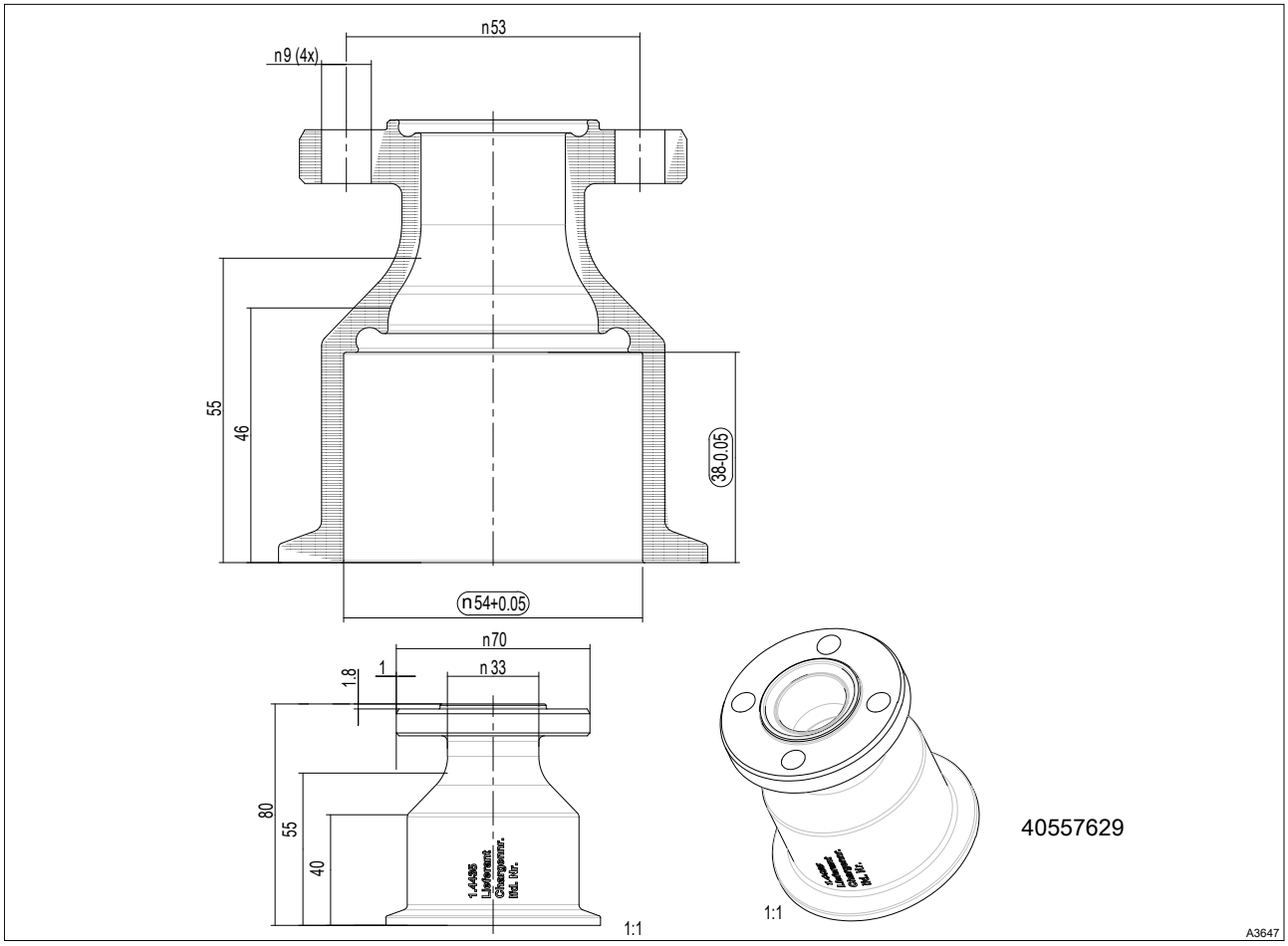


Fig. 2: Connector piece: HD, DN25, 4435, 11864-2

Groove, flange spigot DIN 11864-2

- DN10 = 37 mm
- DN15 = 42 mm
- DN25 = 53 mm
- DN32 = 50.5 mm

4.2 Clamp spigot

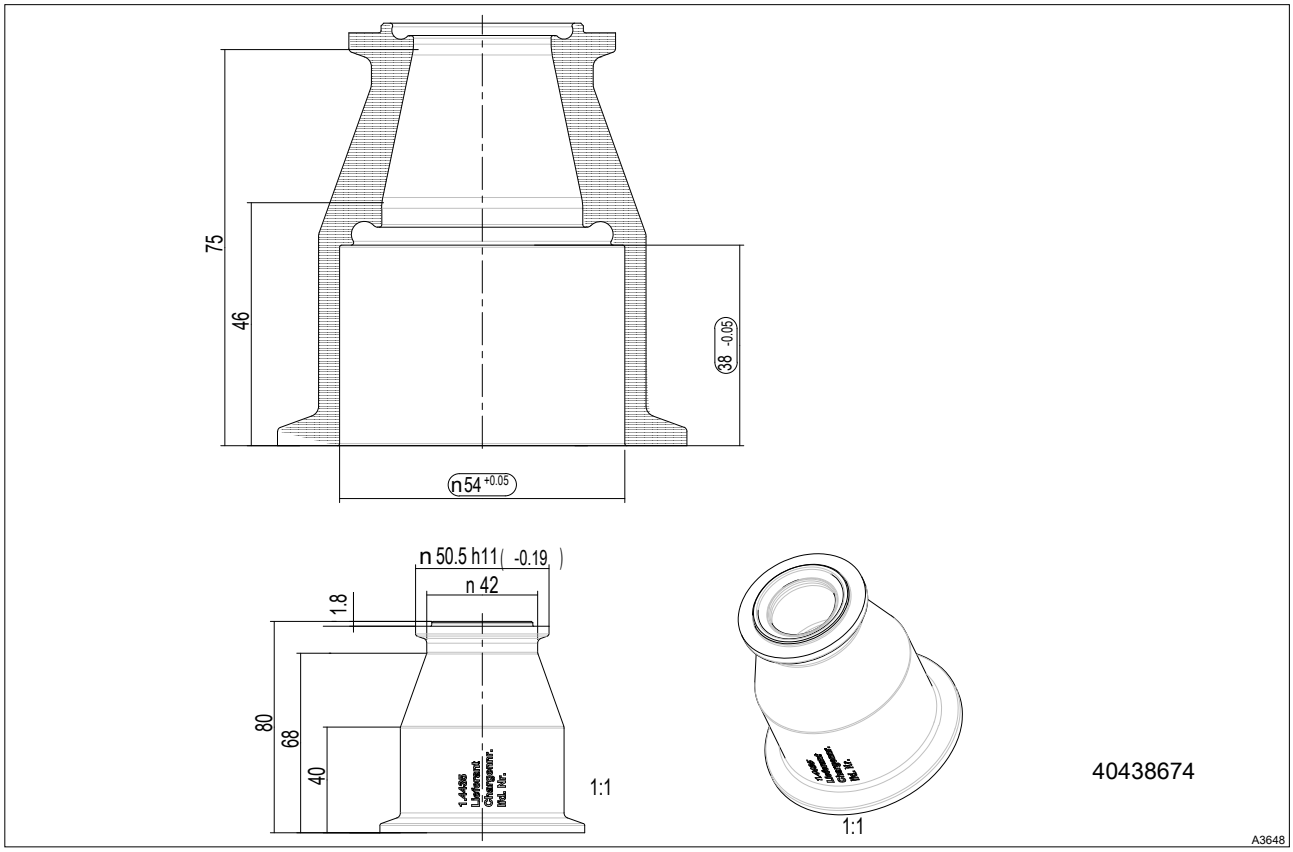


Fig. 3: Connector piece: HD, DN25, 4435, 11864-3

Groove, clamp spigot DIN 11864-3:

- DN10 = 34 mm
- DN15 = 34 mm
- DN25 = 50.5 mm
- DN32 = 50.5 mm

5 Installation, hydraulic

Store and transport the pump in such a way that its hygienic properties are not impaired by the entrainment of feed chemicals, dirt etc. In this respect, refer also to Regulation (EC) no. 852/2004 governing food hygiene.

In addition, select the installation place in such a way as to ensure that the hygienic properties of the pump are guaranteed throughout all its life phases, including repair and maintenance.

The maximum particle size in the feed chemical: 0.3 mm.

The connection to the pipework system: it is the responsibility of the operator to provide the corresponding components in compliance with DIN 11864.

The correct 2 O-rings in compliance with DIN 11864 R are supplied separately. The O-rings are relevant in terms of hygiene, see ↳ *Further information on page 6* and may not be replaced by unsuitable O-rings. The O-rings will come into contact with food products and, as such, are components relevant in terms of hygiene.

Take into account the resistance of materials that will come into contact with food products and the ProMinent Resistance List when selecting the feed chemical - see the ProMinent Product Catalogue or visit our website.

The construction of the discharge and suction valve of the pump tapers the overall cross-section. Pay attention to the tapered cross-section when designing cleaning processes. Therefore, if necessary, install a correctly fitting bypass with shut-off valves around the liquid end to flush your system.

The smallest opening cross-section in the valve based on the nominal bore of the valve (e.g. DN 10 with ADN=$10^2 \cdot \pi/4$) is as follows:

- DN 10 at 47% of the nominal cross-section.
- DN 15 at 51% of the nominal cross-section.
- DN 25 at 42% of the nominal cross-section.
- DN 32 at 45% of the nominal cross-section.

Always take into account the minimum flow velocity and the maximum permissible priming pressure on the suction side, ↳ *Chapter 11 'Technical data' on page 27*

6 Start up

WARNING!

Danger from hazardous substances!

Possible consequence: Fatal or very serious injuries.

Please ensure when handling hazardous substances that you have read the latest safety data sheets provided by the manufacture of the hazardous substance. The actions required are described in the safety data sheet. Check the safety data sheet regularly and replace, if necessary, as the hazard potential of a substance can be re-evaluated at any time based on new findings.

The system operator is responsible for ensuring that these safety data sheets are available and that they are kept up to date, as well as for producing an associated hazard assessment for the workstations affected.

→ Rinse or clean the pump prior to each commissioning to guarantee the hygienic properties of the process, e.g. by cleaning the dosing head, ↳ *Chapter 8 'Notes on cleaning metering pumps with hygienic pump head' on page 14*.

