



# Aratula STP Treatment Wetlands Operation and Maintenance Manual

Project Reference No. AWWTAA003

| OPERATION AND MAINTENANCE MANUAL APPROVAL |      |           |      |
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# Aratula Treatment Wetland

## Operation and Maintenance Manual

Prepared for



By



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# 1 Introduction

This Operation and Maintenance Manual (O&M Manual) has been prepared in order to maintain the long-term health and functionality of the Aratula Treatment Wetland. This Manual has been developed in accordance with Queensland Urban Utilities and DEHP requirements.

## 1.1 Purpose of Document

This O&M Manual is intended to;

- Detail specific activities required for operating and maintaining the treatment wetland.
- Provide guidance on required timing of inspections.
- Provide direction for the changes in operation that will be required during operation of the treatment wetland system.
- Ensure operational & maintenance issues are identified and acted upon appropriately. This includes referring problems to external contractors and specialists.

The main objective of this manual is to provide the System Operator (written as Operator from herein) with enough knowledge and confidence to sustain a healthy treatment wetland over the long-term. The Operator must be aware that wetland ecosystems are naturally evolving and therefore operational parameters and quantities in this document will require reassessment as the system develops over time. Hence, procedures in this manual are to be reviewed in consultation with the Queensland Urban Utilities Service Delivery Leader (Scenic Rim Region) and updated accordingly.

## 1.2 Related Documents

The O&M Manual draws upon information provided in the Detailed Design Documentation and Work-as-Executed Plans. These documents should also be referred to for a broader perspective of management issues. In addition, the Operator should have a copy of the relevant wetland plant guides detailed in Appendix 6 Wetland Vegetation Guide.

## 1.3 Document Revision

This document is to be reviewed by the QUU Service Delivery Leader (Scenic Rim Region) and updated periodically. A new revision is to be published with all agreed modifications after completion of system establishment.

Operators are to form a major part of this review as their practical experience will be vital in determining required changes to the Manual. Reference must be made to all records including observation notes to identify areas that require attention. The version table at the front of this O&M Manual is to be updated with each revision.

## 1.4 Record Keeping

The keeping of informative, organised records is necessary and will enable efficient document revision. The following is a list of documents to be utilised for record keeping:

- Log book.
- Inspection checklists (Appendix 1)
- Wetland hydrology recording sheet (Appendix 2)
- Water quality recording sheet.(Appendix 3)
- Mosquito larvae recording sheet (Appendix 8)

## **1.5 Operation and Maintenance Tools**

The Wetland Inspection Checklist, Wetland Hydrology Sheet, Water Quality Record Sheet, Observation and Monitoring Plan and Maintenance Schedule Recording Sheet (Appendices 1, 2, 3, 4, and 5) have been provided in conjunction with the O&M Manual as tools to help the Operator conduct thorough inspections and appropriately respond to observations. They are also intended to be used for record keeping and for future reference. The Overall Site Plan (486/5/5-0159-003) is provided as an illustrated overview of the operation of the Aratula Treatment Wetland.

## **1.6 Site Information**

The Aratula Treatment Wetland is located on Sawmill Road, Aratula, QLD 4309.

## **1.7 Site Access**

Main and secondary access points are shown on the Plan 486/5/5-0159-003. The plans show vehicle access tracks and pedestrian pathways.

## **1.8 Roles and Responsibilities**

The aim of establishing clear roles and responsibilities is to ensure that the Parties can work concurrently to achieve the System Operation objectives and fulfil their respective environmental duty of care.

### **1.8.1 Operator**

Within this document the term 'Operator' refers to the party responsible for operating and maintaining the Treatment Wetland. The Contractor (Civil works constructor) must operate and maintain the Treatment Wetland for a maintenance period after completion of construction. The maintenance period commences post practical completion of civil works and for this project is duration of 24 months. The maintenance period commences January 2015.

The Operation and Maintenance of the Aratula Treatment Wetland is covered in detail within relevant sections of this manual, however typically includes (but is not limited to) the following:

- Routine inspections for monitoring the condition of the wetland and associated structures.
- Managing control and water flow from the Aratula STP Facultative Ponds to the Treatment Wetland.
- Managing the water level within the wetland.
- Managing weeds and controlling pest fauna.
- Mosquito monitoring.
- Managing odours, complaints and security maintenance.
- Maintaining all assets and signage.
- Ensuring safety of all people located within the boundary of the site.
- Ensuring appropriate personnel are skilled and trained to carry out required duties.
- Addressing any events that may impact on the system.
- Compliance monitoring and continual improvement of the system operations.

In managing the Aratula Treatment Lagoons and Wetland, the Operator shall:

- Operate at all times in accordance with all environmental or other laws and regulations in force at the date of this Agreement and comply with any changes in such laws and regulations and with any new laws and regulations.
- On becoming aware of any physical (i.e. water levels, water quality or other degradation) or operational (i.e. repairs, maintenance) changes occurring within the system that will affect the delivery of treated effluent from the Aratula STP, contact the duty operator and or Queensland Urban Utilities Supervisor at the Aratula STP and advise accordingly.
- Immediately refer any community or public relations issues to the QUU Community Engagement Officer.

Additionally, the initial Operator (i.e. Construction Contractor) will be required to adequately train the asset owner's operator (Trainee Operator) prior to handover of the project at the end of the contractual establishment period.

#### 1.8.2 Contact list

| Role                        | Name          | Phone        | Email  |
|-----------------------------|---------------|--------------|--|
| QUU Senior Operator         | Troy Smith    | 0429 067 554 |  |
| QUU Service Delivery Leader | Mike Oakey    | 0447 206 089 | <a href="mailto:michael.oakey@urbanutilities.com.au">michael.oakey@urbanutilities.com.au</a> |
| QUU Project Manager         | Will Campbell | 07 3403 3320 | <a href="mailto:Will.campbell@urbanutilities.com.au">Will.campbell@urbanutilities.com.au</a> |
| Wetland Specialist          | Rob McKenzie  | 07 3211 9997 | <a href="mailto:r.mckenzie@waterandcarbon.com.au">r.mckenzie@waterandcarbon.com.au</a>       |

### 1.9 Operator Qualifications and Training

The Contractor will adequately train the Operator prior to handover of the project at the end of the contractual maintenance period. In addition, any further handovers require the leaving Operator to adequately train the incoming Operator.

Prior to handover training of the Operator has been undertaken over the course of the establishment period. Operators have been provided with an understanding of the day to day operational tasks for the system. Operators have been given basic plant identification skills, information on operation of pipe manifolds and vertical riser outlets.

Prior to asset handover a workshop day will be provided to Operators who will be required to sign an attendance sheet indicating their participation in training. The training workshop will include a half day in a meeting room and half day on site and will cover the following:

- wetland plant and weed identification;
- understanding and managing plant health;
- appropriate weed management strategies;
- operation of pipe manifolds;
- wetland management flooding; and
- requirements for wetland drawdown.

Any Operator(s) appointed to the Treatment Wetland complex require the following skill set as a guide:

- Plant identification skills;
- Under the Agricultural Chemicals Distribution Control Act 1996 (ACDC Act) any worker distributing herbicides or chemicals must be licensed and hold a ACDC chemical spraying certificate;
- Essential skills/knowledge specific to constructed wetlands

Specialists can provide further training of the operator when deemed required by the QUU supervisor.

Any persons working at the treatment wetland complex must receive a site induction, any person operating the wetland must also be familiar with this manual and record keeping requirements for the site. Any contractors working on the site must sign in and out to the site office and provide a safe work methods statement.

### **1.10 Safety**

The effluent supplied contains pathogens (disease-causing organisms). However, it is considered that the numbers of pathogens in water leaving the Aratula STP is low and the risk of infection is also low provided simple precautions are taken.

These precautions include:

- Ensuring a hygiene protocol is followed when authorised persons have contact with the effluent during work operations.

When work operations are undertaken in the Treatment Wetland and handling of treated effluent is likely to occur, it is required that the following hygiene protocol be followed:

- Latex gloves are to be worn during water quality sampling.
- Rubber gloves or gardening gloves to be worn during weed and plant maintenance.
- Open wounds are to be protected from physical contact with treated effluent.
- Hands must be washed after operation and maintenance work is completed for the day and prior to eating or drinking.
- Any persons who might have cause to work at the site will be advised of the above precautions.

#### **1.10.1 Operation and Maintenance Safety**

The Operator requires the following items during treatment wetland operation and maintenance:

- Waders or wet weather boots for working within the wetland.
- Boots and long pants for working around the wetland.
- Proper sun protection such as hat, long sleeves and pants, glasses and sun screen.
- A first aid kit and emergency numbers.
- Snake (compression) bandage.
- Mobile phone or other remote communication device.
- Closed in foot wear and or gum boots.
- Disinfectant hand wash.

## 2 Project Background

Lagoon treatment enhancement works have been undertaken at Aratula Sewage Treatment Plant (STP). The enhancement works include modifications to the existing ponds and installation of a Free Water Surface (FWS) treatment wetland in order to bring the STP into compliance with current (Development Approval (DA)) effluent quality release limits.

### 2.1 Design Flows

The treatment enhancement works have been designed for the predicted Average Dry Weather Flow (ADWF) of 45 kL/day. The enhancements will also provide for management and treatment of wet weather flows of up to 4 times ADWF. A Peak Wet Weather Flow (PWWF) of 180 kL/day (Table 1).

**Table 1: Average Dry Weather and Peak Wet Weather Flows for the Aratula STP.**

| ADWF (kL/day) | PWWF (kL/day) |
|---------------|---------------|
| 45            | 180           |

### 2.2 Effluent Quality

As the amended infrastructure will provide an integrated process for wastewater treatment at the Aratula STP it is essential that necessary standards are achieved by the different system components. The wastewater treatment wetland performance is influenced by the quality of water discharged from the lagoons.

Thus a minimum effluent quality for the lagoons is required in order for design performance, and licence compliance, for the treatment wetland component of the system to be achieved. The required maximum influent quality concentrations to the wetland from the second facultative lagoon (Pond 2) to the treatment wetland are provided in Table 2.

**Table 1. Maximum effluent discharge limits from the second facultative lagoon.**

| Parameter               | Parameter |
|-------------------------|-----------|
| Flow (kL/day)           | 45        |
| BOD <sub>5</sub> (mg/L) | 150 (max) |
| TSS (mg/L)              | 250 (max) |

Effluent quality from the treatment wetland has been designed to comply with the Aratula Development Approval release limits for BOD<sub>5</sub> and TSS values shown in Table 2. In addition, pH, Dissolved Oxygen and faecal coliforms licence requirements will be met by the enhanced treatment process at Aratula.

**Table 2: Aratula STP Development Approval Release Limits**

| Quality Characteristics                            | Release Limit  | Limit Type |
|--|--|------------|
| <b>5-day Biochemical Oxygen Demand (inhibited)</b> | 20 mg/L  | Maximum    |
| <b>Suspended Solids</b>                            | 30 mg/L  | Maximum    |
| <b>pH</b>  | 6.5 to 8.5   | Range      |
| <b>Dissolved Oxygen</b>                            | 2.0 mg/L   | Minimum    |
| <b>Faecal Coliforms</b>                            | 1000 organisms per 100 mL as a median value (minimum of 5 samples taken at not less than half-hourly intervals in any one day, with 4 out of the 5 samples containing less than 4000 organisms per 100 mL) |            |

In addition to the Approval release Limits the following table indicates the predicted long term averages for the treatment enhancement works. These averages account for variations in outlet concentrations under a range of flow conditions. Tables 4 and 5 provide predicted long term average outlet concentrations for current and future flows.

**Table 4:** Predicted outlet concentrations, treatment wetland for current flows (45kL/day)

| Current Flow: 45kL/day  |                  |            |            |            |
|---|------------------|------------|------------|------------|
| Parameter   | BOD <sub>5</sub> | TSS        | TN         | TP         |
| Concentration into wetlands (mg/L)<br>(Maximum)                                 | 110              | 234        | 40         | 8          |
| <b>Modelled concentration out of<br/>Aratula constructed wetland<br/>(mg/L)</b> | <b>5.0</b>       | <b>2.5</b> | <b>3.1</b> | <b>2.4</b> |

**Table 5:** Predicted outlet concentrations, treatment wetland for predicted ultimate flows (160kL/day)

| Predicted Ultimate Flow: 160kL/day  |                  |            |            |            |
|---|------------------|------------|------------|------------|
| Parameter   | BOD <sub>5</sub> | TSS        | TN         | TP         |
| Concentration into wetlands (mg/L)<br>(Maximum)                                 | 110              | 234        | 26         | 8          |
| <b>Modelled concentration out of<br/>Aratula constructed wetland<br/>(mg/L)</b> | <b>20</b>        | <b>5.8</b> | <b>5.6</b> | <b>4.8</b> |

### 3 Process Overview

Refer to the Pipe and Instrumentation Diagram (DRG 486/5/5-0160-014C) for the key components and layout of the amended treatment infrastructure.

Effluent flows from the new circular weir outlets from pond 2 to treatment wetland cells 1 and 2 via transfer lines to the pipe manifolds at the top of Cells 1 and 2. Effluent flows are then distributed across the top of the wetland Cells across the planted beds to the outlets of the wetland cells.

Following the wetland cell outlets effluent is collected in the bunded contact tank for chlorine dosing before discharge via the licensed sampling pit to the creek.

More detail on the system components is provided in the following sections.

#### 3.1 System Components

The STP enhancement works include the following components:

1. Pond 2 baffles
2. Pond 2 circular weir outlets
3. Sluice valves (gate)
4. Knife gate Valves
5. Transfer lines
6. Pipe manifolds
7. Treatment wetland cells 1 and 2
8. Wetland cell batters
9. Wetland cell berms
10. Wetland plants
11. Wetland outlets
12. Spillways
13. Sluice gate valves
14. Contact tank
15. Disinfection system
16. Licensed sampling point

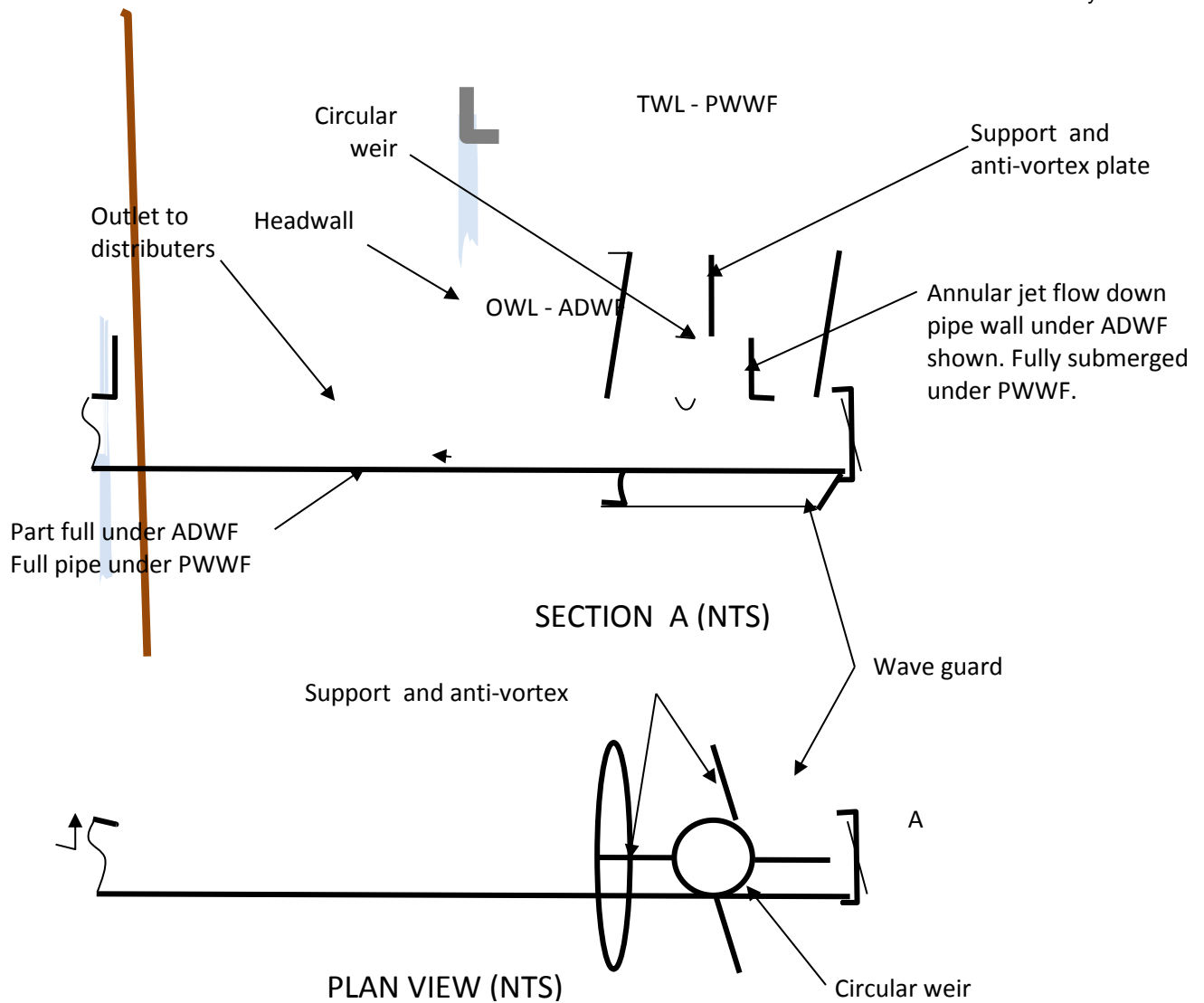
##### 3.1.1 Pond 2 Baffles

Remediation of pond 2 baffles was undertaken to improve function and performance of the ponds. The baffles function to increase the hydraulic retention time in the secondary lagoon. 100mm diameter baffle perforations have been installed in the baffles to maximise mixing and flow length in Lagoon 2. Lagoon baffles are installed in locations shown on DRG 486/5/5-0159-011E.

##### 3.1.2 Pond 2 Circular Weir Outlets

Circular weirs have been installed on the two outlet pipes between Lagoon 2 and wetland Cell 1 and 2 to provide accurate flow splitting. Circular weirs are shown on DRG 486/5/5-0159-011E. Figure 1 shows section and plan views of the circular weirs. Section A shows the operation of the weir at Operating Water Level (ADWF) and Top Water Level (PWWF).





### CIRCULAR WEIR HI-LO FLOW OUTLET

**Figure 1: Section and plan views for the circular weir outlets at Aratula STP**

The pond outlets to wetland cells 1 and 2 convey effluent and wet weather flows (from the Aratula STP Pond 2) into the wetland inlet distributors.

#### 3.1.3 Transfer Lines

A new transfer pipeline has been installed to gravity feed effluent from Lagoon 2 into each wetland cell. PN12.5 PE100 HDPE pipe work has been used for its physical strength performance under vehicle loads and other operational conditions.

Table 6 details the pipe internal diameters and locations.

**Table 6: Specified pipe type and size (refer to DRG for locations 486/5/5-0159-009E).**

| Pipe Specification    | Location (Refer DRG 486/5/5-0159-009E) | Description                     |
|-----------------------|--|---------------------------------|
| DN100 PN12 SER 2 UPVC | A1 - A2                                | Gravity Transfer Line To Cell 1 |
| DN110 PN12.5 PE100    | A2 - A6                                | Gravity Transfer Line To Cell 1 |
| DN75 PN16 PE100       | A6 - A7 & A6 - A8                      | Gravity Transfer Line To Cell 1 |
| DN75 PN16 PE100       | A7 - A9, A10, A8 - A11, A12            | Gravity Transfer Line To Cell 1 |
| DN65 PN12 SER 1 UPVC  | A13 - A14                              | Gravity Transfer Line To Cell 2 |
| DN90 PN12.5 PE100     | A14 - A18                              | Gravity Transfer Line To Cell 2 |
| DN75 PN16 PE100       | A18 - A19 & A20                        | Gravity Transfer Line To Cell 2 |

### 3.1.4 Sluice Valves (Gate)

Two sluice gates have been installed at the Aratula Treatment Wetlands, each sluice gate valve is located upstream of the inlet pipe manifolds (refer to DRG 486/5/5-0159-011C). Sluice gate valves allow the cells to be closed off for maintenance or cell drying.

**Table 7: Asset Tags for Sluice Gate Valves, Refer to DRG 486/5/014D for the location of Knife Gate Valves.**

| Asset Tag   |
|-------------|
| VV-0614-003 |
| VV-0614-004 |

### 3.1.5 Knife Gate Valves

Knife gate valves x 3 have been installed to clean out the transfer lines to each treatment wetland cell from Pond 2 as required. Two knife gate valves on the scour line have been installed for Cell 1 and one knife gate valve on the scour line for Cell 2 has been installed. Refer to DRG 486/5/014D for the location of Knife Gate Valves

**Table 8: Asset Tags for Knife Gate Valves, Refer to DRG 486/5/014D for the location of Knife Gate Valves.**

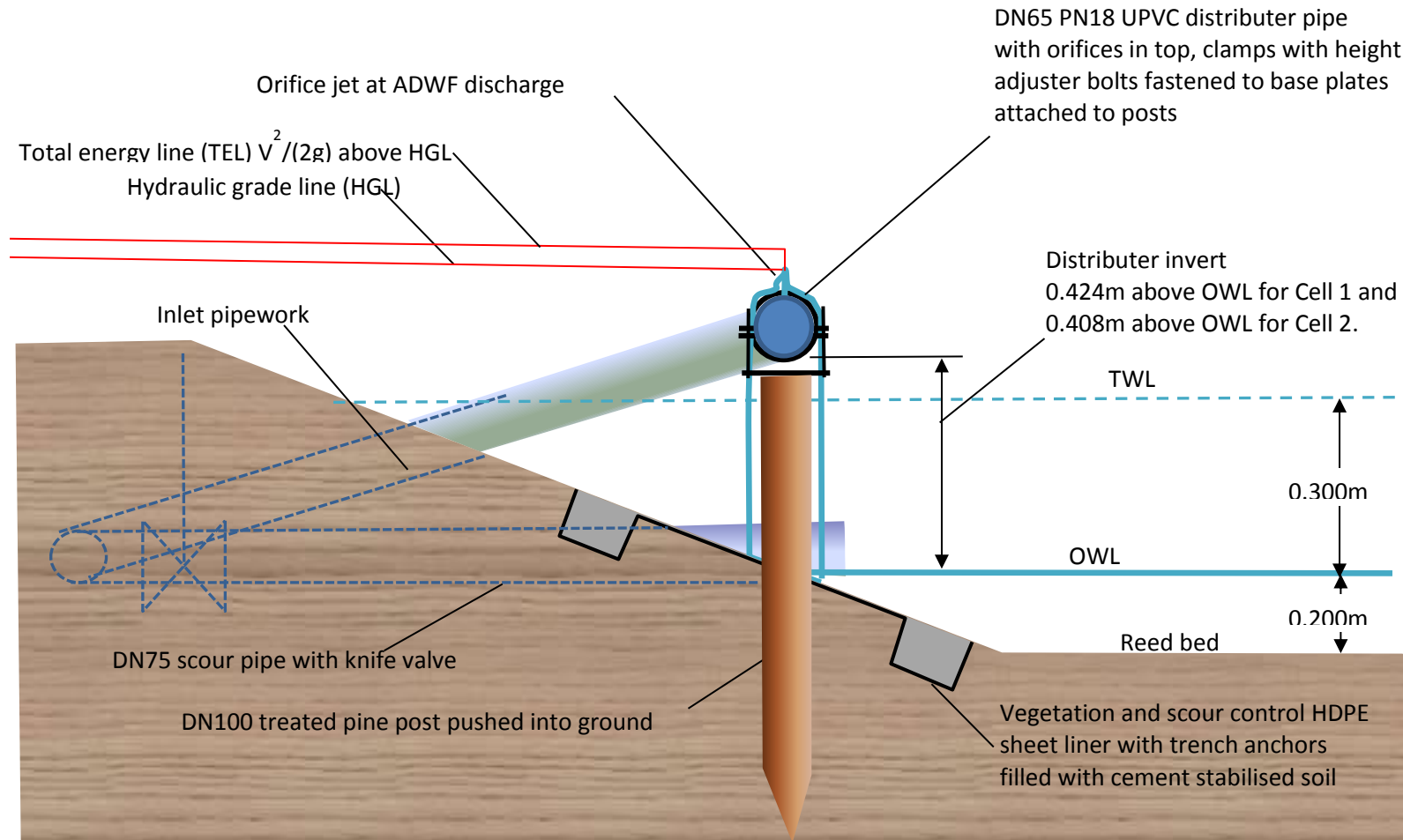
| Asset Tag   |
|-------------|
| VV-0164-002 |
| VV-0613-002 |
| VV-0613-003 |

### **3.1.6 Wetland Inlets - Pipe Manifolds**

Flows from the transfer pipeline are split between each wetland cell and discharge through perforated inlet distributors (Refer DRG 486/5/5-0159-017E). The arrangement of the inflow works have been designed to provide an even distribution across the inlets over the range of flows. The wetland inlets consist of 6 pipe manifolds that evenly distribute the pond outflow across the head of each wetland cell (Figures 2 and 3).



Inlet distributors are DN65 PN18 UPVC.



SECTION A-A (NTS)

Figure 3: Pipe Manifold section view Aratula STP.

Table 9 details the type, size and locations of inlet pipe manifolds

**Table 9: Specified pipe type and size (refer to DRG for locations 486/5/5-0159-009E).**

| Pipe Specification | Location (Refer DRG 486/5/5-0159-009E) | Description                 |
|--------------------|--|-----------------------------|
| DN65 PN18 UPVC     | A9, A10, A11, A12                      | Inlet Distributor Manifolds |
| DN65 PN18 UPVC     | A19 & A20                              | Inlet Distributor Manifolds |

To facilitate cleaning the distributors include scour pipes and removable end caps to allow high pressure jetting.

### 3.1.7 Treatment Wetland Cells 1 and 2

Treatment wetlands are typically shallow, man-made impoundments planted with emergent, rooted vegetation. A constructed treatment wetland is designed to regulate water depth and residence time, two important factors in treatment wetland performance.

The plants in constructed treatment wetlands are not harvested to remove nutrients. Rather, the microbial flora (bacteria and fungi) that attach to the plants have the natural assimilative capacity to remove biodegradable organics and nitrogen

As the wastewater flows through the treatment wetland, it is treated by the processes of sedimentation, filtration, oxidation, reduction, adsorption and precipitation. Higher treatment performance has been shown with full vegetation where greater abundance and diversity of microbes colonise the more abundant surface area.

The Aratula STP now includes 2 treatment wetland cells (DRG 486/5/5-0159-011 E). Table 10 details the key features of wetland Cells 1 and 2.

**Table 10: Area, Volumes and Water Levels for Cells 1 and 2, Aratula STP.**

|                            | Cell 1 | Cell 2 |
|----------------------------|--------|--------|
| Area (m2)                  | 2500   | 1600   |
| Average Volume (m3)        | 500    | 320    |
| Maximum volume (m3)        | 1250   | 800    |
| Operating Water Level (mm) | 200    | 200    |
| Top Water Level (mm)       | 500    | 500    |

### 3.1.8 Wetland Plants

Plants within the wetland cells include a number of aquatic macrophyte species known to grow well in the conditions present in the wetland cells (water depth, nutrients, operational regime). The location and species of plants within the treatment wetland are detailed in the Aratula Planting Plan. The selected planted species have been planted in a series of bands. After the establishment period the treatment wetland cell floors will be fully vegetated with no areas of open water visible.

Table 11 details the plants within the wetland cells and their minimum and average plant densities.

**Table 11: Plant species, minimum and average stem densities.**

| Species                          | Minimum (no. of plants/m <sup>2</sup> ) | Average (no. of plants/m <sup>2</sup> ) |
|----------------------------------|---|---|
| <i>Baumea rubiginosa</i>         | 500                                     | 1250                                    |
| <i>Baumea articulata</i>         | 500                                     | 1250                                    |
| <i>Bolboschoenus fluviatilis</i> | 350                                     | 800                                     |
| <i>Eleocharus sphacelata</i>     | 1000                                    | 2500                                    |
| <i>Schoenoplectus validus</i>    | 500                                     | 800                                     |

### 3.1.9 Wetland Berms

Berms are low profile earth embankments that function to hold water within the wetland cells (Refer to DRG 486/5/5-0159-015D). The top of berms is grassed for access around the wetland area. The berm batters have been planted with a number of sedge, trees and plants that are tolerant of the conditions present around the edge of the wetland.

### 3.1.10 Spillways

Spillways are structurally designed to convey storm flows that exceed the capacity of the wetland outlets. Scour protection is provided to minimise the risk of erosion during large storm events.

Spillways have been provided to convey Q100 flows to the receiving waterway via the discharge point in a controlled manor. Spillways are located Between Pond 2 and Cell 1, between Cell 1 and Cell 2 and Cell 2 and the receiving waterway at the DEHP sampling point (Refer to DRG 486/5/5-0159-015D).

The Emergency Spillways are 2.5m wide with 1:5 (trafficable) side slopes. The spillways have been designed to convey 400kL/hr at a depth of 100mm. In the event of a blockage of all outlet risers simultaneously a 3-5 day detention has been provided within the wetland cells.

### 3.1.11 Wetland Outlets

Flows through the wetland have been designed to pass slowly through the densely planted vegetation. Flows are controlled via screened effluent risers. Vertical risers function to both control water level within the wetland and convey flows to downstream chlorine contact tank. Vertical risers are PVC pipes with swivelling elbows, they are simple to operate with a handle or rod. Water levels can be controlled exactly and easily, and reducer caps installed to control flow rates out of the wetland. A plan and cross section of the wetland outlet configuration is provided in DRG 486/5/5-0159-016E.

### 3.1.12 Contact Tank

Flows from each wetland cell outlet are gravity drained via a chlorine mixing line into a 7.5kL submerged contact tank. The contact tank includes an internal 'T-piece' that directs chlorinated effluent to the bottom of the tank for enhance mixing.

### 3.1.13 Chlorine Dosing Arrangement and Dosing Unit

The existing chlorine dosing unit has been relocated adjacent to the submerged tank. The chlorine dosing unit injects chlorine into the chlorine contact tank at the inlet pipe.

Figure 4 shows detail of the area surrounding the chlorine Dosing Unit

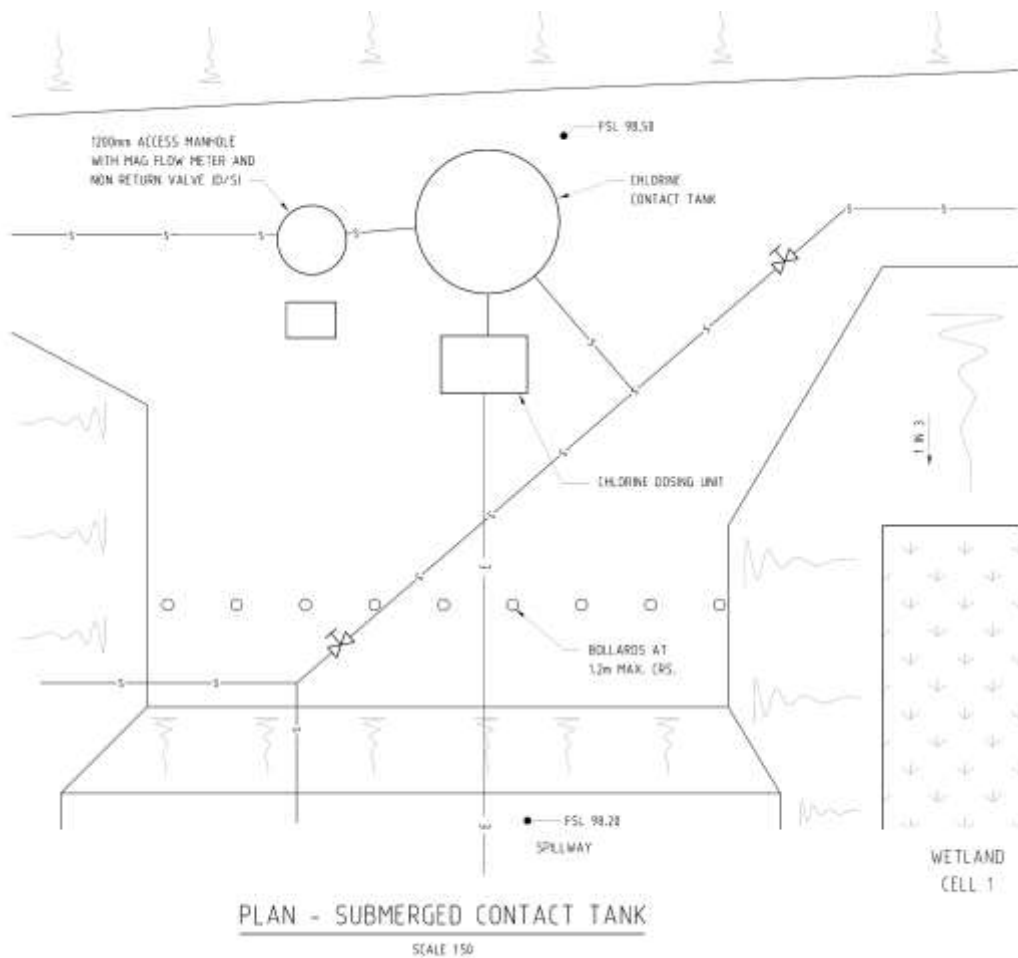


Figure 4: Detail of area around Chlorine contact tank, Aratula STP.

The Gamma L Dosing Unit settings for the chlorine dosing are below:

- The Gamma L is receiving an analogue input <4 – 20milliamps>from the Flow Meter Transmitter.
- The stroke length of the Gamma L is currently set at 42%, the range of dosage is-
  - If Input is at 4.6 milliamps doser pumps at 0.04 L/hr.
  - If Input is at 20 milliamps doser pumps at 0.72 L/hr.

Refer to Appendix B for the Dosing Unit Manuals.

### 3.1.14 Flow Metre

The Proline Promag 50W magnetic flow meter has been installed to provide a flow based chlorine dosing process at the Aratula STP. In the Proline Promag 50W, the flowing medium is the moving conductor. The voltage induced is proportional to the flow velocity and is supplied to the amplifier by means of two measuring electrodes. The flow volume is calculated by means of the pipe cross-sectional area. The DC magnetic field is created through a switched direct current of alternating polarity.



The measuring ranges for the treated effluent velocities between 0.01 to 10 m/s (0.03 to 33 ft/s).

### **3.2 System Documentation and Operation and Maintenance Manuals**

The following documents are provided in the appendices at the end of this manual:

- Appendix A: Flow Metre Manual
- Appendix B: Chlorine Dosing Unit Manual
- Appendix C: Electrical Certificate
- Appendix D: Civil Certificate
- Appendix E: Plumbing Certificate

## 4 Process Water Quality Management and Monitoring

Water Quality monitoring is necessary for the site to ensure that the nominated operational and maintenance procedures are effective.

### 4.1 Maintenance Objectives

- Maintain high quality water throughout the treatment wetland.
- Achieve necessary water quality standards for discharge.
- Appropriately respond to and investigate water quality if trigger values are exceeded.

### 4.2 Water Quality Standards and Monitoring

Long term water quality analysis and monitoring is used to:

- Monitor the quality being delivered to and from Pond 2
- Ensure water quality standards are met at the discharge point from the treatment wetland

**Table 30: Outflow water quality standards after wetland plant establishment.**

| BOD <sub>5</sub><br>(mg/L) | TSS<br>(mg/L) | NH <sub>4</sub> -N<br>(mg/L) | NO <sub>x</sub> -N<br>(mg/L) | TN<br>(mg/L) | TP<br>(mg/L) | Faecal coliforms<br>(cfu/100mL) |
|----------------------------|---------------|------------------------------|------------------------------|--------------|--------------|---------------------------------|
| 10                         | 10            | 0.5                          | 1                            | 2.15         | 0.8          | <100                            |

Process monitoring of the effluent at a number of internal locations is recommended to continually inform operational procedures.

#### 4.2.1 Internal Process Water Quality Monitoring Points

The Observation and Monitoring Plan (Appendix 4) indicates the monitoring points to be used for taking internal water quality samples. A total of 4 monitoring points are shown located at the pond 2 circular weir outlets the outlets of Cells 1 and 2. A composite sample (2 samples combined) should be taken at the outlets of cells 1 and 2. Internal process water quality samples are recommended when observation identifies water quality issues or DEHP license requirements are not met. The following parameters should be analysed at the recommended sampling points:

1. pH
2. Dissolved Oxygen
3. BOD<sub>5</sub>
4. Total Suspended Solids
5. E. Coli and Faecal Coliforms
6. Nutrients

## **5 System Components Operations and Maintenance**

The following is an outline of the guiding principles required to effectively operate and maintain the Aratula Treatment Wetland in respect of hydrology, vegetation and water quality.

Refer to the Pipe and Instrumentation Diagram (DRG 486/5/5-0160-014D) for the key components and layout of the amended treatment infrastructure. The Pipe and Instrumentation Diagram also shows the location of the system monitoring points.

The guiding principles to operate and maintain the Aratula wetland are provided below. Periodic review of this Manual should be undertaken to assess and update changes to wetland operations.

### **5.1 System and Wetland Management**

#### **5.1.1 Maintenance Objectives**

- Manage effluent flows to the wetland to sustain system function and treatment performance
- Maintain plant health and plant cover (full vegetation) within the wetland cells and surrounding berms
- Minimise and control weeds within the wetland cells and surrounding berms
- Manage wetland hydrology for plant growth and treatment performance.
- Provide for seasonal oxidation in the wetland sediments.

#### **5.1.2 Guiding Principles**

The operation and management of a wetland is undertaken in response to environmental conditions and effluent flows. Regular observation and assessment of the system allows for the necessary operation and maintenance tasks to be identified early and pre-emptive actions undertaken.

The main treatment wetland management tasks are setting the hydrological operation and maintaining dense and healthy plant cover in the treatment wetland. By effectively managing the hydrological conditions necessary to support healthy plant cover and continuous growth the wetland will deliver the treatment performance requirements. In addition, early identification and detection of any weed species and appropriate weed removal is required.

### **5.2 Pond 2 Baffles**

The Pond 2 baffles do not require Operational control they function passively based on the flow of effluent into the ponds and wind action across the surface of the pond.

Maintenance requirements for the baffles involve ensuring that baffle integrity is maintained. If observations indicate short circuiting then pond baffles will require realignment. A boat will be required to access the floating baffles for realignment.

### **5.3 Pond 2 Circular Weir Outlets**

The main operational and maintenance task associated with the Pond 2 circular weir outlets is checking for and removing any debris that may obstruct water movement into the wetland. This is carried out by removing the hat screen over the weir and cleaning the screen prior to placement back over the orifice. In addition, the circular weirs heights need to be checked to ensure permanent

invert levels have not changed and negatively effected the flow splitting of pond effluent between Wetland Cell 1 and 2. If this occurs a plumber will be required to reset the invert levels.

#### **5.4 Sluice Valves (Gate)**

Maintenance requirements on the sluice gate valves are to ensure they are in good working order. If problems are observed a plumber will be required to replace or fix the gate valves.

#### **5.5 Knife Gate Valves**

Maintenance requirements on the knife gate valves are to ensure they are in good working order. If problems are observed a plumber will be required to replace or fix the valves.

#### **5.6 Wetland Inlets - Pipe manifolds**

The main operational requirement for the inlets is to ensure all orifices are clean and functional. If orifices are blocked the end caps to the pipe manifold are removed and the blockage is cleaned.

The hydraulic design of the wetland inlets has been done to allow self-cleaning velocity in the pipeline to remove accumulated debris or biofilm accumulation.

This requires surcharging Pond 2 and opening the scour line using the knife gate valve adjacent to the manifold (Figure 3).

If adequate flow from Pond 2 exists then simply open the scour lines using the knife gate valve. If flows are low then undertake a pond surcharge for 24hrs to 48hrs by closing sluice gate valve and then undertake scour cleaning by opening the appropriate knife gate valve.

The procedure for cleaning of the inlet pipe manifolds is as follows:

1. Fortnightly- basic scouring
  - Remove the end caps at the end of the pipe manifolds until the water flow is clear and free from sludge.
  - Scrub the pipe manifolds with the brush provided on site to remove algae and biofilm accumulation.
  - Following scrubbing reinstall the caps to the end of the pipe manifolds and open the knife gate valve (VV-0614-002, VV-0613-002, VV-0613-003) on both sides of the pipe manifolds to allow basic scouring of the main pipe.
  - Close knife gate valves (VV-0614-002, VV-0613-002, VV-0613-003) after 10 minutes of scouring flow through the pipe manifolds.
2. Monthly - extended scouring
  - Remove the end caps at the end of the pipe manifolds until the water flow is clear and free from sludge.
  - Scrub the pipe manifolds with the brush provided on site to the remove algae and biofilm accumulation.
  - Following scrubbing close sluice gate valve of cell 1 and cell 2 (VV-0614-001, VV-0613-001) to surcharge pond 2.
  - Reopen sluice gate valves (VV-0613-003, VV-0614-003) and open scour lines using the knife gate valve adjacent to the manifold (Figure 3).
  - Close knife valves after 10 min of scouring or when biofilm has been removed and clear water is flowing from the pipeline.

## **5.7 Outlets - Vertical Risers (Adjustable)**

In normal operation the wetland outlet is set at the designated operational depth above the wetland floor (200mm) measured at the outlet headwall. However, the wetland requires water level adjustment for optimal health.

Vertical risers function to both control water level and convey flows out of the treatment system to the contact tank. The outlet locations in the wetland are:

- 5 vertical risers (adjustable) control the water level of Cell1 (3 vertical risers) and Cell 2 (2 vertical risers).

Vertical risers are operated using a hooked rod and rotated backwards or forwards to adjust water level. All vertical risers should be set at the same level.

## **5.8 Berms**

The main operational task for berm structures is to check for damage (erosion and cracking) and maintain healthy plant cover. Berms need to be assessed during inspections to ensure that any signs of damage such as erosion and cracking are identified and addressed. Berm tops require regular mowing. Weeds need to be identified and appropriate management undertaken for their removal and control on berm batters.

## **5.9 Spillways**

Spillways are structurally designed to convey storm flows that exceed the capacity of the wetland outlets. Scour protection is provided to minimise the risk of erosion during large storm events. The Operator is required to ensure erosion is identified and rectified as required.

## **5.10 Vegetation**

As the treatment wetland is a natural system it is likely that other plant species may colonise the treatment wetland system over time. It is also likely that the position and location of each species will change over time in response to environmental conditions within the wetland cells.

The maintenance of dense healthy plant cover and the control of introduced species is the most important part of managing the treatment wetland. Through appropriate hydrological control (detailed in the Section 5.9) the vegetation within the wetland cells can be managed for healthy growth and maintenance of treatment performance over the long term.

More detailed information on weeds identification and appropriate management strategies is provided in Appendix 6. Appendix 6 also provides detailed information on managing birds, and understanding and interpreting plant health.

Periodic advice and consultation with a wetland specialist is recommended for managing the wetland system over the long term, refer to Section 1.8.3 for contact details.

## 5.11 Flow metre

The operator will check and record flows on the flow meter. Calibration is to be undertaken by a specialist contractor.

## 5.12 Wetland Hydrological Operation

Wetland hydrological operation involves three distinct phases as follows:

1. Normal operating conditions – water level is set at 200mm in all wetland cells
2. Wetland drawdown – wetland cells are subject to controlled drying out
3. Wetland management flooding – water levels are increased

Water level changes and hydrological operations are undertaken in order to:

- Assess and repair engineered structures
- Stimulate plant growth
- Control weeds
- Deter target bird species
- Control mosquitoes
- Manage extended wet weather events

The following sections provide more information and detail on wetland hydrological operations.

### 5.12.1 Normal Conditions

The amount of water entering the system during normal conditions depends on direct rainfall, influent flow and evapotranspiration. This will vary seasonally throughout the year. During normal operation the Operator is required to set the wetland vertical risers (adjustable) at 200mm above the wetland floor. This applies to all wetland cells. To set the water level under Normal Conditions, stand on the Cell (1 or 2) Berm at the vertical riser (adjustable) outlet and adjust the lip of the vertical riser to 200mm on the RL gauge.

The treatment wetland tolerates natural fluctuations in water level. Thus water level in the treatment wetland cells increase or decrease (temporarily) in response to climatic conditions and flows from the STP. The Hydrological Record Sheet (Appendix 2) is to be used to monitor and report on water levels within the wetland.

It is necessary to ensure that effluent flows are maintained to the wetland cells. If there is insufficient water flowing to the wetland cells there is the risk of plant die back and loss of system performance and a breach of the discharge licence. Ensuring that regular inspection and cleaning of circular weir outlet and inlet pipe manifolds is undertaken will provide sufficient flows to the wetland cells and sustain wetland plants. The pipe infrastructure has been designed to provide adequate flow velocities for the range of influent flows received by the STP.

It is essential to ensure that adequate flow splitting occurs of effluent leaving the ponds and entering the wetland cells. By maintaining function and regular cleaning of the circular weir outlets and inlet pipe manifolds normal operation and hence treatment performance of the system.

Table 12 provides a summary of the observations, issues and causes for normal wetland operations.

**Table 12: Troubleshooting Normal Conditions in wetland cells 1 and 2**

| Observation   | Issue                                      | Cause   |
|---|--|---|
| No flow from one or more drilled holes in inlet                             | Blocked inlets                             | Build up of algae and debris in pipes                                       |
| Development of channels and visible flow paths                              | Short circuiting                           | Blockage of inlet manifolds   |
| Different water levels in Cells 1 and 2 and/or dry areas and plant die back | Maintaining adequate flow to wetland cells | Inadequate flow splitting between cells, insufficient influent flows to STP |

### 5.12.2 Wet Weather Flow Conditions

The treatment wetland has the capacity to retain and treat wet weather flows from high rainfall and wet weather flows received from the Aratula STP Ponds. The treatment wetland outlet orifices restrict wet weather flows and allow the wetland to fill up to 500mm depth before discharge over the spillways. The wetland fill function allows for the capture and treatment of high flows.

No adjustment of water level within the treatment wetland cells is required to accept and treat wet weather flows. However, high water levels in the wetland are not to exceed 30days. If extended wet weather is experienced for 30 days the wetland outlets are to be dropped to 0mm for wetland drawdown. Monitoring is used to ensure that levels within the wetland cells are not above the 200mm operating water level for extended periods as this negatively impacts on plant health.

### 5.12.3 Wetland Drawdown (Cells 1, and 2)

Wetland drawdown is the process of drying the wetland cells to oxidise the root zone and invigorate plant growth. Free flowing water will be absent and water levels will drop quickly to below the soil surface following lowering of vertical risers (detailed below). During wetland drawdown no surface water is present in the wetland cells.

A drawdown period of 2 weeks is required for each cell twice a year. A two week period is sufficient to dry out the cell and increase plant growth. Failure to undertake wetland drawdown can result in a reduction of system treatment performance and a breach in DEHP license conditions.

Caution is required not to dry out the wetland substrate for extended periods as long periods without water can impact on the wetland plants resulting in loss off of plants. Hence a maximum timeframe of 2 weeks is specified for wetland drawdown.

Rainfall can increase the time that it takes to dry out the wetland cell. If rainfall occurs during a drawdown the drawdown period should be increased (by a maximum of 3-4 days).

The Drawdown of the wetland should be carried out on Cells 1 and 2 at different times in order to allow the passage of water, and hence license compliance, through the wetland to be maintained

Draw down should be undertaken in Spring and Autumn as during these times plant growth and weather conditions are optimal. It is advisable to undertake drawdown when weather conditions are

relatively dry and no significant wet weather events forecast as this allows for better management of effluent flows through the system when one cell is offline.

As the Aratula system currently experiences low influent flows periodically the requirement for a managed drawdown is reduced. This is due to the fact that the system currently experiences dry periods due to low influent flows. However, as influent flow increase the requirement for drawdown will increase.

The weekly recording and observation of water levels in the wetland cell will provide the Operator with an understanding of the requirement for a managed drawdown. If the system has experienced periods without surface water present then a managed drawdown is not required.

However there are a number of situations that indicate a wetland drawdown is required, these include:

- Reduced wetland plant densities;
- Plant die back not associated with senescence;
- Aquatic floating weeds present in the wetland cells;
- Mosquito problems;
- Algae accumulation at top of wetland;
- Assessment and repair of engineered structures.

To undertake Drawdown the vertical riser outlets are lowered to the floor of the headwall (invert) and water drains out of the wetland and the level of water in the system is lowered. In addition, Wetland drawdown can be used to for problem mosquito infestations, for wetland maintenance or weed management.

The following table provides a list of triggers, causes and actions for wetland drawdown.



**Table 13: Triggers, causes and associated actions for wetland drawdown.**

| Trigger  | Cause                            | Action   |
|--|----------------------------------|--|
| Plant density reduced (refer to Table 9 for minimum plant densities), areas of water surface visible | Absence of wetland drying phase  | Implement wetland drawdown   |
| Plant die back not associated with seasonal senescence   | Lack of plant root oxidation     | Implement wetland drawdown   |
| Aquatic floating weeds present in wetland cell   | Seed dispersal by wind and birds | Implement wetland drawdown and undertake appropriate weed control in wetland cells (refer to Appendix 6) |
| Mosquito infestation   | Areas of stagnant water          | Implement wetland drawdown   |
| Vertical riser outlet or other engineered structure failure/breakdown                                | Old age, blockage                | Implement wetland drawdown and repair structure  |

Observation of wetland cells is critical during drawdown. Both cells are being subjected to changes and as such require monitoring. In the dry cell it is essential to ensure that the cell is not too dry for too long as it can effect plant growth and increase the risks of weeds in the wetland cells.

The drawdown sub soil should have some moisture in it and this can be assessed by simply observing wet soil or digging down below the soil surface and feeling if the substrate contains some moisture (rub soil between thumb and fingers). Plants should also be observed for browning off and wilting. If browning or wilting occurs it is essential that effluent is returned to the cell and the drawdown period ended.

The cell that is receiving increased flows can tolerate both increased flow rates and increased water levels for the period of drawdown (2 weeks). If however, a wetland cell experiences increased flows and increased water levels for extended periods it is possible that plant health and, hence treatment performance, could be impacted. If water levels are too high for too long a reduction in plant density is likely to be observed.

#### **5.12.4 Wetland Terrestrial Weed Management Flooding**

Water levels within the wetland cells can be raised and wetland management flooding undertaken periodically. Wetland management flooding is undertaken in response to the presence of terrestrial weed species within the wetland cells (Appendix 6). Following identification of a terrestrial weed within the wetland cell and determining that management flooding is an appropriate control strategy wetland flooding can be undertaken.

Wetland management flooding involves raising water levels above the normal operating water levels. Wetland flooding does not require alteration to inflow; simply raise the vertical riser to 500mm depth. Once vertical riser levels are increased the water levels within the wetland cell will gradually rise to the new water level. The maximum water level depth for wetland management flooding is 500mm. Wetland management flooding should be applied to a single cell. Care should be taken to

ensure normal wetland operation and hence treatment performance can still be sustained through the wetland complex.