7 Maintenance and functional faults

7.1 Maintenance

Tab. 2: Maintenance intervals

Maintenance interval	Maintenance work
Regularly *	Rinse the interior of the liquid end, see *Chapter 8 'Notes on cleaning metering pumps with hygienic pump head' on page 14*.
Regularly *	Disconnect the supply voltage and flush the exterior surfaces of the pump with a surge of water at atmospheric pressure.
Regularly *	Check the surfaces and seals for scratches and deposits, see .
Regularly *	Check the seals of the hygienic valve and replace them if in doubt, referring to the appropriate chapter "Spare parts lists" and . The O-rings can age faster than usual when exposed to high thermal loads. In extreme cases, particles can enter the feed chemical, which can be avoided by the prompt replacement of the O-rings.
If damaged or worn:	Immediately replace the relevant components of the hygienic valve, referring to the appropriate chapter "Spare parts lists" and .
If the pump is leaking at a valve:	Immediately replace the relevant components of the hygienic valve, referring to the appropriate chapter "Spare parts lists" and .
Annually *	Replace the O-rings, the valve balls and the multi-layer diaphragm, referring to the appropriate chapter "Spare parts lists" and . Replace the valve seats.
Every 2 years *	Replace the valve seats, referring to the relevant chapter "Spare parts lists" and .
* adapted to your process conditions and process requirements.	

When maintaining the pump or components of pumps, make sure that there is no, or could be no, hygienic risk to the process. If in doubt, clean the pump, *Chapter 8 'Notes on cleaning metering pumps with hygienic pump head' on page 14*.

7.2 Rectifying functional faults

Fault description	Cause	Remedy	Personnel
The diaphragm rupture sensor has triggered.	The diaphragm is ruptured.	Replace the diaphragm as quickly as possible, see *Chapter 9.1 'Replacing the diaphragm' on page 22*.	Technical personnel
The pump is leaking at a valve.	An O-ring is damaged.	Replace the O-ring as quickly as possible, see *Chapter 8.5 'Manually cleaning the valves' on page 19*.	Technical personnel

8 Notes on cleaning metering pumps with hygienic pump head

Make sure that the pump is always promptly and adequately cleaned. To do so, you may consider, among other things, including your pump in your operational cleaning schedule. Alternatively put in place other or additional appropriate measures and methods to ensure that there is no, or could be no, hygienic risk to the process.

Make sure, when cleaning too, that all hygienic conditions at the installation site, workplace, tools, equipment etc. are guaranteed and complied with during any associated work.

If water is used as the cleaning agent, auxiliary agent etc. during cleaning, then this water must be of drinking water quality.

Make sure that all surfaces, especially any surfaces that come into contact with food products, are not scratched by tools, cleaning agents, auxiliary agents etc., and that these surfaces are not changed in any other way.

Do not allow the food product being pumped to come into contact with the exterior surfaces. In the event of a leak, remove any residue with a cleaning agent suitable for use with your process, such as drinking water, without damaging the exterior surfaces of the pump.

8.1 Properties of parts that come into contact with food products

Materials of parts that come into contact with food products

The following materials that may come into contact with food products are used in ProMinent metering pumps with hygienic pump head:

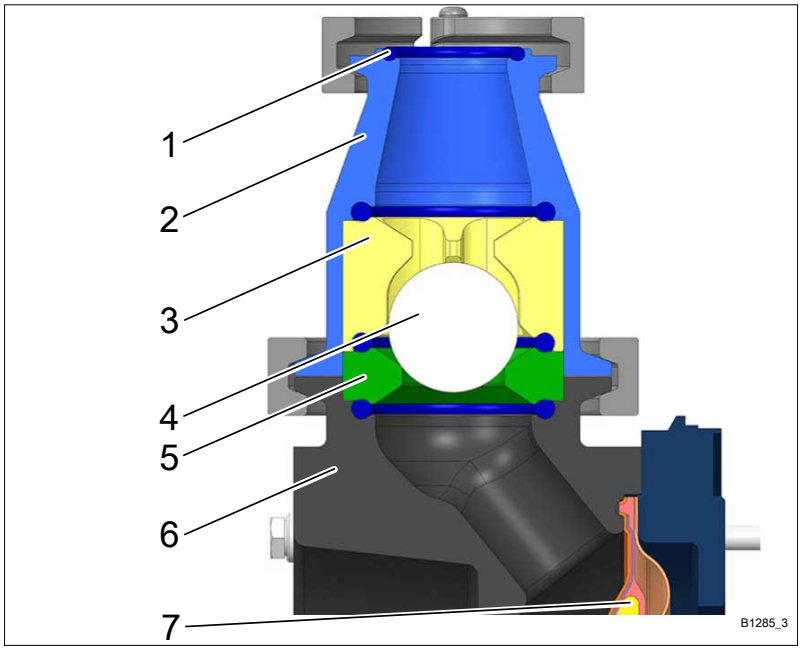


Fig. 4: Section: the liquid end of the Sigma hygienic pump

1 O-ring
2 Connector piece
3 Valve housing
4 Ball
5 Valve seat
6 Dosing head
7 Diaphragm

Tab. 3: The materials conform to Regulation (EC) no. 1935/2004.

Dosing head	Valve seats / valve housing / connector piece	O-rings *	Balls	Diaphragm
1.4435	1.4435	EPDM	Al_2O_3	PTFE
* O-rings DIN 11864 R				

8.2 Surfaces that come into contact with food products

Surface quality:

- The metallic surfaces that come into contact with food products are electropolished with a max. roughness value (Ra) of 0.8 µm.
- Make sure that the surfaces that come into contact with food products are not scratched or damaged.
- The side of the diaphragm that comes into contact with food products may not be scratched or damaged.

Do not exceed the chloride content of the batching water, as the steel parts could then become unhygienic due to corrosion.

8.3 Valve cross-sections

The smallest cross-section of the dosing head with its nominal width is derived from the cross-section of the ball check valve.

DN	Smallest cross-section surface	Equivalent diameter
DN10	80 mm^2	8.9 mm
DN15	83 mm^2	10.3 mm
DN25	275 mm^2	16.6 mm
DN32	402 mm^2	22.6 mm

8.4 Cleaning by flushing

WARNING!

Danger from hazardous substances!

Possible consequence: Fatal or very serious injuries.

Please ensure when handling hazardous substances that you have read the latest safety data sheets provided by the manufacture of the hazardous substance. The actions required are described in the safety data sheet. Check the safety data sheet regularly and replace, if necessary, as the hazard potential of a substance can be re-evaluated at any time based on new findings.

The system operator is responsible for ensuring that these safety data sheets are available and that they are kept up to date, as well as for producing an associated hazard assessment for the workstations affected.

8.4.1 Flow velocity / Flushing the liquid end

Flow velocity

Use a suitable flushing medium to flush the pump regularly at 100% delivery stroke in line with your cleaning schedule.

Set up an appropriate flushing assembly to flush the liquid end.

Ensure that the metering pump is operating at 100% delivery stroke during flushing.

Flushing the liquid end

The fundamental prerequisite for a successful CIP (cleaning in place) process is a turbulent flow at a minimum flow velocity of 1.5 m/s based on the “pipe diameter of the pump feed”.

However, never exceed the maximum permitted priming pressure on the suction side, referring to the “Technical data” chapter of the “Operating instructions for the diaphragm motor driven dosing pump Sigma”.

8.4.2 Selected cleaning agents and parameters

Tab. 4: Selected cleaning agents and parameters

Cleaning agent	Max. chloride content in the batching water in mg/l	Concentration in %	Dwell time in minutes	Max. temperature in °C
Flushing with cold water	150	-	-	-
Sodium hydroxide solution NaOH	150	2 ... 3	30 ... 45	80
Hydrogen peroxide (H_2O_2) product used as an intensifier for 1 ... 2% NaOH	150	Injection: 0.1 Batch: 0.5	30	80
Acidic cleaning agent based on phosphoric acid H_3PO_4	150	3	45	70
Acidic cleaning agent based on nitric acid HNO_3	150	2	45	70
Acidic cleaning agent based on a mixture of phosphoric acid and nitric acid	150	2	45	70
Chloro-alkaline cleaning agent / disinfectant, pH value > 11	120	1.5	45	60

8.4.3 Selected disinfectants and parameters

Disinfectant	Max. chloride content in the batching water in mg/l	Concentration in %	Dwell time in minutes	Max. temperature in °C
Acidic disinfectant based on peracetic acid	150	0.2 ... 1.0	20	25
Acidic disinfectant application version	150	0.5	45	40
Acidic disinfectant based on haloacid / phosphoric acid	150	0.5 ... 1.0	20	25
Acidic disinfectant based on haloacid / nitric acid	150	0.5 ... 1.0	20	25
Neutral disinfectant based on hydrogen peroxide (H_2O_2)	150	0.5 ... 1.0	30	25
Neutral disinfectant, application version	120	0.3	60	70
Chloro-alkaline cleaning agent / disinfectant, pH value > 11	120	1.5	45	60
Bottle disinfection with peracetic acid	5	2000 mg/l *	continuous	60
Bottle disinfection, application version	5	4000 mg/l *	continuous	30
Sterilisation with hot water	150	-	45	140
Sterilisation with steam	-	-	45	135
* Concentration based on pure peracetic acid				

8.4.4 Cleaning and CIP (cleaning in place)

Never exceed the concentration and temperatures prescribed by the manufacturer of the cleaning agent during cleaning and CIP (cleaning in place).

The pump needs to be running at 100% stroke during the flushing process.

However, never exceed the maximum permitted priming pressure on the suction side, referring to the operating instructions for the pump.

Regularly flush the interior of the pump using a suitable medium, e.g. when changing the product, during idle times ...etc. These intervals must be defined by the operator.

Only use cleaning agents that do not attack or grind the materials of the pump.

Make sure that all surfaces, especially any surfaces that come into contact with food products, are not scratched by tools, cleaning agents, auxiliary agents etc., and that these surfaces are not changed in any other way.

You can clean the pump in its installed state together with its respective pipework.

The required reaction times, temperatures and cleaning agent concentrations are dependent on the level of dirt and contamination, and need to be adapted individually.

8.4.4.1 Max. flushing medium temperature

Tab. 5: Max temperature for 15 minutes and 3 bar

Parameter	Values
Flushing medium	+ 140 °C
The dosing head assumes the temperature of the liquid medium after a short time. The dosing head is then hot. Put in place appropriate protective measures.	

8.4.4.2 Drainage of residual liquid / Self-draining

Metering pumps with hygienic pump head are fitted with tightly closing ball check valves. Flushing liquid can therefore collect in the pump cavity and above the valves after the CIP (cleaning in place) step. Use appropriate processes, e.g. purging, to remove this flushing liquid.

If you wish to completely remove the residual liquid, then you need to dismantle the hygienic head, dry all components, and then re-assemble the hygienic head,

8.5 Manually cleaning the valves

You can clean the pump in its dismantled state. You need to dismantle the liquid end and clean it wet.

Only use cleaning agents that do not attack or grind the materials of the pump.

Make sure that all surfaces, especially any surfaces that come into contact with food products, are not scratched by tools, cleaning agents, auxiliary agents etc., and that these surfaces are not changed in any other way.

- Components can fall out of the valves, such as balls and valve seats Fig. 5, especially out of the discharge valve, and become damaged, making them unsuitable for hygienic use.
- Replace any components that fall out.
- Carefully open the large single-hinge clamps and pay attention to the components.

Only tighten the single-hinge clamps by hand. Do not use any tools or extensions.

Pay attention to the direction of flow. The direction of flow is indicated by the arrows on the dosing head and valve housing. The pump will not pump if assembled incorrectly.

The O-rings need to lie deeply in their groove, as the O-rings could otherwise fall out and the pump then run incorrectly.

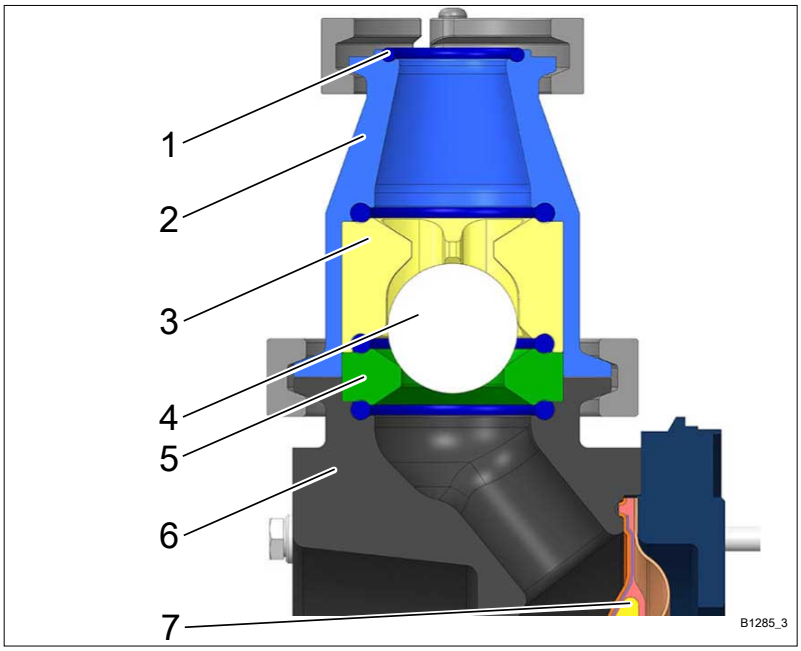


Fig. 5: Cross-section: Sigma Hygiene liquid end

1 O-ring
2 Connector piece
3 Valve housing
4 Ball

5 Valve seat
6 Dosing head
7 Diaphragm

Risk of confusion:

- Once assembled, the balls (4) and their valve seats (5) must be seated at the bottom of their valve housing (3), see *Further information on page 19*.
- Preferably clean the valves individually so that, among other things, the same ball is replaced in the same valve seat.
- Note which side of the valve seat was pointing to the ball and re-assemble the valve in the same way.
- The direction arrows of both connector pieces (2) must point upwards once assembled.

8.6 Exterior cleaning of the pump

1. Disconnect the pump from the supply voltage.
2. Check whether the protective cowlings are assembled on the pump foot and on the operating panel.
3. Note the degree of protection of your pump, referring to the nameplate on the pump.
4. Flush the exterior surfaces of the pump with a surge of water at atmospheric pressure.

   Parameter:

   - Your minimum distance from the pump: 3 metres
   - Maximum cleaning time: 2 minutes
   - Maximum water temperature: 40 °C.

9 Replacement and checking

Make sure that the pump is always promptly and adequately cleaned. To do so, you may consider, among other things, including your pump in your operational cleaning schedule. Alternatively put in place other or additional appropriate measures and methods to ensure that there is no, or could be no, hygienic risk to the process.

Make sure, when cleaning too, that all hygienic conditions at the installation site, workplace, tools, equipment etc. are guaranteed and complied with during any associated work.

If water is used as the cleaning agent, auxiliary agent etc. during cleaning, then this water must be of drinking water quality.

Make sure that all surfaces, especially any surfaces that come into contact with food products, are not scratched by tools, cleaning agents, auxiliary agents etc., and that these surfaces are not changed in any other way.

Carry out a commissioning process after all work or longer periods of downtime, ↳ *Procedure instructions on page 12*

9.1 Replacing the diaphragm

WARNING!

Danger from hazardous substances!

Possible consequence: Fatal or very serious injuries.

Please ensure when handling hazardous substances that you have read the latest safety data sheets provided by the manufacture of the hazardous substance. The actions required are described in the safety data sheet. Check the safety data sheet regularly and replace, if necessary, as the hazard potential of a substance can be re-evaluated at any time based on new findings.

The system operator is responsible for ensuring that these safety data sheets are available and that they are kept up to date, as well as for producing an associated hazard assessment for the workstations affected.

- Damage due to the possible falling of the heavy Sigma 3 dosing head (types 070410, 070580, 040830 and 041030). Weight: 32 kg.
- Use lifting straps to move the large dosing head.

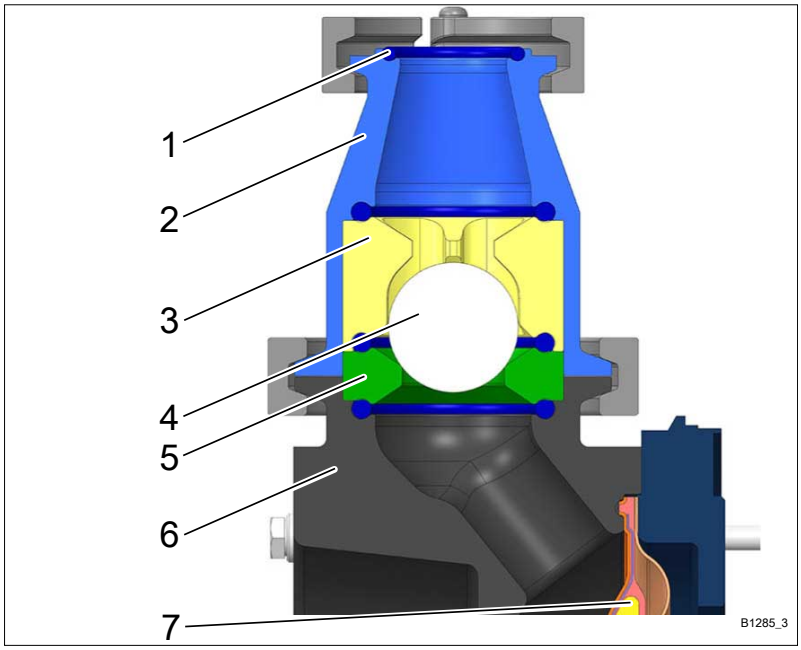


Fig. 6: Cross-section through the Sigma Hygiene liquid end

1 O-ring
2 Connector piece
3 Valve housing
4 Ball
5 Valve seat
6 Dosing head
7 Diaphragm

Requirements:

- Put in place protective measures, if necessary.
- Note the material safety data sheet for the feed chemical.
- Ensure that the system is at atmospheric pressure.

1. Drain the liquid end: purge the liquid end and then flush using a suitable medium.
2. With the pump running, move the stroke adjustment dial to the stop at 0% stroke length.

   ⇨ The drive axle is now difficult to turn.
3. Switch off the pump.
4. Remove the small single-hinge clamps and separate the hydraulic connectors from the discharge and suction side.
5. Unscrew the diaphragm rupture sensor from the dosing head.
6. Suspend the dosing head from lifting straps, if necessary.
7. Remove the 4 or 6 screws on the very heavy dosing head.
8. Remove the very heavy dosing head.
9. Check the condition of the diaphragm rupture sensor, see *Chapter 10 'Checking the condition of the diaphragm rupture sensor' on page 25*.
10. Clean all components, adapted to the conditions subsequently required.
11. When re-assembling, note the direction of flow and replace all seals. When doing so, take the specification of the seals into consideration.

    The O-rings must lie deeply in their grooves.

    Place the dosing head with the screws onto the diaphragm. The suction connector should be pointing downwards when the pump is in its fitting position.
12. Initially slightly tighten the screws, then tighten crosswise to 25% of the tightening torque (note the laser engraving), see *'Tightening torques' on page 23*.
13. Screw the diaphragm rupture sensor into the dosing head.
14. Start the pump and adjust the stroke length to 100%.
15. Stop the pump and tighten the screws crosswise to 100% of the tightening torque. For the tightening torque, see *'Tightening torques' on page 23*.
16. Start the pump and check its leak-tightness with water at maximum pressure.

    The liquid end may leak if the tightening torque of the screws is not checked.

    - Check the tightening torque of the screws after 24 hours of operation.

Tightening torques

Tightening torque of dosing head screws: note the laser engraving on the surface of the dosing head.

Tighten the dosing head screws crosswise in 2 torque stages:

Stage 1	Stage 2
25%	100%

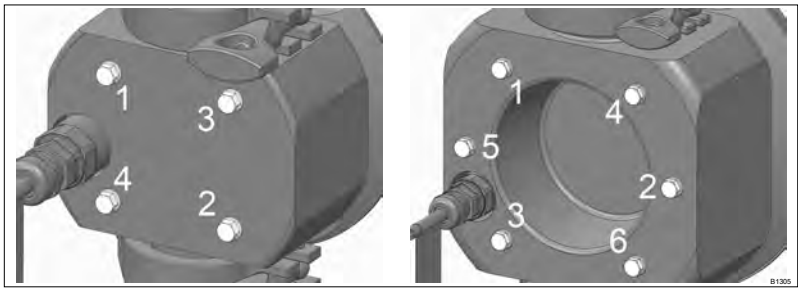


Fig. 7: Screwing sequence

10 Checking the condition of the diaphragm rupture sensor

Make sure that all surfaces, especially any surfaces that come into contact with food products, are not scratched by tools, cleaning agents, auxiliary agents etc., and that these surfaces are not changed in any other way.