By only undertaking management flooding for short periods (less than 20 days) and one cell only normal wetland operation and treatment performance can be sustained. If wetland flooding occurs over long periods (more than 30days) plants may impacted and reduce in cover (refer to Table 9). This will then reduce treatment performance of the system.

It is essential that wetland flooding be only undertaken for short periods. Observing the weed present and its response to increased water levels may allow for reducing the duration of weed management flooding. If the targeted weed species browns and dies back water levels should be returned to the normal operational setting (200mm). Increased water levels must not persist in the wetland cell(s) for durations greater than 30 days.

### **5.13 Wetland Observation and Inspection Points**

The Operation and Monitoring Plan indicates the key areas for monitoring the health of the wetland. These inspection points are to be monitored weekly and the Operator is to use the checklist provided in Appendix 1 as a guide to assessing the health of the wetland.

During inspections the Operator is to assess the following:

1. Structural damage to engineered structures.
2. Erosion and/or cracks visible on berms.
3. Blockages to inlets and outlets.
4. Vegetation health, loss of vegetation and presence of weeds.
5. Water quality.
6. Presence of debris or rubbish.
7. Water levels and flow through the wetland.
8. Mosquito abundance.
9. Damage to access tracks and gravel roads.
10. Presence of pest fauna.
11. Identify safety issues.

The inspection points are as follows:

1. Pond outlets and wetland inlets into Cells 1 and 2
2. Vertical Risers (Cell 1 and 2)
3. Spillways
4. Sampling point and discharge to creek
5. Walkways and access tracks.

### **5.14 Photographic Points**

The Observation and Monitoring Plan has a series of photographic points to be used for the long term observation of the wetland. Wetland Operators are to take photos using the same view every month. These photographs will indicate areas of growth, dieback and the overall wetland development. Digital photos should read (detail) the date on the image and location on the digital file name.

### 5.15 Maintenance Schedule

The Operator is responsible for undertaking the inspection schedule set out in the checklist (Appendix 1). The checklist provided in Appendix 1 is to be used during inspections and records kept. The Maintenance Schedule (Appendix 5) has also been included to assist in the scheduling and follow up of maintenance tasks.

The following table outlines the weekly, monthly, and annual operation and maintenance tasks for the Aratula treatment wetland.

| Component     | Task   | Frequency  |
|---------------|--|--|
| Vegetation    | Check for presence of weeds or unidentified plants and action as required. (Refer to Appendix 6)                           | Weekly   |
|               | Assess plant coverage in Cells 1 and 2 (100% cover required, Refer to Table 9)   | Weekly   |
|               | Assess vegetation health – check colour of leaves, wilting, dieback (plants must be healthy and free from disease)         | Weekly   |
|               | Check for and assess water bird damage. Action as required.  | Monthly  |
|               | Monitor and record (at photo points) plant coverage in Cells 1 and 2.  | Monthly  |
| Water Quality | Assess water colour and odour at outlets (water should be clear and free from odour).                                      | Weekly   |
|               | Take water quality samples at monitoring points, send for analysis and record (Appendix 3 - Water Quality Recording Sheet) | Weekly   |
|               | Check for areas of stagnant water  | Monthly  |
|               | Check for the presence of any scum or green coloured water   | Monthly  |
|               | Check for and record abundance of mosquitoes (Refer to Appendix 7 and 8)   | Monthly  |
| Berms         | Check for presence of weeds or unidentified plants and action as required. (Refer to Appendix 6)                           | Weekly   |
|               | Assess plant coverage on Cells 1 and 2 (100% cover required)   | Weekly   |
|               | Assess vegetation health – check colour of leaves, wilting, dieback (plants must be healthy and free from disease)         | Weekly   |
|               | Observe and record the condition of turf and action mowing maintenance as required   | Fortnightly in Spring/Summer, monthly in Autumn/Winter |
|               | Check for erosion and cracking and repair if required.   | Monthly and following storms                           |
| Outlets       | Check and remove any obstructions to water flow (Nil blockage required)  | Weekly and following storms                            |
|               | Assess vegetation health at Cell 1 and 2 outlet area – check colour of leaves, wilting, dieback                            | Weekly   |
|               | Ensure vertical riser caps are flowing and free from obstruction   | Weekly   |
|               | Assess and check wetland outlets are in good working order   | Monthly  |

| Component     | Task   | Frequency                   |
|---------------|--|-----------------------------|
| Inlets        | Check for and remove any sediment accumulation   | Weekly and following storms |
|               | Check for and remove any rubbish, debris and obstructions to water flow                  | Weekly and following storms |
|               | Assess and check wetland inlets are in good working order                                | Monthly                     |
| Hydrology     | Record Cell 1 water level depth (Appendix 2 - Wetland Hydrology Record)                  | Weekly                      |
|               | Record Cell 2 water level depth (Appendix 2- Wetland Hydrology Record)                   | Weekly                      |
|               | Adjust water level depths to required level (200mm for Normal Conditions)                | Seasonally                  |
|               | Undertake and record wetland drawdown (Appendix 2 - Wetland Hydrology Record)            | Annually                    |
|               | Record and observe flow to wetland Cells   | Weekly                      |
| Public safety | Check and identify and repair any damage to access and tracks                            | Weekly and following storms |
|               | Check and identify and potential risks to safety   | Weekly                      |
| Pest fauna    | Check for the presence of any pest animal species such as cane toads, foxes and rabbits. | Monthly                     |
| Reporting     | Prepare and complete summary report for QUU management                                   | Quarterly                   |

## 6 Instrumentation

### Chlorine Dosing Unit

|                |   |
|----------------|---|
| Model:         | Solenoid diaphragm dosing pump Gamma/ I   |
| Make:          | Prominent Fluid   |
| Type:          | GALA1008NPB2OOUC013000  |
| Serial Number: | 3710139687A59860  |
| Power Supply:  | 240V AC 50Hz  |
| AMP PEAK:      | 22W 0.5 A   |
| Dosing Rate    | 6.8 L/h 10 bar  |
| Service:       | ProMinent Fluid Controls Pty Ltd (Q'ld)<br>Ph.: (07) 3213 1900 fax.: (07) 3272 0445 |

### Flow Meter

|                  |   |
|------------------|---|
| Model:           | Proline Promag 50W (DN80) with Remote Transmitter   |
| Make:            | Endress & Hauser  |
| Service Contact: | Endress + Hauser Australia<br>Office 2, 35 Miles Platting Road,<br>Brisbane Technology Park, Eight Mile Plains   Brisbane 4113,<br>Queensland<br>Phone: +61 1800 363 737, Fax: +61 (07) 3457 0299<br><a href="http://www.au.endress.com">www.au.endress.com</a> |

## 7 Operations & Maintenance Tools

This section provides a description and use of the Operations & Maintenance Tools:

- Inspection Checklist (Appendix 1)
- Wetland Hydrology Record (Appendix 2)
- Water Quality Recording Sheet (Appendix 3)
- Observation and Monitoring Plan (Appendix 4)
- Maintenance Schedule Recording Sheet (Appendix 5)
- Mosquito Larvae Record Sheet (Appendix 8)

Inspections are required; as a routine event, following large rainfall events and following a public complaint. When conducting an inspection, the Operator should carry copies of the Inspection Checklist and the Observation and Monitoring Plan. The Inspection Checklist lists the O&M issues at the irrigated forest and treatment wetland, a range of checklist items that need to be monitored and their required inspection frequencies. The Operator needs to take note of the type of inspection he or she is undertaking and, referring to the correct Required Inspection Frequency column, make observations of items in the checklist as necessary. Note that during a flood event or public complaint, the Operator must use his or her own judgment to decide what needs to be checked.

Once an item is identified as NOT OK, the Operator needs to provide a label (e.g. number, letter) on the Inspection Checklist under the correct checklist item (use other if observed problem is not on checklist). This label should then be used to identify the area of the problem on the Observation and Monitoring Plan where the Operator must make notes describing the observation, its extents and perceived cause or source. The Operator should also record any immediate action taken in response to the problem.

Following an inspection, the Operator should fill in the Inspection Checklist. Referring to the relevant section in the O&M Manual the Operator should devise a recommended action; this may include seeking advice from an external specialist. All recommended actions should be followed up on and completed.

Care must be taken to ensure that the Inspection Checklists, Observation and Monitoring Plan for each individual inspection are stored in the same place so that they can be easily located for future reference.

## Appendix 1 – Inspection Checklist

## INSPECTION CHECKLIST

| Component     | Task   | Frequency                    | Condition and comments<br>1- Satisfactory<br>2 - Action required<br>3 - Satisfactory after action | Action | Initial and date | Further response required |
|---------------|--|------------------------------|---|--------|------------------|---------------------------|
| Vegetation    | Check for presence of weeds or unidentified plants and action as required. (Refer to Appendix 6)                           | Weekly                       |   |        |                  |                           |
|               | Assess plant coverage in Cells 1 and 2 (100% cover required)   | Weekly                       |   |        |                  |                           |
|               | Assess vegetation health – check colour of leaves, wilting, dieback (plants must be healthy and free from disease)         | Weekly                       |   |        |                  |                           |
|               | Check for and assess water bird damage. Action as required.  | Monthly                      |   |        |                  |                           |
|               | Monitor and record (at photo points) plant coverage in Cells 1 and 2.  | Monthly                      |   |        |                  |                           |
| Water Quality | Assess water colour and odour at outlets (water should be clear and free from odour).                                      | Weekly                       |   |        |                  |                           |
|               | Take water quality samples at monitoring points, send for analysis and record (Appendix 3 - Water Quality Recording Sheet) | Weekly                       |   |        |                  |                           |
|               | Check for areas of stagnant water  | Monthly                      |   |        |                  |                           |
|               | Check for the presence of any scum or green coloured water   | Monthly                      |   |        |                  |                           |
|               | Check for and record abundance of mosquitoes (Refer to Appendix 7 and 8)   | Monthly                      |   |        |                  |                           |
| Berms         | Check for presence of weeds or unidentified plants and action as required. (Refer to Appendix 6)                           | Weekly                       |   |        |                  |                           |
|               | Assess plant coverage on Cells 1 and 2 (100% cover required)   | Weekly                       |   |        |                  |                           |
|               | Assess vegetation health – check colour of leaves, wilting, dieback (plants must be healthy and free from disease)         | Weekly                       |   |        |                  |                           |
|               | Check for erosion and cracking and repair if required.   | Monthly and following storms |   |        |                  |                           |



# INSPECTION CHECKLIST

Aratula Treatment Wetland  
Operation and Maintenance Manual – Version 3  
January 2015

| Component     | Task  | Frequency                   | Condition and comments<br>1- Satisfactory<br>2 - Action required<br>3 - Satisfactory after action | Action | Initial and date | Further response required |
|---------------|---|-----------------------------|---|--------|------------------|---------------------------|
| Outlets       | Check and remove any obstructions to water flow (Nil blockage required)                         | Weekly and following storms |   |        |                  |                           |
|               | Assess vegetation health at Cell 1 and 2 outlet area – check colour of leaves, wilting, dieback | Weekly                      |   |        |                  |                           |
|               | Ensure vertical riser caps are flowing and free from obstruction                                | Weekly                      |   |        |                  |                           |
|               | Assess and check wetland outlets are in good working order                                      | Monthly                     |   |        |                  |                           |
| Inlets        | Check for and remove any sediment accumulation  | Weekly and following storms |   |        |                  |                           |
|               | Check for and remove any rubbish, debris and obstructions to water flow                         | Weekly and following storms |   |        |                  |                           |
|               | Assess and check wetland inlets are in good working order                                       | Monthly                     |   |        |                  |                           |
| Hydrology     | Record Cell 1 water level depth (Appendix 2 - Wetland Hydrology Record)                         | Weekly                      |   |        |                  |                           |
|               | Record Cell 2 water level depth (Appendix 2- Wetland Hydrology Record)                          | Weekly                      |   |        |                  |                           |
|               | Adjust water level depths to required level (200mm for Normal Conditions)                       | Seasonally                  |   |        |                  |                           |
|               | Undertake and record wetland drawdown (Appendix 2 - Wetland Hydrology Record)                   | Annually                    |   |        |                  |                           |
|               | Record and observe flow to wetland Cells  | Weekly                      |   |        |                  |                           |
| Public safety | Check and identify and repair any damage to access and tracks                                   | Weekly and following storms |   |        |                  |                           |
|               | Check and identify and potential risks to safety  | Weekly                      |   |        |                  |                           |
| Pest fauna    | Check for the presence of any pest animal species such as cane toads, foxes and rabbits.        | Monthly                     |   |        |                  |                           |

## Appendix 2 - Wetland Hydrology Record

## WETLAND HYDROLOGY RECORD

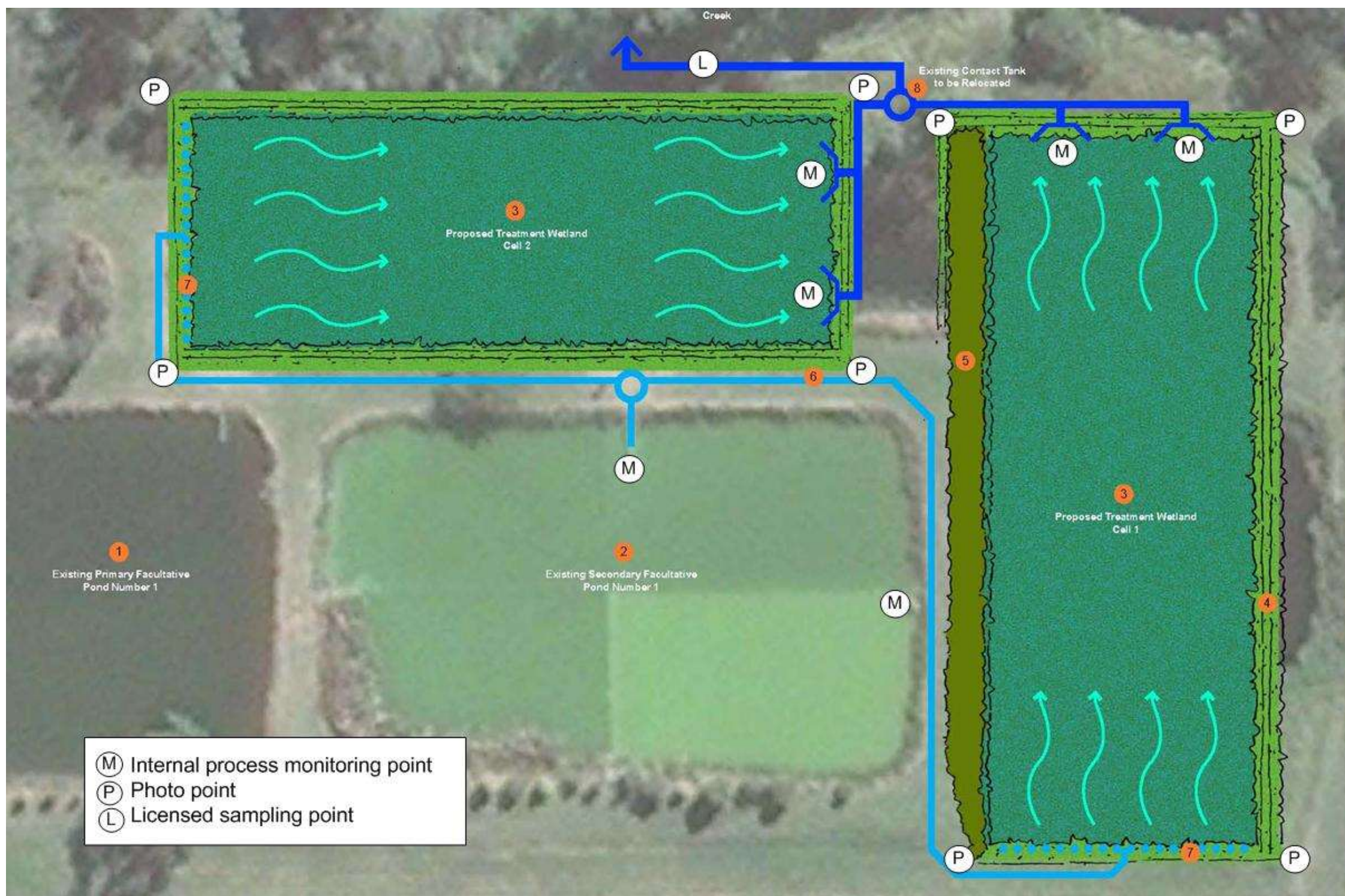
[illegible]

## **Appendix 3 – Water Quality Recording Sheet**

Queensland Urban Utilities to provide and insert here

## **Appendix 4 – Observation and Monitoring Plan**





| Observation Reference No. | Observation: description, extent, perceived cause / source | Immediate action taken |
|---------------------------|--|------------------------|
|                           |  |                        |

## **Appendix 5 – Maintenance Schedule**



Maintenance Schedule Date:

Prepared by:

[illegible]

## Appendix 6 – Wetland Vegetation Guide

### Wetland Cells and Berms - Maintenance Objectives

- Weed control in all areas.
- Minimise and monitor damage to vegetation from water birds.
- Healthy plant populations maintained over the long term.

### Background

After a period of plant establishment (initial 24 months) Cells 1 & 2 will be fully vegetated with a number of selected macrophyte species. Note that other native plant species may colonise Cells 1 & 2 and this natural process should not be prevented, unless they are identified weeds. The selected species have been planted in defined blocks but the planted patterns will change over time in response to the particular soil, climate and water characteristics of the site.

A number of guides to wetland plants are available. Refer to firstly *Wetland Plants of Queensland – A Field Guide* (Stephens and Dowling, 2002) and *Waterplants in Australia: A Field Guide* (Sainty and Jacobs, 2003) for photos of the more common wetland plants to be found on the site.

A list of common weeds is also provided in *Wetland Plants of Queensland – A field guide*. Identification of unknown plant species is required before undertaking any control program. Some grasses and many native sedges such as *Juncus* spp. can colonise the wetland providing ecological and treatment benefits.

The Weed Pocket Guide (1997), Department of Natural Resources, Queensland and Field Guide to the Weeds in Australia (3<sup>rd</sup> Edition) (C. Lamp and F. Collet, 2002 reprint) are not as up to date but are still useful resources.

Online resources can also provide useful information on identifying weeds. The following websites are also suggested reference tools:

[www.weeds.org](http://www.weeds.org) (Weeds Australia)

[www.weeds.gov.au](http://www.weeds.gov.au) (Weeds of national significance)

[www.saveourwatwaysnow.com.au](http://www.saveourwatwaysnow.com.au) (Community organisation list and photographs Weeds to whack)

[www.DEHP.qld.gov.au](http://www.DEHP.qld.gov.au) (Weed spotters Queensland network)

### Weed Control

Weeds are non-native plants that compete with native plants for dominance. Weeds reduce the level of biodiversity and may affect the performance of the wetland in meeting water quality requirements.

Early intervention of weed colonisation is the preferred approach to maintaining a healthy wetland system. Operators should be trained to recognise the most common weeds in the area in order to maintain effective weed control.

Three main options are available for weed control are:

1. Manually removing weeds before abundant growth.
2. Hydrological control - Raising (terrestrial weeds) or reducing (aquatic weeds) the water level to manage weeds.
3. Chemical control

The most suitable control method will depend on the extent of the identified weed problem, the growing season and the life form of the species.

Under healthy wetland conditions when selected plant species are established the risk of weeds colonising the wetland cells or outlet channel is significantly reduced. Refer to *Appendix 1.6 – Vegetation Guide* for photos, descriptions and control techniques for the more likely weeds to be found on the site.

### Wetland Planting - Water Bird Damage

Some waterbirds, particularly the purple swamphen (*Porphyrio porphyrio*) (Plate 1) and dusky moorhen (*Gallinula tenebrosa*) (Plate 2), are known to cause damage to seedlings and plants. Notably the risk to wetland plants is highest during the establishment phase. (Refer to establishment manual)



**Plate 1: Purple Swamphen (*Porphyrio porphyrio*)**



**Plate 2: Dusky Moorhen (*Gallinula tenebrosa*)**

If waterbirds significantly damage an area of plantings, firstly transplant clumps of well established plants from healthy sections of the wetland if possible. Otherwise replant with larger plants sourced from a nursery. Visitors to the area should be discouraged from feeding waterbirds.

### Senescence

There is a risk of confusing plants in senescence (hibernation) with those that are dead or unhealthy. Senescence can occur over the winter months, but sometimes not at all. Although plants in senescence may appear dead or lose their foliage, closer inspection will show either green shoots at the base of the plant and/or a firmly anchored root system. The Operator is required to know or be trained in the difference between senescence and dead or unhealthy plants.

"Senescence" is the natural (ageing) or climatic condition of plants in which leaves and stems may turn brown and/or wilt. It will usually occur in patches, is often associated with very cold or very hot weather and re-growth will usually begin in a short time. The process is a natural and desirable part of ongoing wetland renewal. Senescence should be reported as a threat only if it occurs over large areas of the wetland at one time.





**Plate 3 Senescent Bolboschoenus (brownish)**



**Plate 4 Healthy Phragmites (middle-ground)**





**Plate 5 Healthy Bolboschoenus (foreground)**

### **Dieback**

Dieback can be defined as an unusual decline in health of a significant area or number of plants. Experience will assist in distinguishing dieback from senescence and in practice is not difficult. There have been no known cases of large-scale disease or dieback in Australian wetland except where water levels and/or water quality have occurred outside the plants' known range of tolerance. Dieback might occur where drying periods are far too long, or water levels are too high for too long, or in the case of an unknown disease or pest. Expert advice should be sought if large-area dieback is suspected.

## Common Weeds

### **Baccharis halimifolia (Groundsel)**

Groundsel is a small densely branched shrub 2.5m high (up to 6m), a native of North America, it was first introduced as an ornamental. It is now found in swamps and is tolerant of a range of soil types and also frost.

Leaves are waxy and pale green, toothed and alternate (2.5-5cm long and 1-2.5cm wide). Flowers are small (5mm ) cream or white and clustered in a hairy panicle.

Groundsel grows rapidly and reproduces by seed (dispersed by wind and birds) germinating when soil moisture is high.

### **Management strategies**

Pull up, or dig out. Remove all pieces; bag and destroy.

Care should be taken to remove roots as it can reshoot.

Once established mechanical removal can be difficult due to strong roots.

Herbicides (cut stump, scrape and paint, spot spray) are effective but often require follow up.



**Figure 1.6.1: Groundsel**

### **Echinochloa crus-galli (Barnyard grass)**

Barnyard grass is naturalised throughout much of Australia and its origin is uncertain. It is found in pastures, waterways, wetland and damp habitats.

It grows to 1m tall and is characterized by its erect panicle (to 20cm long). It flowers in summer and spreads via seed dispersed on wind, water and birds.

#### **Management strategies**

Pull up, or dig out. Remove all pieces; bag and destroy.

If treating barnyard grass with herbicide in an aquatic situation, be sure to only use products registered for that particular use. Glyphosate can be effective (spot spray).



**Figure 1.6.2: Barnyard grass**



### **Hymenachne amplexicaulis (Olive hymenachne)**

Olive hymenachne is an emergent semi-aquatic grass 1-2.5m tall. It was introduced as a pasture species for wet areas and is now found on stream banks and wetland areas. Olive hymenachne is declared as a Class 2 species under the *Land Protection (Pest and Stock Route Management) Act 2002*. It is also classified as a weed of National Significance.

Olive hymenachne grows from seed spread by water and birds. It can also grow from stem fragments.

The leaves are up to 50cm long and 3cm wide with a characteristic clasp around the stem at the base of the leaf. Flowers are a cylindrical spike (sometimes branching) 20-40cm long, flowering occurs from April to June.

### **Management strategies**

Pull up, or dig out. Remove all pieces; bag and destroy.

It is essential to remove all material due to its ability to shoot from roots or stem material.

If treating olive hymenachne with herbicide in an aquatic situation, be sure to only use products registered for that particular use. Glyphosate can be effective (spot spray).



**Figure 1.6.3: Olive hymenachne**

### **Ludwigia peruviana (Peruvian primrose)**

This semi-terrestrial shrub (to 4m) is native to South America and grows in partially submerged environments. It can be found on the edges of streams and wetland systems. It produces a large number of seeds, easily transported by birds, and can also spread by fragments. The species is a declared Class 1 species under the Land Protection (Pest and Stock Route Management) Act 2002, thus its removal if detected is essential.

Peruvian primrose has alternate dark green leaves 4-12cm long and 1-3cm wide with a 4-5 petal flower. The lower surfaces of the leaves are hairy.

It can be confused with the similar native species *Ludwigia peploides* ssp. *montividenensis* but is distinguished by its shrub habit. *Ludwigia peploides* ssp. *montividenensis* has smaller shiny leaves and is generally creeping or floating rather than an upright shrub.

### **Management strategies**

Pull up, or dig out. Remove all pieces; bag and destroy.

It is important to ensure that roots are also removed as it can reshoot from remaining root material; If treating Peruvian primrose with herbicide in an aquatic situation, be sure to only use products registered for that particular use. Glyphosate can be effective (spot spray or scrape and paint) during the main growth season (prior to autumn).



**Figure 1.6.4: Peruvian primrose**

### **Myriophyllum aquaticum (Parrot's feather)**

*Myriophyllum aquaticum* or Parrot's feather is a submerged to emergent plant found in floating and on edges of streams and wetland and is often associated with nutrient enriched water. It is spread by leaf fragments as seed is not produced by this plant within Australia (male and female flowers are produced by separate plants). This species is a declared Class 1 species under the *Land Protection (Pest and Stock Route Management) Act 2002*.

Parrot's feather has characteristic small blue-green feathery leaves arranged in whorls. The leaf blade is toothed, generally 2.5-3.5cm long and 0.5-0.8cm wide.

### **Management strategies**

Pull up, or dig out. Remove all pieces; bag and destroy.

Water level control, both raising to drown out, and drying can be effective means of control. Glyphosate can be effective (spot spray)



**Figure 1.6.5: Parrot's feather**

### **Panicum repens (Torpedo grass)**

Torpedo grass is naturalised throughout much of the world and its origin is uncertain. It is found in wet pastures, waterways, wetland and damp habitats. It is of particular concern due to its rapid rate of spread and once established it is difficult to control. It is also tolerant of both wet and dry conditions.

It is a rhizomatous perennial that grows to 1.2m. It flowers in summer and the seed head (26cm long) is a number of spikelets. It is spread by seed and underground rhizomes

### **Management strategies**

Pull up, or dig out. Remove all pieces; bag and destroy.

Water level control, raising to drown out, could be used for control but this has not currently been trialed.

Chemical control can be attempted (spot spray) but should be done in the peak growing season (spring summer) and follow up is essential.



**Figure 1.6.6: Torpedo grass**

***Persicaria lapathifolia* (Pale smartweed)**

Erect or ascending annual or biennial herb growing to 0.8–1.8 m high. Flowers are white to pink and blossom in August to May. Pale smartweed colonises sandy mud, black mud, and coarse clay loam. Usually found in damp situations, floodplains, margins of pools, creeks & rivers.

**Management strategies**

Pull up, or dig out if smartweed becomes dominant species. Remove all selected pieces; bag and destroy;

Frost can be possibly be used if water levels are low but yet to be trialled;

If treating pale smartweed with herbicide in an aquatic situation, be sure to only use products registered for that particular use. Glyphosate can be effective at higher strength particularly with surfactant.



**Figure 1.6.7: Pale Smartweed**



### **Tradescantia fluminensis ("Trad" or "Wandering Jew")**

A fast growing fleshy and herbaceous South American ground creeper. This weed favours damp and shady areas particularly on the edge of nutrient-enriched waters. The weed can climb on wetland plants if plant populations are not dense. Healthy aquatic plants are resistant, but every instance of *Tradescantia* should be removed as soon as it is observed.

The stems are long and succulent, curving upwards at the tips. The leaves are shiny green, smooth and fleshy, sheathed where they join the stems. Small white flowers with 3 triangular petals in spring to summer. A similar native plant is *Commelina cyanea* (*Commelina diffusa*) which has blue flowers, not white.

### **Management strategies**

Pull up, or dig out. Remove all pieces; bag and destroy;

Frost can be used as an effective control measure if water levels are low (i.e. during wetland drawdown);

Increasing water levels to drown Trad;

If treating Trad with herbicide in an aquatic situation, be sure to only use products registered for that particular use. Glyphosate can be effective at higher strength particularly with surfactant.



**Figure 1.6.8: Trad**

**Sagittaria platyphyla (Sagittaria or arrowhead)**

Sagittaria is a native of the U.S.A and Central America and was introduced as an ornamental garden plant. It is an emergent up to 1.2m tall and is spread by seed, rhizomes and tubers. It is grows in often nutrient rich conditions and can form dense infestations in drains, shallow creek sand wetland.

It has a large blade-like 28cm leaf 28cm long and 10cm wide with a prominent central vein. It has a small 3 petal white flower; flowering spring to autumn.

**Management strategies**

Pull up, or dig out. Remove all pieces; bag and destroy;

If treating Sagittaria with herbicide in an aquatic situation, be sure to only use products registered for that particular use. Glyphosate can be effective.



**Figure 1.6.9: Sagittaria**

### **Setaria sphacelata (Setaria)**

Setaria was introduced as pasture plant. It is an aggressive perennial grass that is widely distributed in the local area and as tolerant of wet conditions is a threat to the Aratula treatment wetland area. It is an emergent 2-3m tall and is spread by seed. Leaves are bluish grey-green 7-25cm long and 3-10mm wide. It has a characteristic inflorescence in a dense panicle 7-50cm long (see image below). Seeds are dispersed by birds, wind and water.

### **Management strategies**

Pull up, or dig out. Remove all pieces particularly seed heads; bag and destroy;

If treating Sagittaria with herbicide in an aquatic situation, be sure to only use products registered for that particular use. Glyphosate can be effective for small infestations.



**Figure 1.6.10: Setaria**



### ***Urochloa mutica* or *Brachiaria mutica* (Para grass)**

This weed is a fast-growing perennial African grass up to about 2m tall. The stems are hollow and robust, creeping in a prostrate growth habit. The stems stand erect towards the ends and sprout new roots wherever the nodes touch the ground. Leaf blades are hairy and dark green in colour.

They are usually up to 15 cm long and less than 1 cm wide, tapering to a long, fine point. The leaf sheaths are also hairy, particularly where they join the stem. Flower heads are up to 18 cm long and are made up of several spikes, each about 5 cm long. Seeds cluster thickly along each of these spikes, although Para grass seldom sets seed in southern Queensland.

### **Management strategies**

Hand removal of Para grass whenever individual plants are observed;

Frost can be used if water levels are low;

Increasing water levels to drown Para grass, particularly if cut close to the ground first;

If treating Para grass with herbicide in an aquatic situation, be sure to only use products registered for that particular use. Not in waterways deeper than 60 cm.



**Figure 1.6.11: Para Grass**



**Figure 1.6.12: Para Grass (yellowing, foreground)**

## Appendix 7 – Mosquitoes

### Mosquito Control

Mosquito control if required can be managed with a drying phase targeted at the area of mosquito infestation. Mosquito infestations are not likely to be a problem once the wetland is well established. Dense plant growth, predatory macro invertebrates in the water column and lack of stagnant water inhibit the success of mosquito larvae. During the establishment phase, environmental conditions may exist for mosquito infestations.

During visual inspections the Operator will observe for adult mosquito populations throughout the site. If it is considered that mosquito populations are potentially high (based on observation of clusters of wrigglers at outlet headwalls) and are possibly a public nuisance then a generic DAFOR (Dominant, Abundant, Frequent, Occasional, Rare) scale sampling program will be triggered. In addition, if community complaints are received in regards to mosquito infestations a generic DAFOR scale sampling program applied to mosquitoes would also be triggered.

The DAFOR scale (Dominant, Abundant, Frequent, Occasional, Rare) is to be used once a mosquito infestation has been identified. The DAFOR scale would involve sampling mosquito larvae numbers at sampling points shown on the Wetland Plan. Three samples will be taken with a 200ml container at each sampling location and numbers of larvae in each sample recorded on the mosquito larvae record sheet provided in Appendix 4.

Table 5 shows the classification of the DAFOR scale to mean number of larvae at each sampling site.

**Table 4: DAFOR scale relating mosquito larvae numbers**

| DAFOR scale | Mean number of larvae at sample site |
|-------------|--------------------------------------|
| Dominant    | >100                                 |
| Abundant    | 75 - 100                             |
| Frequent    | 25 -75                               |
| Occasional  | 5 -25                                |
| Rare        | 1 - 5                                |

In the case of dominant, abundant, frequent numbers of mosquito larvae it is necessary to lower water levels.

Once the mosquito infestation has been located, a targeted lowering of water levels in the identified area is required. This following procedure is provided to lower water levels:

- Close Gate Valve
- Berm vertical riser outlets of the effected cells are to be set at the floor
- After a period of 5 days, revert back to normal conditions.

The Operator in consultation with the Project Manager may decide, following careful monitoring, that a mosquito assessment by a specialist should be undertaken if the health risk to the public warrants this approach.

The DAFOR scale is a visual evaluation of mosquito abundance for a particular site. The following list provides the categories of the scale:

- Dominant: Mean number of mosquito larvae is greater than 100;
- Abundant: Mean number of mosquito larvae is between 75 to 100;
- Frequent: Mean number of mosquito larvae is between 25 to 75;
- Occasional: Mean number of mosquito larvae is between 5 to 25;
- Rare: Mean number of mosquito larvae is between 1 to 5.



**Plate A2-1 Example of common characteristics of Mosquito larvae**

## Appendix 8 – Mosquito Larvae Record Sheet

The classification scheme for the mean number of larvae is shown in the following table.

| DAFOR scale | Mean number of larvae at sample site |
|-------------|--------------------------------------|
| Dominant    | >100                                 |
| Abundant    | 75 - 100                             |
| Frequent    | 25 -75                               |
| Occasional  | 5 -25                                |
| Rare        | 1 - 5                                |

Fill in the following records for each sampling site as marked.

### Sample Site 1

| Sample | Mosquito larvae numbers |
|--------|-------------------------|
| 1      |                         |
| 2      |                         |
| 3      |                         |
| Mean   |                         |

### Sample Site 2

| Sample | Mosquito larvae numbers |
|--------|-------------------------|
| 1      |                         |
| 2      |                         |
| 3      |                         |
| Mean   |                         |

### Sample Site 3

| Sample | Mosquito larvae numbers |
|--------|-------------------------|
| 1      |                         |
| 2      |                         |
| 3      |                         |
| Mean   |                         |

**Sample Site 4**

| Sample | Mosquito larvae numbers |
|--------|-------------------------|
| 1      |                         |
| 2      |                         |
| 3      |                         |
| Mean   |                         |

**Sample Site 5**

| Sample | Mosquito larvae numbers |
|--------|-------------------------|
| 1      |                         |
| 2      |                         |
| 3      |                         |
| Mean   |                         |

**Sample Site 6**

| Sample | Mosquito larvae numbers |
|--------|-------------------------|
| 1      |                         |
| 2      |                         |
| 3      |                         |
| Mean   |                         |

**Sample Site 7**

| Sample | Mosquito larvae numbers |
|--------|-------------------------|
| 1      |                         |
| 2      |                         |
| 3      |                         |
| Mean   |                         |

**Sample Site 8**

| Sample | Mosquito larvae numbers |
|--------|-------------------------|
| 1      |                         |
| 2      |                         |
| 3      |                         |
| Mean   |                         |

**Sample Site 9**

| Sample | Mosquito larvae numbers |
|--------|-------------------------|
| 1      |                         |
| 2      |                         |
| 3      |                         |
| Mean   |                         |

**Sample Site 10**

| Sample | Mosquito larvae numbers |
|--------|-------------------------|
| 1      |                         |
| 2      |                         |
| 3      |                         |
| Mean   |                         |

**Sample Site 11**

| Sample | Mosquito larvae numbers |
|--------|-------------------------|
| 1      |                         |
| 2      |                         |
| 3      |                         |
| Mean   |                         |

**Sample Site 12**

| Sample | Mosquito larvae numbers |
|--------|-------------------------|
|--------|-------------------------|

|      |  |
|------|--|
| 1    |  |
| 2    |  |
| 3    |  |
| Mean |  |

**Sample Site 13**

| Sample | Mosquito larvae numbers |
|--------|-------------------------|
| 1      |                         |
| 2      |                         |
| 3      |                         |
| Mean   |                         |

**Sample Site 14**

| Sample | Mosquito larvae numbers |
|--------|-------------------------|
| 1      |                         |
| 2      |                         |
| 3      |                         |
| Mean   |                         |

**Sample Site 15**

| Sample | Mosquito larvae numbers |
|--------|-------------------------|
| 1      |                         |
| 2      |                         |
| 3      |                         |
| Mean   |                         |

**Sample Site 16**

| Sample | Mosquito larvae numbers |
|--------|-------------------------|
| 1      |                         |

|      |  |
|------|--|
| 2    |  |
| 3    |  |
| Mean |  |

**Sample Site 17**

| Sample | Mosquito larvae numbers |
|--------|-------------------------|
| 1      |                         |
| 2      |                         |
| 3      |                         |
| Mean   |                         |

**Sample Site 18**

| Sample | Mosquito larvae numbers |
|--------|-------------------------|
| 1      |                         |
| 2      |                         |
| 3      |                         |
| Mean   |                         |

Once all samples are taken, calculate mean number of mosquito larvae in each sampling site. If any mean value triggers the following categories of dominant, abundant, frequent on the DAFOR scale then appropriate water level management is required as per Section 2.1 of the O&M Manual.



## Appendix A – Flow metre manual



Level



Pressure



Flow



Temperature

Liquid  
Analysis

Registration

Systems  
Components

Services



Solutions

## Technical Information

# Proline Promag 50W, 53W

## Electromagnetic Flow Measuring System

Flow measurement of liquids in water or wastewater applications



### Application

Electromagnetic flowmeter for bidirectional measurement of liquids with a minimum conductivity of  $\geq 5 \mu\text{S}/\text{cm}$ :

- Drinking water
- Wastewater
- Sewage sludge
- Flow measurement up to  $110\,000 \text{ m}^3/\text{h}$  ( $484\,315 \text{ gal}/\text{min}$ )
- Fluid temperature up to  $+80^\circ\text{C}$  ( $+176^\circ\text{F}$ )
- Process pressures up to 40 bar (580 psi)
- Lengths in accordance with DVGW/ISO

Application-specific lining of the measuring pipe from polyurethane or hard rubber with the following drinking water permissions:

- KTW
- WRAS
- NSF
- ACS

Approvals for hazardous area:

- ATEX
- IECEX
- FM

- CSA
- NEPSI

Connection to process control system:

- HART
- PROFIBUS DP/PA
- FOUNDATION Fieldbus
- MODBUS RS485

### Your benefits

Promag measuring devices offer you cost-effective flow measurement with a high degree of accuracy for a wide range of process conditions.

The uniform Proline transmitter concept comprises:

- Modular device and operating concept resulting in a higher degree of efficiency
- Software options for batching, electrode cleaning and for measuring pulsating flow
- High degree of reliability and measuring stability
- Uniform operating concept

The tried-and-tested Promag sensors offer:

- No pressure loss
- Not sensitive to vibrations
- Simple installation and commissioning

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## Function and system design

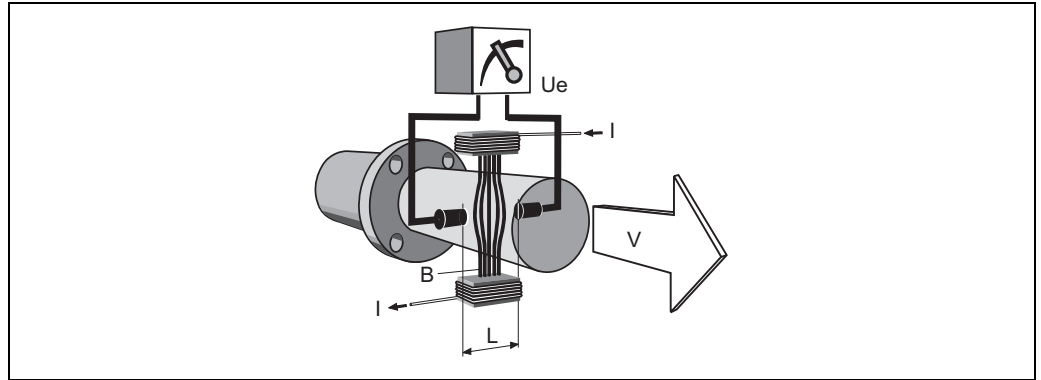
### Measuring principle

Following *Faraday's law of magnetic induction*, a voltage is induced in a conductor moving through a magnetic field.

In the electromagnetic measuring principle, the flowing medium is the moving conductor.

The voltage induced is proportional to the flow velocity and is supplied to the amplifier by means of two measuring electrodes. The flow volume is calculated by means of the pipe cross-sectional area.

The DC magnetic field is created through a switched direct current of alternating polarity.



$$U_e = B \cdot L \cdot v$$

$$Q = A \cdot v$$

$U_e$  Induced voltage

$B$  Magnetic induction (magnetic field)

$L$  Electrode spacing

$v$  Flow velocity

$Q$  Volume flow

$A$  Pipe cross-section

$I$  Current strength

A0003191

### Measuring system

The measuring system consists of a transmitter and a sensor.

Two versions are available:

- Compact version: Transmitter and sensor form a mechanical unit.
- Remote version: Sensor is mounted separate from the transmitter.

Transmitter:

- Promag 50 (user interface with push buttons for operation, two-line display, illuminated)
- Promag 53 ("Touch Control" without opening the housing, four-line display, unilluminated)

Sensor:

- Promag W (DN 25 to 2000 / 1 to 78")

## Input

|                            |  |
|----------------------------|--|
| <b>Measured variable</b>   | Flow velocity (proportional to induced voltage)  |
| <b>Measuring ranges</b>    | Measuring ranges for liquids<br>Typically $v = 0.01$ to $10$ m/s ( $0.03$ to $33$ ft/s) with the specified accuracy  |
| <b>Operable flow range</b> | Over $1000 : 1$  |
| <b>Input signal</b>        | <p><b>Status input (auxiliary input)</b></p> <ul style="list-style-type: none"> <li>■ <math>U = 3</math> to <math>30</math> V DC, <math>R_i = 5</math> k<math>\Omega</math>, galvanically isolated</li> <li>■ Configurable for: totalizer(s) reset, measured value suppression, error-message reset</li> </ul> <p><b>Status input (auxiliary input) with PROFIBUS DP and MODBUS RS485</b></p> <ul style="list-style-type: none"> <li>■ <math>U = 3</math> to <math>30</math> V DC, <math>R_i = 3</math> k<math>\Omega</math>, galvanically isolated</li> <li>■ Switching level: <math>3</math> to <math>30</math> V DC, independent of polarity</li> <li>■ Configurable for: totalizer(s) reset, measured value suppression, error-message reset, batching start/stop (optional), batch totalizer reset (optional)</li> </ul> <p><b>Current input (only Promag 53)</b></p> <ul style="list-style-type: none"> <li>■ active/passive selectable, galvanically isolated, full scale value selectable, resolution: <math>3</math> <math>\mu</math>A, temperature coefficient: typ. <math>0.005\%</math> o.r./<math>^{\circ}</math>C (o.r. = of reading)</li> <li>■ active: <math>4</math> to <math>20</math> mA, <math>R_i \leq 150</math> <math>\Omega</math>, max. <math>24</math> V DC, short-circuit-proof</li> <li>■ passive: <math>0/4</math> to <math>20</math> mA, <math>R_i &lt; 150</math> <math>\Omega</math>, max. <math>30</math> V DC</li> </ul> |

## Output

|                      |  |
|----------------------|--|
| <b>Output signal</b> | <p><b>Promag 50</b></p> <p><b>Current output</b></p> <p>active/passive selectable, galvanically isolated, time constant selectable (<math>0.01</math> to <math>100</math> s), full scale value selectable, temperature coefficient: typ. <math>0.005\%</math> o.r./<math>^{\circ}</math>C (o.r. = of reading), resolution: <math>0.5</math> <math>\mu</math>A</p> <ul style="list-style-type: none"> <li>■ active: <math>0/4</math> to <math>20</math> mA, <math>R_L &lt; 700</math> <math>\Omega</math> (HART: <math>R_L \geq 250</math> <math>\Omega</math>)</li> <li>■ passive: <math>4</math> to <math>20</math> mA, operating voltage <math>V_S</math>: <math>18</math> to <math>30</math> V DC, <math>R_i \geq 150</math> <math>\Omega</math></li> </ul> <p><b>Pulse/frequency output</b></p> <p>passive, open collector, <math>30</math> V DC, <math>250</math> mA, galvanically isolated</p> <ul style="list-style-type: none"> <li>■ Frequency output: full scale frequency <math>2</math> to <math>1000</math> Hz (<math>f_{\max} = 1250</math> Hz), on/off ratio <math>1:1</math>, pulse width max. <math>10</math> s</li> <li>■ Pulse output: pulse value and pulse polarity selectable, max. pulse width configurable (<math>0.5</math> to <math>2000</math> ms)</li> </ul> <p><b>PROFIBUS DP interface</b></p> <ul style="list-style-type: none"> <li>■ Transmission technology (Physical Layer): RS485 in accordance with ANSI/TIA/EIA-485-A: 1998, galvanically isolated</li> <li>■ Profil version 3.0</li> <li>■ Data transmission rate: <math>9,6</math> kBaud to <math>12</math> MBaud</li> <li>■ Automatic data transmission rate recognition</li> <li>■ Function blocks: <math>1 \times</math> analog Input, <math>1 \times</math> totalizer</li> <li>■ Output data: volume flow, totalizer</li> <li>■ Input data: positive zero return (ON/OFF), totalizer control, value for local display</li> <li>■ Cyclic data transmission compatible with previous model Promag 33</li> <li>■ Bus address adjustable via miniature switches or local display (optional) at the measuring device</li> </ul> <p><b>PROFIBUS PA interface</b></p> <ul style="list-style-type: none"> <li>■ Transmission technology (Physical Layer): IEC 61158-2 (MBP), galvanically isolated</li> <li>■ Profil version 3.0</li> <li>■ Current consumption: <math>11</math> mA</li> <li>■ Permissible supply voltage: <math>9</math> to <math>32</math> V</li> <li>■ Bus connection with integrated reverse polarity protection</li> <li>■ Error current FDE (Fault Disconnection Electronic): <math>0</math> mA</li> <li>■ Function blocks: <math>1 \times</math> analog input, <math>2 \times</math> totalizer</li> <li>■ Output data: volume flow, totalizer</li> <li>■ Input data: positive zero return (ON/OFF), control totalizer, value for local display</li> <li>■ Cyclic data transmission compatible with previous model Promag 33</li> <li>■ Bus address adjustable via miniature switches or local display (optional) at the measuring device</li> </ul> |
|----------------------|--|

**Promag 53****Current output**

active/passive selectable, galvanically isolated, time constant selectable (0.01 to 100 s), full scale value selectable, temperature coefficient: typ. 0.005% o.r./°C (o.r. = of reading), resolution: 0.5  $\mu$ A

- active: 0/4 to 20 mA,  $R_L < 700 \Omega$  (HART:  $R_L \geq 250 \Omega$ )
- passive: 4 to 20 mA, operating voltage  $V_S$ : 18 to 30 V DC,  $R_i \geq 150 \Omega$

**Pulse/frequency output**

active/passive selectable, galvanically isolated (Ex i version: only passive)

- active: 24 V DC, 25 mA (max. 250 mA during 20 ms),  $R_L > 100 \Omega$
- passive: open collector, 30 V DC, 250 mA
- Frequency output: full scale frequency 2 to 10000 Hz ( $f_{\max} = 12500$  Hz), EEx-ia: 2 to 5000 Hz; on/off ratio 1:1, pulse width max. 10 s
- Pulse output: pulse value and pulse polarity selectable, max. pulse width configurable (0.05 to 2000 ms)

**PROFIBUS DP interface**

- Transmission technology (Physical Layer): RS485 in accordance with ANSI/TIA/EIA-485-A: 1998, galvanically isolated
- Profi version 3.0
- Data transmission rate: 9,6 kBaud to 12 MBaud
- Automatic data transmission rate recognition
- Function blocks: 2  $\times$  analog Input, 3  $\times$  totalizer
- Output data: volume flow, calculated mass flow, totalizer 1 to 3
- Input data: positive zero return (ON/OFF), totalizer control, value for local display
- Cyclic data transmission compatible with previous model Promag 33
- Bus address adjustable via miniature switches or local display (optional) at the measuring device
- Available output combination  $\rightarrow$  8

**PROFIBUS PA interface**

- Transmission technology (Physical Layer): IEC 61158-2 (MBP), galvanically isolated
- Profi version 3.0
- Current consumption: 11 mA
- Permissible supply voltage: 9 to 32 V
- Bus connection with integrated reverse polarity protection
- Error current FDE (Fault Disconnection Electronic): 0 mA
- Function blocks: 2  $\times$  analog input, 3  $\times$  totalizer
- Output data: volume flow, calculated mass flow, totalizer 1 to 3
- Input data: positive zero return (ON/OFF), totalizer control, value for local display
- Cyclic data transmission compatible with previous model Promag 33
- Bus address adjustable via miniature switches or local display (optional) at the measuring device

**MODBUS RS485 interface**

- Transmission technology (Physical Layer): RS485 in accordance with ANSI/TIA/EIA-485-A: 1998, galvanically isolated
- MODBUS device type: Slave
- Address range: 1 to 247
- Bus address adjustable via miniature switches or local display (optional) at the measuring device
- Supported MODBUS function codes: 03, 04, 06, 08, 16, 23
- Broadcast: supported with the function codes 06, 16, 23
- Übertragungsmodus: RTU oder ASCII
- Supported baudrate: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 Baud
- Response time:
  - Direct data access = typically 25 to 50 ms
  - Auto-scan buffer (data range) = typically 3 to 5 ms
- Available output combination  $\rightarrow$  8

**FOUNDATION Fieldbus interface**

- FOUNDATION Fieldbus H1
- Transmission technology (Physical Layer): IEC 61158-2 (MBP), galvanically isolated
- ITK version 5.01
- Current consumption: 12 mA
- Error current FDE (Fault Disconnection Electronic): 0 mA
- Bus connection with integrated reverse polarity protection
- Function blocks:
  - 5 × Analog Input (execution time: 18 ms each)
  - 1 × PID (25 ms)
  - 1 × Digital Output (18 ms)
  - 1 × Signal Characterizer (20 ms)
  - 1 × Input Selector (20 ms)
  - 1 × Arithmetic (20 ms)
  - 1 × Integrator (18 ms)
- Output data: volume flow, calculated mass flow, temperature, totalizer 1 to 3
- Input data: positive zero return (ON/OFF), reset totalizer
- Link Master (LM) functionality is supported

**Signal on alarm**

- Current output → failure response selectable (e.g. in accordance with NAMUR recommendation NE 43)
- Pulse/frequency output → failure response selectable
- Status output (Promag 50) → non-conductive by fault or power supply failure
- Relay output (Promag 53) → de-energized by fault or power supply failure

**Load**

see "Output signal"

**Low flow cutoff**

Switch points for low flow cutoff are selectable.