Carry out a commissioning process after all work or longer periods of downtime, *Procedure instructions on page 12*

1. Replace the diaphragm rupture sensor if the inside of the diaphragm rupture sensor has become damp or dirt has penetrated it.

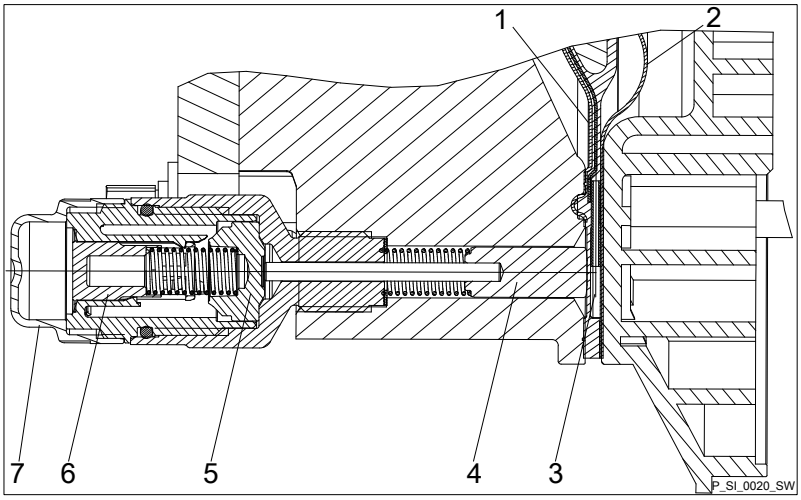


Fig. 8: Section through the Sigma diaphragm rupture warning system ("Visual rupture indicator" design)

1 Working layer (≙ operating diaphragm)
2 Safety layer (≙ safety diaphragm)
3 Flap
4 Piston
5 Diaphragm rupture sensor
6 Cylinder, red
7 Cover, transparent

2. If the piston of the diaphragm rupture sensor, see , item 4, should have become dirty or damp, clean both the piston and the hole in which it runs.
3. Check whether the piston can move freely in the hole.
4. Reassemble the clean diaphragm rupture sensor with the clean piston.
5. Testing the diaphragm rupture sensor:

10.1 Testing the optical diaphragm rupture sensor

1. Unscrew the transparent cover from the diaphragm rupture sensor.
2. Press the red cylinder into the diaphragm rupture sensor until the cylinder engages.

3. Press the piston on the other side of the diaphragm rupture sensor into the dosing head (approximately 4 mm) using a blunt, smooth object until the diaphragm rupture sensor triggers.

   Feed chemical may escape

   - Feed chemical can escape in the event of a diaphragm rupture if the expandable flap of the diaphragm is damaged.
   - Make sure that the piston is not scratched. The piston must remain completely smooth so that the piston does not damage the expandable flap of the diaphragm during operation.

4. Press the red cylinder into the diaphragm rupture sensor again and repeat the test.

5. If it does not trigger both times, replace the diaphragm rupture sensor.

6. After a successful test, screw the transparent cover onto the diaphragm rupture sensor and then continue by assembling the diaphragm.

10.2 Testing the electric diaphragm rupture sensor

1. Press the piston of the diaphragm rupture sensor into the dosing head (approximately 4 mm) using a blunt, smooth object until the monitor triggers an alarm.

   Feed chemical may escape

   - Feed chemical can escape in the event of a diaphragm rupture if the expandable flap of the diaphragm is damaged.
   - Make sure that the piston is not scratched. The piston must remain completely smooth so that the piston does not damage the expandable flap of the diaphragm during operation.

2. Repeat the test.

3. Replace the diaphragm rupture sensor if the monitor does not trigger an alarm both times.

4. After a successful test, continue by assembling the diaphragm.

11 Technical data

Temperature of the flushing medium / feed chemical

Tab. 6: Maximum temperature for 15 minutes

Media	Max. values
Flushing medium or feed chemical	+ 140 °C

The dosing head assumes the temperature of the liquid medium after a short time. Consider taking appropriate protective measures.

The pump can meter the following types of liquid food products or additives:

- Liquid food products or additives with a viscosity of up to 30,000 mPas
- Liquid food products or additives with a temperature of - 10 °C ... 90 °C
- Liquid food products or additives with a pH value of 2 ... 13 pH
- Liquid food products or additives containing solids of < 0.3 mm
- Liquid food products or additives which do not crystallise.

Sound pressure level

Sound pressure level of the dosing heads when the pump is running:

< 80 dB (A) (ISO 11688-1 (11/2009)).

11.1 Product-specific part of the Sigma 1

Should the information in these supplementary operating instructions and in the operating instructions for the pump contradict each other, then the information in these supplementary operating instructions will take precedence.

11.1.1 Performance data of the Sigma 1

S1BA with hygienic pump head at 50 Hz operation

Type	Minimum pump capacity at maximum back pressure		
	bar	l/h	ml/stroke
10022	10	24	5.5
10044	10	46	5.3
07065	7	68	5.5

Type	Maximum stroke rate	Priming lift	Suction lift	Max. permissible priming pressure on the suction side	Connector size [1]
	Strokes/min	mbar	mbar		DN
10022	73	200	500		10
10044	143	200	500		10
07065	205	200	500		10

S1BA with hygienic pump head at 60 Hz operation

Type	Minimum pump capacity at maximum back pressure				
	bar	psi	l/h	gph	ml/stroke
10022	10	145	29	7.6	4.7
10044	10	145	55	21.4	4.5
07065	7	102	81.1	21.4	8.7

Type	Maximum stroke rate	Priming lift	Suction lift	Max. permissible priming pressure on the suction side	Connector size [1]
	Strokes/min	mbar	mbar		DN
10022	88	200	500		10
10044	172	200	500		10
07042	88	200	500		10

S1CB with hygienic pump head

Type	Minimum pump capacity at maximum back pressure		
	bar	l/h	ml/stroke
10022	10	30	4.7
10044	10	54	4.5
07065	7	66	4.7

Type	Maximum stroke rate	Priming lift	Suction lift	Max. permissible priming pressure on the suction side	Connector size [1]
	Strokes/min	mbar	mbar		DN
10022	88	200	500		10
10044	172	200	500		10
07065	200	200	500		10

All figures are guideline values for water at 20 °C.

The priming lift applies to clean, moist valves, an empty suction line and empty liquid end - with correct installation.

[1] The standard connector is an aseptic grooved clamp connection according to DIN11864-3.

11.1.2 Weights of the Sigma 1 dosing heads

Dosing head	Weight
DN 10	approx. 6 kg
DN 15	approx. 8 kg

11.1.3 Dimensional drawings, Sigma 1

Dimensional drawing of the Sigma 1, S1CB with hygienic pump head

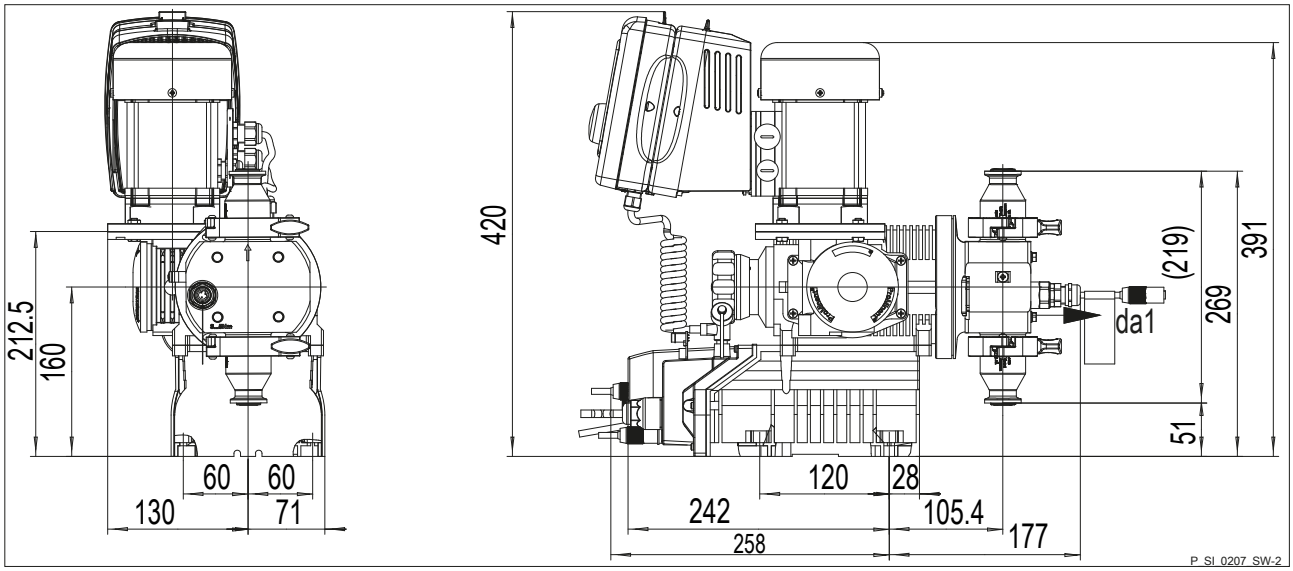


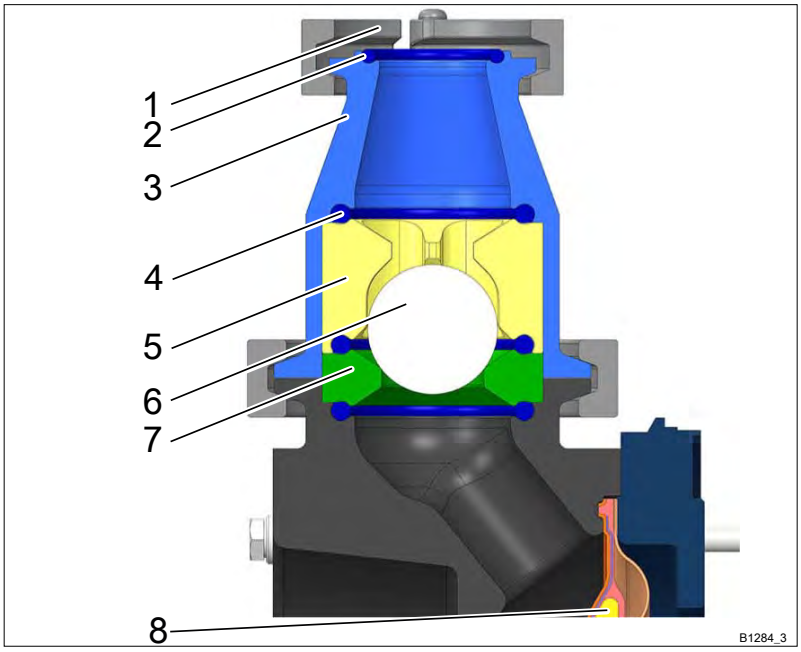
Fig. 9: Dimensional drawing of the Sigma 1, S1CB with hygienic pump head - dimensions in mm

da1 ≥ 150 mm = space to remove the dosing head

11.1.4 Spare parts lists for Sigma 1

Sigma 1 with hygienic pump head

Store all spare parts, components etc. in such a way that their hygienic properties are not modified, endangered or affected in any other way.