**Galvanic isolation**

All circuits for inputs, outputs and power supply are galvanically isolated from each other.

**Switching output****Status output (Promag 50, Promag 53)**

Open collector, max. 30 V DC / 250 mA, galvanically isolated.

Configurable for: error messages, Empty Pipe Detection (EPD), flow direction, limit values.

**Relay outputs (Promag 53)**

Normally closed (NC or break) or normally open (NO or make) contacts available

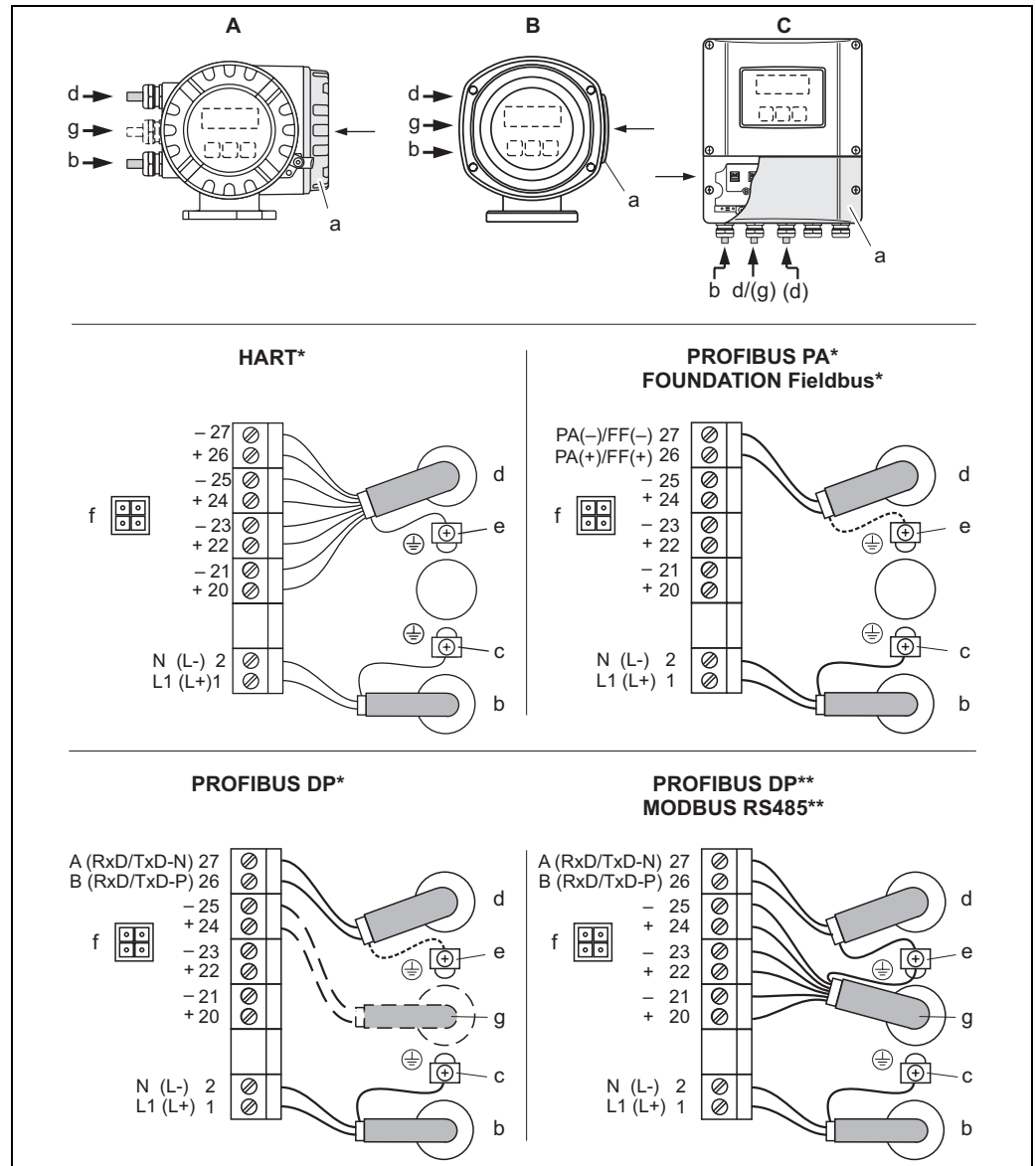
(default: relay 1 = NO, relay 2 = NC), max. 30 V / 0,5 A AC ; 60 V / 0,1 A DC, galvanically isolated.

Configurable for: error messages, Empty Pipe Detection (EPD), flow direction, limit values, batching contacts.



## Power supply

### Electrical connection, measuring unit



A0002441

Connecting the transmitter, cable cross-section max. 2.5 mm<sup>2</sup> (14 AWG)

- A View A (field housing)  
 B View B (stainless steel field housing)  
 C View C (wall-mount housing)

\*) fixed communication boards

\*\*) flexible communication boards

a Connection compartment cover

b Cable for power supply: 85 to 260 V AC / 20 to 55 V AC / 16 to 62 V DC

- Terminal No. 1: L1 for AC, L+ for DC

- Terminal No. 2: N for AC, L- for DC

c Ground terminal for protective conductor

d Signal cable: see "Electrical connection, terminal assignment" → 8

Fieldbus cable:

- Terminal No. 26: DP (B) / PA + / FF + / MODBUS RS485 (B) / (PA, FF: with polarity protection)

- Terminal No. 27: DP (A) / PA - / FF - / MODBUS RS485 (A) / (PA, FF: with polarity protection)

e Ground terminal for signal cable shield / Fieldbus cable / RS485 line

f Service adapter for connecting service interface FXA193 (Fieldcheck, FieldCare)

g Signal cable: see "Electrical connection, terminal assignment" → 8

Cable for external termination (only for PROFIBUS DP with fixed assignment communication board):

- Terminal No. 24: +5 V

- Terminal No. 25: DGND

Electrical connection,  
terminal assignment

## Terminal assignment, Promag 50

| Order variant | Terminal No. (inputs/outputs) |                 |                                 |                                     |
|---------------|-------------------------------|-----------------|---------------------------------|-------------------------------------|
|               | 20 (+) / 21 (-)               | 22 (+) / 23 (-) | 24 (+) / 25 (-)                 | 26 (+) / 27 (-)                     |
| 50***_*****W  | –                             | –               | –                               | Current output HART                 |
| 50***_*****A  | –                             | –               | Frequency output                | Current output HART                 |
| 50***_*****D  | Status input                  | Status output   | Frequency output                | Current output HART                 |
| 50***_*****H  | –                             | –               | –                               | PROFIBUS PA                         |
| 50***_*****J  | –                             | –               | +5 V (external termination)     | PROFIBUS DP                         |
| 50***_*****S  | –                             | –               | Frequency output, Ex i, passive | Current output, Ex i, passive, HART |
| 50***_*****T  | –                             | –               | Frequency output, Ex i, passive | Current output, Ex i, passive, HART |

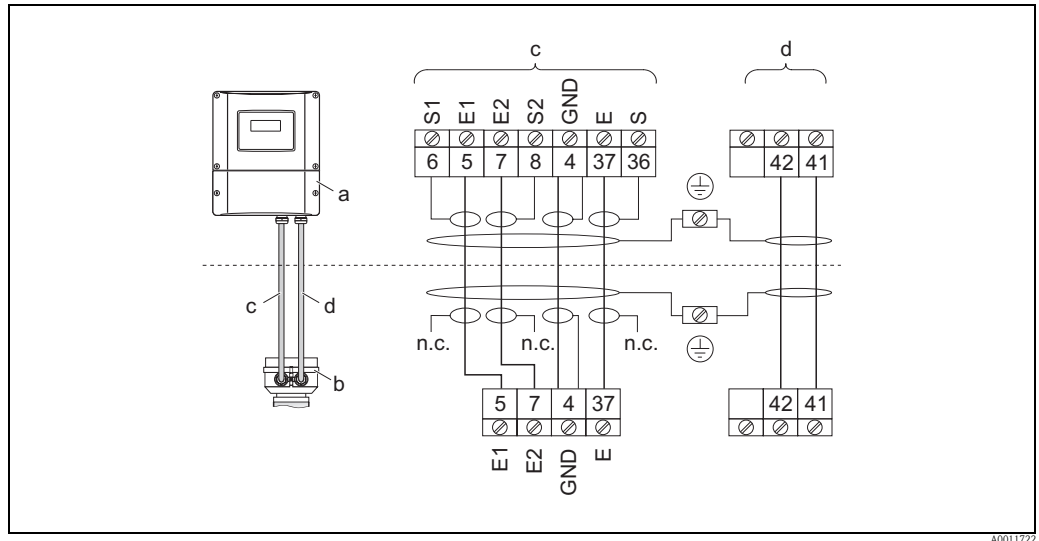
Ground terminal → 7

## Terminal assignment, Promag 53

The inputs and outputs on the communication board can be either permanently assigned or variable, depending on the version ordered (see table). Replacements for modules which are defective or which have to be replaced can be ordered as accessories.

| Order variant  | Terminal No. (inputs/outputs) |                  |                        |                                     |
|--|-------------------------------|------------------|------------------------|-------------------------------------|
|  | 20 (+) / 21 (-)               | 22 (+) / 23 (-)  | 24 (+) / 25 (-)        | 26 (+) / 27 (-)                     |
| <i>Fixed communication boards (fixed assignment)</i> |                               |                  |                        |                                     |
| 53***_*****A   | –                             | –                | Frequency output       | Current output HART                 |
| 53***_*****B   | Relay output 2                | Relay output 1   | Frequency output       | Current output HART                 |
| 53***_*****F   | –                             | –                | –                      | PROFIBUS PA, Ex i                   |
| 53***_*****G   | –                             | –                | –                      | FOUNDATION Fieldbus, Ex i           |
| 53***_*****H   | –                             | –                | –                      | PROFIBUS PA                         |
| 53***_*****J   | –                             | –                | –                      | PROFIBUS DP                         |
| 53***_*****K   | –                             | –                | –                      | FOUNDATION Fieldbus                 |
| 53***_*****Q   | –                             | –                | Status input           | MODBUS RS485                        |
| 53***_*****S   | –                             | –                | Frequency output, Ex i | Current output, Ex i, passive, HART |
| 53***_*****T   | –                             | –                | Frequency output, Ex i | Current output, Ex i, passive, HART |
| <i>Flexible communication boards</i>                 |                               |                  |                        |                                     |
| 53***_*****C   | Relay output 2                | Relay output 1   | Frequency output       | Current output HART                 |
| 53***_*****D   | Status input                  | Relay output     | Frequency output       | Current output HART                 |
| 53***_*****L   | Status input                  | Relay output 2   | Relay output 1         | Current output HART                 |
| 53***_*****M   | Status input                  | Frequency output | Frequency output       | Current output HART                 |
| 53***_*****N   | Current output                | Frequency output | Status input           | MODBUS RS485                        |
| 53***_*****P   | Current output                | Frequency output | Status input           | PROFIBUS DP                         |
| 53***_*****V   | Relay output 2                | Relay output 1   | Status input           | PROFIBUS DP                         |
| 53***_*****2   | Relay output                  | Current output   | Frequency output       | Current output HART                 |
| 53***_*****4   | Current input                 | Relay output     | Frequency output       | Current output HART                 |
| 53***_*****7   | Relay output 2                | Relay output 1   | Status input           | MODBUS RS485                        |

Ground terminal → 7

**Electrical connection,  
remote version**

Connecting the remote version

a Wall-mount housing connection compartment

b Sensor connection housing cover

c Signal cable

d Coil current cable

n.c. Not connected, insulated cable shields

Terminal no. and cable colors: 6/5 = brown; 7/8 = white; 4 = green; 36/37 = yellow

**Supply voltage (power supply)**

- 85 to 260 V AC, 45 to 65 Hz
- 20 to 55 V AC, 45 to 65 Hz
- 16 to 62 V DC

PROFIBUS PA and FOUNDATION Fieldbus

- Non-Ex: 9 to 32 V DC
- Ex i: 9 to 24 V DC
- Ex d: 9 to 32 V DC

**Cable entry**

Power supply and signal cables (inputs/ outputs):

- Cable entry M20 × 1.5 (8 to 12 mm / 0.31 to 0.47")
- Sensor cable entry for armoured cables M20 × 1.5 (9.5 to 16 mm / 0.37 to 0.63")
- Thread for cable entries, 1/2" NPT, G 1/2"

Connecting cable for remote version:

- Cable entry M20 × 1.5 (8 to 12 mm / 0.31 to 0.47")
- Sensor cable entry for armoured cables M20 × 1.5 (9.5 to 16 mm / 0.37 to 0.63")
- Thread for cable entries, 1/2" NPT, G 1/2"

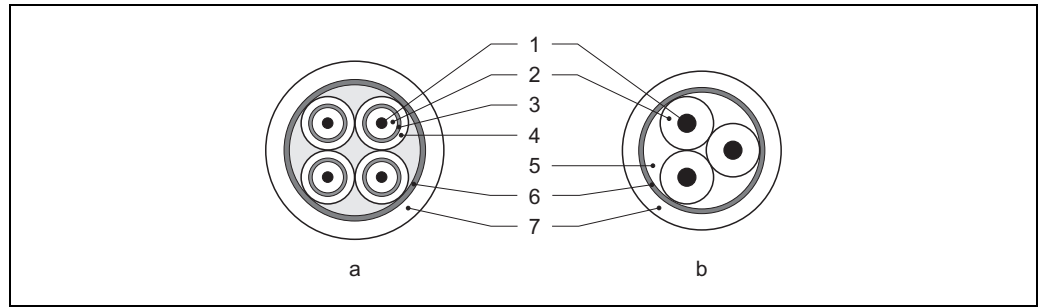
**Remote version cable  
specifications**

Coil cable

- 2 × 0.75 mm<sup>2</sup> (18 AWG) PVC cable with common, braided copper shield (Ø ~ 7 mm / 0.28")
- Conductor resistance: ≤ 37 Ω/km (≤ 0.011 Ω/ft)
- Capacitance core/core, shield grounded: ≤ 120 pF/m (≤ 37 pF/ft)
- Operating temperature: -20 to +80 °C (-68 to +176 °F)
- Cable cross-section: max. 2.5 mm<sup>2</sup> (14 AWG)
- Test voltage for cable insulation: ≤ 1433 AC r.m.s. 50/60 Hz or ≥ 2026 V DC

Signal cable

- 3 × 0.38 mm<sup>2</sup> (20 AWG) PVC cable with common, braided copper shield (Ø ~ 7 mm / 0.28") and individual shielded cores
- With empty pipe detection (EPD): 4 × 0.38 mm<sup>2</sup> (20 AWG) PVC cable with common, braided copper shield (Ø ~ 7 mm / 0.28") and individual shielded cores
- Conductor resistance: ≤ 50 Ω/km (≤ 0.015 Ω/ft)
- Capacitance core/shield: ≤ 420 pF/m (≤ 128 pF/ft)
- Operating temperature: -20 to +80 °C (-68 to +176 °F)
- Cable cross-section: max. 2.5 mm<sup>2</sup> (14 AWG)



A0003194

*a* Signal cable

*b* Coil current cable

1 Core

2 Core insulation

3 Core shield

4 Core jacket

5 Core reinforcement

6 Cable shield

7 Outer jacket

Operation in zones of severe electrical interference

The measuring device complies with the general safety requirements in accordance with EN 61010 and the EMC requirements of IEC/EN 61326 and NAMUR recommendation NE 21.



Caution!

Grounding is by means of the ground terminals provided for the purpose inside the connection housing. Ensure that the stripped and twisted lengths of cable shield to the ground terminal are as short as possible.

#### Power consumption

■ AC: < 15 VA (incl. sensor)

■ DC: < 15 W (incl. sensor)

Switch-on current:

■ Max. 3 A (< 5 ms) for 260 V AC

■ Max. 13.5 A (< 50 ms) for 24 V DC

#### Power supply failure

Lasting min. ½ cycle frequency: EEPROM saves measuring system data

■ EEPROM or T-DAT (Promag 53 only) retain the measuring system data in the event of a power supply failure

■ S-DAT: exchangeable data storage chip which stores the data of the sensor (nominal diameter, serial number, calibration factor, zero point etc.)

## Potential equalization



### Warning!


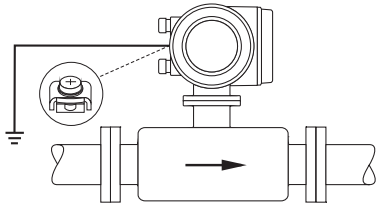
The measuring system must be included in the potential equalization.

Perfect measurement is only ensured when the fluid and the sensor have the same electrical potential. This is ensured by the reference electrode integrated in the sensor as standard.


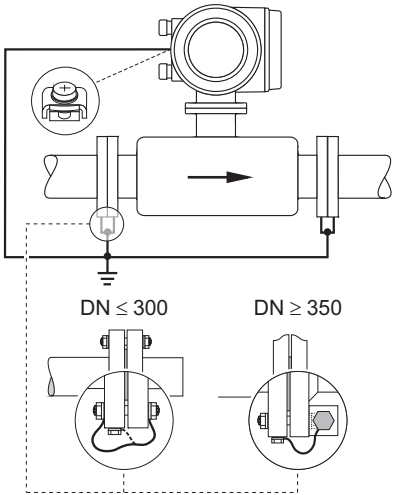
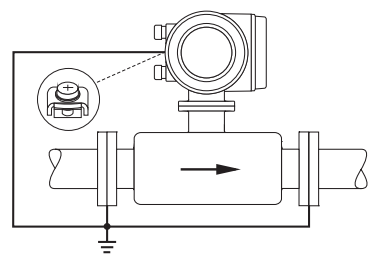
The following should also be taken into consideration for potential equalization:

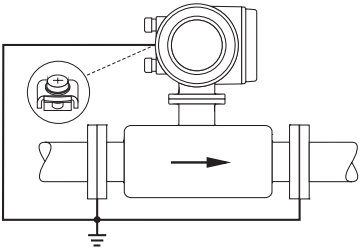
- Internal grounding concepts in the company
- Operating conditions, such as the material/ grounding of the pipes (see table)

### Standard situation

| Operating conditions   | Potential equalization  |
|--|---|
| <p>When using the measuring device in a:</p> <ul style="list-style-type: none"> <li>■ Metal, grounded pipe</li> </ul> <p>Potential equalization takes place via the ground terminal of the transmitter.</p> <p> <b>Note!</b><br/>When installing in metal pipes, we recommend you connect the ground terminal of the transmitter housing with the piping.</p> |  <p style="text-align: right;">A0011892</p> <p><i>Via the ground terminal of the transmitter</i></p> |

### Special situations

| Operating conditions   | Potential equalization  |
|--|---|
| <p>When using the measuring device in a:</p> <ul style="list-style-type: none"> <li>■ Metal pipe that is not grounded</li> </ul> <p>This connection method also applies in situations where:</p> <ul style="list-style-type: none"> <li>■ Customary potential equalization cannot be ensured.</li> <li>■ Excessively high equalizing currents can be expected.</li> </ul> <p>Both sensor flanges are connected to the pipe flange by means of a ground cable (copper wire, at least 6 mm<sup>2</sup> / 0.0093 in<sup>2</sup>) and grounded. Connect the transmitter or sensor connection housing, as applicable, to ground potential by means of the ground terminal provided for the purpose.</p> <ul style="list-style-type: none"> <li>■ DN ≤ 300 (12"): the ground cable is mounted directly on the conductive flange coating with the flange screws.</li> <li>■ DN ≥ 350 (14"): the ground cable is mounted directly on the transportation metal support.</li> </ul> <p> <b>Note!</b><br/>The ground cable for flange-to-flange connections can be ordered separately as an accessory from Endress+Hauser.</p> |  <p style="text-align: right;">A0011893</p> <p><i>Via the ground terminal of the transmitter and the flanges of the pipe</i></p>               |
| <p>When using the measuring device in a:</p> <ul style="list-style-type: none"> <li>■ Plastic pipe</li> <li>■ Pipe with insulating lining</li> </ul> <p>This connection method also applies in situations where:</p> <ul style="list-style-type: none"> <li>■ Customary potential equalization cannot be ensured.</li> <li>■ Excessively high equalizing currents can be expected.</li> </ul> <p>Potential equalization takes place using additional ground disks, which are connected to the ground terminal via a ground cable (copper wire, at least 6 mm<sup>2</sup> / 0.0093 in<sup>2</sup>). When installing the ground disks, please comply with the enclosed Installation Instructions.</p>  |  <p style="text-align: right;">A0011895</p> <p><i>Via the ground terminal of the transmitter and the optionally available ground disks</i></p> |

| Operating conditions   | Potential equalization  |
|--|---|
| <p>When using the measuring device in a:</p> <ul style="list-style-type: none"> <li>■ Pipe with a cathodic protection unit</li> </ul> <p>The device is installed potential-free in the pipe.<br/>Only the two flanges of the pipe are connected with a ground cable (copper wire, at least 6 mm<sup>2</sup> / 0.0093 in<sup>2</sup>). Here, the ground cable is mounted directly on the conductive flange coating with flange screws.</p> <p>Note the following when installing:</p> <ul style="list-style-type: none"> <li>■ The applicable regulations regarding potential-free installation must be observed.</li> <li>■ There should be <b>no</b> electrically conductive connection between the pipe and the device.</li> <li>■ The mounting material must withstand the applicable torques.</li> </ul> |  <p style="text-align: right;">A0011896</p> <p><i>Potential equalization and cathodic protection</i></p> <p>1     Power supply isolation transformer<br/>2     Electrically isolated</p> |

# Performance characteristics

**Reference operating conditions**

- As per DIN EN 29104 and VDI/VDE 2641:**
- Fluid temperature:  $+28\text{ }^{\circ}\text{C} \pm 2\text{ K}$  ( $+82\text{ }^{\circ}\text{F} \pm 2\text{ K}$ )
  - Ambient temperature:  $+22\text{ }^{\circ}\text{C} \pm 2\text{ K}$  ( $+72\text{ }^{\circ}\text{F} \pm 2\text{ K}$ )
  - Warm-up period: 30 minutes

**Installation conditions:**

- Inlet run  $> 10 \times \text{DN}$
- Outlet run  $> 5 \times \text{DN}$
- Sensor and transmitter grounded.
- The sensor is centered in the pipe.

**Maximum measured error**

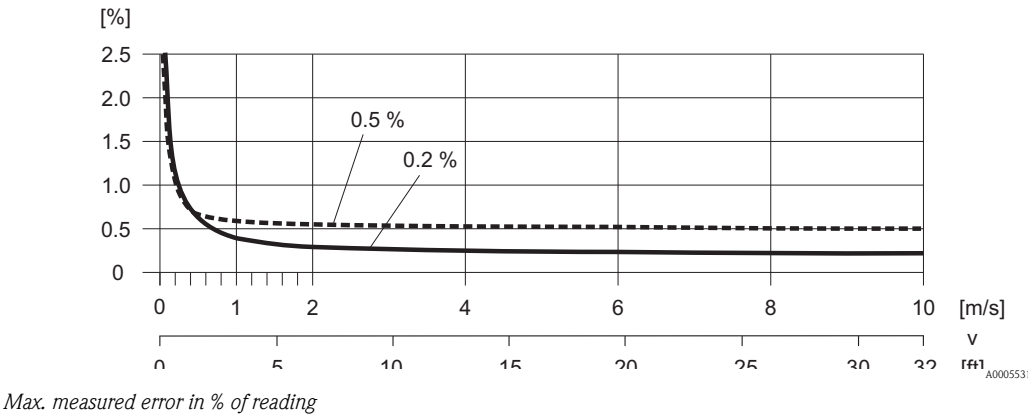
Promag 50:

- Current output: also typically  $\pm 5\text{ }\mu\text{A}$
- Pulse output:  $\pm 0.5\%$  o.r.  $\pm 1\text{ mm/s}$  ( $\pm 0.5\%$  o.r.  $\pm 0.04\text{ in/s}$ )  
optional:  $\pm 0.2\%$  o.r.  $\pm 2\text{ mm/s}$  ( $\pm 0.2\%$  o.r.  $\pm 0.08\text{ in/s}$ ) (o.r. = of reading)

Promag 53:

- Current output: also typically  $\pm 5\text{ }\mu\text{A}$
- Pulse output:  $\pm 0.2\%$  o.r.  $\pm 2\text{ mm/s}$  ( $\pm 0.2\%$  o.r.  $\pm 0.08\text{ in/s}$ ) (o.r. = of reading)

Fluctuations in the supply voltage do not have any effect within the specified range.



**Repeatability**

Max.  $\pm 0.1\%$  o.r.  $\pm 0.5\text{ mm/s}$  ( $\pm 0.1\%$  o.r.  $\pm 0.02\text{ in/s}$ ) (o.r. = of reading)



## Operating conditions: Installations

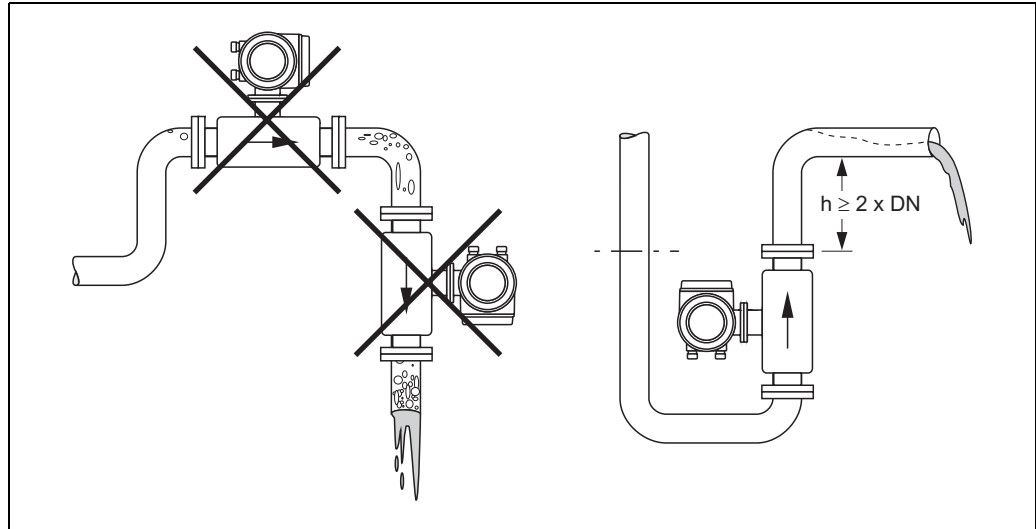
### Installation instructions

#### Mounting location

Entrained air or gas bubble formation in the measuring tube can result in an increase in measuring errors.

**Avoid** the following installation locations in the pipe:

- Highest point of a pipeline. Risk of air accumulating!
- Directly upstream from a free pipe outlet in a vertical pipeline.



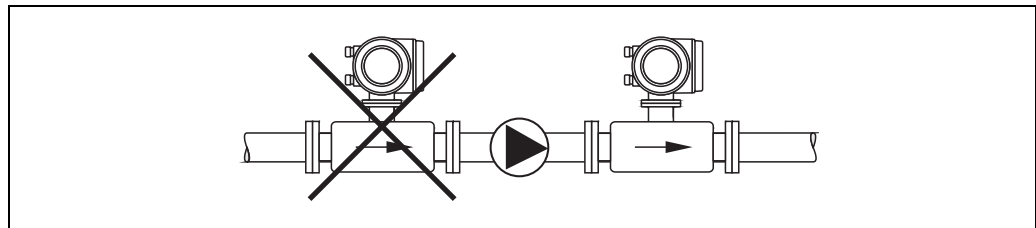
A0011899

Mounting location

#### Installation of pumps

Sensors may not be installed on the pump suction side. This precaution is to avoid low pressure and the consequent risk of damage to the lining of the measuring tube. Information on the pressure tightness of the measuring tube lining → 21, Section "Pressure tightness".

Pulsation dampers may be needed when using piston pumps, piston diaphragm pumps or hose pumps. Information on the shock and vibration resistance of the measuring system → 20, Section "Shock and vibration resistance".



A0011900

Installation of pumps

**Partially filled pipes**

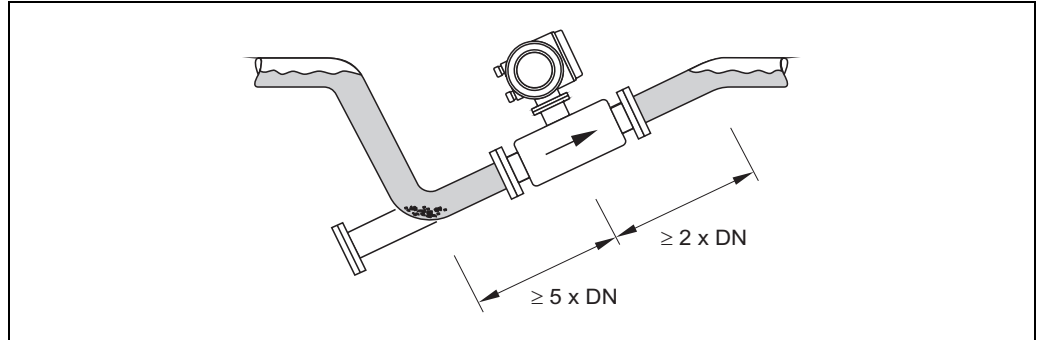
Partially filled pipes with gradients necessitate a drain-type configuration.

The empty pipe detection function (EPD) provides additional security in detecting empty or partially filled pipes.



**Caution!**

Risk of solids accumulating. Do not install the sensor at the lowest point in the drain. It is advisable to install a cleaning valve.

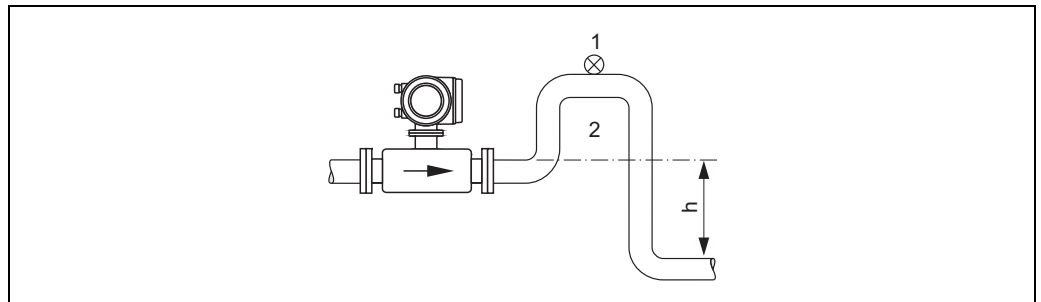


A0011901

*Installation with partially filled pipes*

**Down pipes**

Install a siphon or a vent valve downstream of the sensor in down pipes  $h \geq 5 \text{ m}$  (16.4 ft). This precaution is to avoid low pressure and the consequent risk of damage to the lining of the measuring tube. This measure also prevents the liquid current stopping in the pipe which could cause air locks. Information on the pressure tightness of the measuring tube lining → 21, Section "Pressure tightness".



A0011902

*Installation measures for vertical pipes*

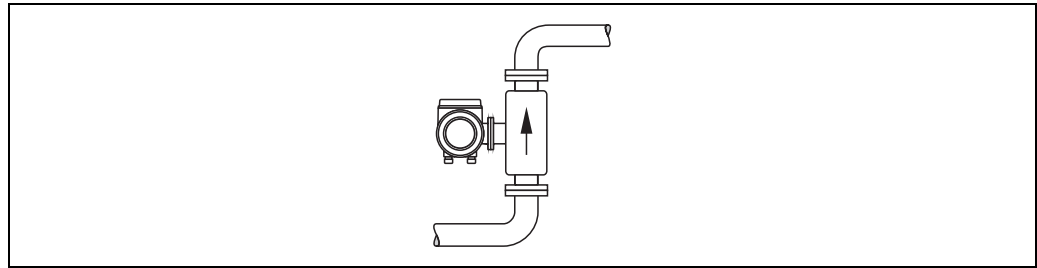
- 1 Vent valve
- 2 Pipe siphon
- h Length of the down pipe

## Orientation

An optimum orientation helps avoid gas and air accumulations and deposits in the measuring tube. However, the measuring device also offers the additional function of empty pipe detection (EPD) for detecting partially filled measuring tubes or if outgassing fluids or fluctuating operating pressures are present.

### Vertical orientation

This is the ideal orientation for self-emptying piping systems and for use in conjunction with empty pipe detection.



A0011903

Vertical orientation

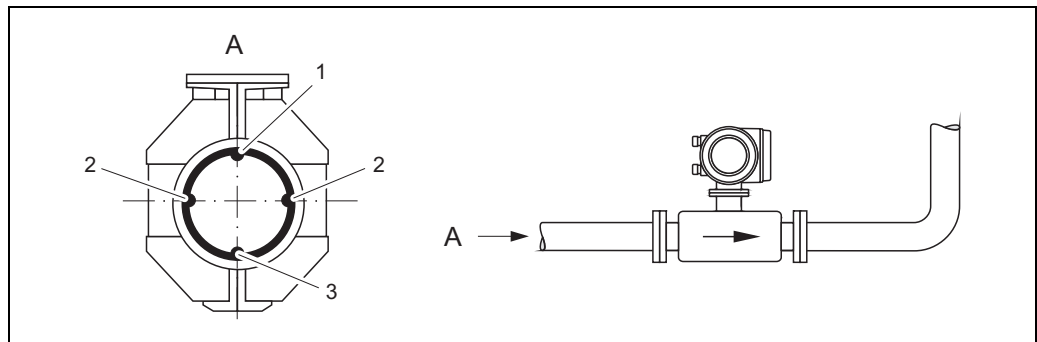
### Horizontal orientation

The measuring electrode axis should be horizontal. This prevents brief insulation of the two measuring electrodes by entrained air bubbles.



#### Caution!

Empty pipe detection only works correctly with horizontal orientation if the transmitter housing is facing upwards. Otherwise there is no guarantee that empty pipe detection will respond if the measuring tube is only partially filled or empty.



A0011904

Horizontal orientation

- 1 EPD electrode for empty pipe detection
- 2 Measuring electrodes for signal detection
- 3 Reference electrode for potential equalization

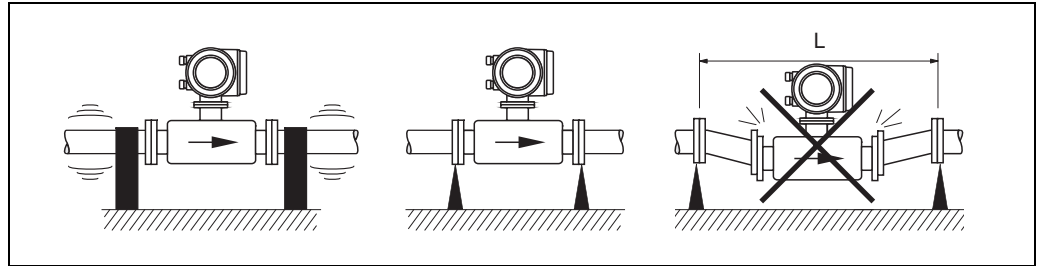
### Vibrations

Secure the piping and the sensor if vibration is severe.



#### Caution!

If vibrations are too severe, we recommend the sensor and transmitter be mounted separately. Information on the permitted shock and vibration resistance → 20, Section "Shock and vibration resistance".



A0011906

Measures to prevent vibration of the measuring device

$L > 10 \text{ m (33 ft)}$

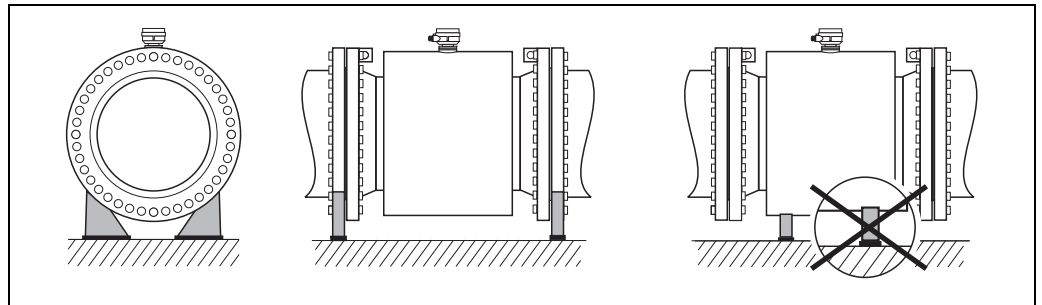
### Foundations, supports

If the nominal diameter is  $\text{DN} \geq 350$ , mount the transmitter on a foundation of adequate load-bearing strength.



#### Caution!

Do not allow the casing to take the weight of the sensor. This would buckle the casing and damage the internal magnetic coils.



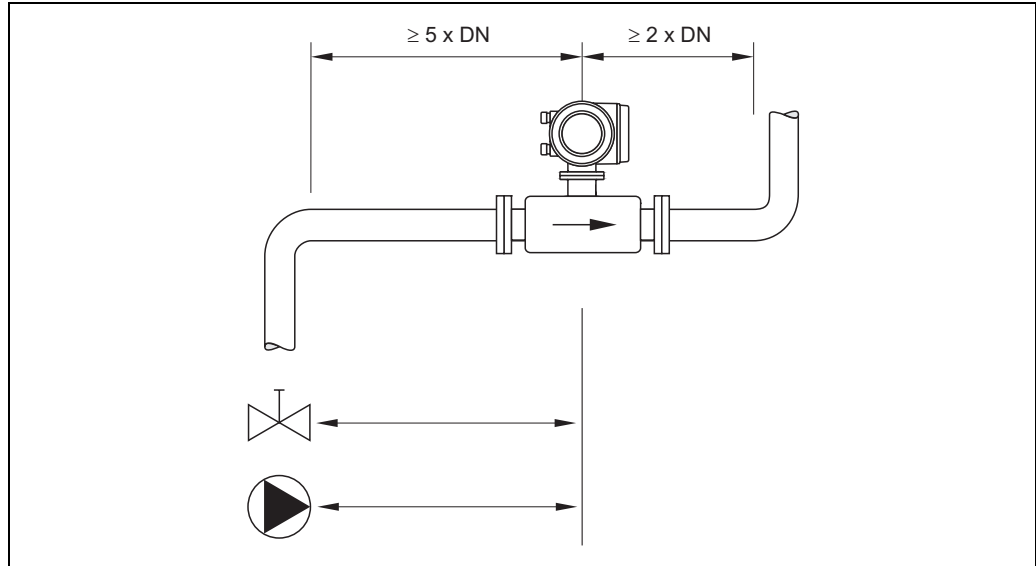
A0003209

**Inlet and outlet run**

If possible, install the sensor well clear of assemblies such as valves, T-pieces, elbows etc.

Note the following inlet and outlet runs to comply with measuring accuracy specifications:

- Inlet run:  $\geq 5 \times \text{DN}$
- Outlet run:  $\geq 2 \times \text{DN}$



A0011905

*Inlet and outlet run*

**Adapters**

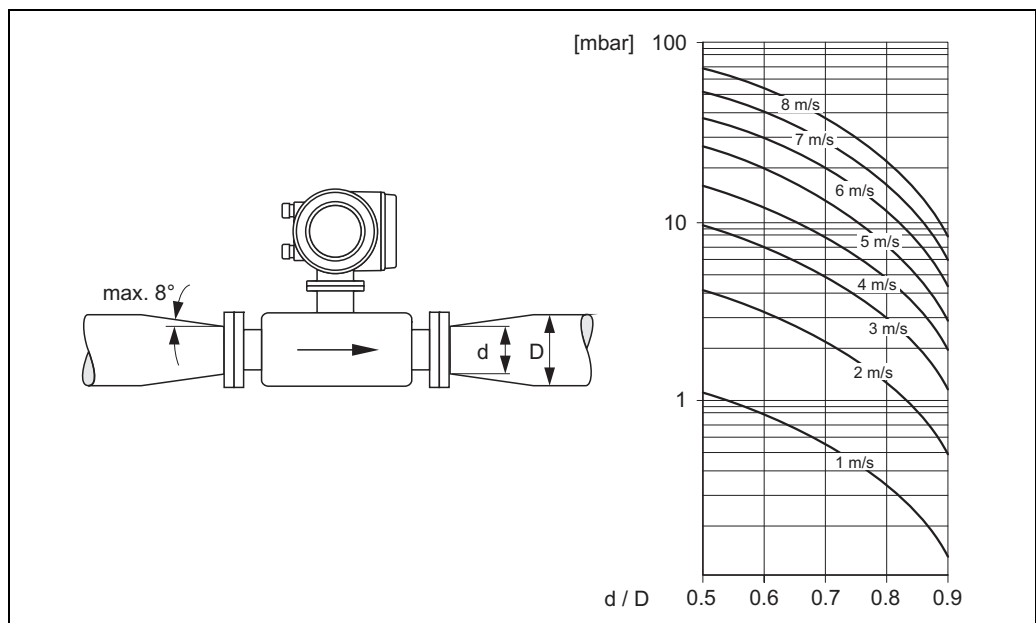
Suitable adapters to DIN EN 545 (double-flange reducers) can be used to install the sensor in larger-diameter pipes. The resultant increase in the rate of flow improves measuring accuracy with very slow-moving fluids. The nomogram shown here can be used to calculate the pressure loss caused by reducers and expanders.



Note!

The nomogram only applies to liquids of viscosity similar to water.

1. Calculate the ratio of the diameters  $d/D$ .
2. From the nomogram read off the pressure loss as a function of flow velocity (downstream from the reduction) and the  $d/D$  ratio.



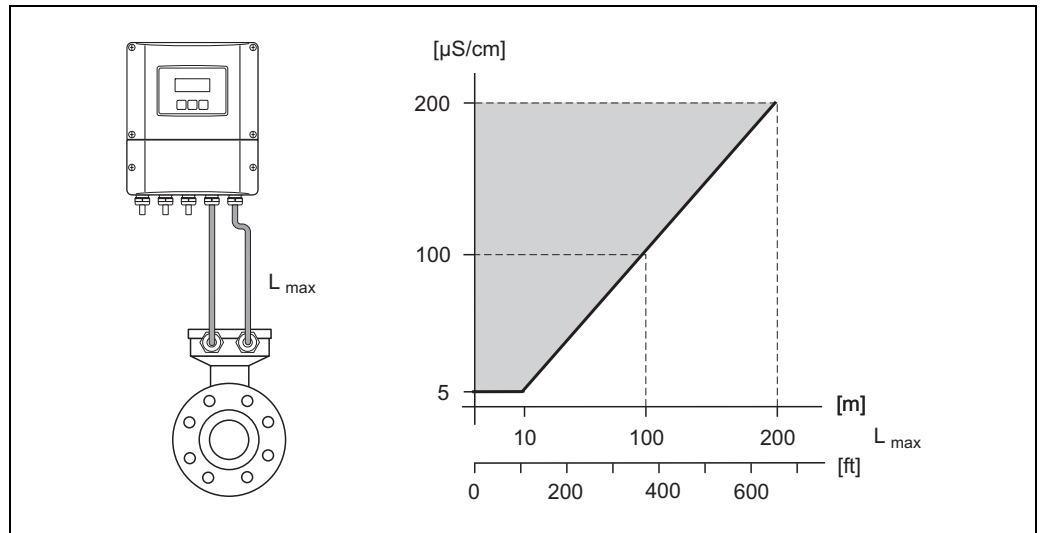
A0011907

*Pressure loss due to adapters*

**Length of connecting cable**

When mounting the remote version, please note the following to achieve correct measuring results:

- Fix cable run or lay in armored conduit. Cable movements can falsify the measuring signal especially in the case of low fluid conductivities.
- Route the cable well clear of electrical machines and switching elements.
- If necessary, ensure potential equalization between sensor and transmitter.
- The permitted cable length  $L_{max}$  is determined by the fluid conductivity. A minimum conductivity of 20  $\mu\text{S}/\text{cm}$  is required for measuring demineralized water.
- When the empty pipe detection function is switched on (EPD), the maximum connecting cable length is 10 m (33 ft).



A0010734

*Permitted length of connecting cable for remote version*

*Area marked in gray = permitted range;  $L_{max}$  = length of connecting cable in [m] ([ft]); fluid conductivity in  $\mu\text{S}/\text{cm}$*

## Operating conditions: Environment

### Ambient temperature range

#### Transmitter

- Standard: -20 to +60 °C (-4 to +140 °F)
- Optional: -40 to +60 °C (-40 to +140 °F)



#### Note!

At ambient temperatures below -20 °C (-4 °F) the readability of the display may be impaired.

#### Sensor

- Flange material carbon steel: -10 to +60 °C (14 to +140 °F)
- Flange material stainless steel: -40 to +60 °C (-40 to +140 °F)



#### Caution!

The permitted temperature range of the measuring tube lining may not be undershot or overshoot

→ 21, Section "Medium temperature range".

Please note the following points:

- Install the device in a shady location. Avoid direct sunlight, particularly in warm climatic regions.
- The transmitter must be mounted separate from the sensor if both the ambient and fluid temperatures are high.

### Storage temperature

The storage temperature corresponds to the operating temperature range of the measuring transmitter and the appropriate measuring sensors.



#### Caution!

- The measuring device must be protected against direct sunlight during storage in order to avoid unacceptably high surface temperatures.
- A storage location must be selected where moisture does not collect in the measuring device. This will help prevent fungus and bacteria infestation which can damage the liner.
- Do not remove the protective plates or caps on the process connections until the device is ready to install.

### Degree of protection

- Standard: IP 67 (NEMA 4X) for transmitter and sensor.
- Optional: IP 68 (NEMA 6P) for sensor for remote version.
- For information regarding applications where the device is buried directly in the soil or is installed in a flooded wastewater basin please contact your local Endress+Hauser Sales Center.

### Shock and vibration resistance

Acceleration up to 2 g following IEC 600 68-2-6

### Electromagnetic compatibility (EMC)

- As per IEC/EN 61326 and NAMUR recommendation NE 21.



## Operating conditions: Process

### Medium temperature range

The permitted temperature depends on the lining of the measuring tube:

- Polyurethane: -20 to +50 °C (-4 to +122 °F) (DN 25 to 1200 / 1 to 48")
- Hard rubber: ±0 to +80 °C (+32 to +176 °F) (DN 50 to 2000 / 2 to 78")

### Conductivity

The minimum conductivity is:

- $\geq 5 \mu\text{S}/\text{cm}$  for fluids generally
- $\geq 20 \mu\text{S}/\text{cm}$  for demineralized water



Note!

In the remote version, the necessary minimum conductivity also depends on the cable length (→ 19, Section "Length of connecting cable").

### Medium pressure range (nominal pressure)

- EN 1092-1 (DIN 2501)
  - PN 6 (DN 350 to 2000 / 14 to 78")
  - PN 10 (DN 200 to 2000 / 8 to 78")
  - PN 16 (DN 65 to 2000 / 3 to 78")
  - PN 25 (DN 200 to 1000 / 8 to 40")
  - PN 40 (DN 25 to 150 / 1 to 6")
- ANSI B 16.5
  - Class 150 (DN 1 to 24")
  - Class 300 (DN 1 to 6")
- AWWA
  - Class D (DN 28 to 78")
- JIS B2220
  - 10 K (DN 50 to 300 / 2 to 12")
  - 20 K (DN 25 to 300 / 1 to 12")
- AS 2129
  - Table E (DN 80, 100, 150 to 400, 500, 600 / 3", 4", 6 to 16", 20", 24")
- AS 4087
  - PN 16 (DN 80, 100, 150 to 400, 500, 600 / 3", 4", 6 to 16", 20", 24")

### Pressure tightness

*Measuring tube lining: Polyurethane*

| Nominal diameter |          | Limit values for abs. pressure [mbar] ([psi]) at fluid temperatures: |       |                |       |
|------------------|----------|--|-------|----------------|-------|
|                  |          | 25 °C (77 °F)  |       | 50 °C (122 °F) |       |
| [mm]             | [inch]   | [mbar]   | [psi] | [mbar]         | [psi] |
| 25 to 1200       | 1 to 48" | 0  | 0     | 0              | 0     |

*Measuring tube lining: Hard rubber*

| Nominal diameter |          | Limit values for abs. pressure [mbar] ([psi]) at fluid temperatures: |       |                |       |                |       |
|------------------|----------|--|-------|----------------|-------|----------------|-------|
|                  |          | 25 °C (77 °F)  |       | 50 °C (122 °F) |       | 80 °C (176 °F) |       |
| [mm]             | [inch]   | [mbar]   | [psi] | [mbar]         | [psi] | [mbar]         | [psi] |
| 50 to 2000       | 2 to 78" | 0  | 0     | 0              | 0     | 0              | 0     |

**Limiting flow**

The diameter of the pipe and the flow rate determine the nominal diameter of the sensor.