Pos.	Article	Quantity	Order no.
1	Single-hinge clamp (not included in the scope of delivery)	-	-
2*/**	O-ring, DIN 11864-R, 12x3.5-EPDM	2	1110596
3	Connector piece, HD, DN10, 4435	2	1109467
4*/**	O-ring, DIN 11864-R, 22x3.5-EPDM	6	1110595
5	Valve housing, HD, DN10, 4435	2	1109441
6*/**	Ball, DIN 5401, D=5/8 G40 Al2O3	2	1110837
7*/**	Valve seat, HD, DN10, 4435	2	1109392
8*/**	Multi-layer diaphragm S1_a d70x37 PTFE/EPDM 1935	1	1106069

* Components relevant in terms of hygiene that come into contact with food products

** Components of the spare parts kit 1119725

11.1.5 Materials that come into contact with food products

These are components relevant in terms of hygiene. Only use suitable components according to the spare parts list.

Dosing head	Valve seat / valve housing / connector piece	Seals	Ball	Diaphragm
1.4435	1.4435	EPDM *	Al_2O_3	PTFE

* O-ring DIN 11864 R

11.1.6 Performance diagrams for the Sigma 1 with hygienic pump head

Sigma 1 S1BA with hygienic pump head (50 Hz)

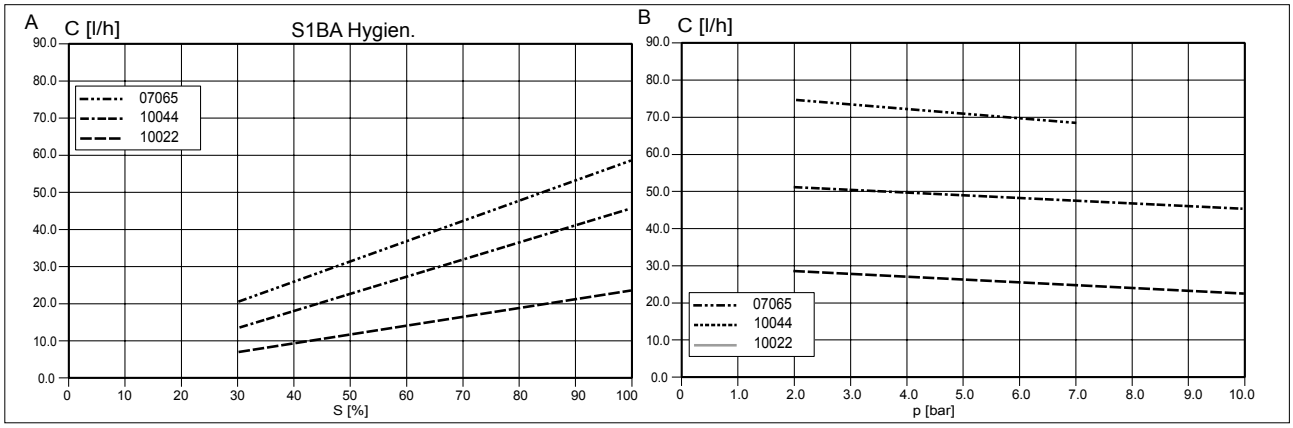


Fig. 10: A) Dosing rate C at maximum back pressure depending on the stroke length “S”.// B) Dosing rate C depending on the back pressure “p”.

Sigma 1 S1CB with hygienic pump head

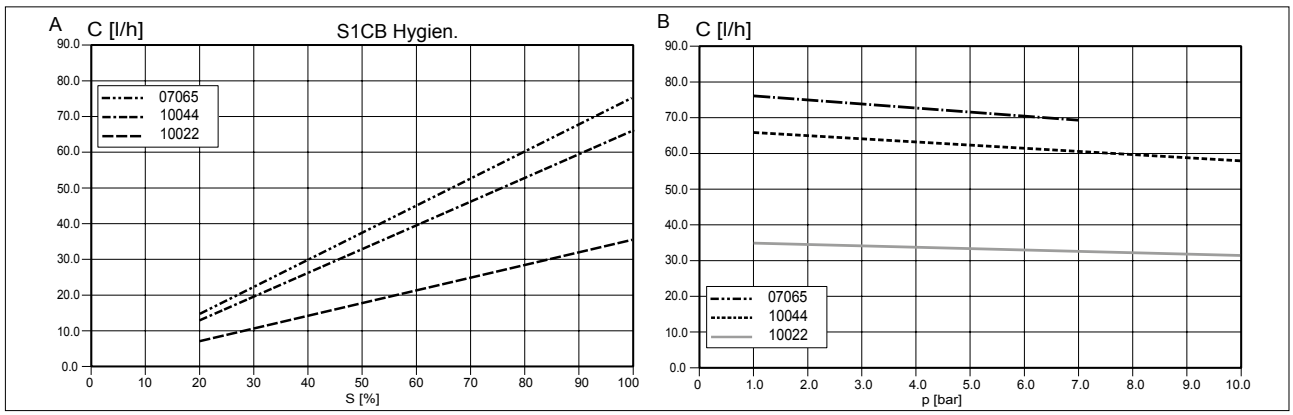


Fig. 11: A) Dosing rate C at maximum back pressure depending on the stroke length “S”. // B) Dosing rate C depending on the back pressure “p”.

11.2 Product-specific part of the Sigma 2

Should the information in these supplementary operating instructions and in the operating instructions for the pump contradict each other, then the information in these supplementary operating instructions will take precedence.

11.2.1 Performance data of the Sigma 2

S2BA with hygienic pump head at 50 Hz operation

Type	Minimum pump capacity at maximum back pressure		
	bar	l/h	ml/stroke
16050	10	49	11.1
16090	10	87	10.9
16130	10	128	10.8
07120	7	122	27.8
07220	7	223	28.1
04350	4	356	30.0

Type	Maximum stroke rate	Priming lift	Suction lift	Max. permissible priming pressure on the suction side	Connector size
	Strokes/min	mbar	mbar		DN
16050	73	190	500		15
16090	132	190	500		15
16130	198	190	500		15
07120	73	150	500		25
07220	132	150	500		25
04350	198	150	500		25

S2BA with hygienic pump head at 60 Hz operation

Type	Minimum pump capacity at maximum back pressure				
	bar	psi	l/h	gph	ml/stroke
16050	10	145	58	15.3	11.1
16090	10	145	102	29.9	10.9
16130	10	145	150	39.5	10.8
07120	7	100	145	38.2	27.8
07220	7	100	263	69.4	28.1
04350	4	58	418	110.3	30.0

Type	Maximum stroke rate	Priming lift	Suction lift	Max. permissible priming pressure on the suction side	Connector size
	Strokes/min	mbar	mbar		DN
16050	87	190	500		15
16090	156	190	500		15
16130	232	190	500		15
07120	87	150	500		25
07220	156	150	500		25
04350	232	150	500		25

S2CB with hygienic pump head

Type	Minimum pump capacity at maximum back pressure		
	bar	l/h	ml/stroke
16050	10	60	11.1
16090	10	105	10.9
16130	10	129	10.8
07120	7	150	27.8
07220	7	270	28.1
04350	4	360	30.0

Type	Priming lift	Suction lift	Max. permissible priming pressure on the suction side	Connector size
	mbar	mbar		DN
16050	190	500		15
16090	190	500		15
16130	190	500		15
07120	150	500		25
07220	150	500		25
04350	150	500		25

All figures are guideline values for water at 20 °C.

The priming lift applies to a filled suction line and filled liquid end, with correct installation.

11.2.2 Weights of the Sigma 2 dosing heads

Dosing head	Weight
DN 15	approx. 8 kg
DN 25	approx. 14 kg

11.2.3 Dimensional drawings, Sigma 2

Dimensional drawings of the Sigma 2, S2CB

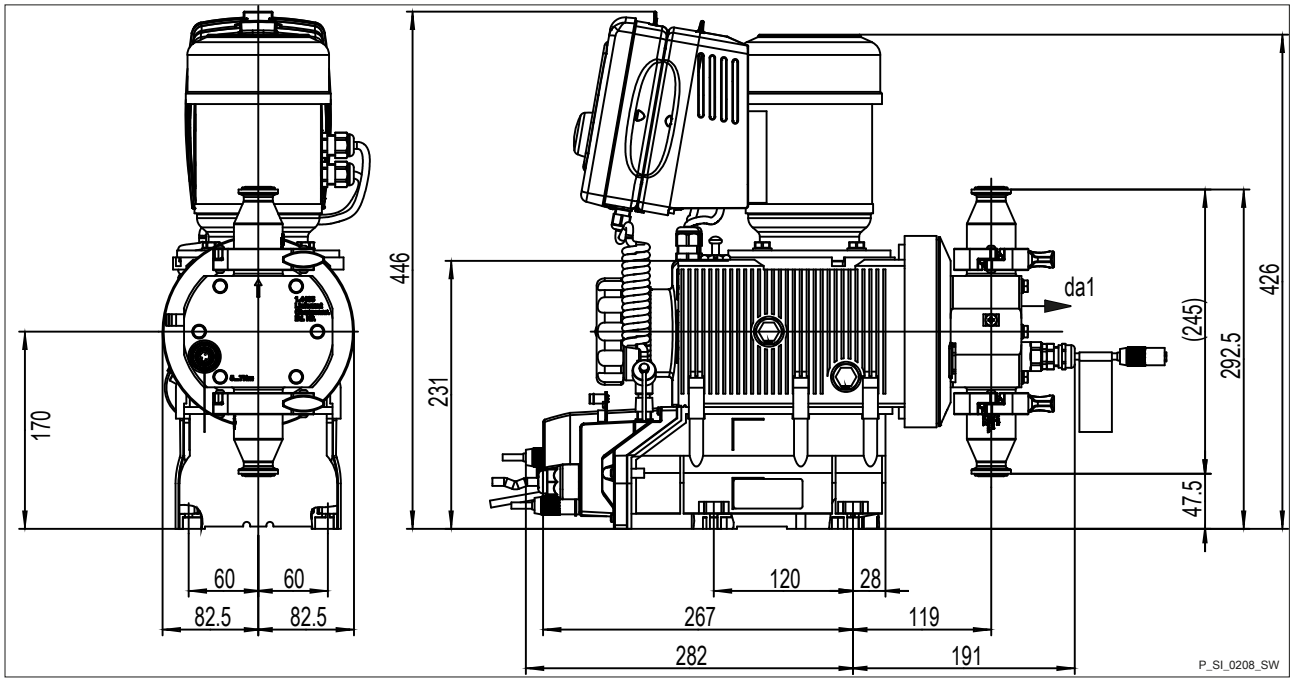


Fig. 12: Dimensional drawing of the Sigma 2, S2CB with hygienic pump head DN15, dimensions in mm