The optimum flow velocity is between 2 to 3 m/s (6.5 to 9.8 ft/s). The velocity of flow (v), moreover, has to be matched to the physical properties of the fluid:

- $v < 2$  m/s (6.5 ft/s): for abrasive fluids such as potter's clay, lime milk, ore slurry etc.
- $v > 2$  m/s (6.5 ft/s): for fluids causing build-up such as wastewater sludges etc.

| Flow characteristic values (SI units) |        |                                  |                                       |                       |                         |
|---------------------------------------|--------|----------------------------------|---------------------------------------|-----------------------|-------------------------|
| Diameter                              |        | Recommended flow                 | Factory settings                      |                       |                         |
|                                       |        | Min./max. full scale value       | Full scale value                      | Pulse value           | Low flow                |
| [mm]                                  | [inch] | ( $v \sim 0.3$ or $10$ m/s)      | Current output<br>( $v \sim 2.5$ m/s) | ( $\sim 2$ pulses/s)  | ( $v \sim 0.04$ m/s)    |
| 25                                    | 1"     | 9 to 300 dm <sup>3</sup> /min    | 75 dm <sup>3</sup> /min               | 0.50 dm <sup>3</sup>  | 1 dm <sup>3</sup> /min  |
| 32                                    | –      | 15 to 500 dm <sup>3</sup> /min   | 125 dm <sup>3</sup> /min              | 1.00 dm <sup>3</sup>  | 2 dm <sup>3</sup> /min  |
| 40                                    | 1½"    | 25 to 700 dm <sup>3</sup> /min   | 200 dm <sup>3</sup> /min              | 1.50 dm <sup>3</sup>  | 3 dm <sup>3</sup> /min  |
| 50                                    | 2"     | 35 to 1100 dm <sup>3</sup> /min  | 300 dm <sup>3</sup> /min              | 2.50 dm <sup>3</sup>  | 5 dm <sup>3</sup> /min  |
| 65                                    | –      | 60 to 2000 dm <sup>3</sup> /min  | 500 dm <sup>3</sup> /min              | 5.00 dm <sup>3</sup>  | 8 dm <sup>3</sup> /min  |
| 80                                    | 3"     | 90 to 3000 dm <sup>3</sup> /min  | 750 dm <sup>3</sup> /min              | 5.00 dm <sup>3</sup>  | 12 dm <sup>3</sup> /min |
| 100                                   | 4"     | 145 to 4700 dm <sup>3</sup> /min | 1200 dm <sup>3</sup> /min             | 10.00 dm <sup>3</sup> | 20 dm <sup>3</sup> /min |
| 125                                   | –      | 220 to 7500 dm <sup>3</sup> /min | 1850 dm <sup>3</sup> /min             | 15.00 dm <sup>3</sup> | 30 dm <sup>3</sup> /min |
| 150                                   | 6"     | 20 to 600 m <sup>3</sup> /h      | 150 m <sup>3</sup> /h                 | 0.025 m <sup>3</sup>  | 2.5 m <sup>3</sup> /h   |
| 200                                   | 8"     | 35 to 1100 m <sup>3</sup> /h     | 300 m <sup>3</sup> /h                 | 0.05 m <sup>3</sup>   | 5.0 m <sup>3</sup> /h   |
| 250                                   | 10"    | 55 to 1700 m <sup>3</sup> /h     | 500 m <sup>3</sup> /h                 | 0.05 m <sup>3</sup>   | 7.5 m <sup>3</sup> /h   |
| 300                                   | 12"    | 80 to 2400 m <sup>3</sup> /h     | 750 m <sup>3</sup> /h                 | 0.10 m <sup>3</sup>   | 10 m <sup>3</sup> /h    |
| 350                                   | 14"    | 110 to 3300 m <sup>3</sup> /h    | 1000 m <sup>3</sup> /h                | 0.10 m <sup>3</sup>   | 15 m <sup>3</sup> /h    |
| 375                                   | 15"    | 140 to 4200 m <sup>3</sup> /h    | 1200 m <sup>3</sup> /h                | 0.15 m <sup>3</sup>   | 20 m <sup>3</sup> /h    |
| 400                                   | 16"    | 140 to 4200 m <sup>3</sup> /h    | 1200 m <sup>3</sup> /h                | 0.15 m <sup>3</sup>   | 20 m <sup>3</sup> /h    |
| 450                                   | 18"    | 180 to 5400 m <sup>3</sup> /h    | 1500 m <sup>3</sup> /h                | 0.25 m <sup>3</sup>   | 25 m <sup>3</sup> /h    |
| 500                                   | 20"    | 220 to 6600 m <sup>3</sup> /h    | 2000 m <sup>3</sup> /h                | 0.25 m <sup>3</sup>   | 30 m <sup>3</sup> /h    |
| 600                                   | 24"    | 310 to 9600 m <sup>3</sup> /h    | 2500 m <sup>3</sup> /h                | 0.30 m <sup>3</sup>   | 40 m <sup>3</sup> /h    |
| 700                                   | 28"    | 420 to 13500 m <sup>3</sup> /h   | 3500 m <sup>3</sup> /h                | 0.50 m <sup>3</sup>   | 50 m <sup>3</sup> /h    |
| –                                     | 30"    | 480 to 15000 m <sup>3</sup> /h   | 4000 m <sup>3</sup> /h                | 0.50 m <sup>3</sup>   | 60 m <sup>3</sup> /h    |
| 800                                   | 32"    | 550 to 18000 m <sup>3</sup> /h   | 4500 m <sup>3</sup> /h                | 0.75 m <sup>3</sup>   | 75 m <sup>3</sup> /h    |
| 900                                   | 36"    | 690 to 22500 m <sup>3</sup> /h   | 6000 m <sup>3</sup> /h                | 0.75 m <sup>3</sup>   | 100 m <sup>3</sup> /h   |
| 1000                                  | 40"    | 850 to 28000 m <sup>3</sup> /h   | 7000 m <sup>3</sup> /h                | 1.00 m <sup>3</sup>   | 125 m <sup>3</sup> /h   |
| –                                     | 42"    | 950 to 30000 m <sup>3</sup> /h   | 8000 m <sup>3</sup> /h                | 1.00 m <sup>3</sup>   | 125 m <sup>3</sup> /h   |
| 1200                                  | 48"    | 1250 to 40000 m <sup>3</sup> /h  | 10000 m <sup>3</sup> /h               | 1.50 m <sup>3</sup>   | 150 m <sup>3</sup> /h   |
| –                                     | 54"    | 1550 to 50000 m <sup>3</sup> /h  | 13000 m <sup>3</sup> /h               | 1.50 m <sup>3</sup>   | 200 m <sup>3</sup> /h   |
| 1400                                  | –      | 1700 to 55000 m <sup>3</sup> /h  | 14000 m <sup>3</sup> /h               | 2.00 m <sup>3</sup>   | 225 m <sup>3</sup> /h   |
| –                                     | 60"    | 1950 to 60000 m <sup>3</sup> /h  | 16000 m <sup>3</sup> /h               | 2.00 m <sup>3</sup>   | 250 m <sup>3</sup> /h   |
| 1600                                  | –      | 2200 to 70000 m <sup>3</sup> /h  | 18000 m <sup>3</sup> /h               | 2.50 m <sup>3</sup>   | 300 m <sup>3</sup> /h   |
| –                                     | 66"    | 2500 to 80000 m <sup>3</sup> /h  | 20500 m <sup>3</sup> /h               | 2.50 m <sup>3</sup>   | 325 m <sup>3</sup> /h   |
| 1800                                  | 72"    | 2800 to 90000 m <sup>3</sup> /h  | 23000 m <sup>3</sup> /h               | 3.00 m <sup>3</sup>   | 350 m <sup>3</sup> /h   |
| –                                     | 78"    | 3300 to 100000 m <sup>3</sup> /h | 28500 m <sup>3</sup> /h               | 3.50 m <sup>3</sup>   | 450 m <sup>3</sup> /h   |
| 2000                                  | –      | 3400 to 110000 m <sup>3</sup> /h | 28500 m <sup>3</sup> /h               | 3.50 m <sup>3</sup>   | 450 m <sup>3</sup> /h   |

| Flow characteristic values (US units) |      |  |   |                               |                            |
|---------------------------------------|------|--|---|-------------------------------|----------------------------|
| Diameter                              |      | Recommended flow rate<br>Min./max. full scale value<br>(v ~ 0.3 or 10 m/s) | Factory settings                                    |                               |                            |
| [inch]                                | [mm] |  | Full scale value<br>Current output<br>(v ~ 2.5 m/s) | Pulse value<br>(~ 2 pulses/s) | Low flow<br>(v ~ 0.04 m/s) |
| 1"                                    | 25   | 2.5 to 80 gal/min  | 18 gal/min  | 0.20 gal                      | 0.25 gal/min               |
| –                                     | 32   | 4 to 130 gal/min   | 30 gal/min  | 0.20 gal                      | 0.50 gal/min               |
| 1½"                                   | 40   | 7 to 190 gal/min   | 50 gal/min  | 0.50 gal                      | 0.75 gal/min               |
| 2"                                    | 50   | 10 to 300 gal/min  | 75 gal/min  | 0.50 gal                      | 1.25 gal/min               |
| –                                     | 65   | 16 to 500 gal/min  | 130 gal/min   | 1 gal                         | 2.0 gal/min                |
| 3"                                    | 80   | 24 to 800 gal/min  | 200 gal/min   | 2 gal                         | 2.5 gal/min                |
| 4"                                    | 100  | 40 to 1250 gal/min   | 300 gal/min   | 2 gal                         | 4.0 gal/min                |
| –                                     | 125  | 60 to 1950 gal/min   | 450 gal/min   | 5 gal                         | 7.0 gal/min                |
| 6"                                    | 150  | 90 to 2650 gal/min   | 600 gal/min   | 5 gal                         | 12 gal/min                 |
| 8"                                    | 200  | 155 to 4850 gal/min  | 1200 gal/min  | 10 gal                        | 15 gal/min                 |
| 10"                                   | 250  | 250 to 7500 gal/min  | 1500 gal/min  | 15 gal                        | 30 gal/min                 |
| 12"                                   | 300  | 350 to 10600 gal/min   | 2400 gal/min  | 25 gal                        | 45 gal/min                 |
| 14"                                   | 350  | 500 to 15000 gal/min   | 3600 gal/min  | 30 gal                        | 60 gal/min                 |
| 15"                                   | 375  | 600 to 19000 gal/min   | 4800 gal/min  | 50 gal                        | 60 gal/min                 |
| 16"                                   | 400  | 600 to 19000 gal/min   | 4800 gal/min  | 50 gal                        | 60 gal/min                 |
| 18"                                   | 450  | 800 to 24000 gal/min   | 6000 gal/min  | 50 gal                        | 90 gal/min                 |
| 20"                                   | 500  | 1000 to 30000 gal/min  | 7500 gal/min  | 75 gal                        | 120 gal/min                |
| 24"                                   | 600  | 1400 to 44000 gal/min  | 10500 gal/min                                       | 100 gal                       | 180 gal/min                |
| 28"                                   | 700  | 1900 to 60000 gal/min  | 13500 gal/min                                       | 125 gal                       | 210 gal/min                |
| 30"                                   | –    | 2150 to 67000 gal/min  | 16500 gal/min                                       | 150 gal                       | 270 gal/min                |
| 32"                                   | 800  | 2450 to 80000 gal/min  | 19500 gal/min                                       | 200 gal                       | 300 gal/min                |
| 36"                                   | 900  | 3100 to 100000 gal/min   | 24000 gal/min                                       | 225 gal                       | 360 gal/min                |
| 40"                                   | 1000 | 3800 to 125000 gal/min   | 30000 gal/min                                       | 250 gal                       | 480 gal/min                |
| 42"                                   | –    | 4200 to 135000 gal/min   | 33000 gal/min                                       | 250 gal                       | 600 gal/min                |
| 48"                                   | 1200 | 5500 to 175000 gal/min   | 42000 gal/min                                       | 400 gal                       | 600 gal/min                |
| 54"                                   | –    | 9 to 300 Mgal/min  | 75 Mgal/min   | 0.0005 Mgal                   | 1.3 Mgal/min               |
| –                                     | 1400 | 10 to 340 Mgal/min   | 85 Mgal/min   | 0.0005 Mgal                   | 1.3 Mgal/min               |
| 60"                                   | –    | 12 to 380 Mgal/min   | 95 Mgal/min   | 0.0005 Mgal                   | 1.3 Mgal/min               |
| –                                     | 1600 | 13 to 450 Mgal/min   | 110 Mgal/min  | 0.0008 Mgal                   | 1.7 Mgal/min               |
| 66"                                   | –    | 14 to 500 Mgal/min   | 120 Mgal/min  | 0.0008 Mgal                   | 2.2 Mgal/min               |
| 72"                                   | 1800 | 16 to 570 Mgal/min   | 140 Mgal/min  | 0.0008 Mgal                   | 2.6 Mgal/min               |
| 78"                                   | –    | 18 to 650 Mgal/min   | 175 Mgal/min  | 0.001 Mgal                    | 3.0 Mgal/min               |
| –                                     | 2000 | 20 to 700 Mgal/min   | 175 Mgal/min  | 0.001 Mgal                    | 3.0 Mgal/min               |

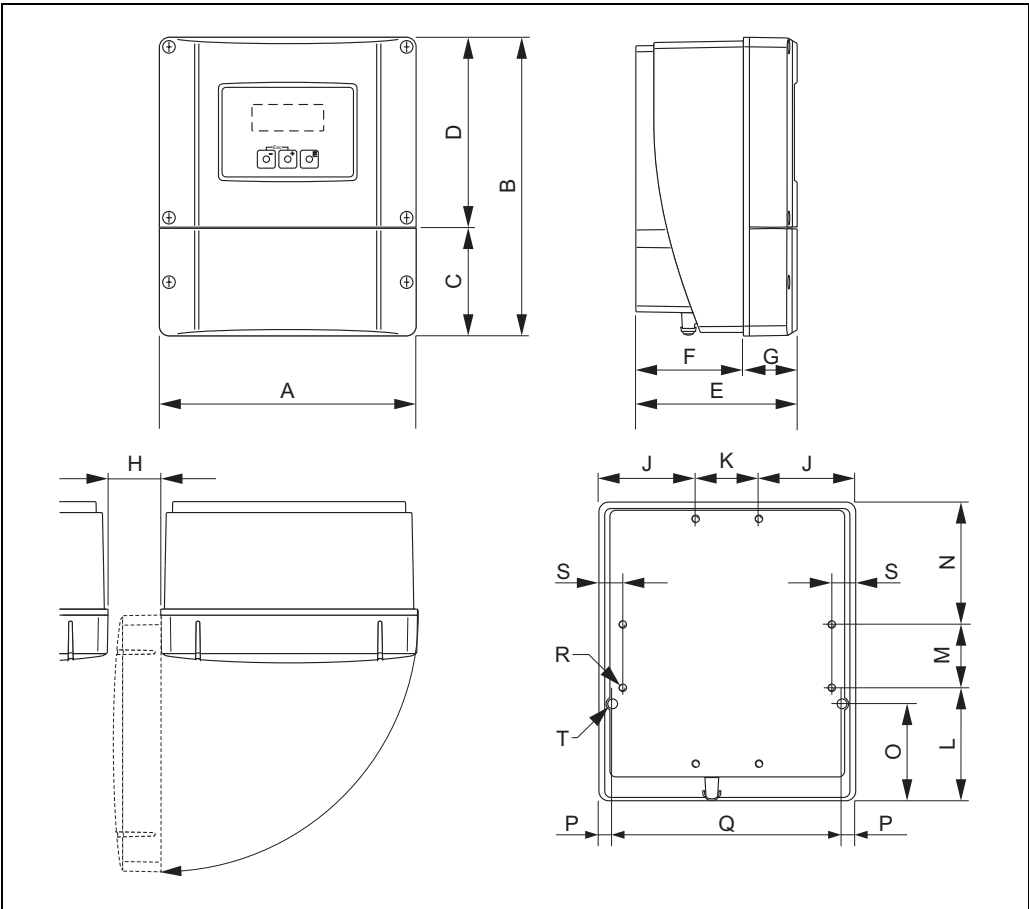
**Pressure loss**

- No pressure loss if the sensor is installed in a pipe with the same nominal diameter.
- Pressure losses for configurations incorporating adapters according to DIN EN 545 (→  18, Section "Adapters").

# Mechanical construction

Design, dimensions

Transmitter remote version, wall-mount housing (non Ex-zone and II3G/Zone 2)



A0001150

Dimensions (SI units)

| A   | B   | C    | D     | E    | F    | G   | H      | J  |
|-----|-----|------|-------|------|------|-----|--------|----|
| 215 | 250 | 90.5 | 159.5 | 135  | 90   | 45  | > 50   | 81 |
| K   | L   | M    | N     | O    | P    | Q   | R      | S  |
| 53  | 95  | 53   | 102   | 81.5 | 11.5 | 192 | 8 × M5 | 20 |

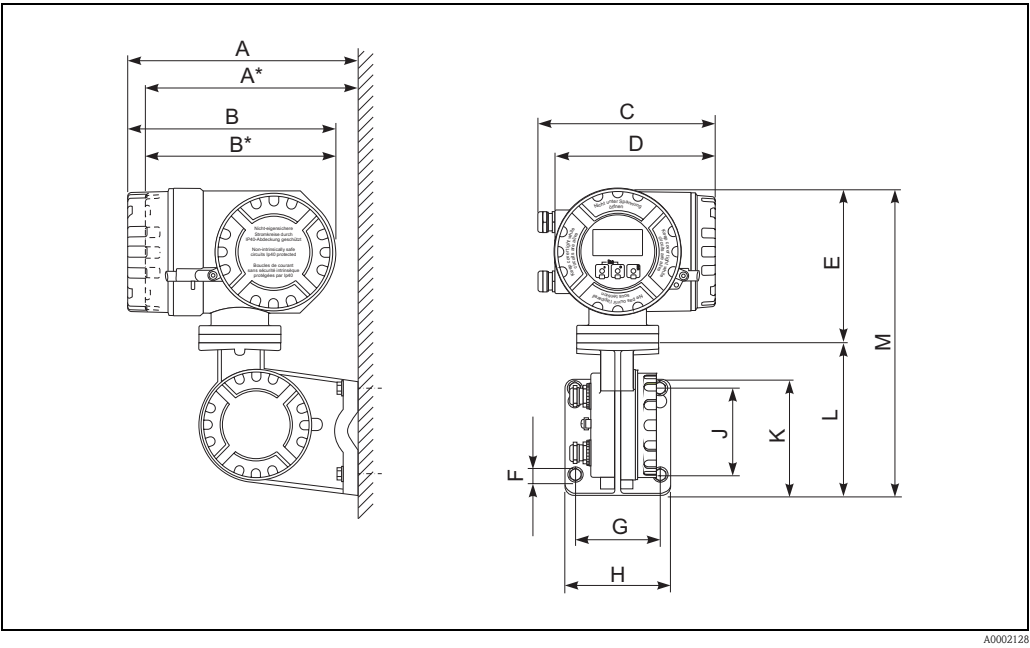
All dimensions in [mm]

Dimensions (US units)

| A    | B    | C    | D    | E    | F    | G    | H      | J    |
|------|------|------|------|------|------|------|--------|------|
| 8.46 | 9.84 | 3.56 | 6.27 | 5.31 | 3.54 | 1.77 | > 1.97 | 3.18 |
| K    | L    | M    | N    | O    | P    | Q    | R      | S    |
| 2.08 | 3.74 | 2.08 | 4.01 | 3.20 | 0.45 | 7.55 | 8 × M5 | 0.79 |

All dimensions in [inch]

Transmitter remote version, connection housing (II2GD/Zone 1)



Dimensions (SI units)

| A   | A*  | B   | B*  | C   | D   | E   | Ø F         | G   | H   | J   | K   | L   | M   |
|-----|-----|-----|-----|-----|-----|-----|-------------|-----|-----|-----|-----|-----|-----|
| 265 | 242 | 240 | 217 | 206 | 186 | 178 | 8.6<br>(M8) | 100 | 130 | 100 | 144 | 170 | 355 |

All dimensions in [mm]

Dimensions (US units)

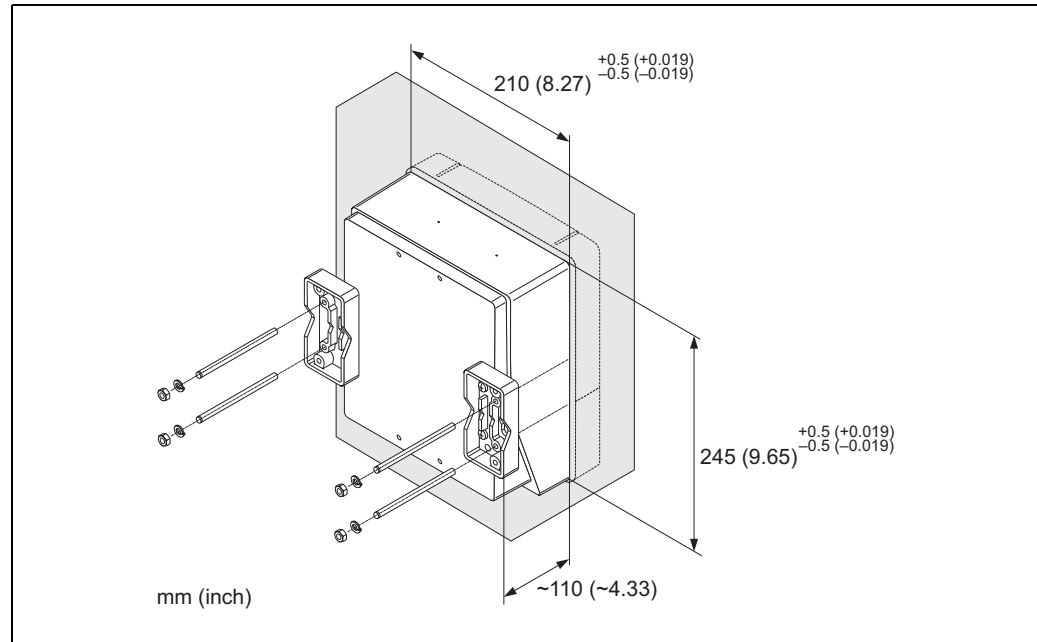
| A    | A*   | B    | B*   | C    | D    | E    | Ø F          | G    | H    | J    | K    | L    | M    |
|------|------|------|------|------|------|------|--------------|------|------|------|------|------|------|
| 10.4 | 9.53 | 9.45 | 8.54 | 8.11 | 7.32 | 7.01 | 0.34<br>(M8) | 3.94 | 5.12 | 3.94 | 5.67 | 6.69 | 14.0 |

All dimensions in [inch]

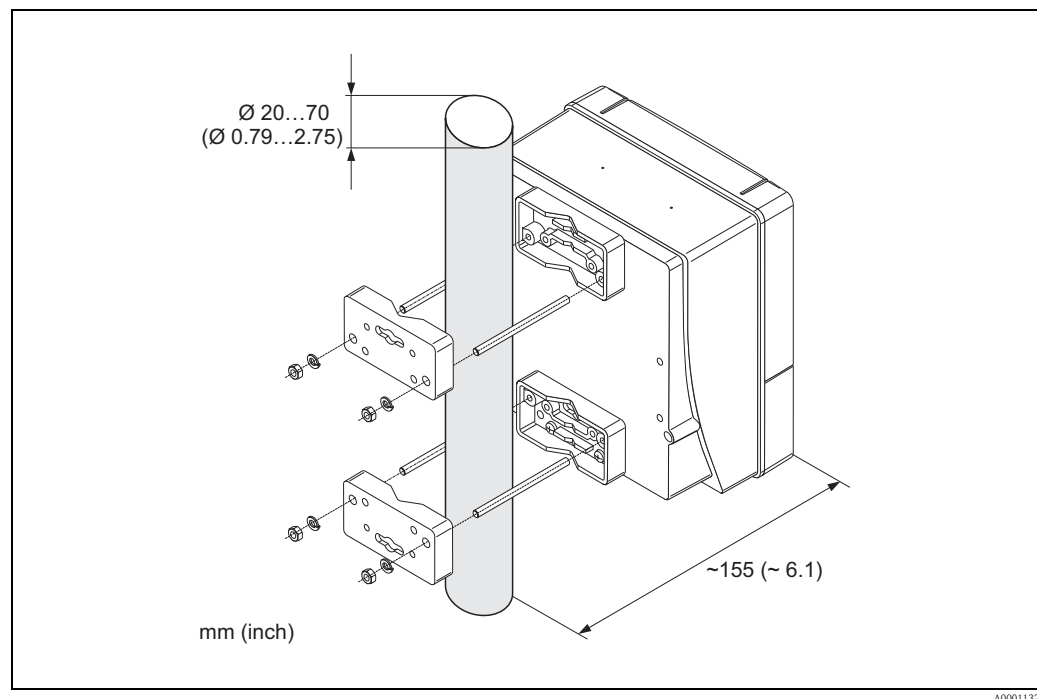
There is a separate mounting kit for the wall-mounted housing. It can be ordered from Endress+Hauser as an accessory. The following installation variants are possible:

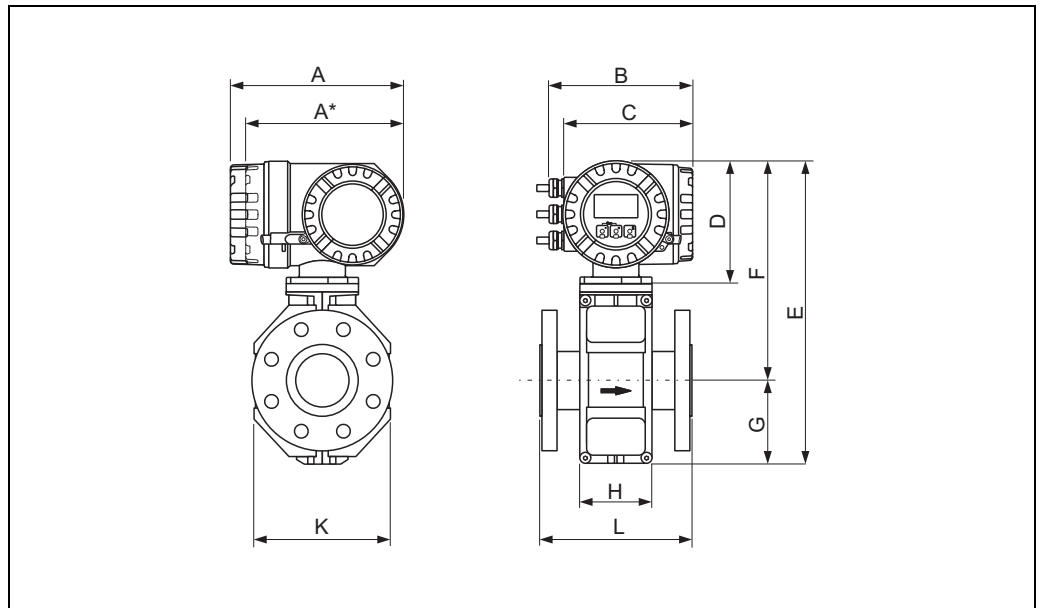
- Panel-mounted installation
- Pipe mounting

#### *Installation in control panel*



#### *Pipe mounting*



**Compact version DN ≤ 300 (12")**

A0005423

*Dimensions (SI units)*

| DN<br>EN (DIN) / JIS / AS <sup>2)</sup> | L <sup>1)</sup> | A   | A*  | B   | C   | D   | E   | F   | G   | H   | K   |
|---|-----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 25                                      | 200             | 227 | 207 | 187 | 168 | 160 | 341 | 257 | 84  | 94  | 120 |
| 32                                      | 200             |     |     |     |     |     | 341 | 257 | 84  | 94  | 120 |
| 40                                      | 200             |     |     |     |     |     | 341 | 257 | 84  | 94  | 120 |
| 50                                      | 200             |     |     |     |     |     | 341 | 257 | 84  | 94  | 120 |
| 65                                      | 200             |     |     |     |     |     | 391 | 282 | 109 | 94  | 180 |
| 80                                      | 200             |     |     |     |     |     | 391 | 282 | 109 | 94  | 180 |
| 100                                     | 250             |     |     |     |     |     | 391 | 282 | 109 | 94  | 180 |
| 125                                     | 250             |     |     |     |     |     | 472 | 322 | 150 | 140 | 260 |
| 150                                     | 300             |     |     |     |     |     | 472 | 322 | 150 | 140 | 260 |
| 200                                     | 350             |     |     |     |     |     | 527 | 347 | 180 | 156 | 324 |
| 250                                     | 450             |     |     |     |     |     | 577 | 372 | 205 | 166 | 400 |
| 300                                     | 500             |     |     |     |     |     | 627 | 397 | 230 | 166 | 460 |

<sup>1)</sup> The length is regardless of the pressure rating selected. Fitting length to DVGW.

<sup>2)</sup> For flanges to AS, only the nominal diameters DN 80, 100 and 150 to 300 are available.

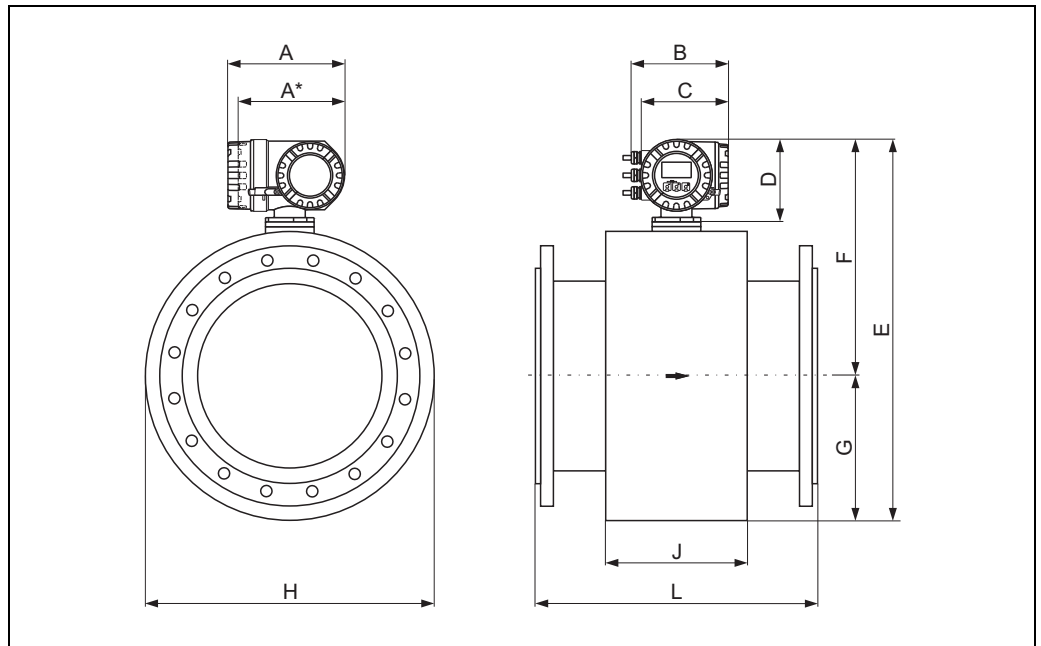
All dimensions in [mm]



*Dimensions (US units)*

| DN<br>ANSI | L <sup>1)</sup> | A    | A*   | B    | C    | D    | E    | F    | G    | H    | K    |
|------------|-----------------|------|------|------|------|------|------|------|------|------|------|
| 1"         | 7.87            | 8.94 | 8.15 | 7.36 | 6.61 | 6.30 | 13.4 | 10.1 | 3.31 | 3.70 | 4.72 |
| 1½"        | 7.87            |      |      |      |      |      | 13.4 | 10.1 | 3.31 | 3.70 | 4.72 |
| 2"         | 7.87            |      |      |      |      |      | 13.4 | 10.1 | 3.31 | 3.70 | 4.72 |
| 3"         | 7.87            |      |      |      |      |      | 15.4 | 11.1 | 4.29 | 3.70 | 7.09 |
| 4"         | 9.84            |      |      |      |      |      | 15.4 | 11.1 | 4.29 | 3.70 | 7.09 |
| 6"         | 11.8            |      |      |      |      |      | 18.6 | 12.7 | 5.91 | 5.51 | 10.2 |
| 8"         | 13.8            |      |      |      |      |      | 20.8 | 13.7 | 7.09 | 6.14 | 12.8 |
| 10"        | 17.7            |      |      |      |      |      | 22.7 | 14.7 | 8.07 | 6.14 | 15.8 |
| 12"        | 19.7            |      |      |      |      |      | 24.7 | 15.6 | 9.06 | 6.54 | 18.1 |

<sup>1)</sup> The length is regardless of the pressure rating selected. Fitting length to DVGW.  
All dimensions in [inch]

**Compact version DN  $\geq$  350 (14")**

A0005424

*Dimensions (SI units)*

| DN<br>EN (DIN) / AS <sup>2)</sup> | L <sup>1)</sup> | A   | A*  | B   | C   | D   | E      | F      | G      | H    | J    |
|-----------------------------------|-----------------|-----|-----|-----|-----|-----|--------|--------|--------|------|------|
| 350                               | 550             | 227 | 207 | 187 | 168 | 160 | 738.5  | 456.5  | 282.0  | 276  | 564  |
| 375                               | 600             |     |     |     |     |     | 790.5  | 482.5  | 308.0  | 276  | 616  |
| 400                               | 600             |     |     |     |     |     | 790.5  | 482.5  | 308.0  | 276  | 616  |
| 450                               | 650             |     |     |     |     |     | 840.5  | 507.5  | 333.0  | 292  | 666  |
| 500                               | 650             |     |     |     |     |     | 891.5  | 533.0  | 358.5  | 292  | 717  |
| 600                               | 780             |     |     |     |     |     | 995.5  | 585.0  | 410.5  | 402  | 821  |
| 700                               | 910             |     |     |     |     |     | 1198.5 | 686.5  | 512.0  | 589  | 1024 |
| 750                               | 975             |     |     |     |     |     | 1198.5 | 686.5  | 512.0  | 626  | 1024 |
| 800                               | 1040            |     |     |     |     |     | 1241.5 | 708.5  | 533.5  | 647  | 1067 |
| 900                               | 1170            |     |     |     |     |     | 1394.5 | 784.5  | 610.0  | 785  | 1220 |
| 1000                              | 1300            |     |     |     |     |     | 1546.5 | 860.5  | 686.0  | 862  | 1372 |
| 1050                              | 1365            |     |     |     |     |     | 1598.5 | 886.5  | 712.0  | 912  | 1424 |
| 1200                              | 1560            |     |     |     |     |     | 1796.5 | 985.5  | 811.0  | 992  | 1622 |
| 1350                              | 1755            |     |     |     |     |     | 1998.5 | 1086.5 | 912.0  | 1252 | 1824 |
| 1400                              | 1820            |     |     |     |     |     | 2148.5 | 1161.5 | 987.0  | 1252 | 1974 |
| 1500                              | 1950            |     |     |     |     |     | 2196.5 | 1185.5 | 1011.0 | 1392 | 2022 |
| 1600                              | 2080            |     |     |     |     |     | 2286.5 | 1230.5 | 1056.0 | 1482 | 2112 |
| 1650                              | 2145            |     |     |     |     |     | 2360.5 | 1267.5 | 1093.0 | 1482 | 2186 |
| 1800                              | 2340            |     |     |     |     |     | 2550.5 | 1362.5 | 1188.0 | 1632 | 2376 |
| 2000                              | 2600            |     |     |     |     |     | 2650.5 | 1412.5 | 1238.0 | 1732 | 2476 |

<sup>1)</sup> The length is regardless of the pressure rating selected. Fitting length to DVGW.<sup>2)</sup> For flanges to AS, only DN 350, 400, 500 and 600 are available.

All dimensions in [mm]

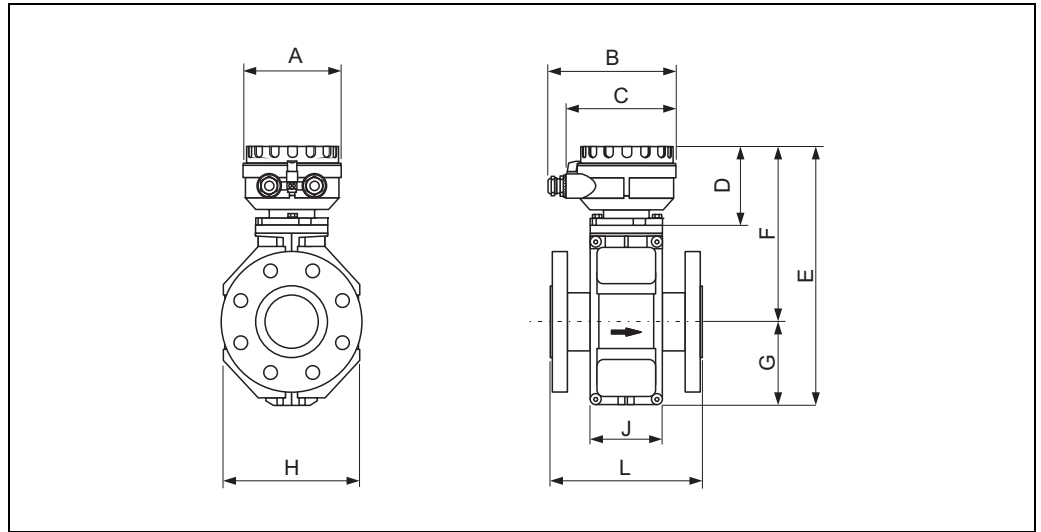
*Dimensions (US units)*

| DN<br>ANSI / AWWA <sup>2)</sup> | L <sup>1)</sup> | A    | A*   | B    | C    | D    | E     | F    | G    | H    | J    |
|---------------------------------|-----------------|------|------|------|------|------|-------|------|------|------|------|
| 14"                             | 21.6            | 8.94 | 8.15 | 7.36 | 6.61 | 6.30 | 29.1  | 17.9 | 11.1 | 10.9 | 22.2 |
| 15"                             | 23.6            |      |      |      |      |      | 31.1  | 18.9 | 12.1 | 10.9 | 24.2 |
| 16"                             | 23.6            |      |      |      |      |      | 31.1  | 18.9 | 12.1 | 10.9 | 24.2 |
| 18"                             | 25.6            |      |      |      |      |      | 33.1  | 19.9 | 13.1 | 11.5 | 26.2 |
| 20"                             | 25.6            |      |      |      |      |      | 35.1  | 20.9 | 14.1 | 11.5 | 28.2 |
| 24"                             | 30.7            |      |      |      |      |      | 39.2  | 23.0 | 16.2 | 15.8 | 32.3 |
| 28"                             | 35.8            |      |      |      |      |      | 47.2  | 27.0 | 20.1 | 23.2 | 40.3 |
| 30"                             | 38.4            |      |      |      |      |      | 47.2  | 27.0 | 20.1 | 24.6 | 40.3 |
| 32"                             | 40.9            |      |      |      |      |      | 48.9  | 27.9 | 21.0 | 25.5 | 42.0 |
| 36"                             | 46.0            |      |      |      |      |      | 54.9  | 30.9 | 24.0 | 30.9 | 48.0 |
| 40"                             | 51.2            |      |      |      |      |      | 60.9  | 33.9 | 27.0 | 33.9 | 54.0 |
| 42"                             | 53.7            |      |      |      |      |      | 62.9  | 34.9 | 28.0 | 35.9 | 56.0 |
| 48"                             | 61.4            |      |      |      |      |      | 71.7  | 38.8 | 31.9 | 39.0 | 63.8 |
| 54"                             | 69.1            |      |      |      |      |      | 78.7  | 42.8 | 35.9 | 42.3 | 71.8 |
| 56"                             | 71.7            |      |      |      |      |      | 84.6  | 45.7 | 38.9 | 49.3 | 77.7 |
| 60"                             | 76.8            |      |      |      |      |      | 86.5  | 46.7 | 39.8 | 54.8 | 79.6 |
| 64"                             | 81.9            |      |      |      |      |      | 90.0  | 48.4 | 41.6 | 58.4 | 83.2 |
| 66"                             | 84.4            |      |      |      |      |      | 92.9  | 49.9 | 43.0 | 58.4 | 86.0 |
| 72"                             | 92.1            |      |      |      |      |      | 100.4 | 53.6 | 46.8 | 64.2 | 93.5 |
| 78"                             | 102.3           |      |      |      |      |      | 104.3 | 55.6 | 48.7 | 68.2 | 97.5 |

<sup>1)</sup> The length is regardless of the pressure rating selected. Fitting length to DVGW.

<sup>2)</sup> Flanges ≤ 24" only to ANSI available, ≥ 28" only to AWWA available.

All dimensions in [inch]

**Sensor, remote version DN ≤ 300 (12")**

A0012462

*Dimensions (SI units)*

| DN<br>EN (DIN) / JIS / AS <sup>2)</sup> | L <sup>1)</sup> | A   | B   | C   | D   | E   | F   | G   | H   | J   |
|---|-----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 25                                      | 200             | 129 | 163 | 143 | 102 | 286 | 202 | 84  | 120 | 94  |
| 32                                      | 200             | 129 | 163 | 143 | 102 | 286 | 202 | 84  | 120 | 94  |
| 40                                      | 200             | 129 | 163 | 143 | 102 | 286 | 202 | 84  | 120 | 94  |
| 50                                      | 200             | 129 | 163 | 143 | 102 | 286 | 202 | 84  | 120 | 94  |
| 65                                      | 200             | 129 | 163 | 143 | 102 | 336 | 227 | 109 | 180 | 94  |
| 80                                      | 200             | 129 | 163 | 143 | 102 | 336 | 227 | 109 | 180 | 94  |
| 100                                     | 250             | 129 | 163 | 143 | 102 | 336 | 227 | 109 | 180 | 94  |
| 125                                     | 250             | 129 | 163 | 143 | 102 | 417 | 267 | 150 | 260 | 140 |
| 150                                     | 300             | 129 | 163 | 143 | 102 | 417 | 267 | 150 | 260 | 140 |
| 200                                     | 350             | 129 | 163 | 143 | 102 | 472 | 292 | 180 | 324 | 156 |
| 250                                     | 450             | 129 | 163 | 143 | 102 | 522 | 317 | 205 | 400 | 166 |
| 300                                     | 500             | 129 | 163 | 143 | 102 | 572 | 342 | 230 | 460 | 166 |

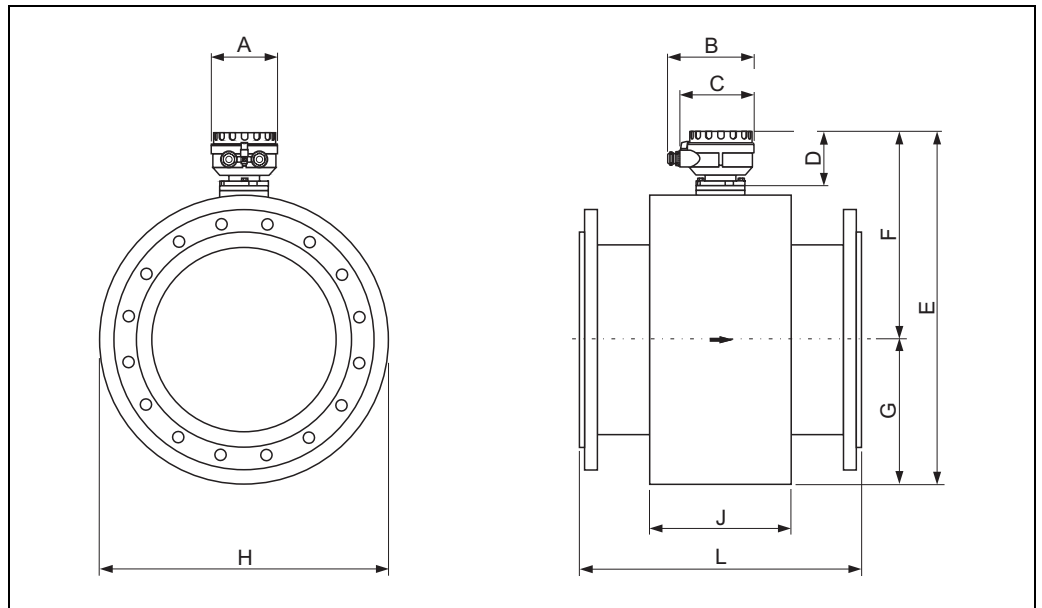
<sup>1)</sup> The length is regardless of the pressure rating selected. Fitting length to DVGW.

<sup>2)</sup> For flanges to AS, only the nominal diameters DN 80, 100 and 150 to 300 are available.  
All dimensions in [mm]

*Dimensions (US units)*

| DN<br>ANSI | L <sup>1)</sup> | A    | B    | C    | D    | E    | F    | G    | H    | J    |
|------------|-----------------|------|------|------|------|------|------|------|------|------|
| 1"         | 7.87            | 5.08 | 6.42 | 5.63 | 4.02 | 11.3 | 7.95 | 3.32 | 4.72 | 3.70 |
| 1½"        | 7.87            | 5.08 | 6.42 | 5.63 | 4.02 | 11.3 | 7.95 | 3.32 | 4.72 | 3.70 |
| 2"         | 7.87            | 5.08 | 6.42 | 5.63 | 4.02 | 11.3 | 7.95 | 3.32 | 4.72 | 3.70 |
| 3"         | 7.87            | 5.08 | 6.42 | 5.63 | 4.02 | 13.2 | 8.94 | 4.30 | 7.10 | 3.70 |
| 4"         | 9.84            | 5.08 | 6.42 | 5.63 | 4.02 | 13.2 | 8.94 | 4.30 | 7.10 | 3.70 |
| 6"         | 11.8            | 5.08 | 6.42 | 5.63 | 4.02 | 16.4 | 10.5 | 5.91 | 10.2 | 5.51 |
| 8"         | 13.8            | 5.08 | 6.42 | 5.63 | 4.02 | 18.6 | 11.5 | 7.10 | 12.8 | 6.14 |
| 10"        | 17.7            | 5.08 | 6.42 | 5.63 | 4.02 | 20.6 | 12.5 | 8.08 | 15.8 | 6.14 |
| 12"        | 19.7            | 5.08 | 6.42 | 5.63 | 4.02 | 22.5 | 13.5 | 9.06 | 18.1 | 6.54 |

<sup>1)</sup> The length is regardless of the pressure rating selected. Fitting length to DVGW.  
All dimensions in [inch]

**Sensor, remote version DN ≥ 350 (14")**

A0003220

*Dimensions (SI units)*

| DN<br>EN (DIN) / AS <sup>2)</sup> | L <sup>1)</sup> | A   | B   | C   | D   | E      | F      | G      | H    | J    |
|-----------------------------------|-----------------|-----|-----|-----|-----|--------|--------|--------|------|------|
| 350                               | 550             | 129 | 163 | 143 | 102 | 683.5  | 401.5  | 282.0  | 564  | 276  |
| 375                               | 600             |     |     |     |     | 735.5  | 427.5  | 308.0  | 616  | 276  |
| 400                               | 600             |     |     |     |     | 735.5  | 427.5  | 308.0  | 616  | 276  |
| 450                               | 650             |     |     |     |     | 785.5  | 452.5  | 333.0  | 666  | 292  |
| 500                               | 650             |     |     |     |     | 836.5  | 478.0  | 358.5  | 717  | 292  |
| 600                               | 780             |     |     |     |     | 940.5  | 530.0  | 410.5  | 821  | 402  |
| 700                               | 910             |     |     |     |     | 1143.5 | 631.5  | 512.0  | 1024 | 589  |
| 750                               | 975             |     |     |     |     | 1143.5 | 631.5  | 512.0  | 1024 | 626  |
| 800                               | 1040            |     |     |     |     | 1186.5 | 653.0  | 533.5  | 1067 | 647  |
| 900                               | 1170            |     |     |     |     | 1339.5 | 729.5  | 610.0  | 1220 | 785  |
| 1000                              | 1300            |     |     |     |     | 1491.5 | 805.5  | 686.0  | 1372 | 862  |
| 1050                              | 1365            |     |     |     |     | 1543.5 | 831.5  | 712.0  | 1424 | 912  |
| 1200                              | 1560            |     |     |     |     | 1741.5 | 930.5  | 811.0  | 1622 | 992  |
| 1350                              | 1755            |     |     |     |     | 1943.5 | 1031.5 | 912.0  | 1824 | 1252 |
| 1400                              | 1820            |     |     |     |     | 2093.5 | 1106.5 | 987.0  | 1974 | 1252 |
| 1500                              | 1950            |     |     |     |     | 2141.5 | 1130.5 | 1011.0 | 2022 | 1392 |
| 1600                              | 2080            | 129 | 163 | 143 | 102 | 2231.5 | 1175.5 | 1056.0 | 2112 | 1482 |
| 1650                              | 2145            |     |     |     |     | 2305.5 | 1212.5 | 1093.0 | 2186 | 1482 |
| 1800                              | 2340            |     |     |     |     | 2495.5 | 1307.5 | 1188.0 | 2376 | 1632 |
| 2000                              | 2600            |     |     |     |     | 2595.5 | 1357.5 | 1238.0 | 2476 | 1732 |

<sup>1)</sup> The length is regardless of the pressure rating selected. Fitting length to DVGW.

<sup>2)</sup> For flanges to AS, only DN 350, 400, 500 and 600 are available.

All dimensions in [mm]

*Dimensions (US units)*

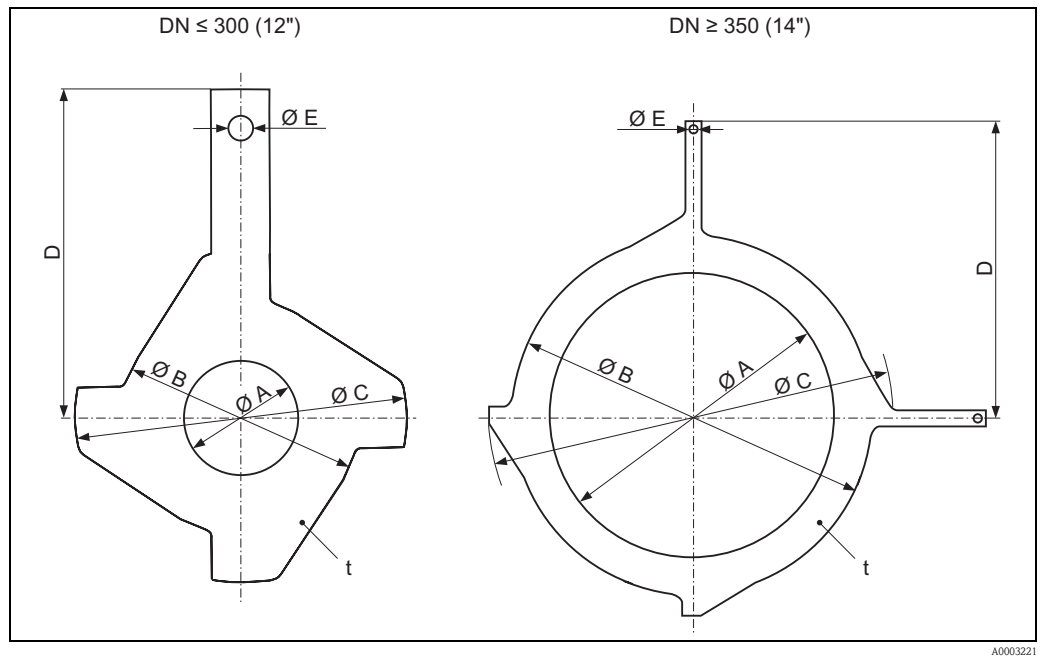
| DN<br>ANSI / AWWA <sup>2)</sup> | L <sup>1)</sup> | A    | B    | C    | D    | E     | F    | G    | H    | J    |
|---------------------------------|-----------------|------|------|------|------|-------|------|------|------|------|
| 14"                             | 21.6            | 5.08 | 6.42 | 5.63 | 4.02 | 29.1  | 15.8 | 11.1 | 22.2 | 10.9 |
| 15"                             | 23.6            |      |      |      |      | 31.1  | 16.8 | 12.1 | 24.2 | 10.9 |
| 16"                             | 23.6            |      |      |      |      | 31.1  | 16.8 | 12.1 | 24.2 | 10.9 |
| 18"                             | 25.6            |      |      |      |      | 33.1  | 17.8 | 13.1 | 26.2 | 11.5 |
| 20"                             | 25.6            |      |      |      |      | 35.1  | 18.8 | 14.1 | 28.2 | 11.5 |
| 24"                             | 30.7            |      |      |      |      | 39.2  | 20.9 | 16.2 | 32.3 | 15.8 |
| 28"                             | 35.8            |      |      |      |      | 45.0  | 24.9 | 20.1 | 40.3 | 23.2 |
| 30"                             | 38.4            |      |      |      |      | 45.0  | 24.9 | 20.1 | 40.3 | 24.6 |
| 32"                             | 40.9            |      |      |      |      | 46.7  | 25.7 | 21.0 | 42.0 | 25.5 |
| 36"                             | 46.0            |      |      |      |      | 52.7  | 28.7 | 24.0 | 48.0 | 30.9 |
| 40"                             | 51.2            |      |      |      |      | 58.7  | 31.7 | 27.0 | 54.0 | 33.9 |
| 42"                             | 53.7            |      |      |      |      | 60.7  | 32.7 | 28.0 | 56.0 | 35.9 |
| 48"                             | 61.4            |      |      |      |      | 68.5  | 36.6 | 31.9 | 63.8 | 39.0 |
| 54"                             | 69.1            |      |      |      |      | 76.5  | 40.6 | 35.9 | 71.8 | 42.3 |
| 56"                             | 71.7            |      |      |      |      | 82.4  | 43.6 | 38.9 | 77.7 | 49.3 |
| 60"                             | 76.8            |      |      |      |      | 84.3  | 44.5 | 39.8 | 79.6 | 54.8 |
| 64"                             | 81.9            |      |      |      |      | 87.9  | 46.3 | 41.6 | 83.2 | 58.4 |
| 66"                             | 84.4            |      |      |      |      | 90.8  | 47.7 | 43.0 | 86.0 | 58.4 |
| 72"                             | 92.1            |      |      |      |      | 98.2  | 51.5 | 46.8 | 93.5 | 64.2 |
| 78"                             | 102.3           |      |      |      |      | 102.2 | 53.4 | 48.7 | 97.5 | 68.2 |

<sup>1)</sup> The length is regardless of the pressure rating selected. Fitting length to DVGW.

<sup>2)</sup> Flanges ≤ 24" only to ANSI available, ≥ 28" only to AWWA available.

All dimensions in [inch]

## Ground disk for flange connections



A0003221

## Dimensions (SI units)

| DN <sup>1)</sup><br>EN (DIN) / JIS / AS <sup>2)</sup> | A   | B   | C     | D    | E   | t |
|---|-----|-----|-------|------|-----|---|
| 25  | 26  | 62  | 77.5  | 87.5 | 6.5 | 2 |
| 32  | 35  | 80  | 87.5  | 94.5 |     |   |
| 40  | 41  | 82  | 101   | 103  |     |   |
| 50  | 52  | 101 | 115.5 | 108  |     |   |
| 65  | 68  | 121 | 131.5 | 118  |     |   |
| 80  | 80  | 131 | 154.5 | 135  |     |   |
| 100   | 104 | 156 | 186.5 | 153  |     |   |
| 125   | 130 | 187 | 206.5 | 160  |     |   |
| 150   | 158 | 217 | 256   | 184  |     |   |
| 200   | 206 | 267 | 288   | 205  |     |   |
| 250   | 260 | 328 | 359   | 240  |     |   |
| 300 <sup>3)</sup>                                     | 312 | 375 | 413   | 273  |     |   |
| 300 <sup>4)</sup>                                     | 310 | 375 | 404   | 268  | 9.0 |   |
| 350 <sup>3)</sup>                                     | 343 | 433 | 479   | 365  |     |   |
| 375 <sup>3)</sup>                                     | 393 | 480 | 542   | 395  |     |   |
| 400 <sup>3)</sup>                                     | 393 | 480 | 542   | 395  |     |   |
| 450 <sup>3)</sup>                                     | 439 | 538 | 583   | 417  |     |   |
| 500 <sup>3)</sup>                                     | 493 | 592 | 650   | 460  |     |   |
| 600 <sup>3)</sup>                                     | 593 | 693 | 766   | 522  |     |   |

<sup>1)</sup> Ground disks can be used for all flange standards/pressure ratings that can be delivered, except for DN ≥ 300.

<sup>2)</sup> Only DN 32, 40, 65 and 125 are available for flanges according to AS.

<sup>3)</sup> PN 10/16

<sup>4)</sup> PN 25, JIS 10K/20K

All dimensions in [mm]



*Dimensions (US units)*

| DN <sup>1)</sup><br>ANSI | A     | B    | C     | D    | E    | t    |
|--------------------------|-------|------|-------|------|------|------|
| 1"                       | 1.02  | 2.44 | 3.05  | 3.44 | 0.26 | 0.08 |
| 1½"                      | 1.61  | 3.23 | 3.98  | 4.06 |      |      |
| 2"                       | 2.05  | 3.98 | 4.55  | 4.25 |      |      |
| 3"                       | 3.15  | 5.16 | 6.08  | 5.31 |      |      |
| 4"                       | 4.09  | 6.14 | 7.34  | 6.02 |      |      |
| 6"                       | 6.22  | 8.54 | 10.08 | 7.24 |      |      |
| 8"                       | 8.11  | 10.5 | 11.3  | 8.07 |      |      |
| 10"                      | 10.2  | 12.9 | 14.1  | 9.45 |      |      |
| 12"                      | 12.3  | 14.8 | 16.3  | 10.8 |      |      |
| 14"                      | 13.5  | 17.1 | 18.9  | 14.4 | 0.35 |      |
| 15"                      | 15.45 | 18.9 | 21.3  | 15.6 |      |      |
| 16"                      | 15.45 | 18.9 | 21.3  | 15.6 |      |      |
| 18"                      | 17.3  | 21.2 | 23.0  | 16.4 |      |      |
| 20"                      | 19.4  | 23.3 | 25.6  | 18.1 |      |      |
| 24"                      | 23.4  | 27.3 | 30.1  | 20.6 |      |      |

<sup>1)</sup> Ground disks can be used for all flange standards/pressure ratings.  
All dimensions in [inch]

**Weight***Weight in SI units*

| Weight data in kg |        |                             |      |             |                                |        |             |             |                    |
|-------------------|--------|-----------------------------|------|-------------|--------------------------------|--------|-------------|-------------|--------------------|
| Nominal diameter  |        | Compact version             |      |             | Remote version (without cable) |        |             |             |                    |
| [mm]              | [inch] | EN (DIN) / AS <sup>1)</sup> | JIS  | ANSI / AWWA | EN (DIN) / AS <sup>1)</sup>    | Sensor | ANSI / AWWA | Transmitter | Wall-mount housing |
|                   |        |                             |      |             |                                | JIS    |             |             |                    |
| 25                | 1"     | PN 40                       | 7.3  | 7.3         | 7.3                            | PN 40  | 5.3         | 5.3         | 6.0                |
| 32                | –      |                             | 8.0  | 7.3         | –                              |        | 6.0         | 5.3         |                    |
| 40                | 1½"    |                             | 9.4  | 8.3         | 9.4                            |        | 7.4         | 6.3         |                    |
| 50                | 2"     |                             | 10.6 | 9.3         | 10.6                           |        | 8.6         | 7.3         |                    |
| 65                | –      | PN 16                       | 12   | 11.1        | –                              | PN 16  | 10.0        | 9.1         |                    |
| 80                | 3"     |                             | 14   | 112.5       | 14.0                           |        | 12.0        | 10.5        |                    |
| 100               | 4"     |                             | 16   | 14.7        | 16.0                           |        | 14.0        | 12.7        |                    |
| 125               | –      |                             | 21.5 | 21.0        | –                              |        | 19.5        | 19.0        |                    |
| 150               | 6"     | PN 10                       | 25.5 | 24.5        | 25.5                           | PN 10  | 23.5        | 22.5        |                    |
| 200               | 8"     |                             | 45   | 41.9        | 45                             |        | 43          | 39.9        |                    |
| 250               | 10"    |                             | 65   | 69.4        | 75                             |        | 63          | 67.4        |                    |
| 300               | 12"    |                             | 70   | 72.3        | 110                            |        | 68          | 70.3        |                    |
| 350               | 14"    | PN 6                        | 105  | Class D     | 175                            | PN 6   | 103         | 173         |                    |
| 375               | 15"    |                             | 120  |             | –                              |        | 118         | –           |                    |
| 400               | 16"    |                             | 120  |             | 205                            |        | 118         | 203         |                    |
| 450               | 18"    |                             | 161  |             | 255                            |        | 159         | 253         |                    |
| 500               | 20"    |                             | 156  |             | 285                            |        | 154         | 283         |                    |
| 600               | 24"    |                             | 208  |             | 405                            |        | 206         | 403         |                    |
| 700               | 28"    |                             | 304  |             | 400                            |        | 302         | 398         |                    |
| –                 | 30"    |                             | –    |             | 460                            |        | –           | 458         |                    |
| 800               | 32"    |                             | 357  |             | 550                            |        | 355         | 548         |                    |
| 900               | 36"    |                             | 485  |             | 800                            |        | 483         | 798         |                    |
| 1000              | 40"    |                             | 589  |             | 900                            |        | 587         | 898         |                    |
| –                 | 42"    |                             | –    |             | 1100                           |        | –           | 1098        |                    |
| 1200              | 48"    |                             | 850  |             | 1400                           |        | 848         | 1398        |                    |
| –                 | 54"    |                             | –    |             | 2200                           |        | –           | 2198        |                    |
| 1400              | –      |                             | 1300 |             | –                              |        | 1298        | –           |                    |
| –                 | 60"    |                             | –    |             | 2700                           |        | –           | 2698        |                    |
| 1600              | –      |                             | 1700 |             | –                              |        | 1698        | –           |                    |
| –                 | 66"    |                             | –    |             | 3700                           |        | –           | 3698        |                    |
| 1800              | 72"    |                             | 2200 |             | 4100                           |        | 2198        | 4098        |                    |
| –                 | 78"    |                             | –    |             | 4600                           |        | –           | 4598        |                    |
| 2000              | –      |                             | 2800 |             | –                              |        | 2798        | –           |                    |

<sup>1)</sup> For flanges to AS, only DN 80, 100, 150 to 400, 500 and 600 are available.

- Transmitter (compact version): 3.4 kg
- Weight data valid for standard pressure ratings and without packaging material.

Weight in US units (only ANSI / AWWA)

| Weight data in lbs |        |                 |         |                                |                                   |
|--------------------|--------|-----------------|---------|--------------------------------|-----------------------------------|
| Nominal diameter   |        | Compact version |         | Remote version (without cable) |                                   |
| [mm]               | [inch] | ANSI / AWWA     |         | Sensor<br>ANSI / AWWA          | Transmitter<br>Wall-mount housing |
| 25                 | 1"     | Class 150       | 16.1    | Class 150                      | 13.2                              |
| 40                 | 1½"    |                 | 20.7    |                                |                                   |
| 50                 | 2"     |                 | 23.4    |                                |                                   |
| 80                 | 3"     |                 | 30.9    |                                |                                   |
| 100                | 4"     |                 | 35.3    |                                |                                   |
| 150                | 6"     |                 | 56.2    |                                |                                   |
| 200                | 8"     |                 | 99.2    |                                |                                   |
| 250                | 10"    |                 | 165.4   |                                |                                   |
| 300                | 12"    |                 | 242.6   |                                |                                   |
| 350                | 14"    |                 | 385.9   |                                |                                   |
| 400                | 16"    |                 | 452.0   |                                |                                   |
| 450                | 18"    |                 | 562.3   |                                |                                   |
| 500                | 20"    |                 | 628.4   |                                |                                   |
| 600                | 24"    |                 | 893.0   |                                |                                   |
| 700                | 28"    | Class D         | 882.0   | Class D                        |                                   |
| –                  | 30"    |                 | 1014.3  |                                |                                   |
| 800                | 32"    |                 | 1212.8  |                                |                                   |
| 900                | 36"    |                 | 1764.0  |                                |                                   |
| 1000               | 40"    |                 | 1984.5  |                                |                                   |
| –                  | 42"    |                 | 2425.5  |                                |                                   |
| 1200               | 48"    |                 | 3087.0  |                                |                                   |
| –                  | 54"    |                 | 4851.0  |                                |                                   |
| –                  | 60"    |                 | 5953.5  |                                |                                   |
| –                  | 66"    |                 | 8158.5  |                                |                                   |
| 1800               | 72"    |                 | 9040.5  |                                |                                   |
| –                  | 78"    |                 | 10143.0 |                                |                                   |

- Transmitter (compact version): 7,5 lbs
- Weight data valid for standard pressure ratings and without packaging material.

## Measuring tube specifications

| Diameter |        | EN (DIN)<br>[bar] | Pressure rating |         |               |         |      | Internal diameter |        |              |        |
|----------|--------|-------------------|-----------------|---------|---------------|---------|------|-------------------|--------|--------------|--------|
| [mm]     | [inch] |                   | AS 2129         | AS 4087 | ANSI<br>[lbs] | AWWA    | JIS  | Hard rubber       |        | Polyurethane |        |
|          |        |                   |                 |         |               |         |      | [mm]              | [inch] | [mm]         | [inch] |
| 25       | 1"     | PN 40             | —               | —       | Cl. 150       | —       | 20 K | —                 | —      | 24           | 0.94   |
| 32       | —      | PN 40             | —               | —       | —             | —       | 20 K | —                 | —      | 32           | 1.26   |
| 40       | 1½"    | PN 40             | —               | —       | Cl. 150       | —       | 20 K | —                 | —      | 38           | 1.50   |
| 50       | 2"     | PN 40             | Table E         | PN 16   | Cl. 150       | —       | 10 K | 50                | 1.97   | 50           | 1.97   |
| 65       | —      | PN 16             | —               | —       | —             | —       | 10 K | 66                | 2.60   | 66           | 2.60   |
| 80       | 3"     | PN 16             | Table E         | PN 16   | Cl. 150       | —       | 10 K | 79                | 3.11   | 79           | 3.11   |
| 100      | 4"     | PN 16             | Table E         | PN 16   | Cl. 150       | —       | 10 K | 102               | 4.02   | 102          | 4.02   |
| 125      | —      | PN 16             | —               | —       | —             | —       | 10 K | 127               | 5.00   | 127          | 5.00   |
| 150      | 6"     | PN 16             | Table E         | PN 16   | Cl. 150       | —       | 10 K | 156               | 6.14   | 156          | 6.14   |
| 200      | 8"     | PN 10             | Table E         | PN 16   | Cl. 150       | —       | 10 K | 204               | 8.03   | 204          | 8.03   |
| 250      | 10"    | PN 10             | Table E         | PN 16   | Cl. 150       | —       | 10 K | 258               | 10.2   | 258          | 10.2   |
| 300      | 12"    | PN 10             | Table E         | PN 16   | Cl. 150       | —       | 10 K | 309               | 12.2   | 309          | 12.2   |
| 350      | 14"    | PN 6              | Table E         | PN 16   | Cl. 150       | —       | —    | 342               | 13.5   | 342          | 13.5   |
| 375      | 15"    | —                 | —               | PN 16   | —             | —       | —    | 392               | 15.4   | —            | —      |
| 400      | 16"    | PN 6              | Table E         | PN 16   | Cl. 150       | —       | —    | 392               | 15.4   | 392          | 15.4   |
| 450      | 18"    | PN 6              | —               | —       | Cl. 150       | —       | —    | 437               | 17.2   | 437          | 17.2   |
| 500      | 20"    | PN 6              | Table E         | PN 16   | Cl. 150       | —       | —    | 492               | 19.4   | 492          | 19.4   |
| 600      | 24"    | PN 6              | Table E         | PN 16   | Cl. 150       | —       | —    | 594               | 23.4   | 594          | 23.4   |
| 700      | 28"    | PN 6              | —               | —       | —             | Class D | —    | 692               | 27.2   | 692          | 27.2   |
| —        | 30"    | —                 | —               | —       | —             | Class D | —    | 742               | 29.2   | 742          | 29.2   |
| 800      | 32"    | PN 6              | —               | —       | —             | Class D | —    | 794               | 31.3   | 794          | 31.3   |
| 900      | 36"    | PN 6              | —               | —       | —             | Class D | —    | 891               | 35.1   | 891          | 35.1   |
| 1000     | 40"    | PN 6              | —               | —       | —             | Class D | —    | 994               | 39.1   | 994          | 39.1   |
| —        | 42"    | —                 | —               | —       | —             | Class D | —    | 1043              | 41.1   | 1043         | 41.1   |
| 1200     | 48"    | PN 6              | —               | —       | —             | Class D | —    | 1197              | 47.1   | 1197         | 47.1   |
| —        | 54"    | —                 | —               | —       | —             | Class D | —    | 1339              | 52.7   | —            | —      |
| 1400     | —      | PN 6              | —               | —       | —             | —       | —    | 1402              | 55.2   | —            | —      |
| —        | 60"    | —                 | —               | —       | —             | Class D | —    | 1492              | 58.7   | —            | —      |
| 1600     | —      | PN 6              | —               | —       | —             | —       | —    | 1600              | 63.0   | —            | —      |
| —        | 66"    | —                 | —               | —       | —             | Class D | —    | 1638              | 64.5   | —            | —      |
| 1800     | 72"    | PN 6              | —               | —       | —             | Class D | —    | 1786              | 70.3   | —            | —      |
| 2000     | 78"    | PN 6              | —               | —       | —             | Class D | —    | 1989              | 78.3   | —            | —      |

**Material**

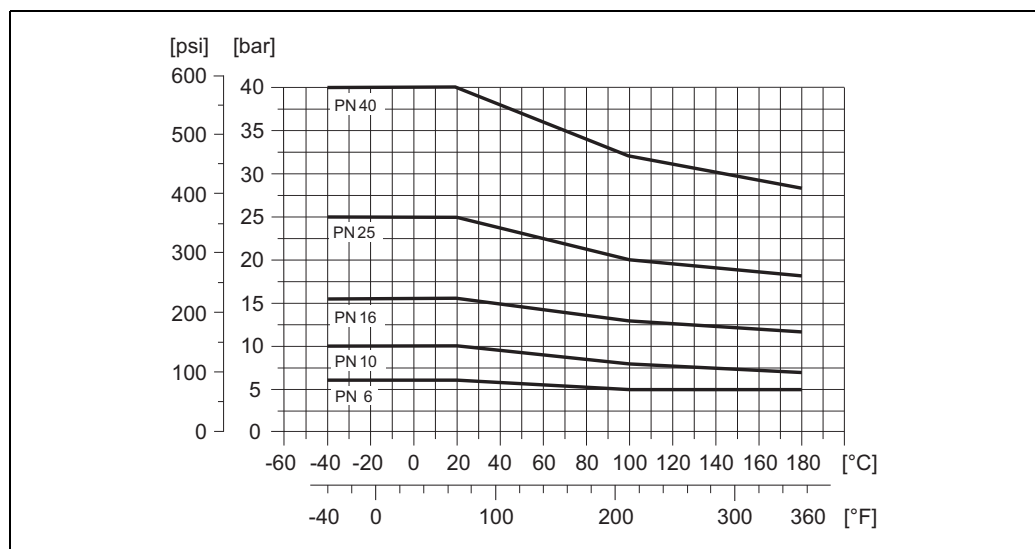
- Transmitter housing
  - Compact housing: powder-coated die-cast aluminum
  - Wall-mount housing: powder-coated die-cast aluminum
- Sensor housing
  - DN 25 to 300 (1 to 12"): powder-coated die-cast aluminum
  - DN 350 to 2000 (14 to 78"): with protective lacquering
- Measuring tube
  - DN ≤ 300 (12"): stainless steel 1.4301 or 1.4306/304L;  
(for flanges made of carbon steel with Al/Zn protective coating)
  - DN ≥ 350 (14"): stainless steel 1.4301 or 1.4306/304L;  
(for flanges made of carbon steel with Al/Zn protective coating)
- Electrodes: 1.4435, Alloy C-22, Tantalum
- Flanges
  - EN 1092-1 (DIN 2501): 1.4571/316L; RSt37-2 (S235JRG2); C22; FE 410W B  
(DN ≤ 300 (12"): with Al/Zn protective coating; DN ≥ 350 (14") with protective lacquering)
  - ANSI: A105; F316L  
(DN ≤ 300 (12"): with Al/Zn protective coating; DN ≥ 350 (14") with protective lacquering)
  - AWWA: 1.0425
  - JIS: RSt37-2 (S235JRG2); HII; 1.0425/316L  
(DN ≤ 300 (12"): with Al/Zn protective coating; DN ≥ 350 (14") with protective lacquering)
  - AS 2129
    - DN 150 to 300, 600 (6 to 12", 24"): A105 or RSt37-2 (S235JRG2)
    - DN 50, 80, 100, 350, 400, 500 (2", 3", 4", 14", 16", 20"): A105 or St44-2 (S275JR)
  - AS 4087: A105 or St44-2 (S275JR)
- Seals: to DIN EN 1514-1
- Ground disks: 1.4435/316L, Alloy C-22, Tantalum

**Material load diagram****Caution!**

The following diagrams contain material load diagrams (reference curves) for flange materials with regard to the medium temperature. However, the maximum medium temperatures permitted always depend on the lining material of the sensor and/or the sealing material (→ 21).

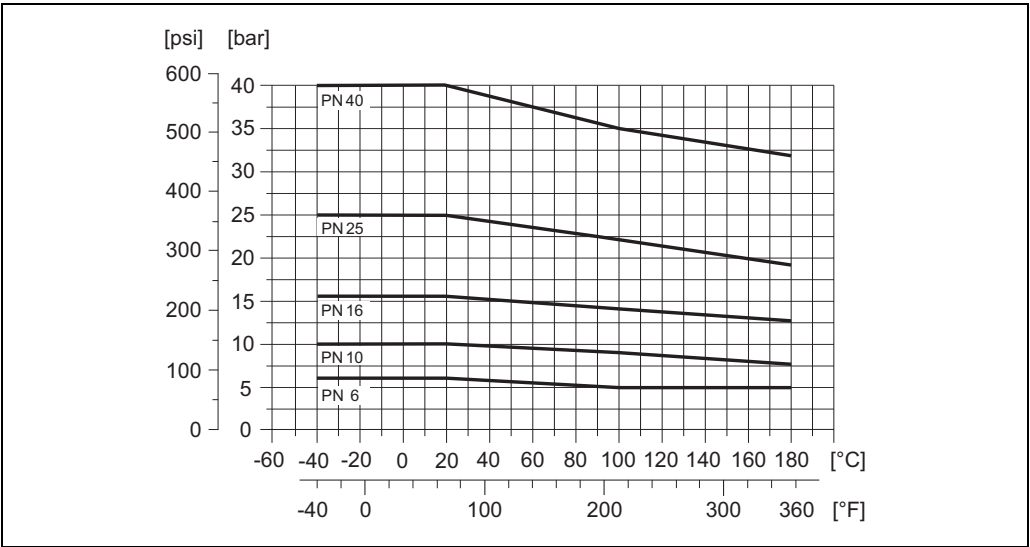
**Flange connection to EN 1092-1 (DIN 2501)**

Material: RSt37-2 (S235JRG2) / C22 / Fe 410W B



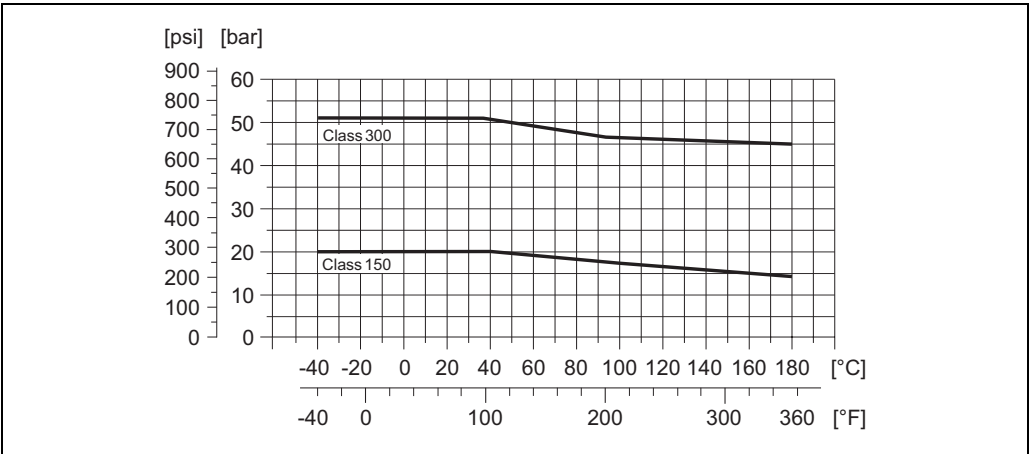
A0005594

**Flange connection to EN 1092-1 (DIN 2501)**  
Material: 316L / 1.4571



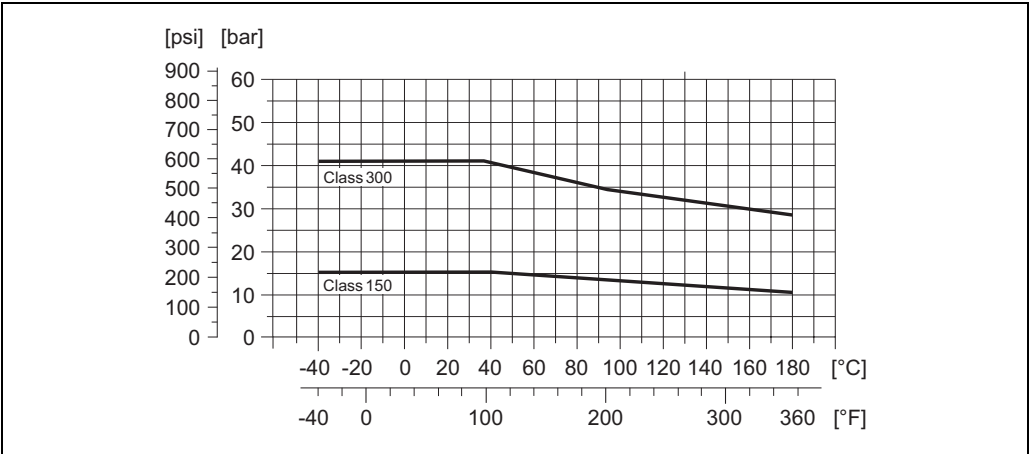
A0005304

**Flange connection to ANSI B16.5**  
Material: A 105



A0005326

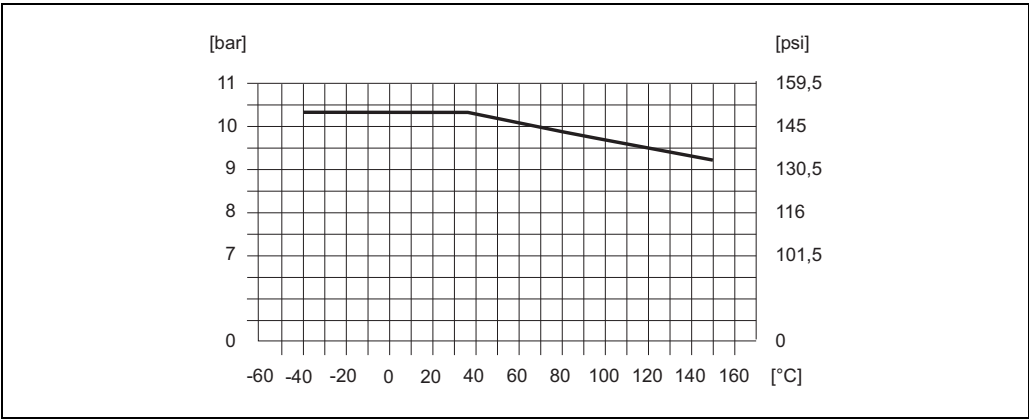
**Flange connection to ANSI B16.5**  
Material: F316L



A0005307

Flange connection to AWWA C 207, Class D

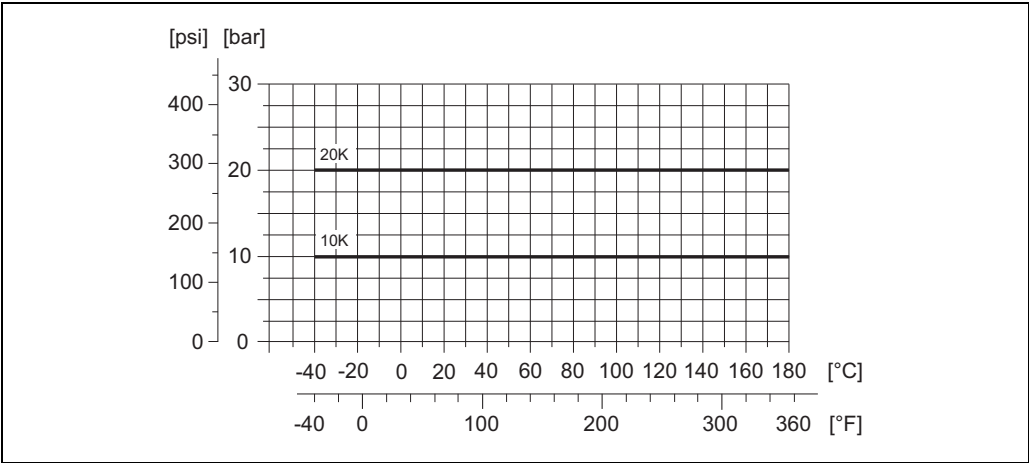
Material: 1.0425



A0005592

Flange connection to JIS B2220

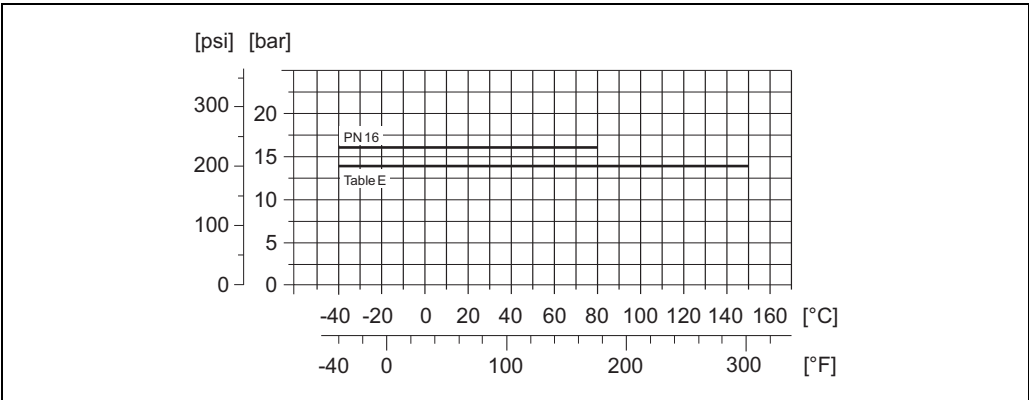
Material: RSt37-2 (S235JRG2) / HII / 1.0425 / 316L



A0003228

Flange connection to AS 2129 Table E or AS 4087 PN 16

Material: A105 / RSt37-2 (S235JRG2) / St44-2 (S275JR)



A0005595

|                            |  |
|----------------------------|--|
| <b>Fitted electrodes</b>   | <p>Measuring electrodes, reference electrodes and empty pipe detection electrodes:</p> <ul style="list-style-type: none"> <li>■ Standard available with 1.4435, Alloy C-22, tantalum</li> <li>■ Optional: exchangeable measuring electrodes made of 1.4435 (DN 350 to 2000 / 14 to 78")</li> </ul>   |
| <b>Process connections</b> | <p>Flange connection:</p> <ul style="list-style-type: none"> <li>■ EN 1092-1 (DIN 2501), DN ≤ 300 (12") form A, DN ≥ 350 (14") form B<br/>(Dimensions to DIN 2501, DN 65 PN 16 and DN 600 (24") PN 16 exclusively to EN 1092-1)</li> <li>■ ANSI B16.5</li> <li>■ AWWA C 207, Class D</li> <li>■ JIS B2220</li> <li>■ AS 2129 Table E</li> <li>■ AS 4087 PN 16</li> </ul> |
| <b>Surface roughness</b>   | <ul style="list-style-type: none"> <li>■ Elektroden <ul style="list-style-type: none"> <li>– 1.4435, Alloy C-22, tantal: ≤ 0.3 to 0.5 µm (≤ 11.8 to 19.7 µin)</li> </ul> </li> </ul> <p>(all data refer to parts in contact with medium)</p>   |



## Human interface

|                           |   |
|---------------------------|---|
| <b>Display elements</b>   | <ul style="list-style-type: none"> <li>■ Liquid crystal display: backlit, two lines (Promag 50) or four lines (Promag 53) with 16 characters per line</li> <li>■ Custom configurations for presenting different measured-value and status variables</li> <li>■ Totalizer               <ul style="list-style-type: none"> <li>– Promag 50: 2 totalizers</li> <li>– Promag 53: 3 totalizers</li> </ul> </li> </ul>   |
| <b>Operating elements</b> | <p>Unified operation concept for both types of transmitter:</p> <p>Promag 50:</p> <ul style="list-style-type: none"> <li>■ Local operation via three keys (◀, +, ▶)</li> <li>■ Quick Setup menus for straightforward commissioning</li> </ul> <p>Promag 53:</p> <ul style="list-style-type: none"> <li>■ Local operation via three keys (◀, +, ▶)</li> <li>■ Application-specific Quick Setup menus for straightforward commissioning</li> </ul>  |
| <b>Language groups</b>    | <p>Language groups available for operation in different countries:</p> <p>Promag 50, Promag 53:</p> <ul style="list-style-type: none"> <li>■ Western Europe and America (WEA):<br/>English, German, Spanish, Italian, French, Dutch, Portuguese</li> <li>■ Eastern Europe and Scandinavia (EES):<br/>English, Russian, Polish, Norwegian, Finnish, Swedish, Czech</li> <li>■ South and east Asia (SEA):<br/>English, Japanese, Indonesian</li> </ul> <p>Promag 53:</p> <ul style="list-style-type: none"> <li>■ China (CN):<br/>English, Chinese</li> </ul> <p>You can change the language group via the operating program "FieldCare".</p> |
| <b>Remote operation</b>   | <ul style="list-style-type: none"> <li>■ Promag 50: Remote control via HART, PROFIBUS DP/PA</li> <li>■ Promag 53: Remote control via HART, PROFIBUS DP/PA, MODBUS RS485, FOUNDATION Fieldbus</li> </ul>   |

## Certificates and approvals

|   |  |
|---|--|
| <b>CE mark</b>                            | The measuring system is in conformity with the statutory requirements of the EC Directives. Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.  |
| <b>C-tick mark</b>                        | The measuring system meets the EMC requirements of the "Australian Communications and Media Authority (ACMA)".   |
| <b>Pressure measuring device approval</b> | Measuring devices with a nominal diameter smaller than or equal to DN 25 correspond to Article 3(3) of the EC Directive 97/23/EC (Pressure Equipment Directive) and have been designed and manufactured according to good engineering practice. Where necessary (depending on the medium and process pressure), there are additional optional approvals to Category II/III for larger nominal diameters.   |
| <b>Ex approval</b>                        | Information about currently available Ex versions (ATEX, IECEx, FM, CSA, NEPSI) can be supplied by your Endress+Hauser Sales Center on request. All explosion protection data are given in a separate documentation which is available upon request.   |
| <b>Other standards and guidelines</b>     | <ul style="list-style-type: none"> <li>■ EN 60529<br/>Degrees of protection by housing (IP code)</li> <li>■ EN 61010<br/>Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures.</li> <li>■ IEC/EN 61326<br/>"Emission in accordance with requirements for Class A".<br/>Electromagnetic compatibility (EMC requirements)</li> <li>■ NAMUR NE 21:<br/>Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment.</li> <li>■ NAMUR NE 43:<br/>Standardization of the signal level for the breakdown information of digital transmitters with analog output signal.</li> <li>■ NAMUR NE 53:<br/>Software of field devices and signal-processing devices with digital electronics.</li> <li>■ ANSI/ISA-S82.01<br/>Safety Standard for Electrical and Electronic Test, Measuring, Controlling and related Equipment - General Requirements Pollution degree 2, Installation Category II.</li> <li>■ CAN/CSA-C22.2 No. 1010.1-92<br/>Safety requirements for Electrical Equipment for Measurement and Control and Laboratory Use.<br/>Pollution degree 2, Installation Category II</li> </ul> |
| <b>FOUNDATION Fieldbus certification</b>  | <p>The flow device has successfully passed all the test procedures carried out and is certified and registered by the Fieldbus Foundation. The device thus meets all the requirements of the following specifications:</p> <ul style="list-style-type: none"> <li>■ Certified to FOUNDATION Fieldbus Specification</li> <li>■ The device meets all the specifications of the FOUNDATION Fieldbus H1.</li> <li>■ Interoperability Test Kit (ITK), revision status 5.01 (device certification number: on request)</li> <li>■ The device can also be operated with certified devices of other manufacturers</li> <li>■ Physical Layer Conformance Test of the Fieldbus Foundation</li> </ul>  |
| <b>MODBUS RS485 certification</b>         | The measuring device meets all the requirements of the MODBUS/TCP conformity test and has the "MODBUS/TCP Conformance Test Policy, Version 2.0". The measuring device has successfully passed all the test procedures carried out and is certified by the "MODBUS/TCP Conformance Test Laboratory" of the University of Michigan.  |
| <b>PROFIBUS DP/PA certification</b>       | <p>The flow device has successfully passed all the test procedures carried out and is certified and registered by the PNO (PROFIBUS User Organisation). The device thus meets all the requirements of the following specifications:</p> <ul style="list-style-type: none"> <li>■ Certified to PROFIBUS PA, profile version 3.0 (device certification number: on request)</li> <li>■ The device can also be operated with certified devices of other manufacturers (interoperability)</li> </ul>  |

## Ordering information

Your Endress+Hauser service organization can provide detailed ordering information and information on the order codes on request.

## Accessories

Various accessories, which can be ordered separately from Endress+Hauser, are available for the transmitter and the sensor. Your Endress+Hauser service organization can provide detailed information on the order codes in question.

## Documentation

- Flow Measurement (FA005D/06)
- Operating Instructions Promag Promag 50 (BA046D/06 and BA049D/06)
- Operating Instructions Promag Promag 50 PROFIBUS PA (BA055D/06 and BA056D/06)
- Operating Instructions Promag Promag 53 (BA047D/06 and BA048D/06)
- Operating Instructions Promag Promag 53 FOUNDATION Fieldbus (BA051D/06 and BA052D/06)
- Operating Instructions Promag Promag 53 MODBUS RS485 (BA117D/06 and BA118D/06)
- Operating Instructions Promag Promag 53 PROFIBUS DP/PA (BA053D/06 and BA054D/06)
- Supplementary documentation on Ex-ratings: ATEX, IECEx, FM, CSA, NEPSI

## Registered trademarks

HART®

Registered trademark of the HART Communication Foundation, Austin, USA

PROFIBUS®

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FOUNDATION™ Fieldbus

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MODBUS®

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HistoROM™, S-DAT®, T-DAT™, F-CHIP®, FieldCare®, Fieldcheck®, FieldXpert™, Applicator®

Registered or registration-pending trademarks of Endress+Hauser Flowtec AG, Reinach, CH



---

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**Endress+Hauser**   
People for Process Automation

## **Appendix B - Chlorine dosing unit manual**

# Operating Instructions Manual

## ProMinent® gamma/ L Solenoid Metering Pump



GALA

Please enter ident code of the device here

**Please read the operating instructions through completely before commissioning this equipment! Do not discard!**  
**Any part which has been subject to misuse is excluded from the warranty!**


**Printing:**

Operating Instructions ProMinent® gamma/ L  
© ProMinent Dosiertechnik GmbH, 1999

**Address:**

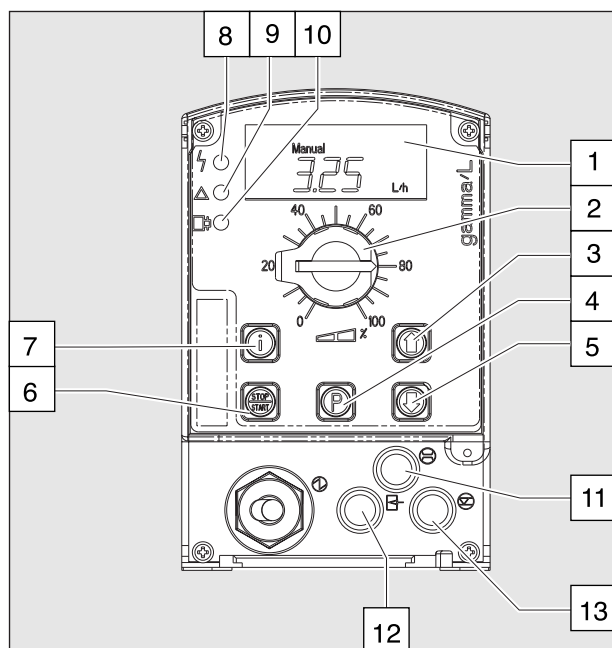
ProMinent Dosiertechnik GmbH  
Im Schuhmachergewann 5-11  
69123 Heidelberg  
Germany  
[info@prominent.com](mailto:info@prominent.com)  
[www.prominent.com](http://www.prominent.com)

Subject to technical alteration.

Please fold out this page! 



## Control elements: overview



- 1 LCD display
- 2 Stroke length adjusting knob
- 3 UP key
- 4 P key
- 5 DOWN key
- 6 STOP/START key
- 7 i key
- 8 Fault indicator (red)
- 9 Warning indicator (yellow)
- 10 Operating indicator (green)

- 11 "Dosing monitor" terminal
- 12 "External control" terminal
- 13 "Float switch" terminal

## Key functions

In continuous display mode  
(operating)In settings mode  
(settings)

## STOP/START key



Press briefly

Stop pump,  
start pumpStop pump,  
start pump

## P key



Press briefly

Start batch (in "batch" operating mode only),  
Cancel errorConfirm entry- jump to next menu  
option or continuous display

Press for 2 s

Change to settings mode

---

Press for 3 s

---

Jump to continuous display

Press for 10 s

Display software version

---

Press for 15 s

Load factory settings (calibration)

---

## Touche i



Press x1

Toggle between continuous displays

Toggle between "change individual digits"  
and change a figure"

Press x2

---

For "change individual digits":  
jumps to first digit

## Arrow keys UP and DOWN

Press x1  
(until "Set" appears)

Change directly alterable values

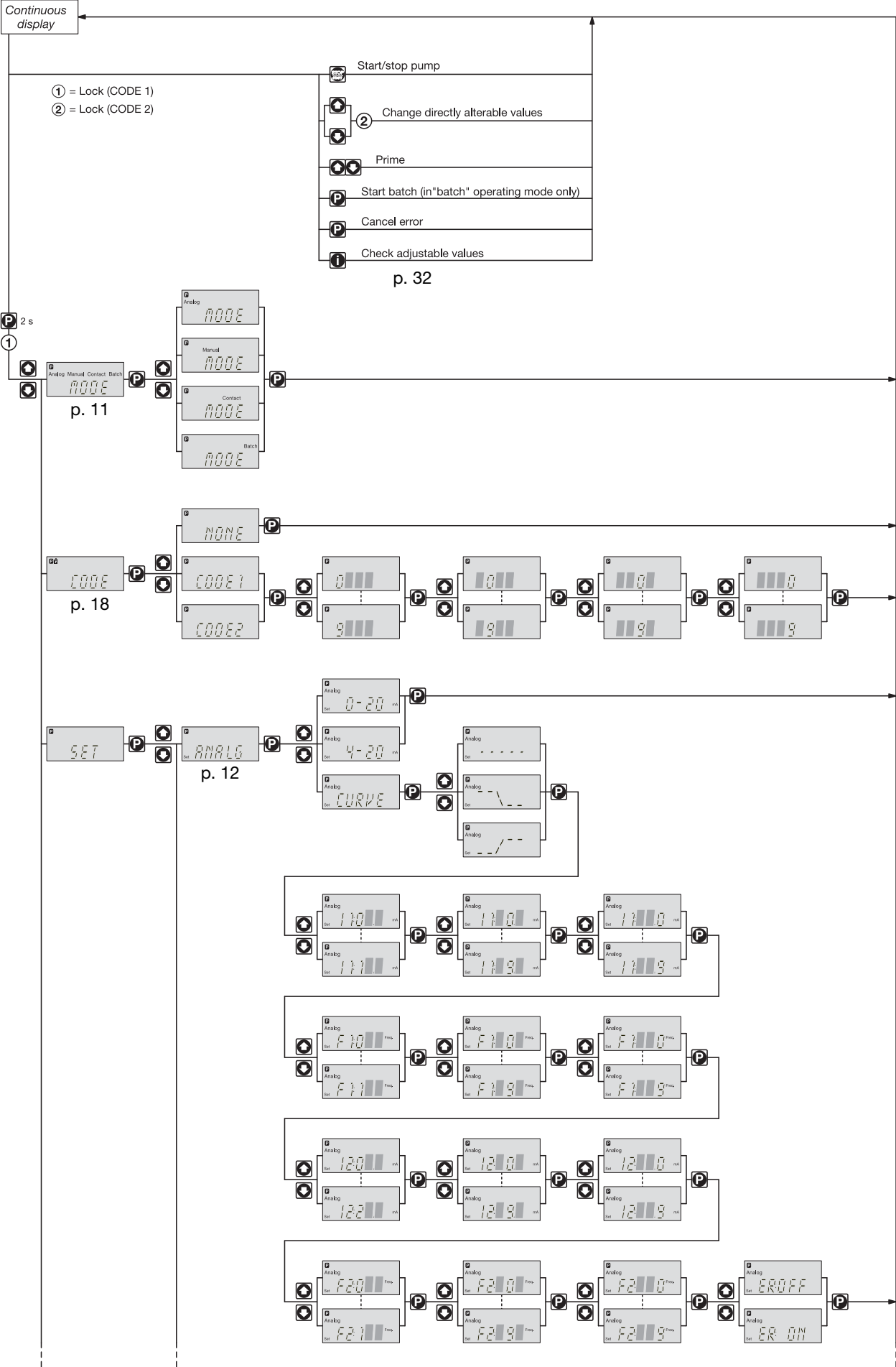
Select other settings,  
change individual digit or figure

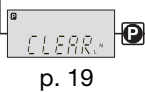
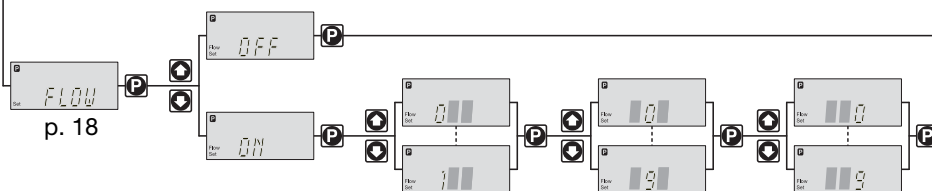
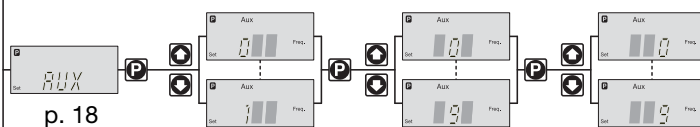
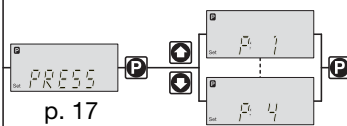
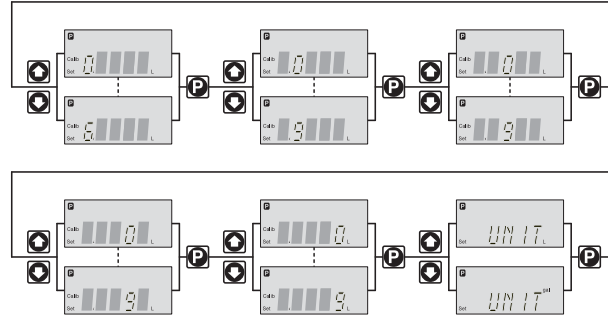
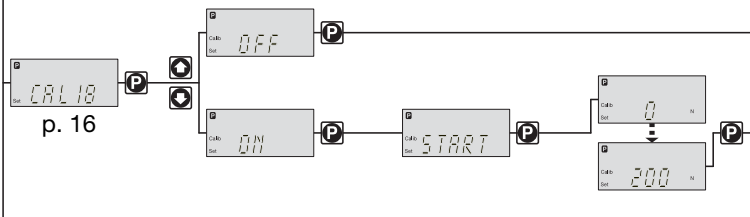
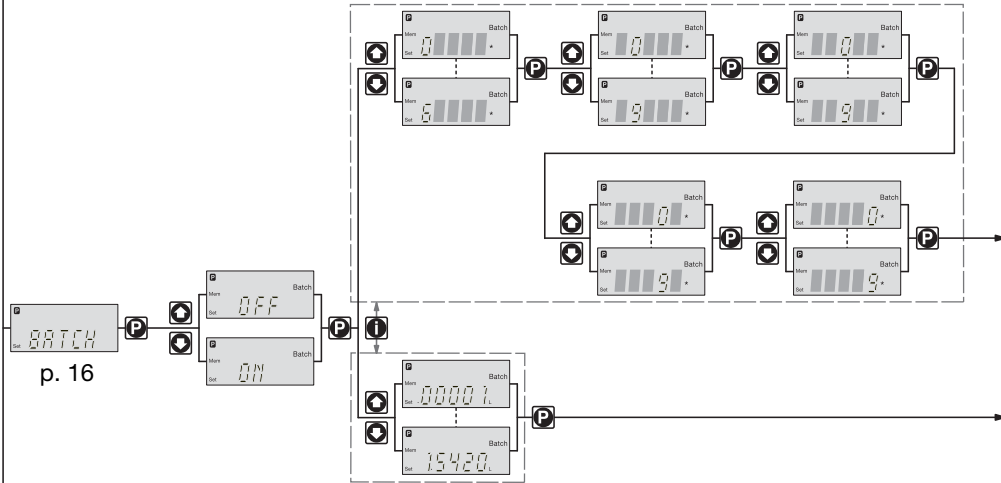
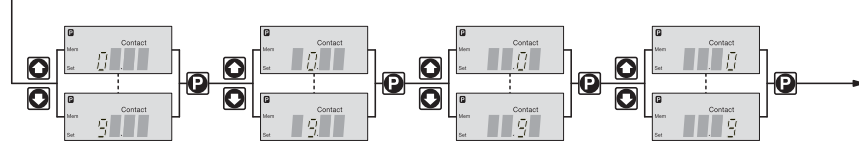
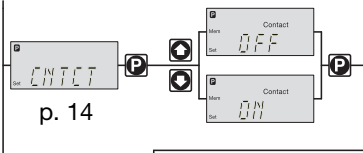
Press simultaneously

Prime

---

# Operating-/Settings Diagram





Continuous display

|                               | Operating mode "Analog" 0-20 mA  | Operating mode "Manual"  | Operating mode "Contact" with memory and transfer factor 5   | Operating mode "Batch" with memory and transfer factor 5   |
|-------------------------------|--|--|--|--|
| <div>Continuous display</div> |  |  |  |  |
| Stroke rate                   | <div><div>Stop Analog</div><div>180 <small>mm/s</small></div><div>1</div><div>Stop Analog</div><div>750 <small>L/h</small></div><div>1</div><div>Stop Analog</div><div>356 <small>N</small></div><div>1</div><div>Stop Analog</div><div>12368 <small>L</small></div><div>1</div><div>Stop Analog</div><div>EXT</div><div>1</div><div>Stop Analog</div><div>200 <small>mA</small></div><div>1</div><div>Stop Analog</div><div>65 <small>N</small></div><div>1</div></div> | <div><div>Stop Manual</div><div>180 <small>mm/s</small></div><div>1</div><div>Stop Manual</div><div>750 <small>L/h</small></div><div>1</div><div>Stop Manual</div><div>356 <small>N</small></div><div>1</div><div>Stop Manual</div><div>12368 <small>L</small></div><div>1</div><div>Stop Manual</div><div>EXT</div><div>1</div><div>Stop Manual</div><div>65 <small>N</small></div><div>1</div></div> | <div><div>Stop Contact</div><div>180 <small>mm/s</small></div><div>1</div><div>Stop Contact</div><div>356 <small>N</small></div><div>1</div><div>Stop Contact</div><div>12368 <small>L</small></div><div>1</div><div>Stop Contact</div><div>EXT</div><div>1</div><div>Stop Contact</div><div>500 <small>N</small></div><div>1</div><div>Stop Contact</div><div>65 <small>N</small></div><div>1</div></div> | <div><div>Stop Batch</div><div>180 <small>mm/s</small></div><div>1</div><div>Stop Batch</div><div>356 <small>N</small></div><div>1</div><div>Stop Batch</div><div>12368 <small>L</small></div><div>1</div><div>Stop Batch</div><div>EXT</div><div>1</div><div>Stop Batch</div><div>25 <small>mm/s</small></div><div>1</div><div>Stop Batch</div><div>00010 <small>L</small></div><div>1</div><div>Stop Batch</div><div>65 <small>N</small></div><div>1</div></div> |
| Feed rate                     |  |  |  |  |
| Total stroke number           |  |  |  |  |
| Total litres (feed quantity)  |  |  |  |  |
| "External" display            |  |  |  |  |
| Signal current                |  |  |  |  |
| Strokes remaining             |  |  |  |  |
| Batch size/ Litres remaining  |  |  |  |  |
| Factor                        |  |  |  |  |
| Stroke length                 |  |  |  |  |

= UP and/or DOWN arrow keys, directly alterable values

"Mem" appears only when "memory" function activated

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## Identcode

Please enter the identity code on the device label into the grey box below

| GALA                  |   | GALA Series gamma/ L, version a |  |
|-----------------------|---|---------------------------------|--|
| Type                  | Capacity<br>bar l/h   |                                 |  |
| 1000                  | 10 0.74   | Solenoid Ø 70/M70               |  |
| 1601                  | 16 1.1  |                                 |  |
| 1602                  | 16 2.1  |                                 |  |
| 1005                  | 10 4.4  |                                 |  |
| 0708                  | 7 7.1   |                                 |  |
| 0413                  | 4 12.3  |                                 |  |
| 0220                  | 2 19.0  | Solenoid Ø 85/M85               |  |
| 1605                  | 16 4.1  |                                 |  |
| 1008                  | 10 6.8  |                                 |  |
| 0713                  | 7 11.0  |                                 |  |
| 0420                  | 4 17.1  |                                 |  |
| 0232                  | 2 32.0  |                                 |  |
| Material version:     |   |                                 |  |
| PPE                   | Polypropylene/EPDM  |                                 |  |
| PPB                   | Polypropylene/FPM   |                                 |  |
| NPE                   | Acrylic glass/EPDM  |                                 |  |
| NPB                   | Acrylic glass/FPM   |                                 |  |
| PVT                   | PVDF/PTFE   |                                 |  |
| TTT                   | PTFE/PTFE   |                                 |  |
| SST                   | Stainless steel 1.4571/PTFE   |                                 |  |
| Liquid end version:   |   |                                 |  |
| 0                     | Non-bleed, no valve spring, for NP, TT and SS only  |                                 |  |
| 1                     | Non-bleed, with valve spring, for NP, TT and SS only                                      |                                 |  |
| 2                     | Bleed function, no valve spring for PP, NP, PV, not type 0232                             |                                 |  |
| 3                     | Bleed function, no valve spring for PP, NP, PV, not type 0232                             |                                 |  |
| 4                     | No-vent with valve springs for highly viscous media                                       |                                 |  |
| 9                     | Self bleed function, for PP, NP, not for type 1000 and 0232                               |                                 |  |
| Hydraulic connection: |   |                                 |  |
| 0                     | Standard connector as indicated in technical data   |                                 |  |
| 5                     | 12/6 hose connector, pressure side only   |                                 |  |
| 9                     | 10/4 hose connector, pressure side only   |                                 |  |
| Version:              |   |                                 |  |
| 0                     | With ProMinent® logo  |                                 |  |
| Power supply:         |   |                                 |  |
| U                     | 100 - 230 V, ±10 %, 50/60 Hz  |                                 |  |
| M                     | 12...24 V DC (only M 70)  |                                 |  |
| N                     | 24 V DC (only M 85)   |                                 |  |
| P                     | 24 V AC   |                                 |  |
| Cable and plug:       |   |                                 |  |
| A                     | 2 m Euro  |                                 |  |
| B                     | 2 m Swiss   |                                 |  |
| C                     | 2 m Australian  |                                 |  |
| D                     | 2 m USA   |                                 |  |
| 1                     | 2 m open end  |                                 |  |
| Relay:                |   |                                 |  |
| 0                     | No relay  |                                 |  |
| 1                     | Fault indicating relay, (N/C) changeover relay  |                                 |  |
| 3                     | Fault indicating relay, (N/O) changeover relay  |                                 |  |
| 4                     | As 1 + pacing relay, (1 input each)   |                                 |  |
| 5                     | As 3 + pacing relay, (1 input each)   |                                 |  |
| Accessories:          |   |                                 |  |
| 0                     | No accessories  |                                 |  |
| 1                     | Foot and dosing valve, 2 m PVC suction tube, 5 m PE discharge tubing, PP, PC, and NP only |                                 |  |
| 2                     | As 0 + calibrating cylinder   |                                 |  |
| 3                     | As 1 + calibrating cylinder   |                                 |  |
| Control variants:     |   |                                 |  |
| 0                     | Manual + external 1:1   |                                 |  |
| 1                     | Manual + external with pulse control  |                                 |  |
| 2                     | Manual + external 1:1 with analogue current   |                                 |  |
| 3                     | Manual + external with pulse control + analogue current                                   |                                 |  |
| 4                     | as 0 + timer  |                                 |  |
| 5                     | as 3 + timer  |                                 |  |
| P                     | as 3 + Profibus®  |                                 |  |
| Access code:          |   |                                 |  |
| 0                     | No access code  |                                 |  |
| 1                     | Access code   |                                 |  |
| Dosing monitoring:    |   |                                 |  |
| 0                     | Pulse input   |                                 |  |
| 1                     | Input for continuous contact  |                                 |  |
| Pause/level:          |   |                                 |  |
| 0                     | Pause N/C level N/C   |                                 |  |
| FPM = Fluorkautschuk  |   |                                 |  |

GALA

### General User Guidelines

Please read through the following user Guidelines. Familiarity with these points ensures optimum use of the operating instructions.