da1 ≥ 150 mm = space to remove the dosing head

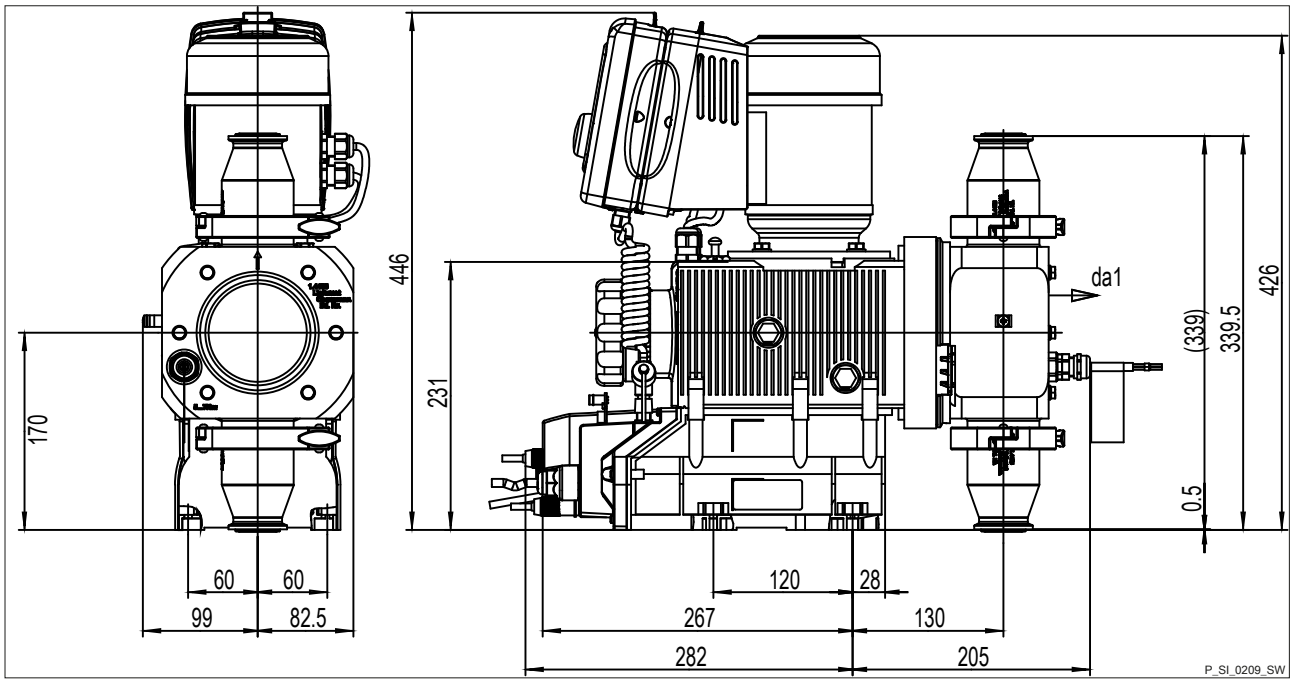
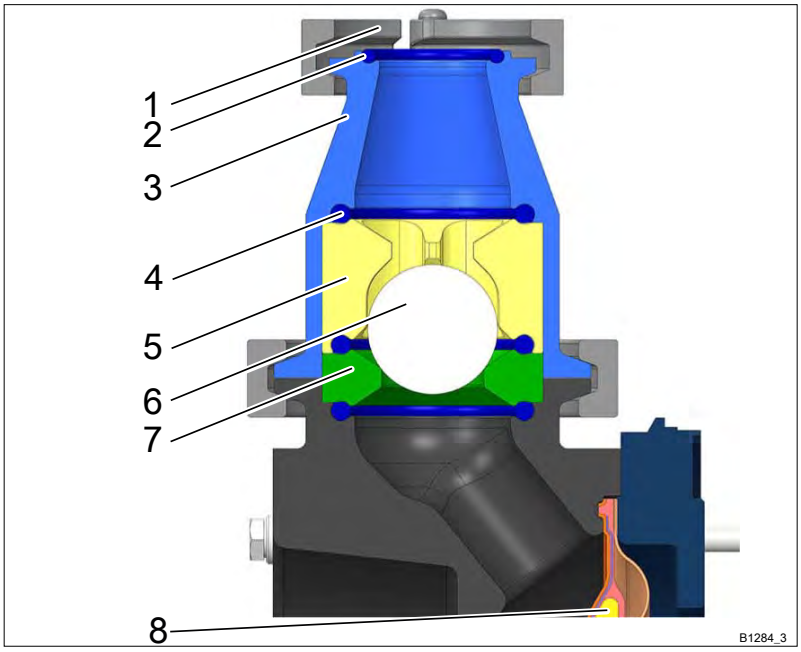


Fig. 13: Dimensional drawing of the Sigma 2, S2CB with hygienic pump head DN25, dimensions in mm

da1 ≥ 150 mm = space to remove the dosing head

11.2.4 Spare parts lists for Sigma 2

Store all spare parts, components etc. in such a way that their hygienic properties are not modified, endangered or affected in any other way.



Tab. 7: DN15 design

Pos.	Article	Quantity	Order no.
1	Single-hinge clamp (not included in the scope of delivery)	-	-
2*/**	O-ring DIN 11864-R-18x3.5-EPDM	2	1110594
3	Connector piece HD DN15 4435	2	1109060
4*/**	O-ring DIN 11864-R-28x3.5-EPDM	6	1110588
5	Valve housing HD DN15 4435	2	1109095
6*/**	Ball DIN 5401 D=7/8 G 40 Al2O3	2	1110916
7*/**	Valve seat HD DN15 4435	2	1109062
8*/**	Multi-layer diaphragm S2_a d86.5x46-M8 PTFE/EPDM 1935	1	1106066

* Components relevant in terms of hygiene that come into contact with food products

** Components of the spare parts kit 1119727

Tab. 8: DN25 design

Pos.	Article	Quantity	Order no.
1	Single-hinge clamp (not included in the scope of delivery)	-	-
2*/**	O-ring DIN 11864-R-28x3.5-EPDM	2	1110588
3	Connector piece HD DN25 4435	2	1109596
4*/**	O-ring DIN 11864-R-40x5-EPDM	6	1110587
5	Valve housing HD DN25 4435	2	1109590
6*/**	Ball DIN 5401 D=1.1/4 G 40 Al2O3	2	1110917
7*/**	Valve seat HD DN25 4435	2	1109586

Pos.	Article	Quantity	Order no.
8*/**	Multi-layer diaphragm S2_a d123.5x75-M8 PTFE/EPDM1935	1	1106067

* Components relevant in terms of hygiene that come into contact with food products

** Components of the spare parts kit 1119729

11.2.5 Materials that come into contact with food products

These are components relevant in terms of hygiene. Only use suitable components according to the spare parts list.

Dosing head	Valve seat / valve housing / connector piece	Seals	Ball	Diaphragm
1.4435	1.4435	EPDM *	Al_2O_3	PTFE

* O-ring DIN 11864 R

11.2.6 Performance diagrams for the Sigma 2 with hygienic pump head

Sigma 2 S2BA with hygienic pump head (50 Hz)

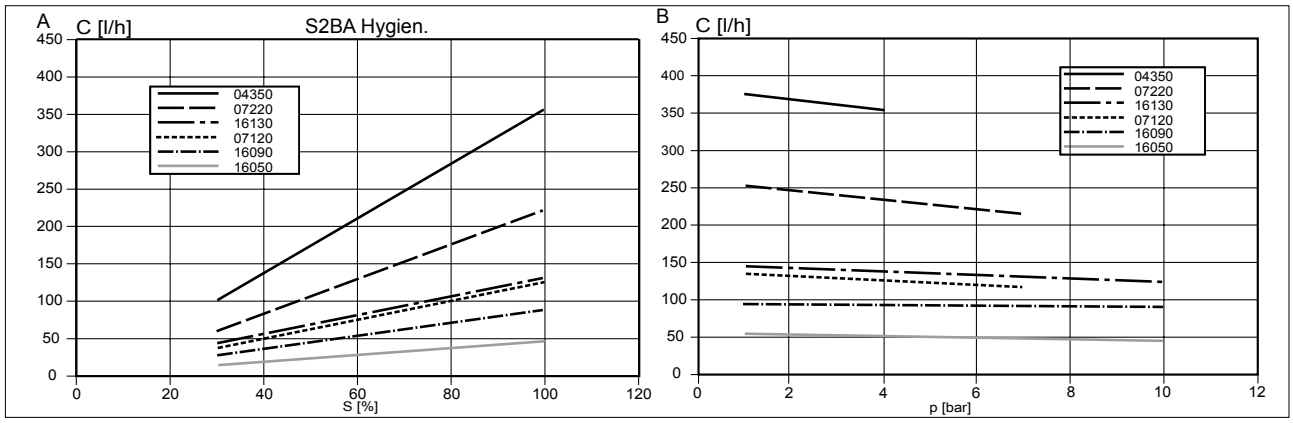


Fig. 14: A) Dosing rate C at maximum back pressure depending on the stroke length “S”. // B) Dosing rate C depending on the back pressure “p”.