On the fold-out page after the title page you will find the overviews “control elements and key functions” and “operating/settings diagrams”.

You will find it useful to open out the “control elements and key functions” overview as you read this instruction manual.

Key points in the text are indicated as follows:

- Enumerated points
- Hints

Working Guidelines:

#### **NOTE**

**Guidelines are intended to make your work easier.**

Safety Guidelines:



#### **WARNING**

**Describes a potentially dangerous situation.  
Could result in loss of life or serious injury if preventative measures are not taken.**



#### **CAUTION**

**Describes a potentially dangerous situation.  
Could result in lesser injuries or damage to property if preventative measures are not taken.**



#### **IMPORTANT**

**Describes a potentially threatening situation.  
Could result in damage to property if preventative measures are not taken.**

The name plate affixed to the title page is identical to that on the gamma/ L pump supplied. This facilitates matching the correct operating instructions manual to the correct pump.

Please quote the identity code and the serial number, which you will find on the name plate, in any subsequent correspondence or when ordering spare parts. This will ensure accurate identification of the pump type and material version.



## 1 About This Pump

The pumps in the ProMinent® gamma/ L pump series are microprocessor controlled solenoid dosing pumps with the following special features:

- The feed rate can be displayed in l/h and/or gal/h (calibrated), or in strokes/min.
- The stroke rate is continuously adjustable and is displayed in the LCD display.
- Stroke rate adjustment is digitally accurate and is displayed in the LCD display.
- The rated pressure of the gamma/ L can be adapted to individual systems.
- Two pumps can be controlled in different ways via the same standard signal.
- Large, illuminated LCD display

The hydraulic parts of the gamma/ L are identical to those of the Beta®.

## 2 Safety

**Correct use** The gamma/ L must be used for liquids only!  
 The gamma/ L may be used only in compliance with the technical data and specifications given in the operating instructions!  
 It is forbidden to use the gamma/ L for any other purpose, or to modify it in any way!  
 The gamma/ L is not suitable for dosing gases or solids!  
 The gamma/ L must be used by trained and authorised personnel only!

### Safety Guidelines



#### WARNING

- As soon as the gamma/ L is connected to the electricity supply it may commence pumping!  
 Avoid leakage of hazardous chemicals in this case!  
 If this should occur, then press the STOP/START key or disconnect the gamma/ L from the power supply immediately!
- The gamma/ L cannot be switched to a current-free status! In the event of an electrical accident, disconnect cable from the mains power supply!
- Disconnect cable from the mains power supply before commencing work on the gamma/ L!
- Always depressurise liquid end before commencing work on the gamma/ L!
- Empty and rinse out the liquid end before commencing work on the gamma/ L after use with hazardous or unknown chemicals!
- Pumps for radioactive materials may not be returned to ProMinent after use!



#### CAUTION

- It is not permitted to assemble and install ProMinent® dosing pumps with non-original parts unless these have been checked and recommended by ProMinent. It can result in harm to persons and property for which no liability will be accepted!
- When dosing aggressive materials, check the resistance of the pump materials (see ProMinent® resistance list in the product catalogue!)
- If another liquid end size is installed the pump must be reprogrammed on factory premises!
- Observe applicable national directives during installation!

**Sound intensity level** The sound intensity level is < 70 dB (A) at maximum stroke, maximum stroke rate, maximum back pressure (water) in accordance with:  
 DIN EN 12639 (Metering Pump Noise Measurement)

### 3 Storage, Transport and Unpacking

Transport and store the gamma/ L in the original packaging!

Protect the packed gamma/ L from moisture and the effects of chemicals!

Environmental conditions for storage and transport:

Storage and transport temperature: -10 bis +50 °C

Humidity: < 92 % relative humidity

Check that the delivery is complete:

- Delivery range*
- Dosing pump with mains lead
  - Operating instructions manual with EU conformity declaration
  - Accessories if applicable

### 4 Device Overview and Control elements

When reading this section it is helpful to fold out the overview "Control elements and key functions"!

#### 4.1 Device overview

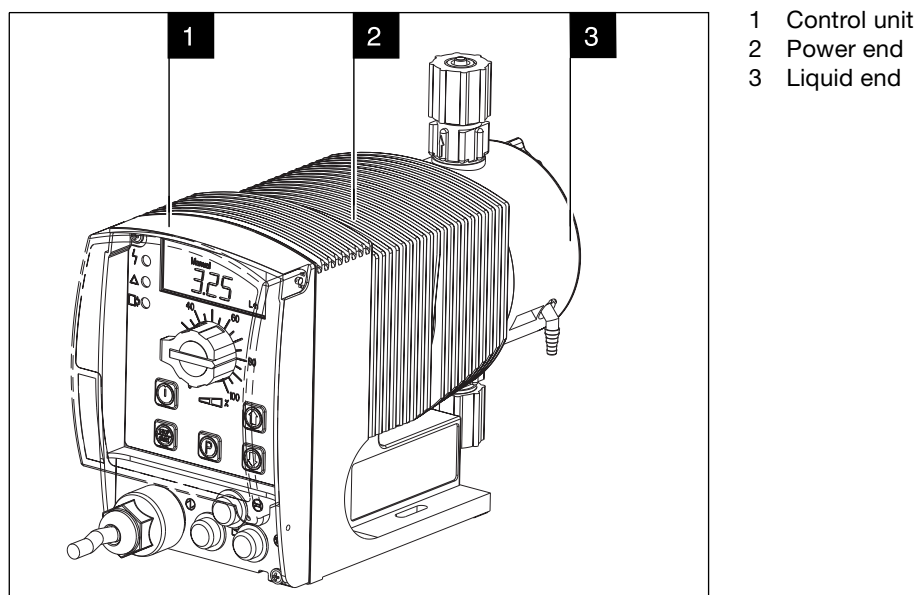


Fig. 01

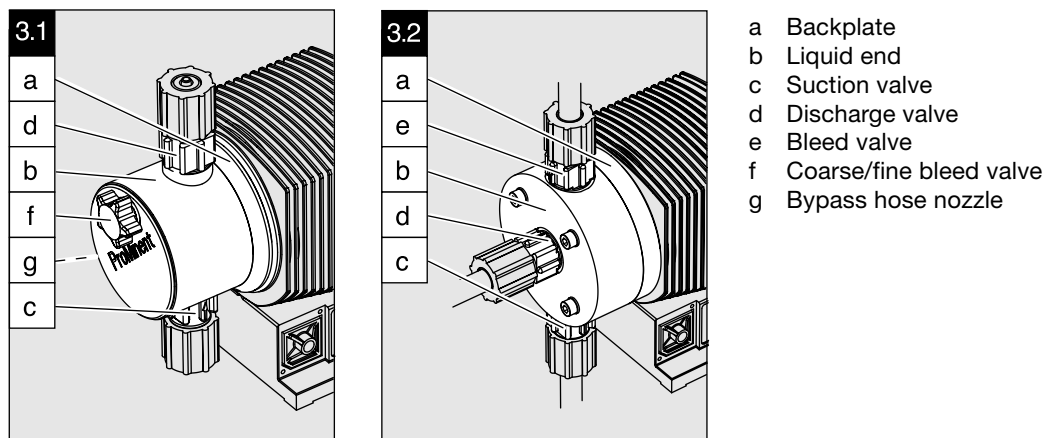


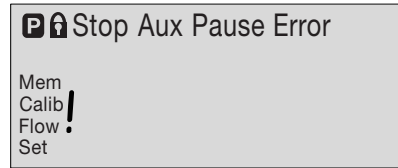
Fig. 02

Fig. 03

## 4.2 Control elements

Please acquaint yourself with the gamma/ L control elements with the help of the “control elements and key functions” overview!

*Indicators* The LCD display supports the operation and setting of the gamma/ L with a range of indicators:



The indicators are interpreted as follows:

|                          |   |
|--------------------------|---|
| <b>Symbol for P key:</b> | The gamma/ L is in settings mode.   |
| <b>Close symbol:</b>     | In a continuous display: lock (if code has been set).<br>In settings mode: indicates access to code menu.   |
| <b>Stop:</b>             | The gamma/ L has been stopped using the STOP/START key.   |
| <b>Aux:</b>              | The gamma/ L is pumping at the auxiliary frequency. In AUX menu: the gamma/ L is in the AUX menu.   |
| <b>Pause:</b>            | The gamma/ L has been stopped using the “pause” function (external).  |
| <b>Error:</b>            | A fault has occurred and the pump has been stopped.   |
| <b>Auto:</b>             | The gamma/ L is in “Auto” operating mode. Depending on the Identcode this means that the gamma/ L can be controlled using PROFIBUS® or the timer (as a comparison see the relevant supplementary instructions).   |
| <b>Mem:</b>              | An additional “memory” function has been set in the “contact” and “batch” operating modes. In CNTCT or BATCH menus (“mem” flashes): the memory function can be set  |
| <b>Calib:</b>            | The gamma/ L is in the CALIB menu.<br>In a continuous display (“calib” flashes): Deviation in stroke length of more than 10 degrees (e.g. a stroke length of 40 % when set at less than 30 % or greater than 50 %) from the value at the time of calibration. |
| <b>Flow:</b>             | The gamma/ L is in the FLOW menu.   |
| <b>Set:</b>              | The gamma/ L is in the SET menu.  |
| <b>Command symbol:</b>   | The number of strokes reached is above the maximum value (99999) that can be shown in the LCD display   |

### NOTE

**The pump gamma/ L only displays the metering output in l or l/h or in gal or gal/h when calibrated.**

## 5 Function Description

*Function principle* Dosing takes place as follows: the dosing diaphragm is forced into the liquid end; the pressure in the liquid end causes the suction valve to close and the chemical flows out of the liquid end through the discharge valve. The dosing diaphragm is then forced back out of the liquid end. The vacuum in the liquid end causes the discharge valve to close and fresh chemical flows into the suction valve in the liquid end. This concludes one operating cycle.

The dosing diaphragm is driven by an electronically controlled electrical solenoid.

*Feed rate* The feed rate is determined by the stroke length and the stroke rate.  
The stroke length is set between 0 - 100 % using the stroke length adjusting knob.  
Optimum dosing reproducibility is achieved by setting the stroke length to between 30 - 100 % (SEK type: 50 - 100 %)!  
The stroke rate is set using the arrow keys (not in “analogue” operating mode) to between 0 - 180 strokes/min.

*Self-bleed function* Pumps with self-bleed function (= SEK types) can operate a prime action even when the discharge tubing is closed, discharging existing air through a bypass valve. These pumps can release gas even during operation, irrespective of the actual operating pressure.  
An in-built pressure maintenance valve allows accurate dosing even in depressurised states.

*Operating modes* Operating modes are selected using the MODE menu (depending upon identity code, some operating modes may be absent).

**“Analog” operating mode: (Identity code, control variant: analogue current)**

The stroke rate is controlled via an analogue electrical signal via the “external control” terminal. Signal processing is pre-selected at the controller.

**“Manual” operating mode: (Identity code, control variant: manual, standard function)**

The stroke rate is controlled manually via the controller.

**“Contact” operating mode:**

**(Identity code, control variant: external 1:1 / external with pulse control)**

This operating mode offers the opportunity to make fine adjustments with small increase/decrease factors. Dosing can be activated by a pulse via the “external control” terminal or by a semiconductor element. With the “pulse control” option it is possible to pre-set a feed quantity (batch) or number of strokes (factor 0.01 to 99.99) via the control unit.

**“Batch” operating function:**

**(Identity code, control variant, external 1:1 / external with pulse control)**

This operating mode offers the option of working with larger transfer factors (up to 65535). Metering can be triggered by pressing the P key or a pulse from the “external control” terminal via a contact or semiconductor element. A batching quantity or number of strokes can be pre-selected via the control unit.

**Operating mode “PROFIBUS®”: (Identcode, control variant: profibus®)**

This operating mode offers the possibility to control the pump via PROFIBUS® (see “supplemental instructions for ProMinent gamma/ L and ProMinent Sigma versions with “PROFIBUS®”).

*Functions* The following functions can be selected using the SET menu:

**“Calibrate” function:**

The gamma/ L can be operated in all operating modes including in calibrating mode. The corresponding continuous displays can show the actual feed quantity or the feed rate. Calibration is maintained within the stroke frequency range 0 - 180 strokes/min. Calibration is also maintained when a stroke frequency is altered up to  $\pm 10\%$ .

**“Pressure level” function:**

It is possible to set different pressure levels.

**“Auxiliary frequency” function:**

It is possible to set a stroke rate in the SET menu, which may be activated via the “external control” terminal. This auxiliary frequency overrides all other pre-set stroke rate frequencies.

**“Flow” function:**

Stops the gamma/ L when the flow is insufficient. In the SET menu, the number of failed strokes is entered after which the pump will be turned off.

The following functions are available as standard:

**“Float switch” function:**

Information on the liquid level in the feed chemical container is transmitted to the gamma/ L. This option requires the installation of a 2-stage float switch. This is connected to the “float switch” terminal.

**“Pause” function:**

The gamma/ L can be stopped by remote control via the “external control” terminal. The “pause” function operates only via the “external control” terminal.

The following functions are activated by keystrokes:

**“Stop” function:**

The gamma/ L can be stopped by pressing the STOP/START key without disconnecting from the mains power supply.

**“Prime” function:**

Priming (short term feed at maximum frequency) is activated by pressing both arrow keys at the same time (in “Stroke rate” permanent display).

*Optional relay* The gamma/ L has two connection options. de deux options :

**“Fault indicating relay” option:**

In the event of fault signals, warning signals or float switch activation signals, connects an electrical circuit to trigger alarm sirens etc. The relay is retrofitted via an aperture in the power end.

**“Fault indicating and pacing relay” option:**

Along with the fault indicating relay, the pacing relay produces a contact for every stroke. The relay is retrofitted via an aperture in the power end.

*Function and error*

*indicators* The operating and error status is shown via the three LEDs and the “error” indicator on the LCD (see also section 11):

*LCD indicator* If a fault occurs “error” will appear along with an additional fault warning.

*LED indicator*

**Operating indicator (green)**

This indicator is lit as long as the gamma/ L is operating correctly. It stops briefly with each stroke.

**Warning indicator (yellow)**

This warning light appears if the gamma/ L electronics detect a situation that could lead to a fault, e.g. “liquid levels low 1st stage”.

**Warning indicator (red)**

This warning light appears if a fault occurs, e.g. “liquid levels low 2nd stage”.

**Hierarchy of operating modes, functions and fault statuses**

The different operating modes, functions and fault statuses each have a differing effect on whether and how the gamma/ L functions. These effects are given below:

- 1. Prime**
- 2. Fault, stop, pause**
- 3. Auxiliary frequency**
- 4. Manual, analogue, contact, batch**

to:

1. “Prime” can take place in the permanent “Stoke rate” display in any pump mode (as long as it is operational).
2. “Fault”, “stop” and “pause” stop all system parts up to “prime”.
3. The stroke frequency of the “auxiliary frequency” always has precedence over the stroke frequency, which is set by an operating mode listed under 4.

## 6 Assembly and Installation



### WARNING

- Installation must be carried out by a trained engineer!
- Disconnect gamma/ L from mains power supply during installation!
- Risk of electric shock – This pump is supplied with a grounding conductor and grounding-type attachment plug. To reduce the risk of electric shock, be certain that it is connected only to a properly grounding-type receptacle.
- Observe applicable national directives when installing the dosing pumps!
- When connecting with parallel inductive power consumers a switch contact must be fitted, e.g. relay or contactor!



### IMPORTANT

The universal signal cable, the external/connecting cable and the liquid level monitoring cable should never be shortened to less than 1.20 m, otherwise the cable identification system will fail.

*Connection  
to mains power supply*

Connect the gamma/ L to the mains power supply using the mains lead

*Parallel connection to  
inductive power consumers*

If the gamma/ L is connected to the mains in parallel with inductive power consumers (e.g. solenoid valve, motor) they must be electrically isolated. This will avoid damage caused by induction and voltage surges when switching off.

► Fit individual contacts for the gamma/ L and supply power via auxiliary contactor or relay.

If this is not possible, then:

► Connect a varistor in parallel (order number 710912) or an RC circuit, 0.22  $\mu$ F/220  $\Omega$  (order number 710802).

*Power element  
(in base of pump)*

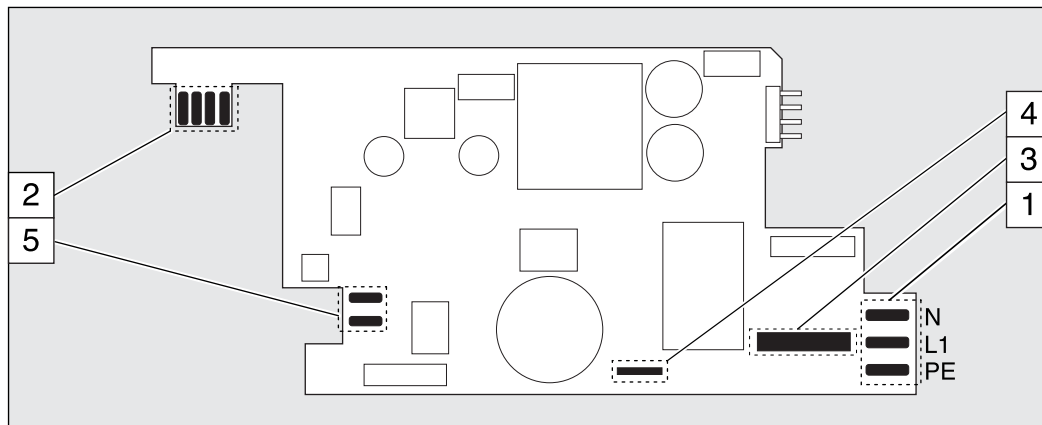


Fig. 04

- 1 Mains terminal
- 2 Relay circuit terminal
- 3 Fuse
- 4 Solenoid earth lead terminal
- 5 Solenoid terminal

*“External control”  
terminal*

The “external control” terminal is a five pin in-built terminal. It is compatible with the two and four core cables used previously.

The “auxiliary frequency” function is only available with a five core cable.

*gamma/ L configuration* Electrical interface for “external contact” - “pause” - “auxiliary frequency”:

- tension contacts ouverts : env. 5 V
- Voltage when contacts open: approx. 5 V
- Input resistance: 10 k $\Omega$
- Control:  
or: voltage free contact (load: 0.5 mA at 5 V),  
Semiconductor switch (residual voltage < 0.7 V)
- Maximum pulse frequency: 25 pulses/s
- Required pulse duration:  $\geq 20$  ms

Electrical interface for “external analogue”:

- Input load resistance: approx. 120  $\Omega$
- Maximum current at input: 50 mA

*gamma/ L configuration*

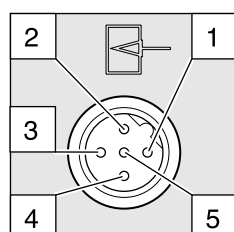


Fig. 05

| Pin   | Function            | 2 core cable    | 4 core cable | 5 core cable |
|-------|---------------------|-----------------|--------------|--------------|
| Pin 1 | Pause               | Jumped at pin 4 | Brown        | Brown        |
| Pin 2 | External contact    | Brown           | White        | White        |
| Pin 3 | External analogue   | –               | Blue         | Blue         |
| Pin 4 | Earth               | White           | Black        | Black        |
| Pin 5 | Auxiliary frequency | –               | –            | Grey         |

*Plug configuration*

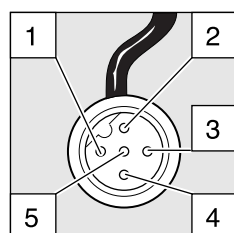


Fig. 06

#### “Pause” function

The gamma/ L is not operating when

- The cable is connected and pins 1 and 4 are free.

The gamma/ L is operating when

- The cable is connected and pins 1 and 4 are connected.
- There is no cable connected (pin 1 is free).

#### “Contact” and “Batch” operating modes

One or more discharge strokes are triggered when pin 2 and pin 4 are connected to one another for at least 20 ms.

Otherwise, pin 1 and pin 4 must be connected.

#### “Analogue” operating mode

The stroke frequency of the gamma/ L is controlled via an electrical signal. The electrical signal is applied between pins 3 and 4.

Otherwise, pin 1 and pin 4 must be connected.

#### “Auxiliary frequency” function

The gamma/ L runs at a pre-set stroke rate when pin 5 and pin 4 are connected to one another. Otherwise, pin 1 and pin 4 must be connected.

The factory setting for this function is 180 strokes.

#### NOTE

For function and operating mode hierarchy, see section 5!

Connecting two gamma/ L pumps in series

Connect two gamma/ L pumps in series as follows if you wish to control both via **one** electrical signal in the “analog” operating mode (see section 7.4.2):

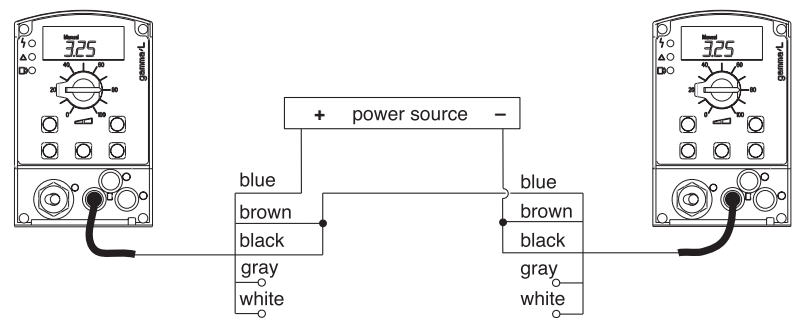


Fig. 07

“Float switch” terminal    Optional fitting of a 2-stage float switch with prior warning and limit switch capacity.

gamma/ L configuration

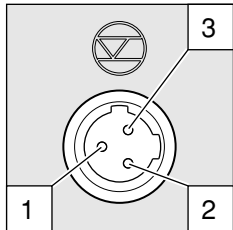


Fig. 08

Electrical interface:

- Voltage when contacts open: approx. +5 V
- Input resistance: 10 kΩ
- Controller: voltage free contact (load: 0.5 mA at + 5V), semiconductor switch (residual voltage < 0.7 V) or:

Plug configuration

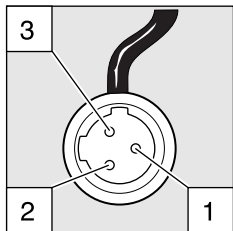


Fig. 09

| Function |                       | 3 core cable |
|----------|-----------------------|--------------|
| Pin 1    | Earth                 | black        |
| Pin 2    | Minimum prior warning | blue         |
| Pin 3    | Minimum limit switch  | brown        |

“Dosing monitor” terminal    Optional connection of dosing monitor.

gamma/ L configuration

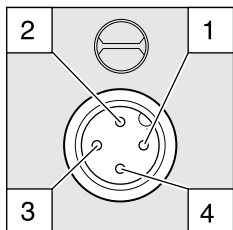


Fig. 10

Electrical interface:

- Voltage when contacts open: approx. +5 V
- Input resistance: 10 kΩ
- Controller: voltage free contact (load: 0.5 mA at + 5 V)

Plug configuration

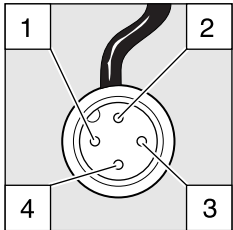


Fig. 11

| Function |                   | 4 core cable |
|----------|-------------------|--------------|
| Pin 1    | Power supply (5V) | brown        |
| Pin 2    | Encoding          | white        |
| Pin 3    | Response          | blue         |
| Pin 4    | Earth             | black        |



## Relay

### “Fault indicating relay”

**output** A fault indicating relay may be ordered optionally. It is used as the signal output when a pump fault has been detected and to indicate the prior warning signal “liquid level low, stage 1” and the fault signal “liquid level low, stage 2”.

Allocation of signal types to “N/O” and “N/C” relay states is selected on the basis of the identity code descriptors.

The relay can be retrofitted and is ready to operate after inserting the relay component (see section 6.2).

The gamma/ L is delivered ex works with default settings for a N/C relay. If an alternative switch function is required the gamma/ L can be reprogrammed at ProMinent.

### Electrical interface

- Contact load: 250 V/2 A 50/60 Hz
- Operating life: > 200.000 switch cycles

### “Fault indicating relay and pacing relay” output

A fault indicating relay and pacing relay output may be ordered optionally. The pacing relay output is electrically isolated via an optical coupler with a semiconductor switch. The second switch is a relay as for the “fault indicating relay” variant.

The fault indicating / pacing relay can be retrofitted (see section 6.2).

The gamma/ L is delivered ex works with default settings for a N/C fault indicating relay and a N/O pacing relay. If an alternative switch function is required the gamma/ L can be reprogrammed at ProMinent.

### Electrical interface

#### For semiconductor switch

- Residual voltage: < 0,4 Volt at  $I_c = 1 \text{ mA}$
- Maximum voltage: < 100 mA
- Maximum current: 24 V/DC
- Pacing relay pulse duration: approx. 100 ms

#### For relay output

- Contact load: 24 V/100 mA 50/60 Hz
- Operating life: > 200.000 switch cycles

### Relay cable contact configuration

#### “Fault indicating relay” option

| VDE cable | CSA cable | Contact              |
|-----------|-----------|----------------------|
| white     | white     | NO (normally open)   |
| green     | red       | NC (normally closed) |
| brown     | black     | C (common)           |

#### “Fault indicating relay and pacing relay” option

| VDE cable                 | Contact                | Relay |
|---------------------------|------------------------|-------|
| yellow NO (normally open) | Fault indicating relay |       |
| green C (common)          | Fault indicating relay |       |
| white NO (normally open)  | Pacing relay           |       |
| brown C (common)          | Pacing relay           |       |

## 6.1 Retrofitting relays

### Delivery range:

- 1 relay circuit set with 2 screw fasteners
- 1 relay cable set with socket
- 1 seal

### Press-out relay opening



#### WARNING

Disconnect gamma/ L from the mains power supply and rinse liquid end before commencing work (see section 12)!



#### IMPORTANT

When preparing the opening, ensure that the punch is not forced through the entire pump base!  
Pump circuits may become damaged.

- ▶ Place the gamma/ L on a firm surface with the relay opening press-out section at the top (see fig. 12:a)
- ▶ Place a punch (dia. 8-15 mm) in the centre of the relay opening press-out section, and strike briefly and sharply with a hammer (approx. 250 g)
- ▶ If necessary clean up the edges of the opening
- ▶ Remove the pressed out section from the gamma/ L

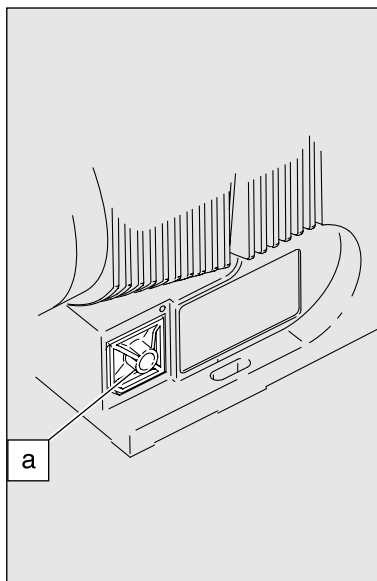


Fig. 12

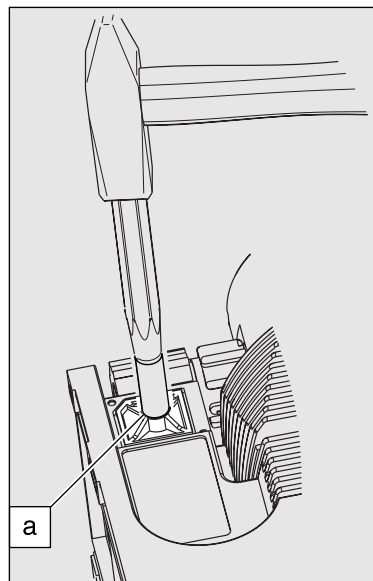


Fig. 13

### *Inserting the relay component*

- ▶ Hold the relay component with your right hand gripping the left and right hand edges of the relay cover, and tilt the front end slightly to the left (see fig. 14)
- ▶ Push the relay component through the relay opening, holding the upper corner of the lower edge against the guide rail on the pump base, until the contact of the relay component has reached the controller contact. (See fig. 15: test: can you still move the end of the circuit back and forth?)
- ▶ Gently push the relay component right into the opening.
- ▶ Screw the relay cover firmly onto the housing using the screws provided.
- ▶ Insert the relay cable plug seal into the relay cover and screw on the plug (see fig. 16)

The gamma/ L is delivered ex works with default settings for a N/C fault indicating relay and a N/O pacing relay. If an alternative switch function is required the gamma/ L can be reprogrammed at ProMinent.

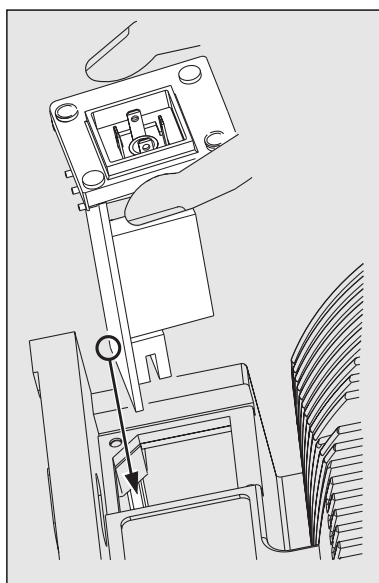


Fig. 14

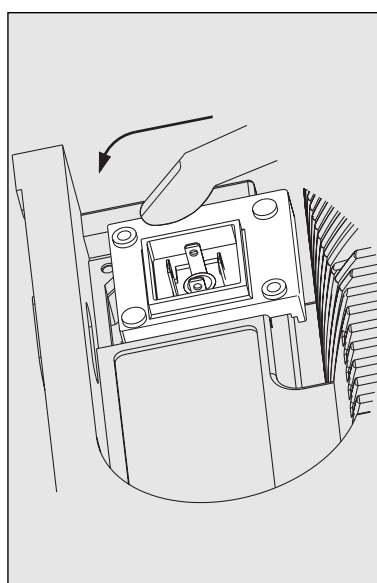


Fig. 15

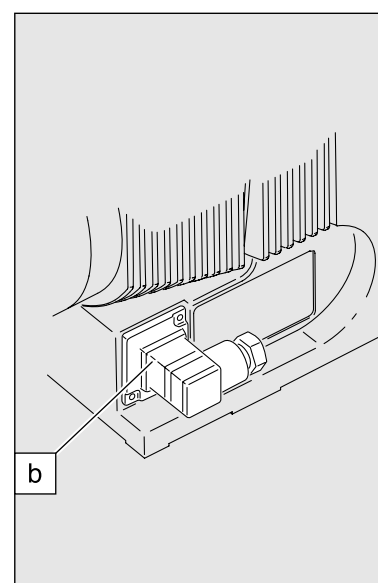


Fig. 16


## 7 Settings

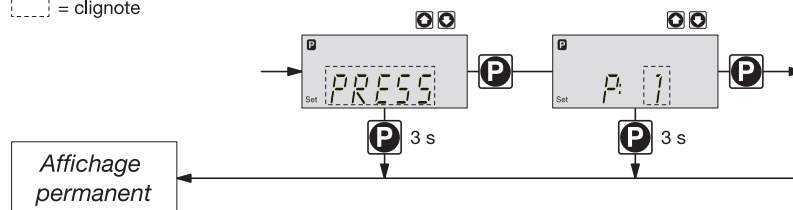
### NOTE

- Open out the fold-out page following the title page fully! There you will find the overviews “control elements and key functions” and “operating/settings diagram”.
- If no keys are pressed within a period of 1 minute, the gamma/ L will return to a continuous display.

### Basic information for setting up the gamma/ L

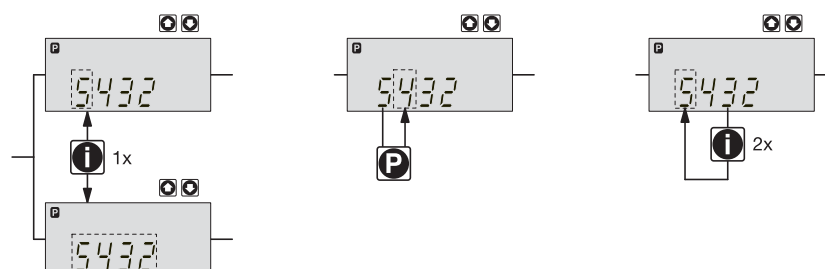
 = possibilité de réglage

 = clignote



**Confirm entries** Press the P key briefly;  
you will automatically move to the next menu option or to a continuous display.

**Exit menu option without confirming** Press the P key for 3 s:  
The entry is cancelled and you will return to a continuous display.



**Incremental change of a value** Press the i key 1x;  
you can toggle between altering the digits of a value (“change individual digits” = standard) or incremental alteration of a value (“change a figure”).

**Change adjustable values** Press UP or DOWN arrow key;  
The flashing digit or figure will start to increase or decrease incrementally.

**Confirm adjustable values** For “change individual digits”: confirm each digit using the P key. When the last digit has been confirmed you will automatically move to the next menu option or to a continuous display.  
For “change a figure”; press the P key 1x; you will simultaneously move to the next menu option or to a continuous display.

**Correct wrongly set digits** Press the i key 2x;  
you will go back to the first digit.

### 7.1 Check adjustable values

Before setting up the gamma/ L you can check the current settings of adjustable values.

Press the i key ("i" as in "info") when the gamma/ L is in continuous display mode  
(There is no P key symbol in the LCD display):

Each time you press the i key you will see a different continuous display. The number of continuous displays depends upon the identcode, the selected operating mode and the connected accessories (see overview "continuous displays").

### 7.2 Change to settings mode

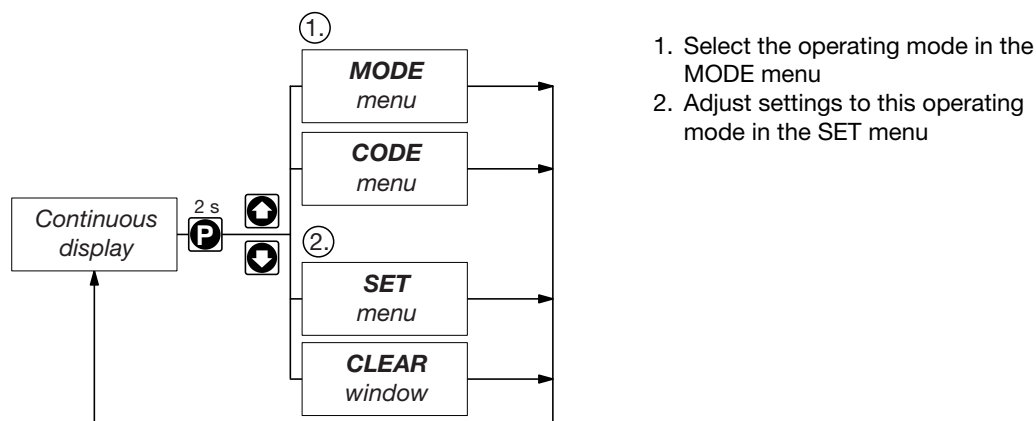
If you hold down the P key for 2 seconds in any continuous display, the gamma/ L will change to the settings mode.

If CODE 1 is set, the code must be entered after pressing the P key.

The following menu options appear first in the settings mode (see also overview "operating/ settings diagram"):

- MODE menu
- CODE menu (optional)
- SET menu
- CLEAR window

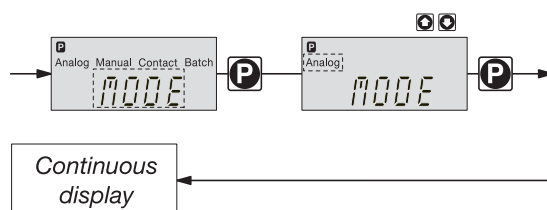
In order to adapt the gamma/ L to your process requirements you must:



### 7.3 Select operating mode (MODE menu)

The following operating modes are selected via the MODE menu (depending upon identcode, some operating modes may be absent):

- Manual: for operation by hand  
(Identcode, control variant: manual, standard option)
- Analogue: for electronic control  
(Identcode, control variant: analogue current)
- Contact: for contact operation  
(Identcode, control variant: external 1:1 / external with pulse control)
- Batch: for batch operation  
(Identcode, control variant: external with pulse control)



### 7.4 Settings for operating mode (SET menu)

In the SET menu you can adjust various settings depending upon the selected operating mode.

The following programmable function settings menus appear in all operating modes:

- Calibrate (CALIB menu)
- Pressure levels (PRESS menu)
- Auxiliary frequency (AUX menu)
- Flow (FLOW menu, available only if flow monitor is connected)

See also section 7.5!

Further settings menus depend upon the selected operating mode.

#### 7.4.1 Settings for “manual” operating mode

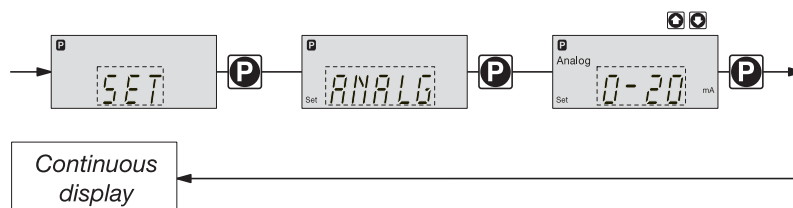
There are no other settings menus in the overall SET menu for the “manual” operating mode apart from those described in 7.5.

#### 7.4.2 Settings for “analogue” operating mode (ANALG menu)

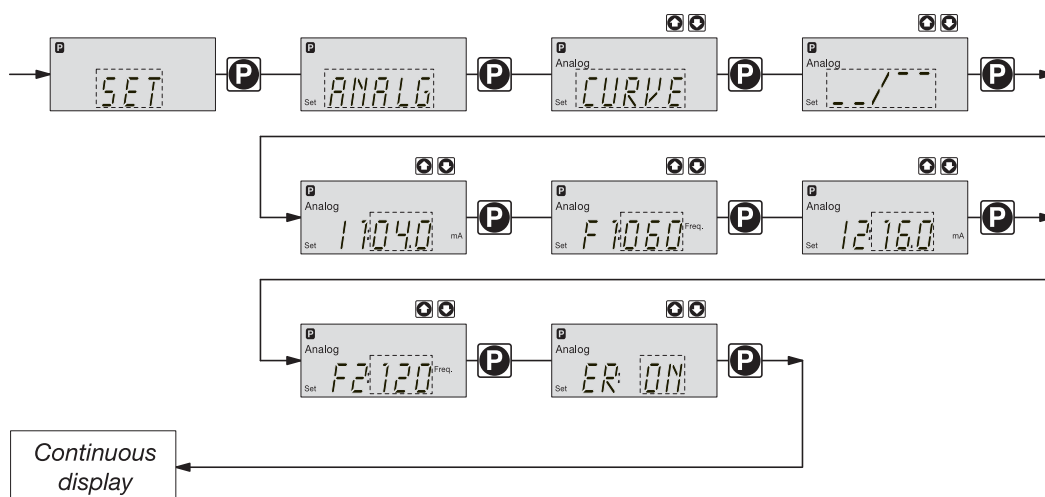
In addition to those settings menus described in 7.5, there is an additional ANALG menu in the overall SET menu for the “analogue” operating mode.

The stroke rate is controlled by an analogue electrical signal via the “external control” terminal. You can select three signal-processing methods:

- 0 - 20 mA: at 0 mA the gamma/ L does not operate  
at 20 mA the gamma/ L operates at max. stroke rate  
Between these two extremes the stroke rate is proportional to the electrical signal.



- 4 - 20 mA: at 4 mA the gamma/ L does not operate  
at 20 mA the gamma/ L operates at max. stroke rate  
Between these two extremes the stroke rate is proportional to the electrical signal.  
For signals of below 3.8 mA a fault will be detected and the gamma/ L will stop (e.g. cable break).
- Curve: In the "curve" processing mode you can programme the gamma/ L ratios.  
There are 3 options available:
  - - - - - = straight line
  - \ / = lower band
  - / \ = upper band



### Straight line:

The following symbol appears in the LCD display: - - - - .

You can enter any stroke frequency ratio for the gamma/ L in proportion to the electrical signal. You must enter two points P1 (I1, F1) and P2 (I2, F2). F1 is the stroke rate at which the pump should operate at current I1: the straight line and the ratio are fixed accordingly:

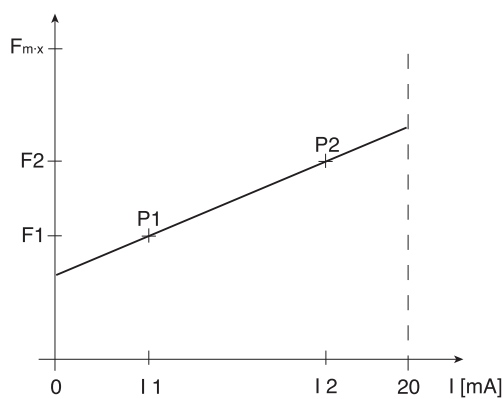


Fig. 17

### NOTE

Draw a diagram like the one above - with values for (I1, F1) and (I2, F2) - in order to set the gamma/ L to your required stroke rate!

**Lower/upper band:**

This processing mode allows you to control a pump via an electrical signal as shown in the diagrams below.

You may also control two pumps for different feed chemicals from a single signal (e.g. one acid pump and one alkali pump from a pH sensor signal). The pumps must be connected electrically in series (see wiring plan in section 6.1).

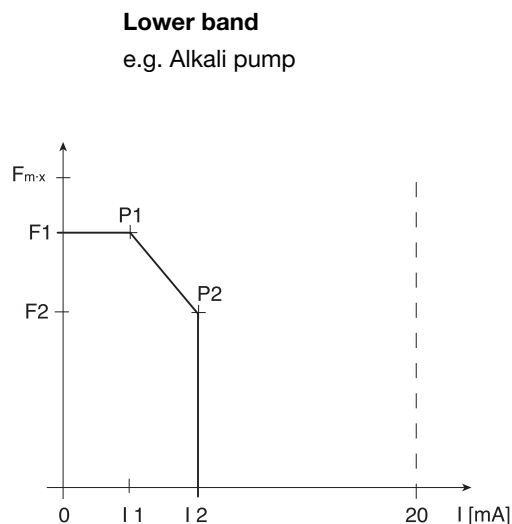


Fig. 18

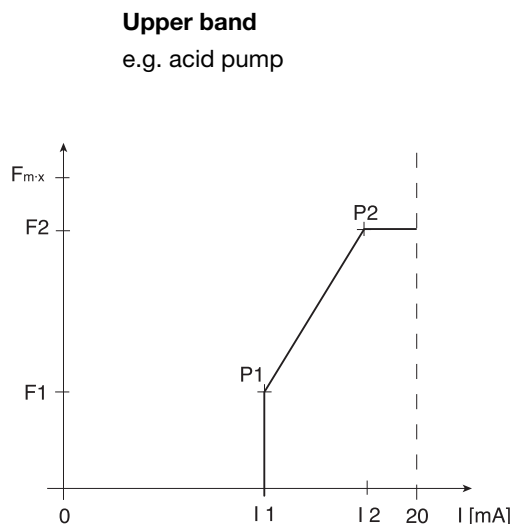


Fig. 19

**Lower band:**

The symbol  $\sim \setminus \_ \_$  appears in the LCD display. The gamma/ L will operate below I1 at F1. Above I2, the gamma/ L ceases to operate. Between I1 and I2 the stroke rate is between F1 and F2, proportional to the signal current.

**Upper band:**

The signal  $\_ \_ / \sim \sim$  appears in the LCD display. The gamma/ L will cease to operate below I1. Above I2, the gamma/ L will operate at F2. Between I1 and I2 the stroke rate between is F1 and F2, proportional to the signal current.

The smallest processable difference between I1 and I2 is 4 mA.

**Error processing** In the “ER” (error) menu option you can activate an error processing function for the “curve” mode. An error message appears for signals below 3.8 mA and the gamma/ L stops.

**7.4.3 Settings for “contact” operating mode (CONTCT menu)**

In addition to those settings menus described in 7.5, there is an additional CONTCT in the overall SET menu for the “contact” operating mode.

The operating mode “contact” allows you to activate a single stroke or a series of strokes. The strokes can be activated by a pulse or via the “external control” terminal. This operating mode is intended to transfer input pulses into a reduction (break) or small increase in strokes.

**IMPORTANT**

**When switching to another operating mode the factor is reset to “1”.**

**The following versions are available:**

- Contact - identcode: external 1:1
- Contact - identcode: external with pulse control

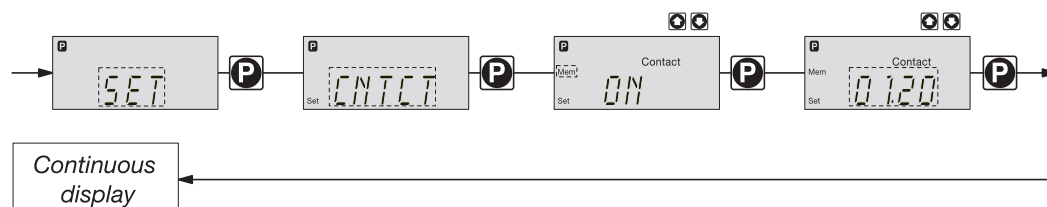
## Contact – identcode: external 1:1

In the “contact - identcode: external 1:1” version the gamma/ L makes precisely 1 stroke per pulse (identcode: external 1:1).

No entry possible.

## Contact – identcode: external with pulse control

In the “contact - identcode: external with external pulse control” you can enter the number of pulses after which a stroke should be carried out. “Contact - identcode: external with external pulse control” is intended for small dosing quantities.



The number of strokes per pulse depends upon the factor, which you can enter. This allows you to vary to a certain extent the input pulses by a factor of 1.01 to 99.99 and/or reduce by a factor of 0.01 to 0.99:

“Number of strokes activated = factor x number of input pulses”

Examples

|                  | Factor | Pulse (sequential) | Stroke number (sequential) |
|------------------|--------|--------------------|----------------------------|
| <b>Increase</b>  | 1      | 1                  | 1                          |
|                  | 2      | 1                  | 2                          |
|                  | 25     | 1                  | 25                         |
|                  | 99.99  | 1                  | 99.99                      |
|                  | 1.50   | 1                  | 1.5 (1 / 2)                |
|                  | 1.25   | 1                  | 1.25 (1 / 1 / 1 / 2)       |
| <b>Reduction</b> | 1      | 1                  | 1                          |
|                  | 0.50   | 2                  | 1                          |
|                  | 0.10   | 10                 | 1                          |
|                  | 0.01   | 100                | 1                          |
|                  | 0.25   | 4                  | 1                          |
|                  | 0.40   | 2.5 (3 / 2)        | (1 / 1)                    |
|                  | 0.75   | 1.33 (2 / 1 / 1)   | (1 / 1 / 1)                |

*Explanation of increase*

|                   |   |
|-------------------|---|
| At a factor of 1  | For every 1 pulse, 1 stroke is activated    |
| At a factor of 2  | For every 1 pulse, 2 strokes are activated  |
| At a factor of 25 | For every 1 pulse, 25 strokes are activated |

*Explanation of decrease*

|                     |   |
|---------------------|---|
| At a factor of 1    | After 1 pulse, 1 stroke is activated  |
| At a factor of 0.5  | After 2 pulses, 1 stroke is activated   |
| At a factor of 0.1  | After 10 pulses, 1 stroke is activated  |
| At a factor of 0.75 | After 2 pulses, 1 stroke is activated, then after 1 pulse, 1 stroke is activated, then after 2 pulses, 1 stroke is activated etc. |



**NOTE**

If a remainder occurs when the factor is processed, the gamma/ L counts up the remainder values. When the sum reaches or exceeds “1” the gamma/ L will activate a stroke. This ensures that the stroke number corresponds exactly to the factor throughout the dosing operation.

The number of input pulses which have not been processed are stored by the gamma/ L in the stroke memory. When the STOP/START key is pressed or the “pause” function is activated, the stroke memory is deleted (this can be avoided using the “memory” extension function, see below).

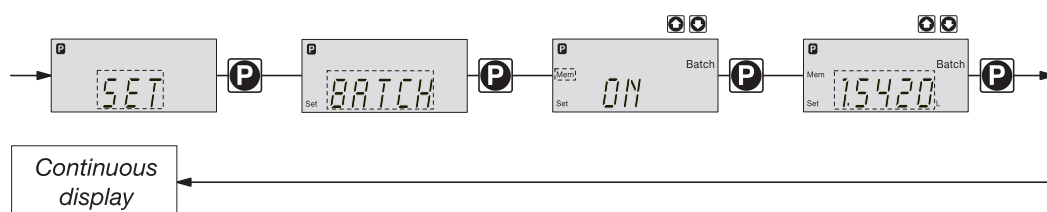
The “contact - identcode: external with pulse control” version allows optimum adaptation of the gamma/ L, in conjunction with e.g. water contact meters, to any process.

**“Memory” extension function**

The “memory” extension function can be optionally activated (“mem” appears in the LCD display). When “Memory” is activated, the gamma/ L adds up the unused excess strokes, up to the stroke memory’s maximum capacity of 65535 strokes. If the maximum capacity is exceeded the pump will malfunction.

**7.4.4 Settings for “batch” operating mode (BATCH menu)**

In addition to those settings menus described in 7.5, there is an additional BATCH menu in the overall SET menu for the “batch” operating mode.



The “batch” operating mode is a variant of the “contact” operating mode (see 7.4.3).

You can pre-select a stroke number (no breaks, whole numbers only from 1 to 65535) as well as a feed quantity (batch). To switch between entries for “stroke number” and “feed quantity” press the i key 1x in the corresponding menu option (see also overview “operating/settings diagram”, fold-out page).

The “batch” operating mode is intended for large dosing quantities.

Metering is activated by pressing the P key or via a pulse from the “external control” terminal.

The number of input pulses which have not been processed are stored by the gamma/ L in the stroke memory. The stroke memory is limited to the batch size if “Memory” is not activated (with “Memory” this is 65535 strokes). You can clear it by changing to a different operating mode.

**“Memory” extension function**

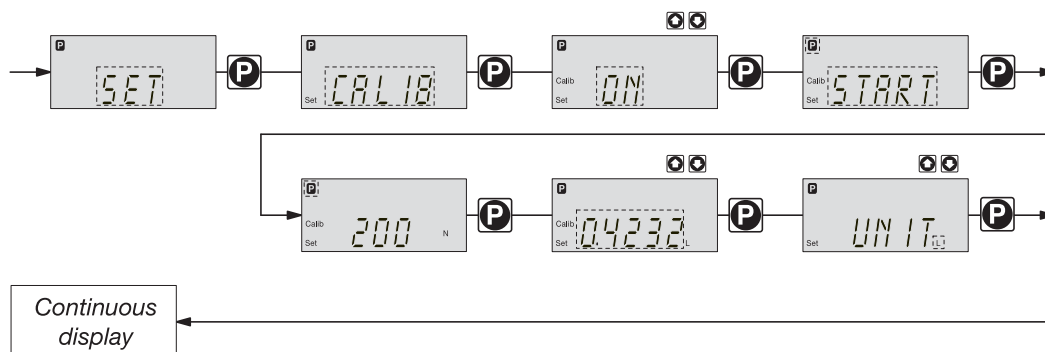
The “memory” extension function can be optionally activated (“mem” appears in the LCD display). When “Memory” is activated, the gamma/ L adds up the unused excess strokes, up to the stroke memory’s maximum capacity of 65535 strokes. If the maximum capacity is exceeded the pump will malfunction.

## 7.5 Settings for programmable functions (SET menu)

The following programmable function settings menus appear in all operating modes:

- Calibrate (CALIB menu)
- Pressure levels (PRESS menu)
- Auxiliary frequency (AUX menu)
- Flow (FLOW menu, available only if flow monitor is connected)

### 7.5.1 Settings for “calibration” function (CALIB menu)



The gamma/ L can also run in calibration mode. The corresponding continuous displays show the current dosing quantities or the feed rate.

Calibration is maintained when a stroke rate is altered up to  $\pm 10$  degrees (where the stroke length is set at 40 %, the range is 30-50 %). If the stroke rate is altered more than  $\pm 10$  degrees the yellow warning light is lit, the continuous display flashes and the flashing message “calib” appears.

#### NOTE

- **Do not go below 30 % stroke length (SEK type: 50 %).**  
**This will significantly affect accuracy of calibration.**
- **Calibration becomes increasingly accurate the more strokes made by the gamma/ L during calibration (recommended: at least 200 strokes).**



#### WARNING

**If using a hazardous feed chemical, the following setting instructions ensure adequate safety precautions have been taken!**

- Calibration*
- ▶ Insert the suction tube into a measuring cylinder containing the feed chemical - the discharge tubing must also be correctly installed (operating pressure, ...!)
  - ▶ Suck up the feed chemical (press both arrow keys at the same time) when the suction tube is empty
  - ▶ Note the liquid level in the measuring cylinder and the stroke length
  - ▶ Select the CALIB menu and go to the first menu option using the P key
  - ▶ Select “ON” using an arrow key and change to the next menu option using the P key
  - ▶ To commence calibration, press the P key. The gamma/ L starts to pump and displays the number of strokes (“STOP” appears at regular intervals) (the gamma/ L works at the stroke frequency set under “MANUAL”).
  - ▶ After a sufficient number of strokes, stop the gamma/ L with the P key
  - ▶ Calculate the dosed quantity (difference between the original quantity and the quantity remaining)
  - ▶ Enter this quantity in the next menu and then go to the next menu option using the P key
  - ▶ Select the unit (“L” or “gal”) in the “UNIT” menu with an arrow key

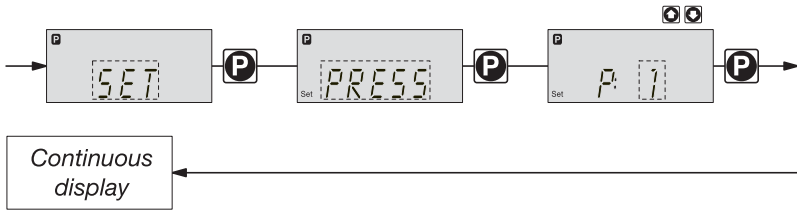
The gamma/ L is calibrated.

The corresponding continuous displays show the calibrated values.

The total stroke number and total litres are set during calibration to “0”.

The gamma/ L is in the STOP state.

### 7.5.2 Settings for the “pressure levels” function (PRESS menu)



The programmable function “pressure levels” is used to reduce the rated pressure of the gamma/ L.



#### CAUTION

- The rated pressure can be considerably exceeded at stroke lengths of below 100 %! The rated pressure relates to a stroke length of 100 %.
- If another liquid end size is installed the pump must be reprogrammed on factory premises!
- Select as large a rated pressure as required and as small as possible! This will increase system safety (reduces the risk of the tubing bursting when blocked)! This also protects the diaphragm and saves electricity.

#### NOTE

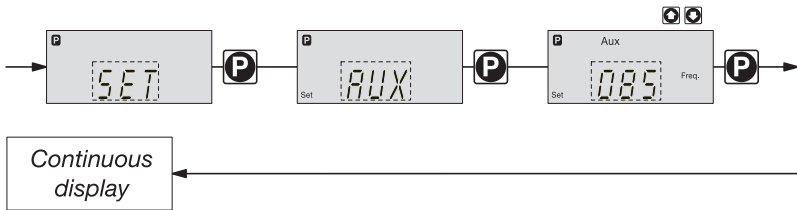
If installing another liquid end size the pump must be reprogrammed on factory premises.

The following rated pressures can be selected for these liquid end sizes (rated pressure in bar):

| Liquid end size  | Pressure level 1 | Pressure level 2 | Pressure level 3 | Pressure level 4 |
|------------------|------------------|------------------|------------------|------------------|
| 1601, 1602, 1605 | 4                | 7                | 10               | 16               |
| 1000, 1005, 1008 | 4                | 7                | 10               |                  |
| 0708, 0713       | 4                | 7                |                  |                  |

No adjustments can be made for pump types 0413, 0420, 0220, 0232.

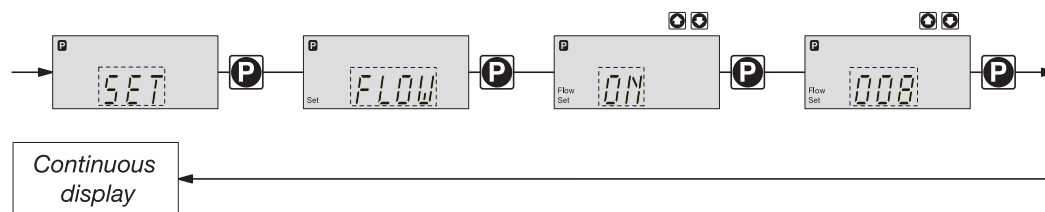
### 7.5.3 Settings for “auxiliary frequency” function (AUX menu)



The programmable function “auxiliary frequency” allows switching to a different stroke frequency, which can be set in the AUX menu. It can be activated via the “external control” terminal. When the auxiliary frequency is activated, “aux” appears in the LCD display.

This auxiliary frequency overrides the current stroke frequency set for the selected operating mode.

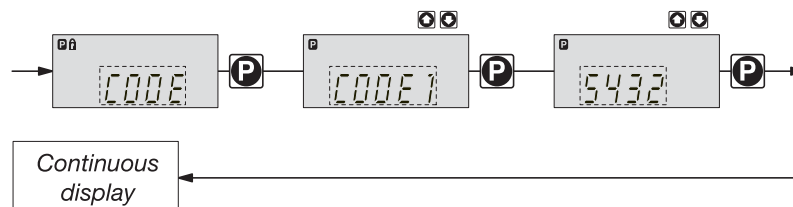
### 7.5.4 Settings for the “flow” function (FLOW menu)



The flow menu only appears when a dosing monitor is connected to the “dosing monitor” terminal. This dosing monitor registers each discharge stroke of the gamma/ L at the discharge connector and transmits it back to the gamma/ L. If this response transmission is serially omitted for a period set in the FLOW menu (due to failure or below-minimum dosing) the gamma/ L stops.

### 7.6 Setting code (CODE menu)

The code menu is used to select whether you want to prevent access to parts of the settings options.



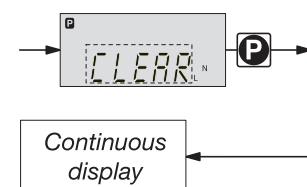
In the first menu option you can choose CODE 1 or CODE 2 (both use the same number).

- Select CODE 1 to prevent access to the settings mode (① in the overview “operating/ settings diagram”, fold-out page). In the next menu option, enter the number you wish to use as the code.
- Select CODE 2 to prevent access to the settings options for directly alterable values in the continuous displays (② in the overview “operating/settings diagram”, fold-out page). In the next menu option, enter the number you wish to use as the code.
- Select NONE to remove a pre-set security lock.

### 7.7 Cancel total stroke number or total litres (CLEAR window)

In the CLEAR window you can delete the stored total stroke number and simultaneously the total litres (= set to “0”). You may then press the P key briefly to exit this window.

The values displayed are counted incrementally from the point of commissioning the pump, or from the last delete action.



## 8 Operating

This section describes all operating options available to you when the gamma/ L is in continuous display mode (no P key symbol in the LCD display).

### NOTE

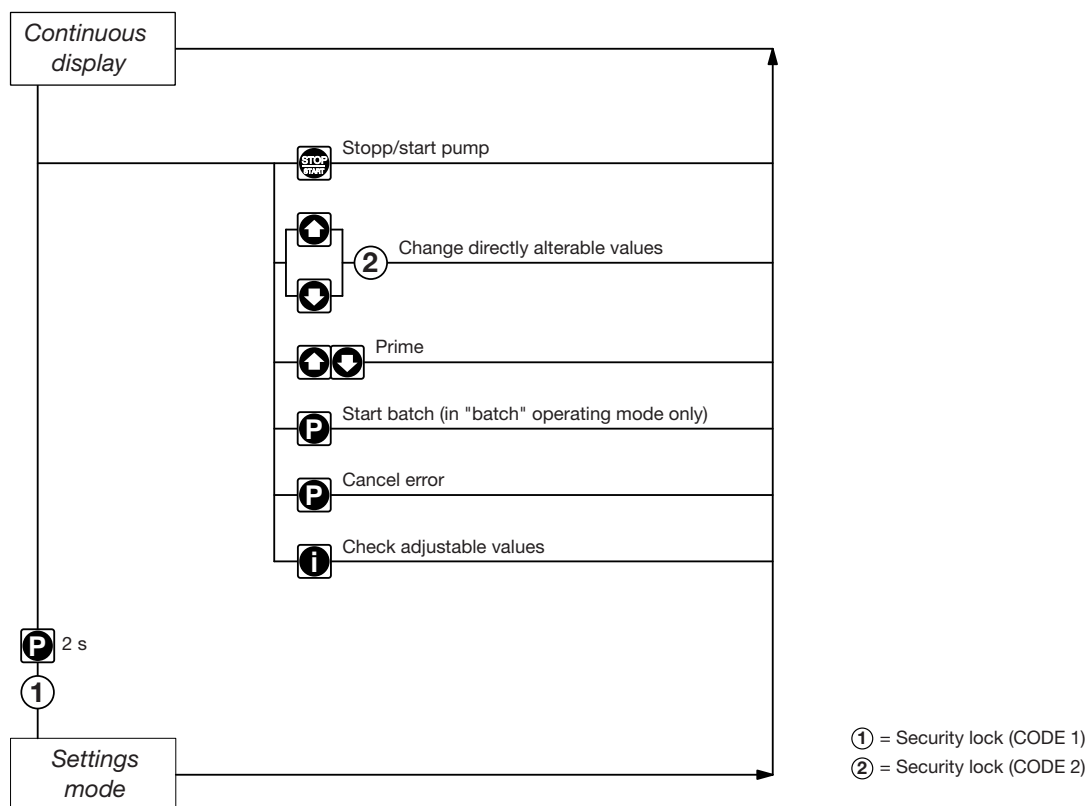
- **Open out the fold-out page following the title page fully! There you will find the overviews “control elements and key functions” and “operating/settings diagram”.**
- **Look at the overview “continuous displays”. This page shows you which displays are available in which operating mode, and which values are directly alterable in the corresponding continuous displays.**

### 8.1 Manual operation

|   |  |
|---|--|
| <i>Set stroke length</i>                | Stroke length is continually adjustable within a range of 0 - 100 %.<br>The recommended stroke length range, which will practically guarantee technical reproducibility, is 30 - 100 % (SEK type: 50 - 100 %).   |
|   | The following operating options are available via the different keys<br>(see also figure on the next page):  |
| <i>Stop/Start gamma/ L</i>              | To stop gamma/ L: press STOP/START key.<br>To start gamma/ L: press STOP/START key.  |
| <i>Start batch</i>                      | Press the P key briefly in “batch” operating mode.   |
| <i>Load factory settings</i>            | Press the P key for 15 s only if you wish to load factory calibration settings!<br>Current settings will be deleted.   |
| <i>Change to settings mode</i>          | When you press the P key for 2 s in any continuous display the gamma/ L will change to settings mode (see section 7).<br>If CODE 1 is set, the code must be entered after pressing the P key.  |
| <i>Check adjustable values</i>          | Each time you press the i key you will see a different continuous display.<br>The number of continuous displays depends upon the identity code, the selected operating mode and the connected accessories.   |
| <i>Change directly alterable values</i> | To change a value (see below) directly in the corresponding continuous display, press one of the arrow keys until “set” appears in the LCD display. The delay has been programmed in to prevent inadvertent changing of values.<br>If CODE 2 has been set, this code must be entered after pressing the arrow key.           |
|   | Directly alterable values are as follows:  |
| <i>Stroke rate</i>                      | In “manual”, “contact” and “batch” operating modes:<br>The stroke rate can be altered in the “stroke rate” display.  |
| <i>Feed rate</i>                        | In “manual” operating mode<br>The feed rate can be altered in the “feed rate” display.   |
| <i>Factor</i>                           | The factor is the number of strokes activated by an external pulse or a press of the P key (in “batch” mode only).<br>In “batch” operating mode:<br>You can alter the factor from the “remaining strokes” display.<br>The gamma/ L returns to the original continuous display a few seconds after the factor has been reset. |
| <i>Batch size</i>                       | In “batch” operating mode:<br>The batch size can be changed from the “batch size/remaining litres” display.<br>The gamma/ L returns to the original continuous display a few seconds after the batch size has been reset.  |
| <i>Priming</i>                          | The “priming” function is activated by pressing both arrow keys at the same time in “Stroke rate” permanent display.   |

**Cancel error** Error messages are cancelled by pressing the P key briefly.

**Display programme versions** Press on the P key for 10 seconds to display the programme versions.  
Example: "V 1052" + X 1010".  
Release the key on "LOAD 3" immediately.



## 8.2 Remote control

It is possible to control the gamma/ L remotely via a signal cable or Profibus® (see section 6.1 and section 7, "Supplementary Instructions for ProMinent® gamma/ L and ProMinent® Sigma versions with Profibus®" and plant documentation).

## 9 Maintenance

- Maintenance intervals*
- Every quarter, when subject to normal usage (continuous operation - approx. 30 % )
  - Shorter intervals when subject to heavier usage (e.g. continuous operation)

*Maintenance actions* Standard liquid ends:

- ▶ Check the diaphragm for damage (see section 10)
- ▶ Check chemical seepage at vent hole
- ▶ Check that the discharge tubing is connected firmly to the liquid end
- ▶ Check that discharge and suction valves are firmly fixed
- ▶ Check that the liquid end is generally watertight (especially vent hole! See fig. 20)
- ▶ Check for correct feed: run the gamma/ L run for a short period (press both arrow keys together)
- ▶ Check electrical connections for wear
- ▶ Check that liquid end screws are fastened tightly (on coarse/fine bleeding versions, first remove knob and cover)

Screw fastening torque: 4,5 to 5 Nm

### NOTE

- For PP liquid end, check fastening torque every quarter!

Additionally, for liquid ends with coarse/fine bleed function and SEK type:

- Check that the bypass tubing is connected firmly to the liquid end
- Check that the bleed valve is firmly fixed in place
- Examine the discharge and bypass tubing for kinks
- Check that the coarse/fine bleed function is working correctly

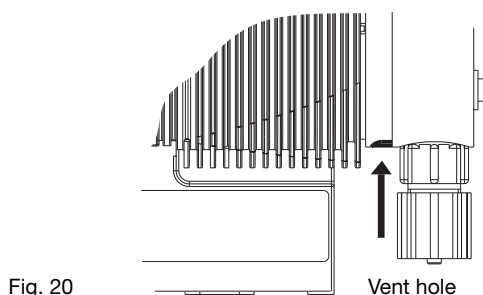


Fig. 20

## 10 Repairs

### NOTE

Repair work may be carried out by authorised personnel only, or on factory premises:

- Replacement of damaged mains cables
- Replacement of fuses and electronic controller.

Please contact your nearest ProMinent branch or representative!

When sending the pump for repair make sure it is clean and that the liquid end has been thoroughly rinsed out (see section 12)! If, despite careful emptying and cleaning, safety precautions are still required for handling the gamma/ L, the necessary information must be entered in the safety declaration!

The safety declaration is a component of the inspection/repair order.

An inspection or repair can only be carried out when a safety declaration has been correctly and completely filled out by an authorised and qualified member of staff from the company operating the pump.

A form is included in the appendix.



### **WARNING**

**Pumps used for radioactive materials cannot be returned to ProMinent after use!  
They will not be accepted by ProMinent!**

Repairs: These should only be carried out by qualified personnel  
(in accordance with Safety section):

- Cleaning the valve
- Changing the diaphragm



### **WARNING**

- **Always take suitable precautions when using hazardous chemicals!**
- **Ensure equipment is de-pressurised**

### **NOTE**

**Take the explosion drawings annexed to the help.**

*Cleaning the discharge valve (PP, NP) for types 1000, 1005, 1605, 1601, 1602*

### **NOTE**

- **Discharge and suction valves are different! Dismantle one after the other to avoid confusion.**
- **Only use new parts, which fit your valve (in shape and chemical resistance)!**
- **The pump must be reset after replacing a valve.**
- **Insert an Allen key or similar into the smaller hole of the pressure connector and push out the valve inserts.**

*Cleaning the suction valve (PP, NP) for types 1000, 1005, 1605, 1601, 1602*

Dismantling, cleaning and reassembly of the suction valve is practically the same as for a discharge valve.

Notice however that:

- both valve inserts are actually identical
- an additional spacer is found under the valve inserts
- in the liquid end a shaped seal is used instead of an O-ring
- the flow direction of the suction connection is reversed as for the pressure connector.

*Cleaning the discharge valve (PP, NP) for types 0708, 1008, 0220, 0420, 0413, 0713, 0232*

### **NOTE**

- **Discharge and suction valves are different! Dismantle one after the other to avoid confusion!**
- **Only use new parts, which fit your valve (in shape and chemical resistance)!**
- **The pump must be reset after replacing a valve.**
- **Insert an Allen key or similar into the smaller hole of the pressure connector and push out the valve inserts.**

*Cleaning the suction valve (PP, NP) for types 0708, 1008, 0220, 0420, 0413, 0713, 0232*

Dismantling, cleaning and reassembly of the suction valve is practically the same as for a discharge valve.

Notice however that:

- an additional spacer is found under the valve inserts
- in the liquid end the O-ring is used, not the shaped seal
- the flow direction of the suction connection is reversed as for the pressure connector.



## Change diaphragm

**WARNING**

- **Always take suitable precautions when using hazardous chemicals!**
- **Ensure that the equipment is de-pressurised!**

- ▶ Empty the liquid end (turn the unit upside down and let the feed chemical run out, rinse with a suitable material: rinse the liquid end thoroughly after use with hazardous materials!).
- ▶ When gamma/ L is running set the stroke length to 0 % (the drive axis is then set).
- ▶ Switch off the gamma/ L.
- ▶ Unscrew the hydraulic connectors from the discharge and suction side.
- ▶ For versions with coarse/fine bleed function: firstly pull out the coarse/fine bleed (knob), then lift off the cover from the liquid end using a screwdriver.
- ▶ Remove the screws (1).

For pump types 0220, 0232 and 0420 see the following page (4 holes on the diaphragm rim)!

Supply unit types,  
except 0220, 0232  
and 0420

- ▶ Loosen the liquid end (2) and the top plate (4) from the pump housing (6) (loosen only!).
- ▶ Hold the housing (6) in one hand and with the other, clamp the diaphragm (3) between the liquid end (2) and the top plate (4); release the diaphragm (3) from the drive spindle with a light anticlockwise turn of the liquid end (2) and top plate (4).
- ▶ Unscrew the diaphragm (3) completely from the drive spindle.
- ▶ Remove the top plate (4) from the housing (6).
- ▶ Check the condition of the safety diaphragm (5) and replace if necessary.
- ▶ Push the safety diaphragm (5) only as far onto the drive axis until it lies flat on the pump housing (6) – no further!
- ▶ Screw the new diaphragm (3) carefully up to the stop on the drive axis – this must be exact to ensure correct metering!
- ▶ Screw the diaphragm (3) tight once more.
- ▶ Position the top plate (4) on the pump housing (6).

**IMPORTANT**

- **The leakage hole must point downwards when the pump is fully assembled (see fig. 20).**
- **Position the top plate (4) correctly on the pump housing (6). Do not distort the top plate on the pump housing, otherwise the safety diaphragm (5) will not fit.**
- ▶ Lay the diaphragm (3) into the top plate (4).
- ▶ Hold the top plate (4) and screw the diaphragm (3) in a clockwise direction until it is firmly in position (you will feel the resistance of the return spring).

**IMPORTANT**

- **Do not overtighten the diaphragm (3) (particularly on type 1601).**
- **The top plate (4) must remain in position to prevent the safety diaphragm (5) from distorting.**
- ▶ Place the liquid end (2) with the screws (1) on the diaphragm (3) and the top plate (4) (the priming connector must point downwards once the pump is fully assembled).
- ▶ Screw on screws (1) lightly and tighten (starting torque, see below).
- ▶ For versions with coarse/fine bleed function, ensure that the liquid end cover engages in the liquid end, then push the coarse/fine bleed vent (knob) into the liquid end.

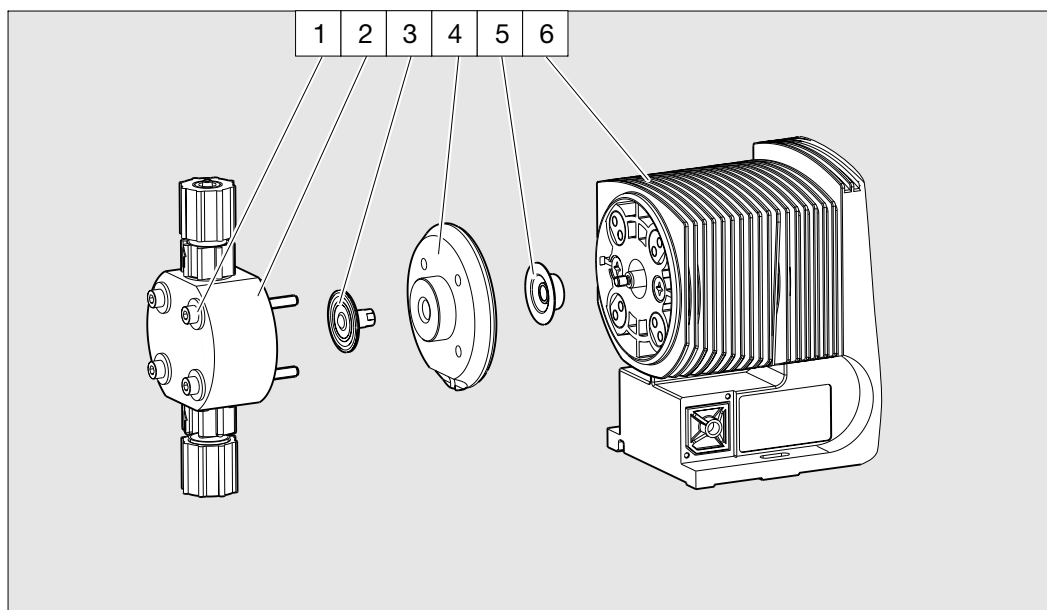


Fig. 21

- |              |                    |
|--------------|--------------------|
| 1 Screws     | 4 Top plate        |
| 2 Liquid end | 5 Safety diaphragm |
| 3 Diaphragm  | 6 Pump housing     |

### NOTE

- **Check the screw torques after 24 hours in operation**
- **For PP liquid ends check the screw torques again after three months.**

Screw torques: 4,5 to 5 Nm

#### *Liquid ends - types 0220, 0232 and 0420*

- ▶ Remove the metering head (2) with the screw (1) from the pump (see fig. 22).
- ▶ Only type 0232: Remove the screws of the set disk (4) below the diaphragm (3).
- ▶ The screws (1) should fit in the holes of the diaphragm (3), but not on the set disk.
- ▶ Hold the housing (6) in one hand and with the other hand, clamp the diaphragm (3) between the liquid end (2) and the top plate (4); release the diaphragm (3) from the drive spindle with a light anti-clockwise turn of the liquid end (2) and top plate (4).
- ▶ Remove the liquid end (2) with screws (1) from of the diaphragm and unscrew completely from the drive spindle.
- ▶ Remove the top plate (4) from the housing (6).
- ▶ Check the condition of the safety diaphragm (5) and replace it necessary.
- ▶ Push the safety diaphragm (5) only as far onto the drive axis until it lies flat on the pump housing (6) – no further!
- ▶ Screw the new diaphragm (3) carefully up to the stop on the drive axis – this must be exact to ensure correct metering!
- ▶ Check that the holes in the diaphragm are aligned with those in the pump housing.
- ▶ If not, start the pump and set the stroke length to 100 %.
- ▶ When the pump is running, turn the diaphragm (3) slowly in a clockwise direction until the four holes in the diaphragm are flush with those on the pump housing (6).
- ▶ Hold the diaphragm (3) in this position, set the stroke length to 0 % and stop the pump.
- ▶ Screw the diaphragm (3) tight once more.
- ▶ Position the top plate (4) on the pump housing (6).
- ▶ Only type 0232: Mount the set disk (4) with the screws.

**IMPORTANT**

- The leakage hole must point downwards when the pump is fully assembled (see fig. 20).
  - Position the top plate (4) correctly on the pump housing (6). Do not distort the top plate on the pump housing, otherwise the safety diaphragm (5) will not fit.
- Lay the diaphragm (3) into the top plate (4).
- Hold the top plate and screw the diaphragm (3) in a clockwise direction until it is firmly in position (you will feel the resistance of the return spring).

**IMPORTANT**

- Do not overtighten the diaphragm (3).
  - The top plate (4) must remain in position to prevent the safety diaphragm (5) from distorting.
- Position the liquid end (2) with the screws (1) on the diaphragm (3) and the top plate (4) (the priming connector must point downwards once the pump is fully assembled).
- Screw on screws (1) lightly and tighten (starting torque, see above).
- For coarse/fine bleed versions: ensure the liquid end cover engages in the liquid end, then push the coarse/fine bleed (knob) into the liquid end.

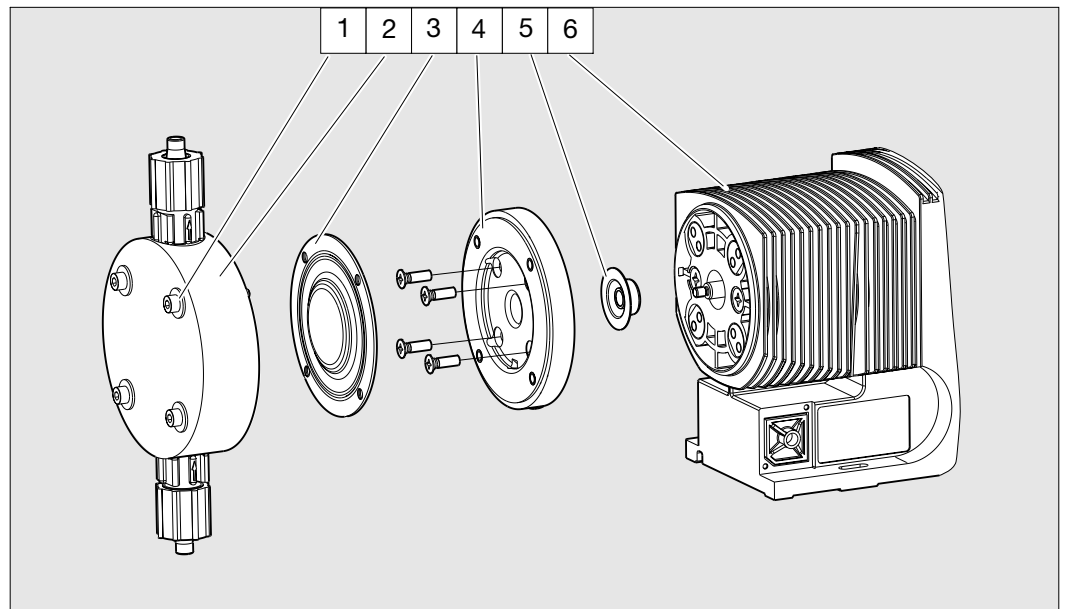


Fig. 22

- |              |                    |
|--------------|--------------------|
| 1 Screws     | 4 Top plate        |
| 2 Liquid end | 5 Safety diaphragm |
| 3 Diaphragm  | 6 Pump housing     |

**NOTE**

- Check the screw torque after 24 hours in operation!
- For PP liquid ends recheck the screw torque after three months!

## 11 Troubleshooting



### **WARNING**

- **Always take suitable precautions when using hazardous chemicals!**
- **Ensure the equipment is de-pressurised before working on the pump!**

### **gamma/ L does not prime despite full stroke and bleed function**

- Cause* Crystalline deposits on the ball seat because valves have dried out
- Remedy* ► Remove the suction sleeve from the chemical supply container and rinse out the liquid end thoroughly
- If still unsuccessful, dismantle valves and clean (see section 9)

### **Fluid is seeping from the top plate**

- Cause* The liquid end is not sealed against the pump diaphragm
- Remedy* ► Tighten screws in the liquid end (see section 9)
- If unsuccessful, replace the diaphragm (see section 10)

### **Green LED indicator (operating display) is not lit**

- Cause* Incorrect or no mains voltage
- Remedy* ► Use the recommended mains voltage as given in the voltage specification on the nameplate

### **Error Messages**

#### **Red LED display is lit, “Error” appears and “MINIM” flashes in the display**

- Cause* Fluid level in the chemical storage tank has reached “liquid level low, stage 2”
- Remedy* ► Fill the chemical supply container

#### **Red LED display is lit, “Error” appears and “ANALG” flashes in the display**

- Cause* gamma/ L is in “analogue” operating mode, a fault routine has been programmed in the ANALG menu and the operating current has fallen below 3.8 mA
- Remedy* ► Remedy low operating current
- Switch fault routine “OFF” (see Section 7.4.2.)

#### **Red LED display is lit, “Error” appears and “CNTCT” flashes in the display**

- Cause* gamma/ L is in “contact” or “batch” operating mode and the extended function “memory” has been set.  
In addition a very large factor has been entered, too many contacts have been input or the P-key has been pressed too often, resulting in an overflow of the stroke memory.
- Remedy* ► Press the P-key, saved data will be deleted
- Change gamma/ L set up

#### **Red LED display is lit, “Error” appears and “FLOW” flashes in the display**

- Cause* Dosing monitor not properly connected
- Remedy* ► Connect dosing monitor properly
- Press P-key
- Cause* Dosing monitor has reported more defective strokes than have been set in the FLOW menu
- Remedy* ► Press P-key
- Investigate the cause and remedy

#### **Red LED display is lit, “Error” appears and “Mem” flashes in the display**

- Cause* Stroke memory full
- Remedy* ► Remove cause
- Press P-key (Consider the consequences this will have on your process)

### **All other Errors**

Please contact your ProMinent branch or representative!

## Fault Signals

### Yellow LED display is lit

- Cause* Liquid level in chemical storage tank has reached “liquid level low, stage 1”  
*Remedy* ► Fill chemical storage tank

### Yellow LED Display is lit and “calib” flashes

- Cause* The pump is calibrated and the stroke length deviates by more than  $\pm 10$  % from the value at the time of calibration.  
*Remedy* ► Reset the stroke length or calibrate the pump again to the desired stroke length

## 12 Decommissioning and Disposal

### Decommissioning



#### WARNING

- When decommissioning the gamma/ L the housing and, in particular, the liquid end must be thoroughly cleaned to remove chemicals and dirt!
  - Always take suitable precautions when using hazardous chemicals!
  - Ensure that the equipment is de-pressurised!
- Disconnect the gamma/ L from the power supply
- Empty the liquid end by turning the gamma/ L upside down and allow the feed chemical to pour out
- Rinse the liquid end with a suitable material, thoroughly rinse the liquid end after use with hazardous materials!

If decommissioning is only temporary, maintain the correct storage conditions:

Storage temperature: -10 to +50 °C

Air humidity: < 92 % relative humidity

### Disposal



#### IMPORTANT

**Electronic waste is classified as special waste!**

Please observe all locally applicable directives!

## 13 Technical Data

### 13.1 Performance data and weights

gamma/ L

at 180 strokes/minute and 100 % stroke length

| Liquid end type | Max. feed rate at maximum operating pressure |      |         | max. feed rate at medium operating pressure |      |         | Connector size outer Ø x inner Ø mm | Suction-lift* m Wg | Priming-lift** m Wg | Admmis. priming pressure bar | Ship. Wt <sup>1</sup> approx. kg |
|-----------------|--|------|---------|---|------|---------|-------------------------------------|--------------------|---------------------|------------------------------|----------------------------------|
|                 | bar  | l/h  | ml/str. | bar   | l/h  | ml/str. |                                     |                    |                     |                              |                                  |
| 1000            | 10   | 0.74 | 0.09    | 5   | 0.82 | 0.076   | 6x4                                 | 6                  | 1.8                 | 8                            | 2.9 / 3.6                        |
| 1601            | 16   | 1.1  | 0.10    | 8   | 1.4  | 0.13    | 6x4                                 | 6                  | 2                   | 8                            | 2.9 / 3.6                        |
| 1602            | 16   | 2.1  | 0.19    | 8   | 2.5  | 0.24    | 6x4                                 | 6                  | 2                   | 5.5                          | 2.9 / 3.6                        |
| 1005            | 10   | 4.4  | 0.41    | 5   | 5.0  | 0.46    | 8x5****                             | 5                  | 3                   | 3                            | 3.1 / 4.5                        |
| 0708            | 7  | 7.1  | 0.66    | 3.5   | 8.4  | 0.78    | 8x5                                 | 6                  | 2                   | 2                            | 3.1 / 4.5                        |
| 0413            | 4  | 12.3 | 1.14    | 2   | 14.2 | 1.31    | 8x5                                 | 3                  | 2                   | 1.5                          | 3.1 / 4.5                        |
| 0220            | 2  | 19.0 | 1.76    | 1   | 20.9 | 1.94    | 12x9                                | 2                  | 2                   | 1                            | 3.1 / 4.5                        |
| 1605            | 16   | 4.1  | 0.38    | 8   | 4.9  | 0.45    | 8x5****                             | 4                  | 3                   | 3                            | 4.5 / 5.9                        |
| 1008            | 10   | 6.8  | 0.63    | 5   | 8.3  | 0.76    | 8x5                                 | 3                  | 3                   | 2                            | 4.5 / 5.9                        |
| 0713            | 7  | 11.0 | 1.02    | 3.5   | 13.1 | 1.21    | 8x5                                 | 3                  | 3                   | 1.5                          | 4.5 / 5.9                        |
| 0420            | 4  | 17.1 | 1.58    | 2   | 19.1 | 1.77    | 12x9                                | 3                  | 3                   | 1                            | 5.5 / 8.6                        |
| 0232            | 2  | 32.0 | 2.96    | 1   | 36.2 | 3.35    | 12x9                                | 2                  | 2                   | 0.8                          | 5.5 / 8.6                        |

gamma/ L with self-degassing liquid end \*\*\*

at 180 strokes/minute and 100 % stroke length

| Liquid end type | Max. feed rate at maximum operating pressure |      |         | max. feed rate at medium operating pressure |      |         | Connector size outer Ø x inner Ø mm | Suction-lift* m Wg | Priming-lift** m Wg | Admmis. priming pressure bar | Ship. Wt <sup>1</sup> approx. kg |
|-----------------|--|------|---------|---|------|---------|-------------------------------------|--------------------|---------------------|------------------------------|----------------------------------|
|                 | bar  | l/h  | ml/str. | bar   | l/h  | ml/str. |                                     |                    |                     |                              |                                  |
| 1601            | 16   | 0.59 | 0.055   | 8   | 0.78 | 0.072   | 6x4                                 | –                  | 1.8                 | 0.5                          | 2.9                              |
| 1602            | 16   | 1.4  | 0.13    | 8   | 1.74 | 0.16    | 6x4                                 | –                  | 2.1                 | 0.5                          | 2.9                              |
| 1005            | 10   | 3.6  | 0.33    | 5   | 4.0  | 0.37    | 8x5                                 | –                  | 2.7                 | 0.5                          | 3.1                              |
| 0708            | 7  | 6.6  | 0.61    | 3.5   | 7.5  | 0.69    | 8x5                                 | –                  | 2                   | 0.5                          | 3.1                              |
| 0413            | 4  | 10.8 | 1.00    | 2   | 12.6 | 1.17    | 8x5                                 | –                  | 2.5                 | 0.5                          | 3.1                              |
| 0220            | 2  | 16.3 | 0.31    | 8   | 3.8  | 0.35    | 8x5                                 | –                  | 3.0                 | 0.5                          | 4.5                              |
| 1008            | 10   | 6.3  | 0.58    | 5   | 7.5  | 0.69    | 8x5                                 | –                  | 3.0                 | 0.5                          | 4.5                              |
| 0713            | 7  | 10.5 | 0.97    | 3.5   | 12.3 | 1.14    | 8x5                                 | –                  | 2.5                 | 0.5                          | 4.5                              |
| 0420            | 4  | 15.6 | 1.44    | 2   | 17.4 | 1.61    | 12x9                                | –                  | 2.5                 | 0.5                          | 4.5                              |

\* Lift when suction line and liquid end are full

\*\* Priming lift with clean and wetted valves, priming lift at 100% stroke length and free flow or opened bleed valve

\*\*\* The feed rate values are for minimum feed rates, based on water at 20° C

\*\*\*\* For material versions SST : 6 x 4 mm

<sup>1</sup> For material versions PPE, PPB, NPE, NPB, PVT, TTT/SST

<sup>2</sup> For material versions PPE, PPB, NPE, NPB

## 13.2 Dosing reproducibility

### Standard Liquid ends

*Dosing precision* -5 to +10 % at max. stroke length and max. operating pressure for all materials.

*Reproducibility*  $\pm 2$  % at constant conditions and minimum 30 % stroke length.

### Self-degassing liquid ends

Since self-degassing liquid ends are filled with air bubbles when in contact with gaseous chemicals and when in operation, no dosing reproducibility values can be given.

The recommended minimum stroke length with self-degassing liquid ends is 50 %.