Sigma 2 S2CB with hygienic pump head

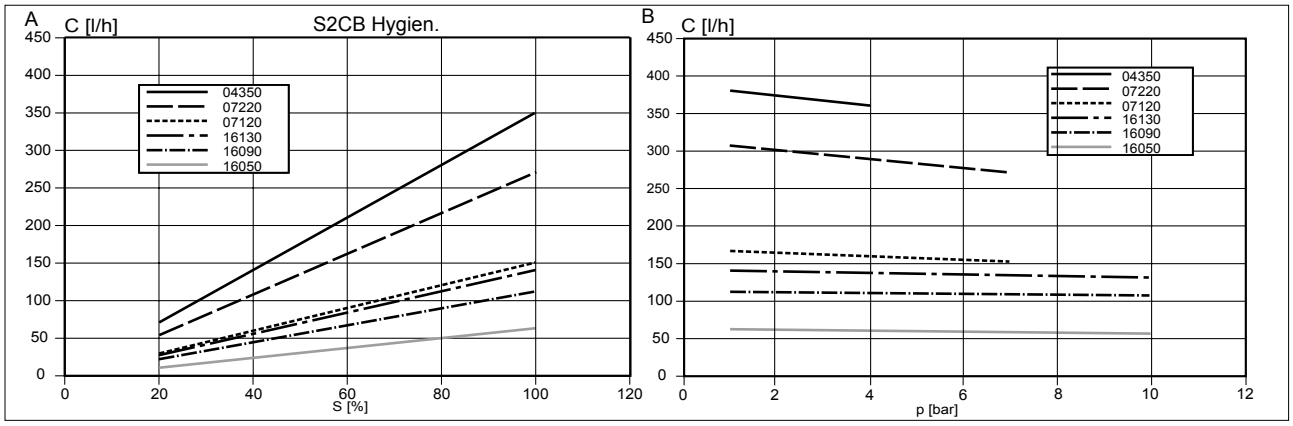


Fig. 15: A) Dosing rate C at maximum back pressure depending on the stroke length “S”. // B) Dosing rate C depending on the back pressure “p”.

11.3 Product-specific part of the Sigma 3

Should the information in these supplementary operating instructions and in the operating instructions for the pump contradict each other, then the information in these supplementary operating instructions will take precedence.

11.3.1 Performance data of the Sigma 3

S3BA with hygienic pump head at 50 Hz operation

Type	Minimum pump capacity at maximum back pressure		
	bar	l/h	ml/stroke
120145	10	149	34.4
120190	10	214	34.6
120270	10	298	34.4
120330	10	372	34.4
070410	7	374	86.7
070580	7	546	88.3
040830	4	800	92.6
041030	4	1000	92.6

Type	Maximum stroke rate	Priming lift	Suction lift	Max. permissible priming pressure on the suction side	Connector size
	Strokes/min	mbar	mbar		DN
120145	72	180	500		25
120190	103	180	500		25
120270	144	180	500		25
120330	180	180	500		25
070410	72	190	400		32
070580	103	190	400		32
040830	144	190	400		32
041030	180	190	400		32

S3BA with hygienic pump head at 60 Hz operation

Type	Minimum pump capacity at maximum back pressure				
	bar	psi	l/h	gph	ml/stroke
120145	10	145	178	46.9	34.4
120190	10	145	257	67.8	34.6
120270	10	145	358	94.4	34.4
070410	7	102	447	117.9	86.7
070580	7	102	657	173.3	88.3
040830	4	58	961	253.5	92.6

Type	Maximum stroke rate	Priming lift	Suction lift	Max. permissible priming pressure on the suction side	Connector size
	Strokes/min	mbar	mbar		DN
120145	86	180	500		25
120190	124	180	500		25
120270	173	180	500		25
070410	86	190	400		32
070580	124	190	400		32
040830	173	190	400		32

S3CB with hygienic pump head

Type	Minimum pump capacity at maximum back pressure		
	bar	l/h	ml/stroke
120145	10	186	29.3
120190	10	249	28.8
120270	10	372	23.8
070410	7	468	77.5
070580	7	636	72.1
040830	4	1000	71.3

Type	Priming lift	Suction lift	Max. permissible priming pressure on the suction side	Connector size
	mbar	mbar		DN
120145	180	500		25
120190	180	500		25
120270	180	500		25
070410	190	400		32
070580	190	400		32
040830	190	400		32

All figures are guideline values for water at 20 °C.

The priming lift applies to a filled suction line and filled liquid end - with correct installation.

11.3.2 Weights of the Sigma 3 dosing heads

Dosing head	Weight
DN 25	approx. 14 kg
DN 32	approx. 32 kg

11.3.3 Dimensional drawings, Sigma 3

**Dimensional drawing of the Sigma 3,
S3CB with hygienic pump head**

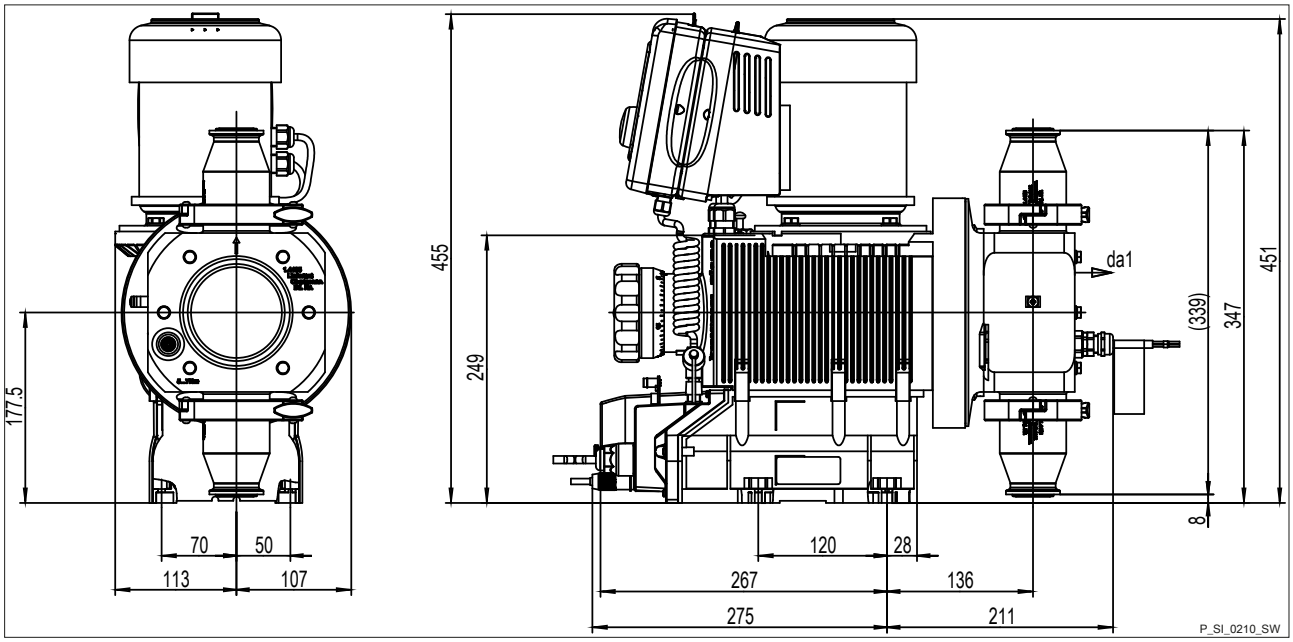


Fig. 16: Dimensional drawing of the Sigma 3, S3CB with hygienic pump head DN25, dimensions in mm

da1 ≥ 150 mm = space to remove the dosing head

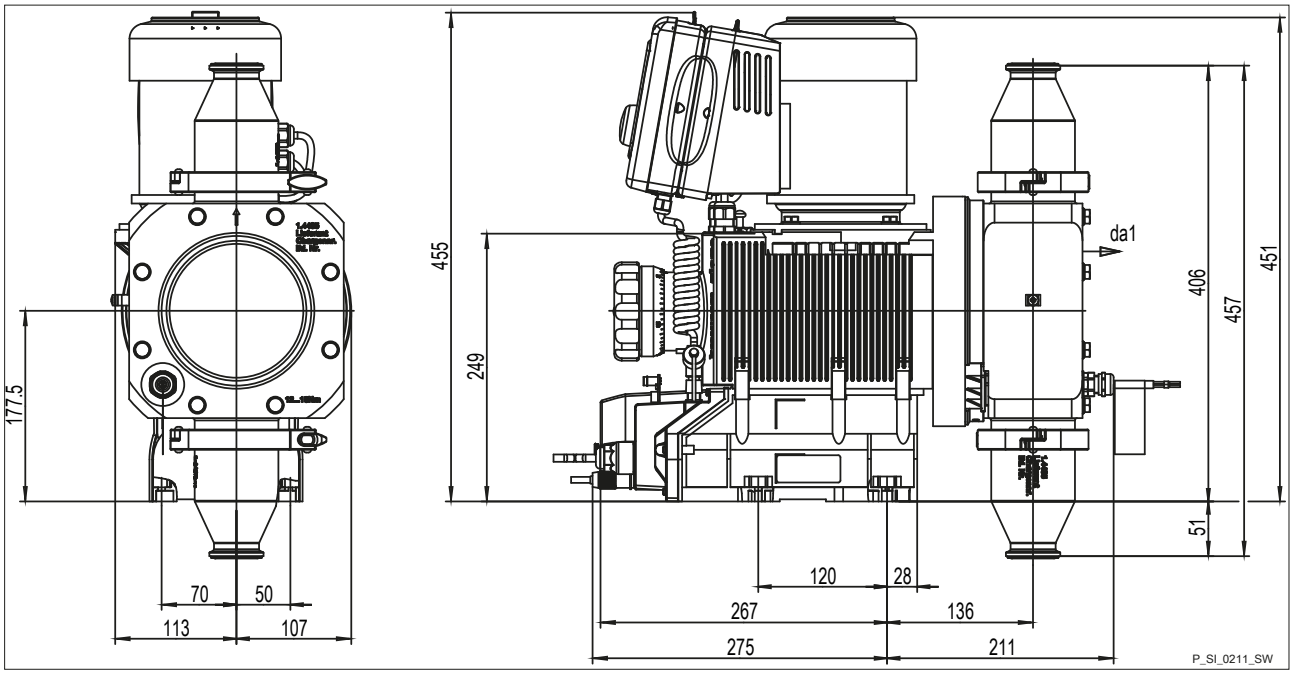
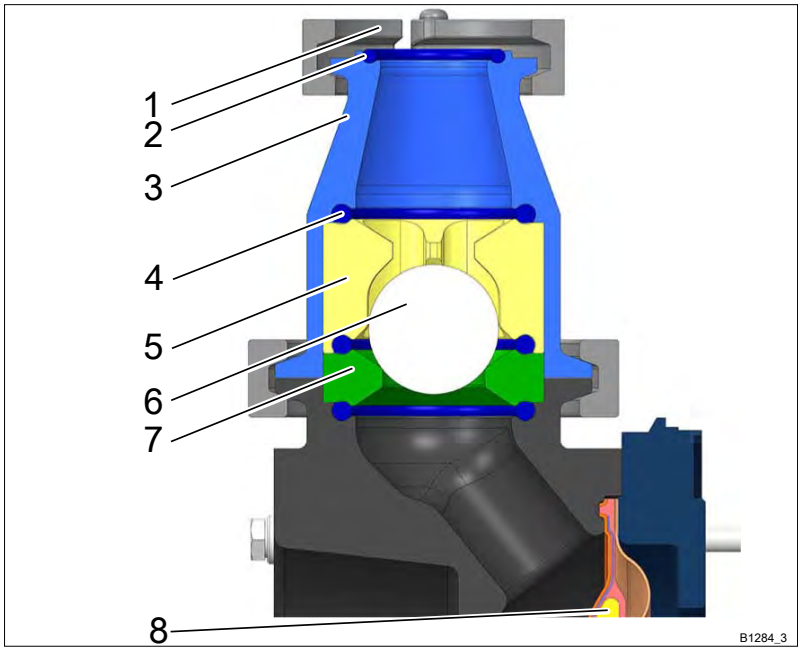


Fig. 17: Dimensional drawing of the Sigma 3, S3CB with hygienic pump head DN32, dimensions in mm

da1 ≥ 150 mm = space to remove the dosing head

11.3.4 Spare parts lists for Sigma 3

Store all spare parts, components etc. in such a way that their hygienic properties are not modified, endangered or affected in any other way.



Tab. 9: DN25 design

Pos.	Article	Quantity	Order no.
1	Single-hinge clamp (not included in the scope of delivery)	-	-
2*/**	O-ring DIN 11864-R-28x3.5-EPDM	2	1110588
3	Connector piece HD DN25 4435	2	1109596
4*/**	O-ring DIN 11864-R-40x5-EPDM	6	1110587
5	Valve housing HD DN25 4435	2	1109590
6*/**	Ball DIN 5401 D=1.1/4 G 40 Al2O3	2	1110917
7*	Valve seat HD DN25 4435	2	1109586
8*/**	Multi-layer diaphragm S3_a d123.5x75-M10 PTFE/EPDM1935	1	1106065

* Components relevant in terms of hygiene that come into contact with food products

** Components of the spare parts kit 1119731

Tab. 10: DN32 design

Pos.	Article	Quantity	Order no.
1	Single-hinge clamp (not included in the scope of delivery)	-	-
2*/**	O-ring DIN 11864-R-34x5-EPDM	2	1110586
3	Connector piece HD DN32 4435	2	1109621
4*/**	O-ring DIN 11864-R-52x5-EPDM	6	1109958
5	Valve housing HD DN32 4435	2	1109620
6*/**	Ball DIN 5401 D=1.5/8 G 40 Al2O3	2	1110918
7*/**	Valve seat HD DN32 4435	2	1109619

Pos.	Article	Quantity	Order no.
8*/**	Multi-layer diaphragm S3_a d178x132 PTFE/EPDM	1	1034953

* Components relevant in terms of hygiene that come into contact with food products

** Components of the spare parts kit 1119733

11.3.5 Materials that come into contact with food products

These are components relevant in terms of hygiene. Only use suitable components according to the spare parts list.

Dosing head	Valve seat / valve housing / connector piece	Seals	Ball	Diaphragm
1.4435	1.4435	EPDM *	Al_2O_3	PTFE

* O-ring DIN 11864 R

11.3.6 Performance diagrams for the Sigma 3 with hygienic pump head

Sigma 3 S3Ba with hygienic pump head (50 Hz) - 1

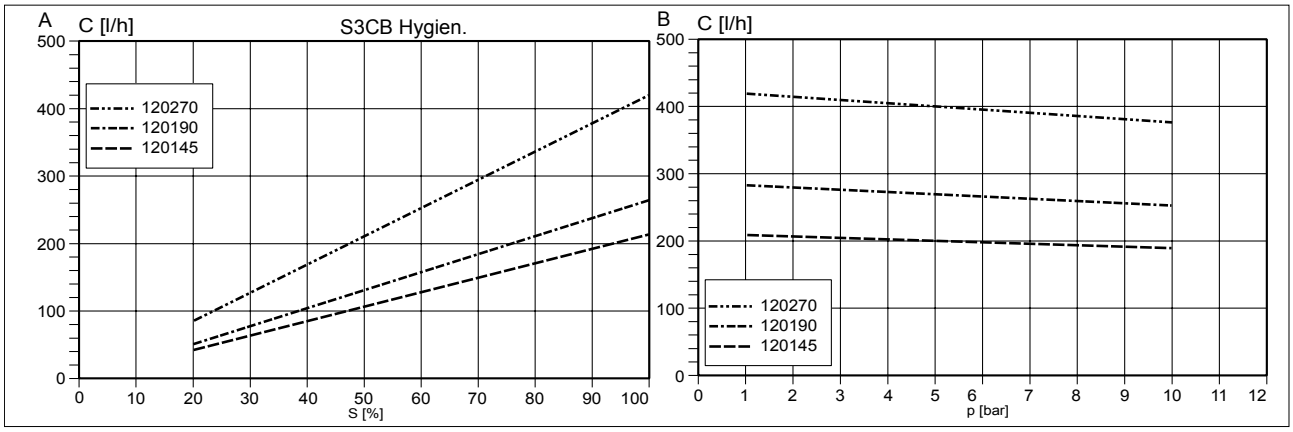


Fig. 18: A) Dosing rate C at maximum back pressure depending on the stroke length “S”. // B) Dosing rate C depending on the back pressure “p”.

Sigma 3 S3Ba with hygienic pump head (50 Hz) - 2

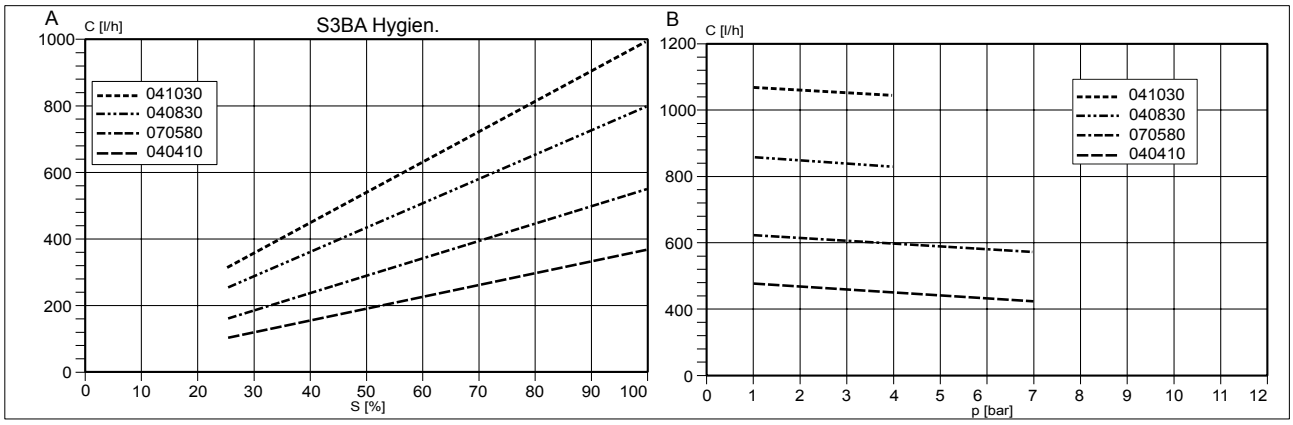


Fig. 19: A) Dosing rate C at maximum back pressure depending on the stroke length “S”. // B) Dosing rate C depending on the back pressure “p”.

Sigma 3 S3Cb with hygienic pump head

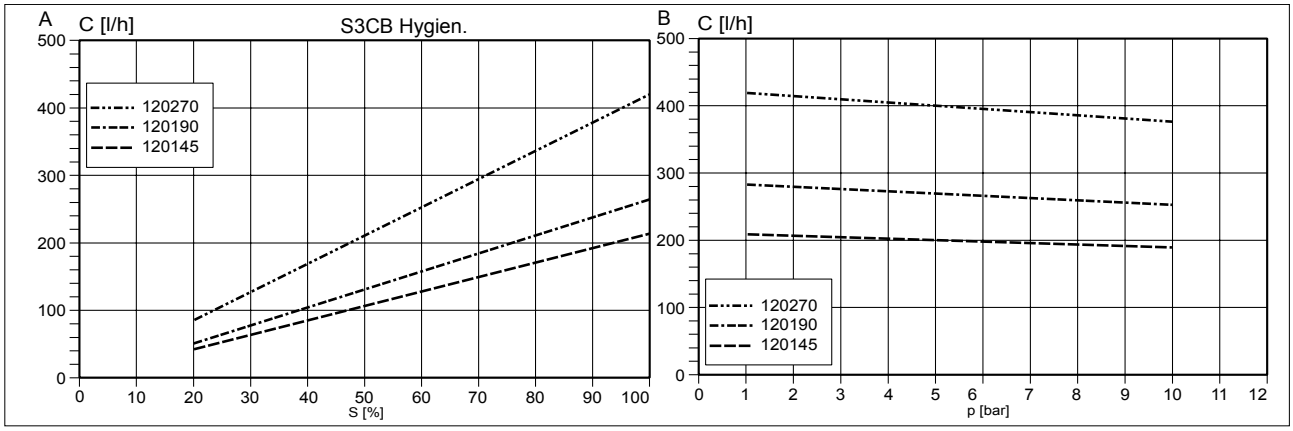


Fig. 20: A) Dosing rate C at maximum back pressure depending on the stroke length “S”. // B) Dosing rate C depending on the back pressure “p”.

12 Standards and regulations

DIN EN 1672-2 - 2021-05: Food processing machinery – General design principles – Part 2: Hygiene and cleaning requirements

EN 13951 (08.2012): Liquid pumps – Safety requirements – Agri-foodstuffs equipment; Design rules to ensure hygiene in use.

ISO 12100 (03.2011): Safety of machinery - General design principles - Risk assessment and risk minimisation.

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