## 13.3 Viscosity

The liquid ends are designed for liquids up to a maximum viscosity of

- 200 mPas for standard liquid ends
- 500 mPas for valves with springs
- 50 mPas for self-degassing liquid ends

## 13.4 Materials Data

### Liquid ends

| Version | Liquid end                | Valves                    | Seals | Balls   |
|---------|---------------------------|---------------------------|-------|---------|
| PPE     | PP                        | PP                        | EPDM  | Ceramic |
| PPB     | PP                        | PP                        | FPM   | Ceramic |
| NPE     | Acrylic glass             | PVC                       | EPDM  | Ceramic |
| NPE     | Acrylic glass             | PVC                       | FPM   | Ceramic |
| PVT     | PVDF                      | PTFE with carbon          | PTFE  | Ceramic |
| TTT     | PTFE with carbon          | PTFE with carbon          | PTFE  | Ceramic |
| SST     | Stainless steel<br>1.4571 | Stainless steel<br>1.4571 | PTFE  | Ceramic |

FPM = Fluorine Rubber

### Pump

Housing Polyphenylene ether (PPE with glass fibre)

Cover Polycarbonate

Electronics Electronic components

## 13.5 Electrical Data

Version: 100 - 230 V  $\pm 10$  %, 50/60 Hz

| Varants 100 - 230 V/AC | gamma/ L M70            | gamma/ L M85            |
|------------------------|-------------------------|-------------------------|
| Power rating           | 17 W                    | 22 W                    |
| Rated current          | 0.7 A                   | 1 A                     |
| Switch on peak current | 15 A (for approx. 1 ms) | 15 A (for approx. 1 ms) |
| Fuse                   | 0.8 AT                  | 0.8 AT                  |

*Note* Fuses must display VDE, UL and CSA certification, e.g. type 19195 from Wickmann in accordance with IEC publication 127 - 2/3

## 13.6 Ambient conditions

|                     |  |                                   |
|---------------------|--|-----------------------------------|
| <i>Temperatures</i> | Storage and transport temperatures:    | -10 to +50 °C                     |
|                     | Feed chemical temperature:             | -10 to +35 °C                     |
|                     | Ambient temperature when in operation: | -10 to +45 °C (drive and control) |

Maximum ambient temperatures for liquid ends depending on material type:

| max. ambient temperature               | PPE, PPB | NPE, NPB | PVT    | TTT    | SST    |
|--|----------|----------|--------|--------|--------|
| Long-term at max. operating pressure   | 50 °C    | 45 °C    | 50 °C  | 50 °C  | 50 °C  |
| Short term (max. 15 min) at max. 2 bar | 100 °C   | 60 °C    | 120 °C | 120 °C | 120 °C |

\* Under extreme conditions such as maximum dosing temperatures, maximum stroke frequency and maximum operating pressure, leakage can occur on the liquid end at an ambient temperature of 35 °C.

|                |                                       |  |
|----------------|---------------------------------------|--|
| <i>Climate</i> | Permissible air humidity:             | 92 % relative humidity, not condensing |
|                | Moist and fluctuating air conditions: | FW 24 in accordance with DIN 50016     |

## 13.7 Enclosure rating and safety class

|                            |   |
|----------------------------|---|
| <i>Enclosure Rating</i>    | Contact and moisture enclosure rating:<br>IP 65 in accordance with IEC 529, EN 60529, DIN VDE 0470 Part 1 |
| <i>Safety Requirements</i> | Safety Class 1 - Mains connection with earth lead   |

## 13.8 Compatibility

The hydraulic parts of the gamma/ L are identical to those of the Beta®.  
The following components and accessories for pumps from the product ranges Beta®, CONCEPT, gamma-Classic and gamma are all compatible:

- gamma/Vario signal cable; 2-, 4- and 5 core for "external" function
- 2 stage float switch (gamma/Vario)
- Discharge tubing diameters
- Standard gamma connector set
- gamma wall bracket
- Chemical feed containers and mounting plates
- Total height (distance between suction and discharge connector)
- Distance between the connectors and locating holes on the pumps
- Accessories such as pressure back pressure valve, multifunctional valve, dosing monitor and rinsing equipment



## PPE, PPB material versions

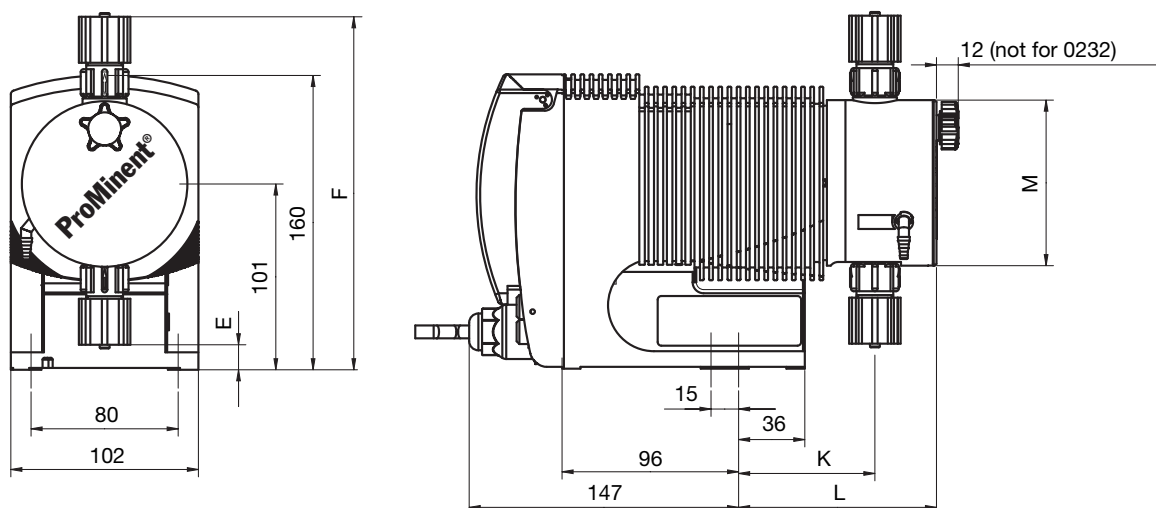


Fig. 23

Dimensions in mm

|          | gamma/ L M70 |      |             |      | gamma/ L M85 |             |      |       |
|----------|--------------|------|-------------|------|--------------|-------------|------|-------|
|          | 1000 - 1602  | 1005 | 0708 - 0413 | 0220 | 1605         | 1008 - 0713 | 0420 | 0232  |
| <b>E</b> | 23           | 13   | 15          | 15   | 13           | 15          | 15   | 5     |
| <b>F</b> | 186          | 193  | 191         | 191  | 193          | 191         | 191  | 197   |
| <b>K</b> | 71           | 71   | 74          | 76   | 71           | 74          | 76   | 76    |
| <b>L</b> | 106          | 105  | 108         | 110  | 105          | 108         | 110  | 91    |
| <b>M</b> | Ø 70         | Ø 90 | Ø 90        | Ø 90 | Ø 90         | Ø 90        | Ø 90 | Ø 110 |

## NPE, NPB material versions (non bleed)

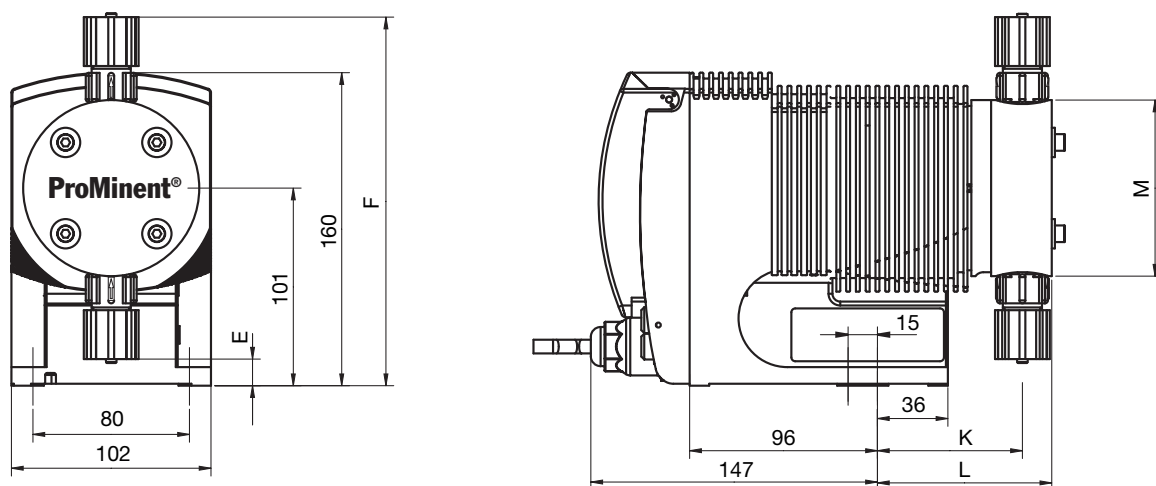


Fig. 24

Dimensions in mm

|          | gamma/ L M70 |           |      |      |             | gamma/ L M85 |             |      |       |
|----------|--------------|-----------|------|------|-------------|--------------|-------------|------|-------|
|          | 1000 - 1601  | 1602      | 1005 | 0708 | 0413 - 0220 | 1605         | 1008 - 0713 | 0420 | 0232  |
| <b>E</b> | 25           | 23        | 16   | 15   | 15          | 16           | 15          | 15   | 5     |
| <b>F</b> | 177          | 179       | 188  | 189  | 189         | 188          | 189         | 189  | 199   |
| <b>K</b> | 77           | 77        | 74   | 74   | 76          | 74           | 74          | 76   | 76    |
| <b>L</b> | 92           | 92        | 89   | 89   | 91          | 89           | 89          | 91   | 91    |
| <b>M</b> | 62 (Ø 70)    | 66 (Ø 70) | Ø 90 | Ø 90 | Ø 90        | Ø 90         | Ø 90        | Ø 90 | Ø 110 |

NPE, NPB material versions (with bleed function)

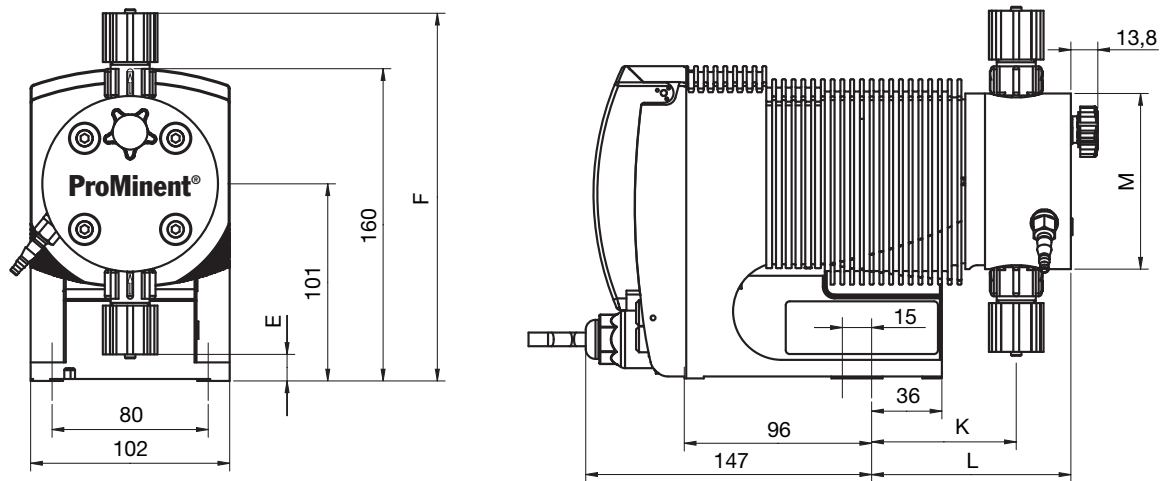


Fig. 25

Dimensions in mm

|          | gamma/ L M70 |           |      |      |             | gamma/ L M85 |      |             |       |
|----------|--------------|-----------|------|------|-------------|--------------|------|-------------|-------|
|          | 1000 - 1601  | 1602      | 1005 | 0708 | 0413 - 0220 | 1605         | 1008 | 0713 - 0420 | 0232  |
| <b>E</b> | 25           | 23        | 16   | 13   | 15          | 16           | 13   | 15          | 5     |
| <b>F</b> | 177          | 179       | 188  | 189  | 189         | 188          | 189  | 189         | 199   |
| <b>K</b> | 77           | 77        | 74   | 74   | 76          | 74           | 74   | 76          | 76    |
| <b>L</b> | 105          | 105       | 102  | 102  | 104         | 102          | 102  | 104         | 105   |
| <b>M</b> | 62 (Ø 70)    | 66 (Ø 70) | Ø 90 | Ø 90 | Ø 90        | Ø 90         | Ø 90 | Ø 90        | Ø 110 |

PPE, PPB, NPE, NPB, SEK material versions

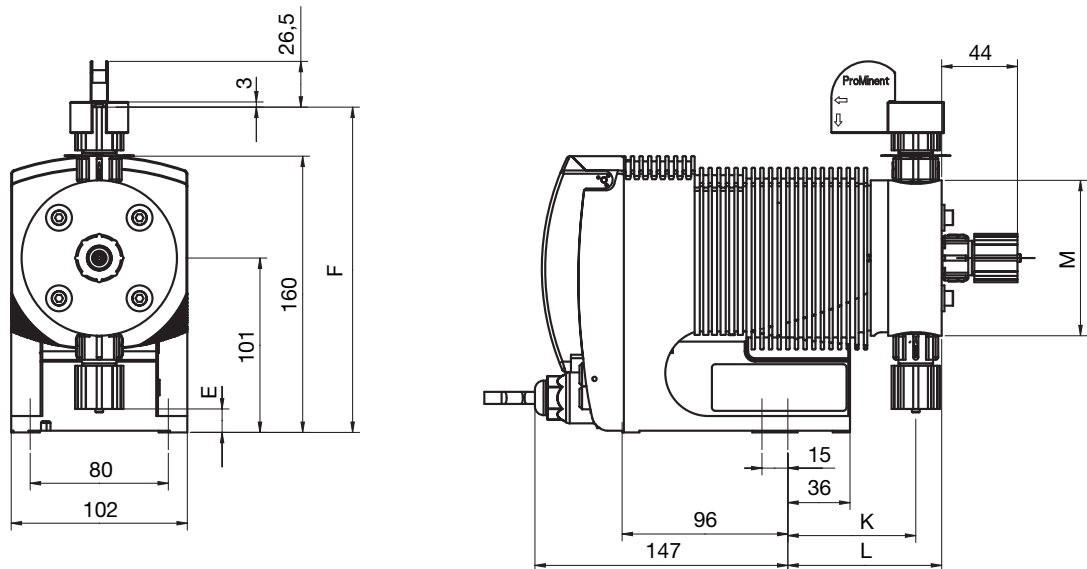


Fig. 26

Dimensions in mm

|          | gamma/ L M70 |           |      |      |             | gamma/ L M85 |             |      |
|----------|--------------|-----------|------|------|-------------|--------------|-------------|------|
|          | 1601         | 1602      | 1005 | 0708 | 0413 - 0220 | 1605         | 1008 - 0713 | 0420 |
| <b>E</b> | 25           | 23        | 16   | 15   | 15          | 16           | 15          | 15   |
| <b>F</b> | 177          | 179       | 188  | 189  | 189         | 188          | 189         | 189  |
| <b>K</b> | 77           | 77        | 74   | 74   | 76          | 74           | 74          | 76   |
| <b>L</b> | 92           | 92        | 89   | 89   | 91          | 89           | 89          | 91   |
| <b>M</b> | 62 (Ø 60)    | 66 (Ø 70) | Ø 90 | Ø 90 | Ø 90        | Ø 90         | Ø 90        | Ø 90 |

PVDF material version

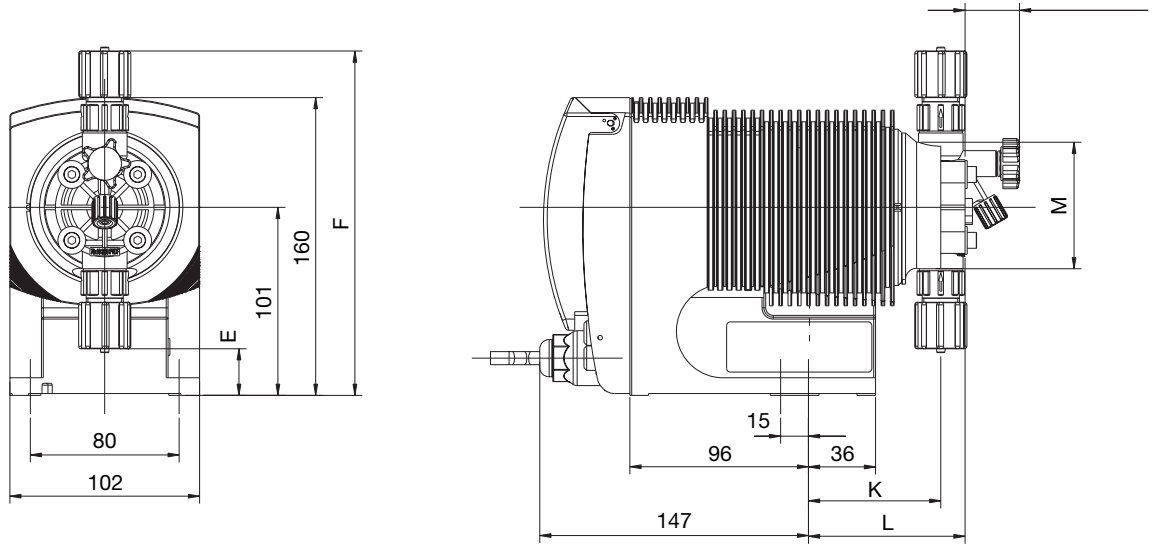


Fig. 27

Dimensions in mm

|   | gamma/ L M70 |      |           |      | gamma/ L M85 |           |      |       |
|---|--------------|------|-----------|------|--------------|-----------|------|-------|
|   | 1000-1602    | 1005 | 0708-0413 | 0220 | 1605         | 0408-0713 | 0420 | 0232  |
| E | 25           | 14   | 14        | 14   | 14           | 14        | 14   | 4     |
| F | 185          | 191  | 191       | 191  | 191          | 191       | 191  | 198   |
| K | 71           | 71   | 73        | 75   | 71           | 73        | 75   | 76    |
| L | 84           | 88   | 90        | 92   | 88           | 90        | 92   | 93    |
| M | Ø 70         | Ø 90 | Ø 90      | Ø 90 | Ø 90         | Ø 90      | Ø 90 | Ø 110 |

TTT material version

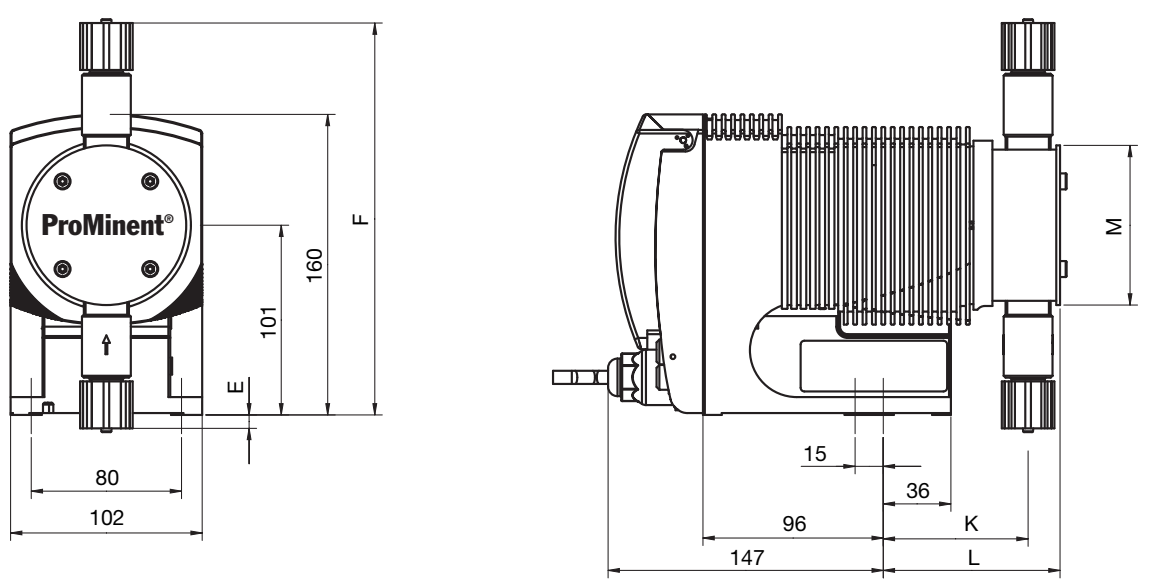


Fig. 28

Dimensions in mm

|   | gamma/ L M70 |           |           |             | gamma/ L M85 |             |            |
|---|--------------|-----------|-----------|-------------|--------------|-------------|------------|
|   | 1000 - 1601  | 1602      | 1005      | 0708 - 0220 | 1605         | 1008 - 0420 | 0232       |
| E | 32           | 25        | 23        | -7          | 23           | -7          | -15        |
| F | 170          | 178       | 179       | 209         | 179          | 209         | 217        |
| K | 78           | 72        | 75        | 77          | 75           | 77          | 78         |
| L | 91           | 87        | 90        | 95          | 90           | 95          | 97         |
| M | 51 (Ø 60)    | 66 (Ø 70) | 68 (Ø 80) | 81 (Ø 85)   | 68 (Ø 80)    | 81 (Ø 85)   | 96 (Ø 100) |

SST material version

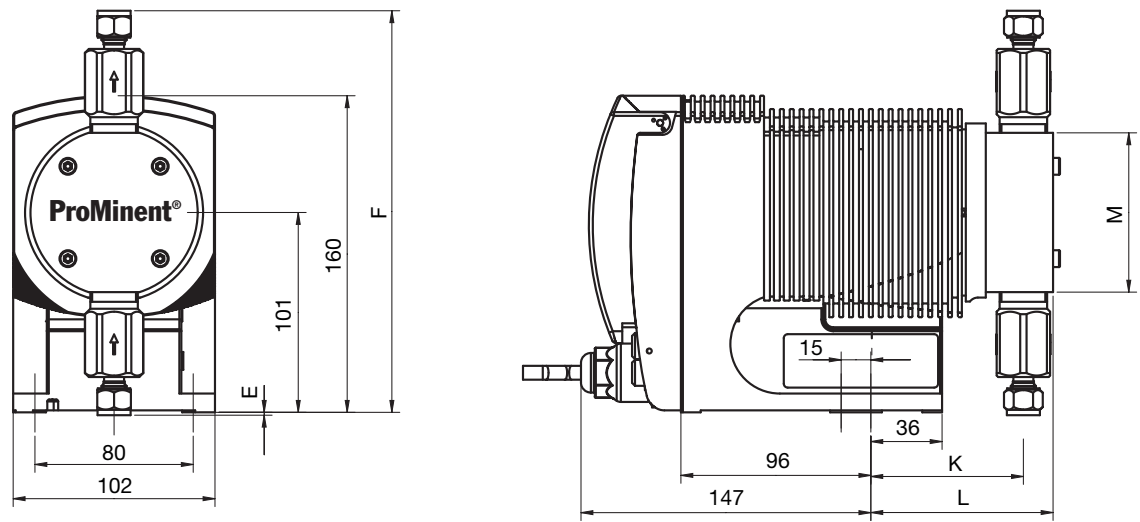
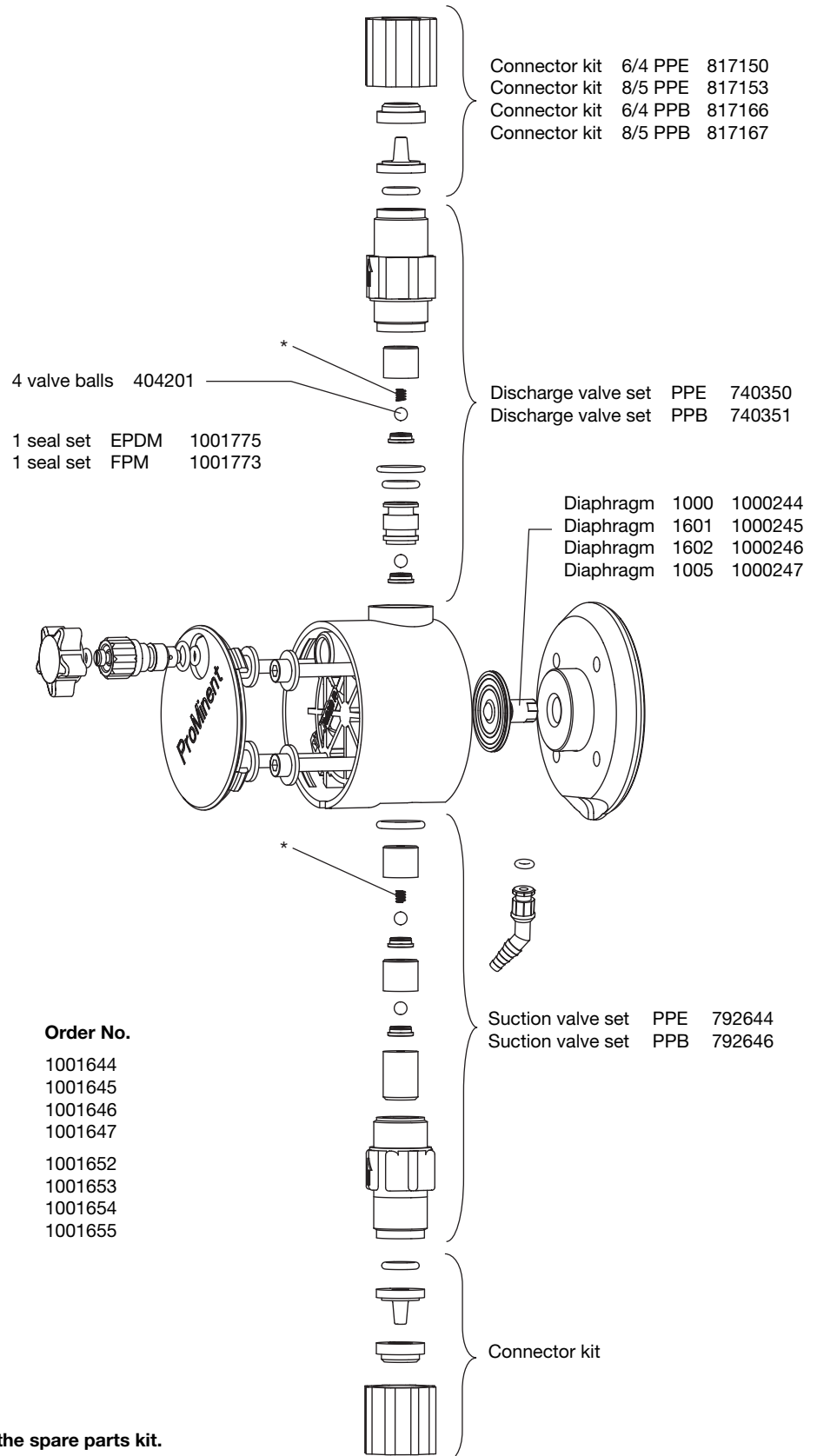


Fig. 29

Dimensions in mm

|   | gamma/ L M70 |           |           |             |           | gamma/ L M85 |             |           |            |
|---|--------------|-----------|-----------|-------------|-----------|--------------|-------------|-----------|------------|
|   | 1000 - 1601  | 1602      | 1005      | 0708 - 0413 | 0220      | 1605         | 1008 - 0713 | 0420      | 0232       |
| E | 40           | 33        | 31        | -2          | -3        | 31           | -2          | -3        | -10        |
| F | 162          | 170       | 171       | 203         | 204       | 171          | 203         | 204       | 212        |
| K | 78           | 72        | 75        | 77          | 77        | 75           | 77          | 77        | 78         |
| L | 89           | 85        | 88        | 93          | 93        | 88           | 93          | 93        | 95         |
| M | 51 (Ø 60)    | 66 (Ø 70) | 68 (Ø 80) | 81 (Ø 85)   | 81 (Ø 85) | 81 (Ø 80)    | 81 (Ø 85)   | 81 (Ø 85) | 96 (Ø 100) |

**Liquid end 1000 - 1005 (1605)  
PP with coarse/fine bleed**



**Spare parts kits for:**

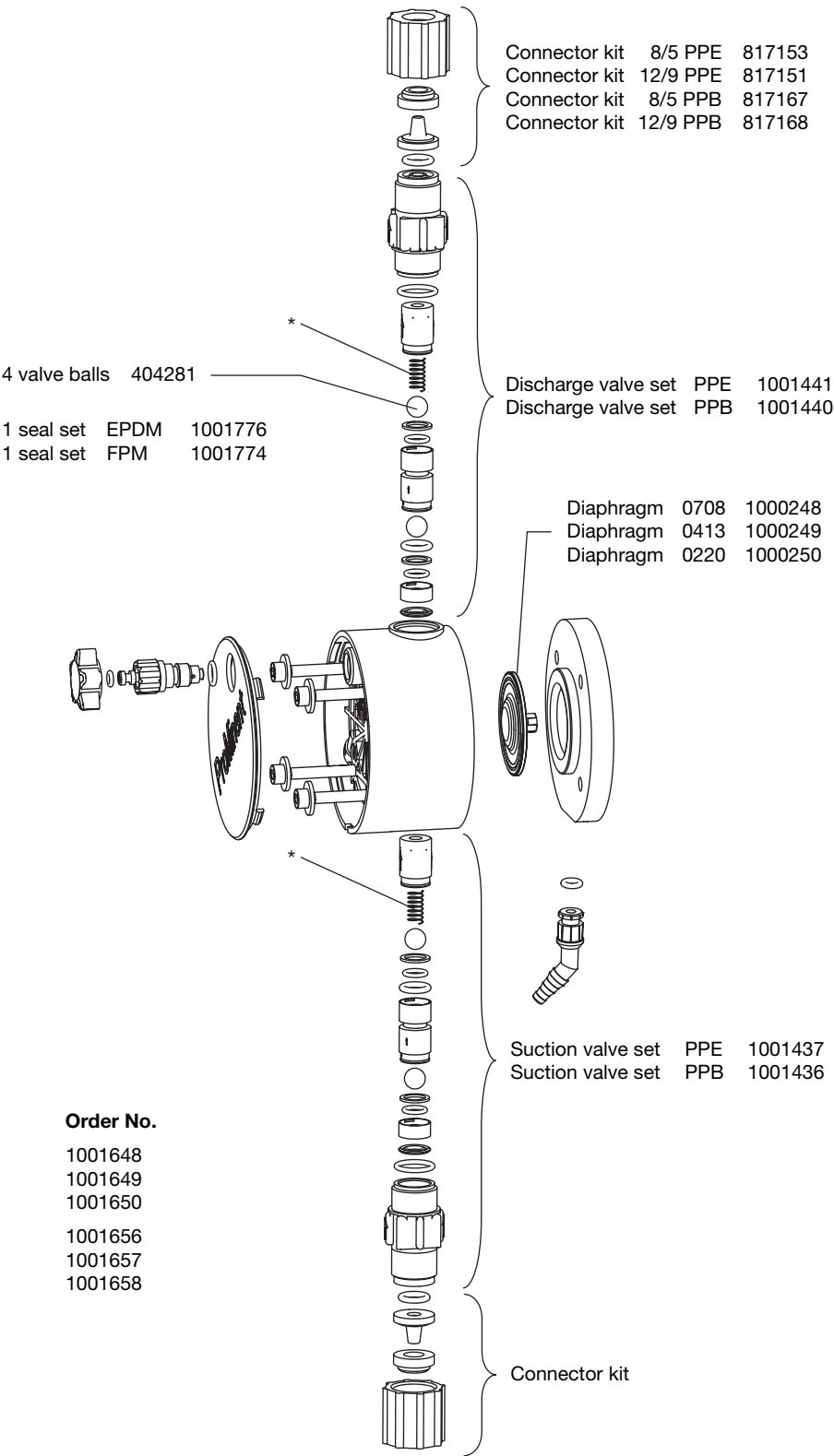
| Type        | Material | Order No. |
|-------------|----------|-----------|
| 1000        | PPE      | 1001644   |
| 1601        | PPE      | 1001645   |
| 1602        | PPE      | 1001646   |
| 1005 (1605) | PPE      | 1001647   |
| 1000        | PPB      | 1001652   |
| 1601        | PPB      | 1001653   |
| 1602        | PPB      | 1001654   |
| 1005 (1605) | PPB      | 1001655   |

The listed items are included in the spare parts kit.  
\* Customer accessories

Subject to technical alterations.

60\_07-104\_00\_18-04\_2

Liquid end 0708 (1008) - 0220 (0420)  
PP with coarse/fine bleed



Spare parts kits for:

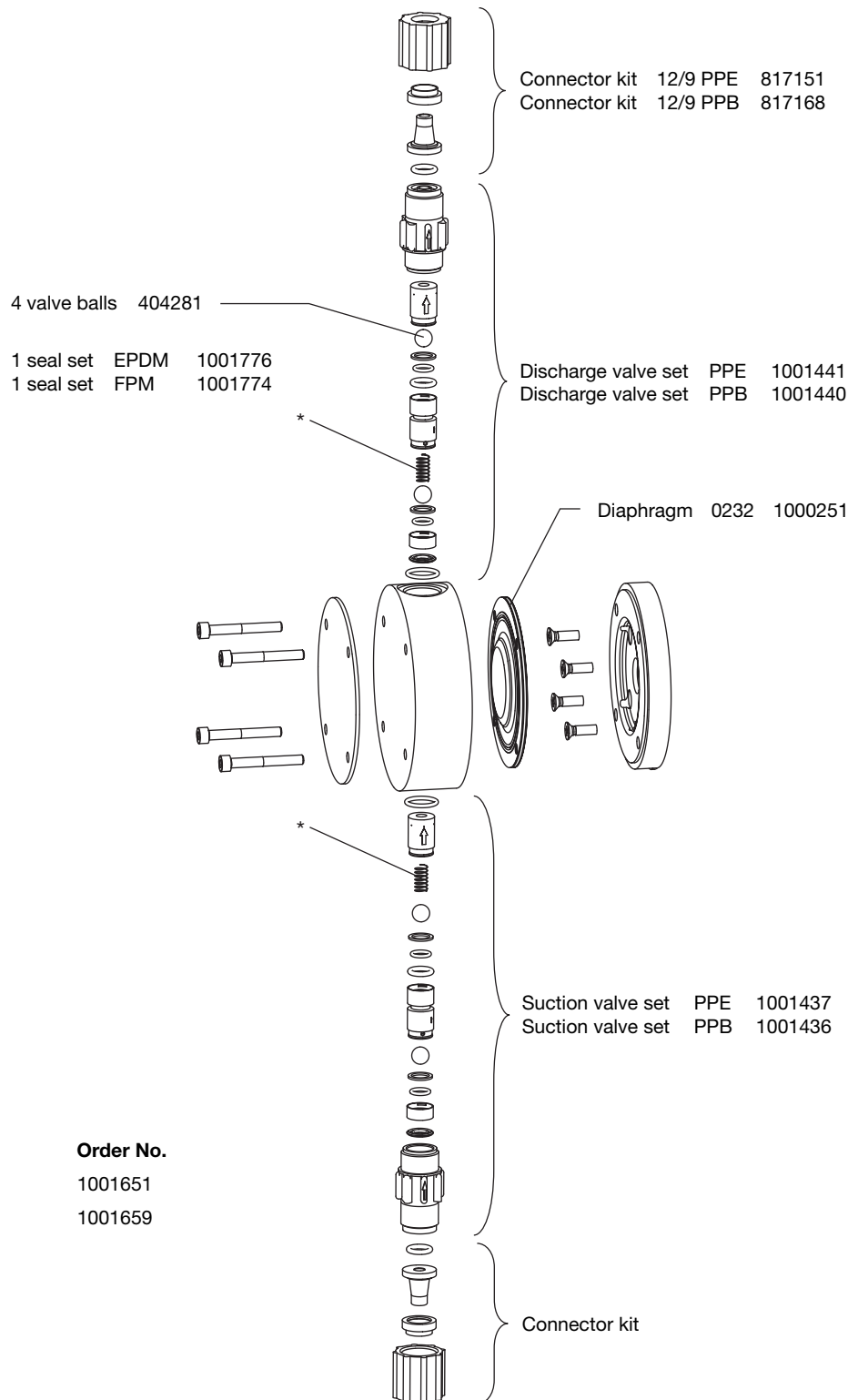
| Type        | Material | Order No. |
|-------------|----------|-----------|
| 0708 (1008) | PPE      | 1001648   |
| 0413 (0713) | PPE      | 1001649   |
| 0220 (0420) | PPE      | 1001650   |
| 0708 (1008) | PPB      | 1001656   |
| 0413 (0713) | PPB      | 1001657   |
| 0220 (0420) | PPB      | 1001658   |

The listed items are included in the spare parts kit.  
\* Customer accessories

Subject to technical alterations.

60\_07-104\_00\_19-04\_2

**Liquid end 0232**  
**PP without coarse/fine bleed**



**Spare parts kits for:**

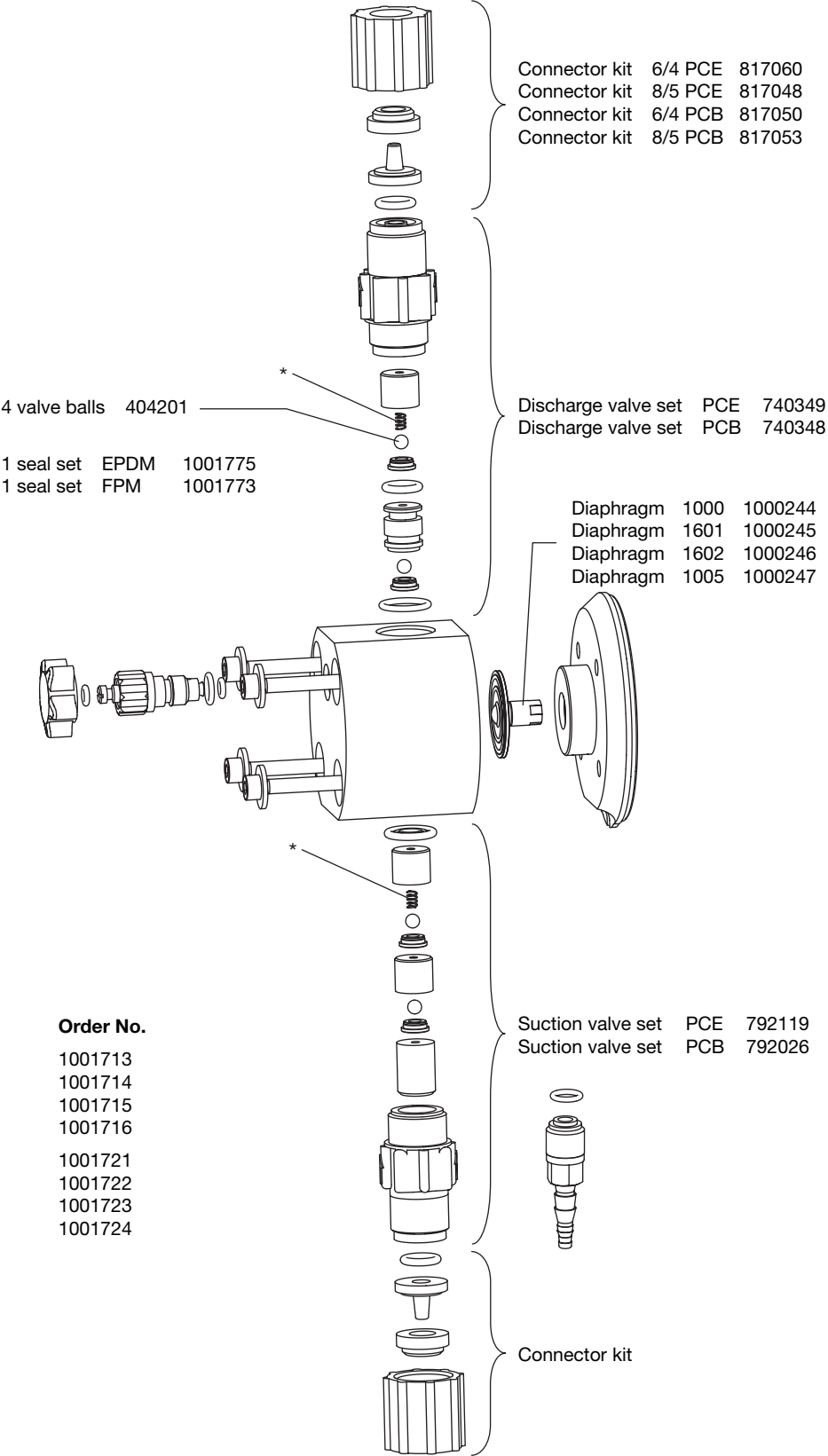
| Type | Material | Order No. |
|------|----------|-----------|
| 0232 | PPE      | 1001651   |
| 0232 | PPB      | 1001659   |

The listed items are included in the spare parts kit.  
\* Customer accessories

Subject to technical alterations.

60\_07-104\_00\_40-04\_2

Liquid end 1000 - 1005 (1605)  
NP with coarse/fine bleed



Spare parts kits for:

| Type        | Material | Order No. |
|-------------|----------|-----------|
| 1000        | NPE      | 1001713   |
| 1601        | NPE      | 1001714   |
| 1602        | NPE      | 1001715   |
| 1005 (1605) | NPE      | 1001716   |
| 1000        | NPB      | 1001721   |
| 1601        | NPB      | 1001722   |
| 1602        | NPB      | 1001723   |
| 1005 (1605) | NPB      | 1001724   |

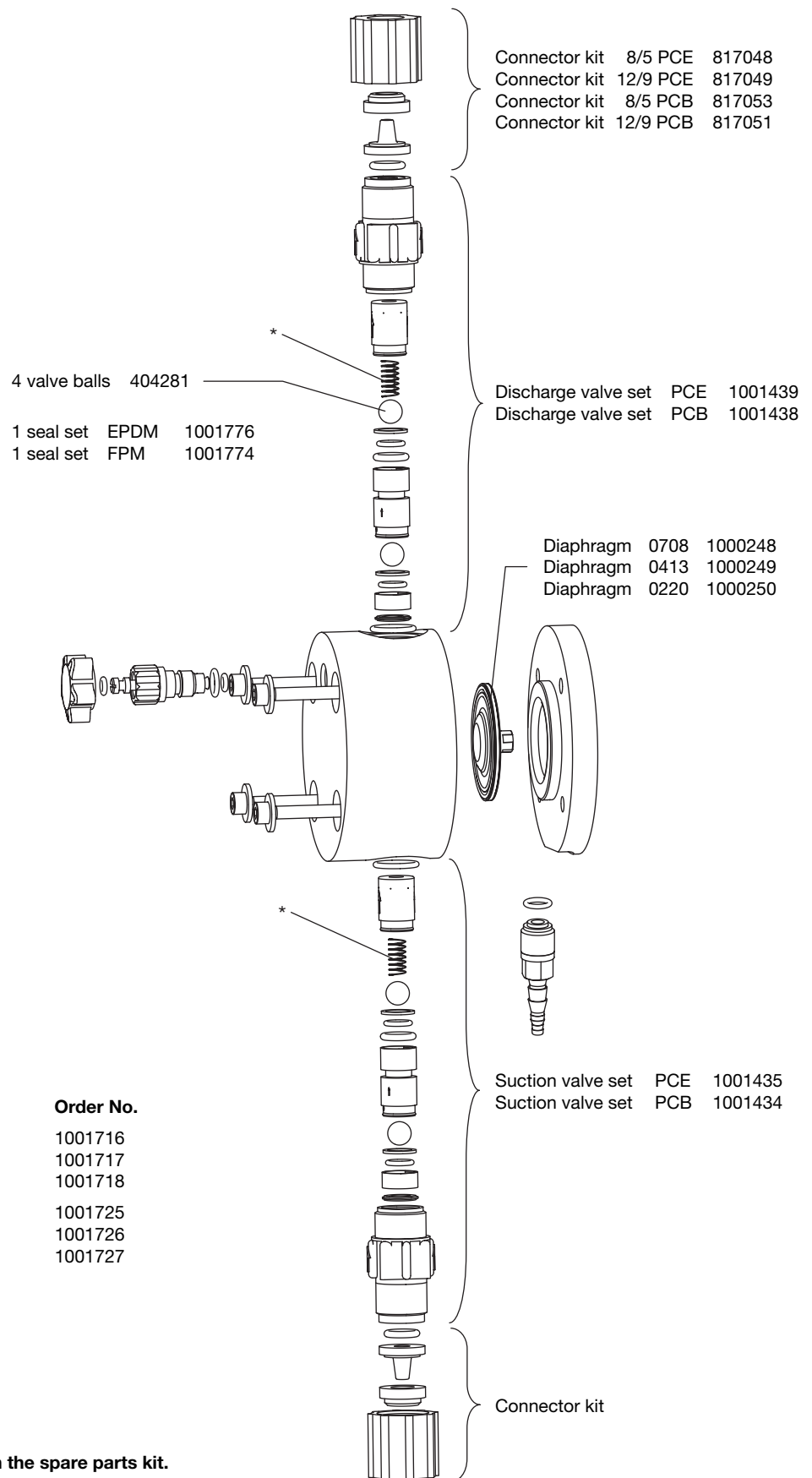
The listed items are included in the spare parts kit.  
\* Customer accessories

Subject to technical alterations.

60\_07-104\_00\_23-04\_2



**Liquid end 0708 (1008) - 0220 (0420)**  
**NP with coarse/fine bleed**



**Spare parts kits for:**

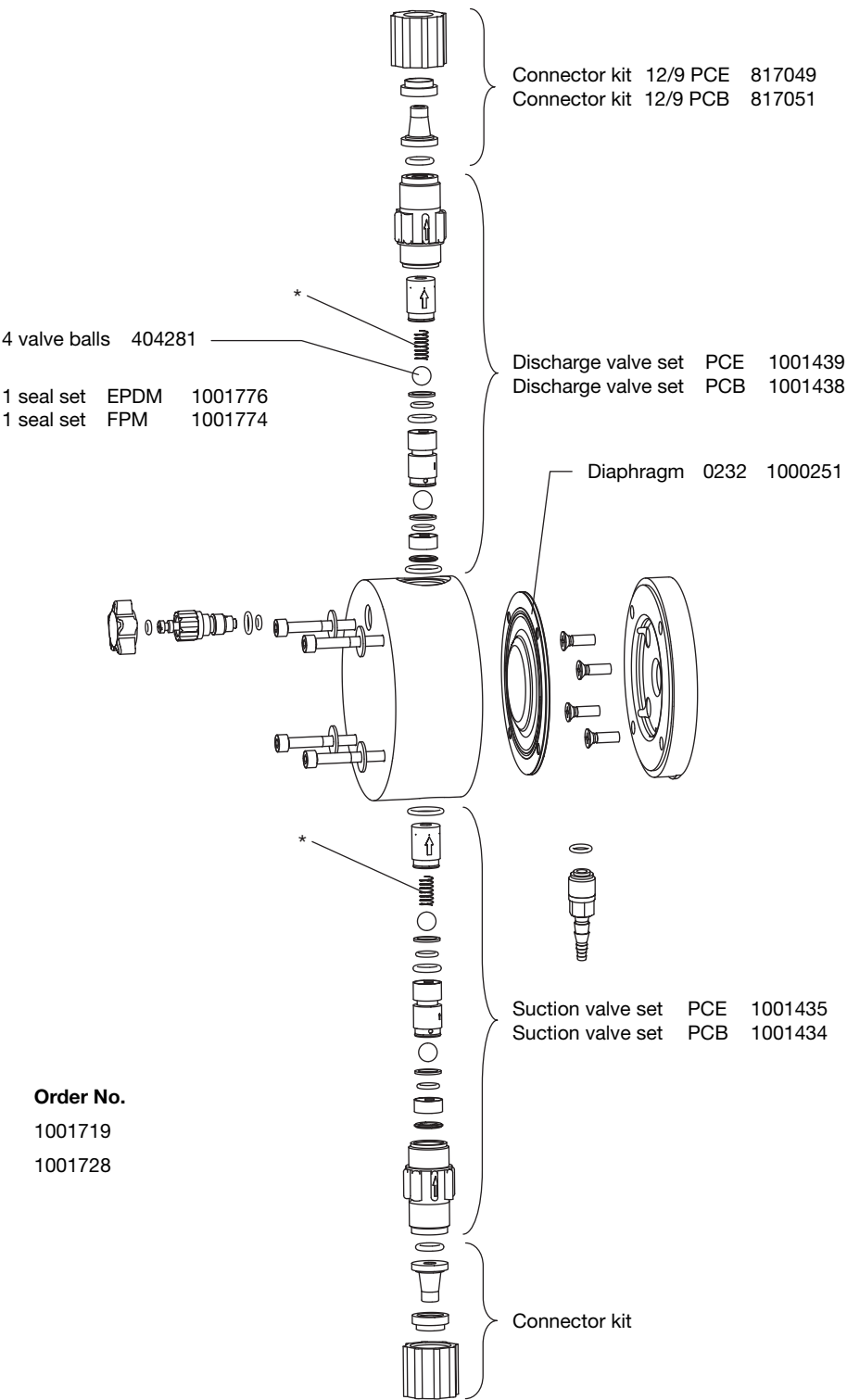
| Type        | Material | Order No. |
|-------------|----------|-----------|
| 0708 (1008) | NPE      | 1001716   |
| 0413 (0713) | NPE      | 1001717   |
| 0220 (0420) | NPE      | 1001718   |
| 0708 (1008) | NPB      | 1001725   |
| 0413 (0713) | NPB      | 1001726   |
| 0220 (0420) | NPB      | 1001727   |

The listed items are included in the spare parts kit.  
 \* Customer accessories

Subject to technical alterations.

60\_07-104\_00\_24-04\_2

Liquid end 0232  
NP with coarse/fine bleed



Spare parts kits for:

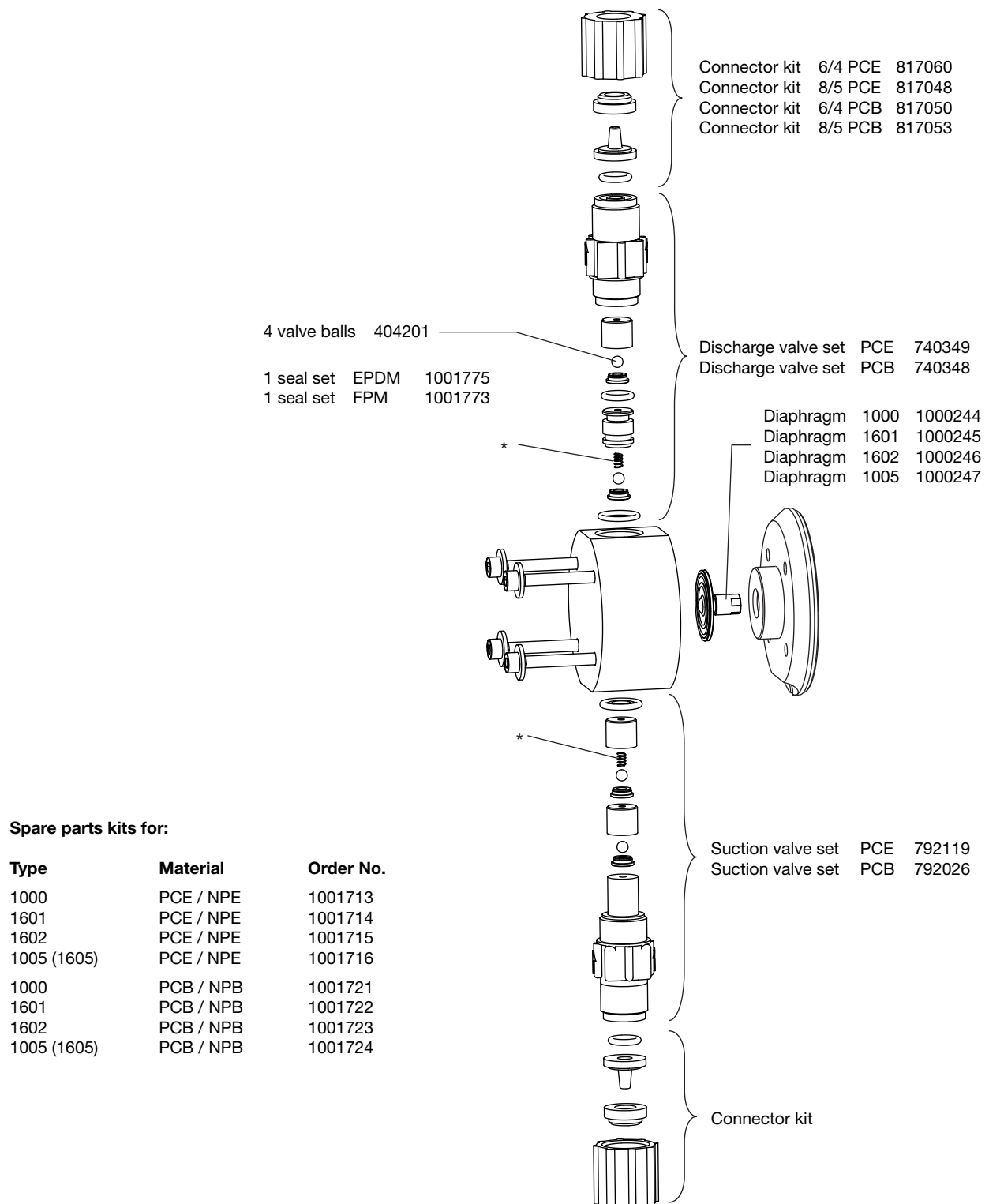
| Type | Material | Order No. |
|------|----------|-----------|
| 0232 | NPE      | 1001719   |
| 0232 | NPB      | 1001728   |

The listed items are included in the spare parts kit.  
\* Customer accessories

Subject to technical alterations.

60\_07-104\_00\_34-04\_2

**Liquid end 1000 - 1005 (1605)  
NP without coarse/fine bleed**



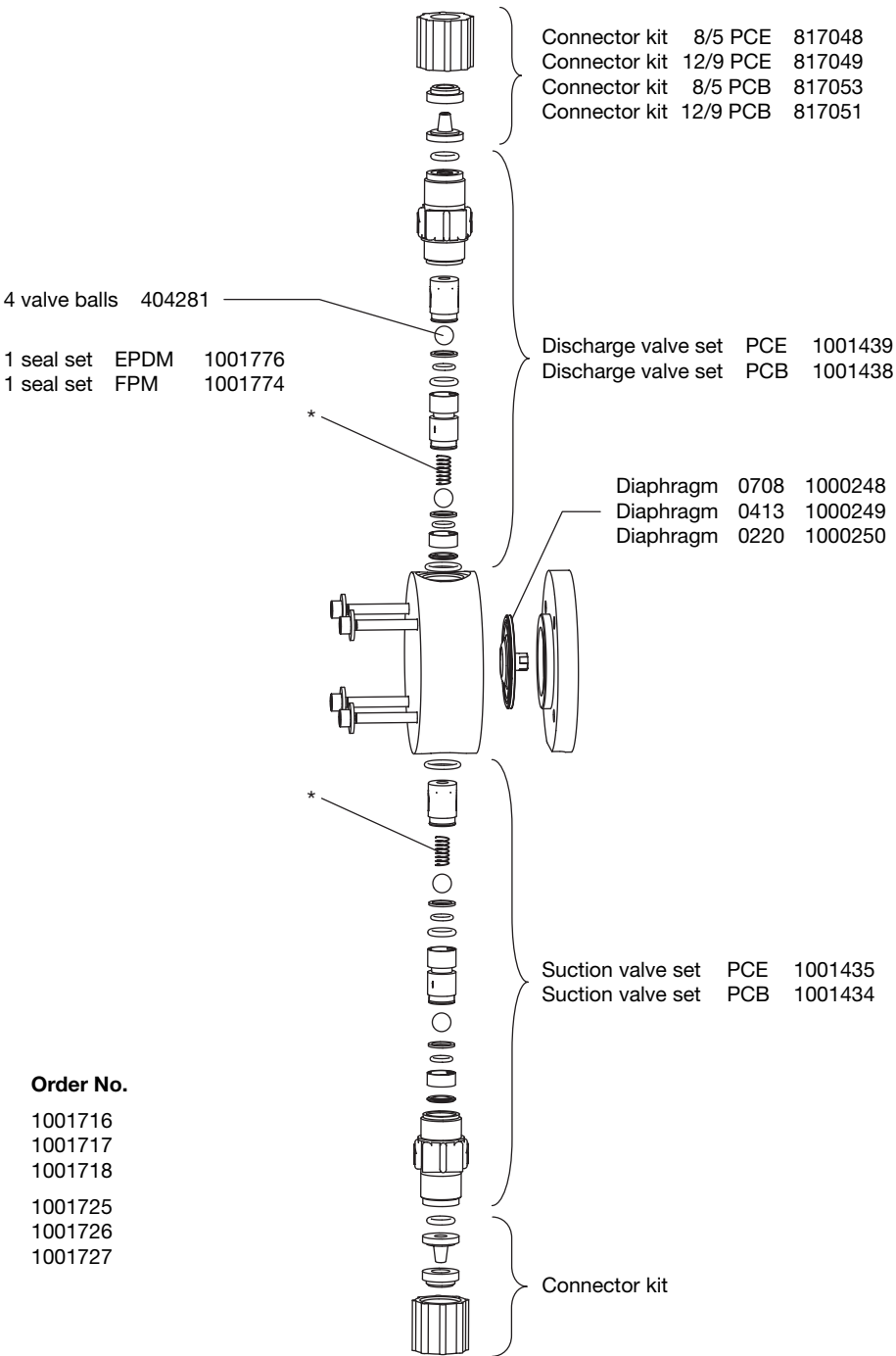
The listed items are included in the spare parts kit.

\* Customer accessories

Subject to technical alterations.

60\_07-104\_00\_21-04\_2

Liquid end 0708 (1008) - 0220 (0420)  
NP without coarse/fine bleed



Spare parts kits for:

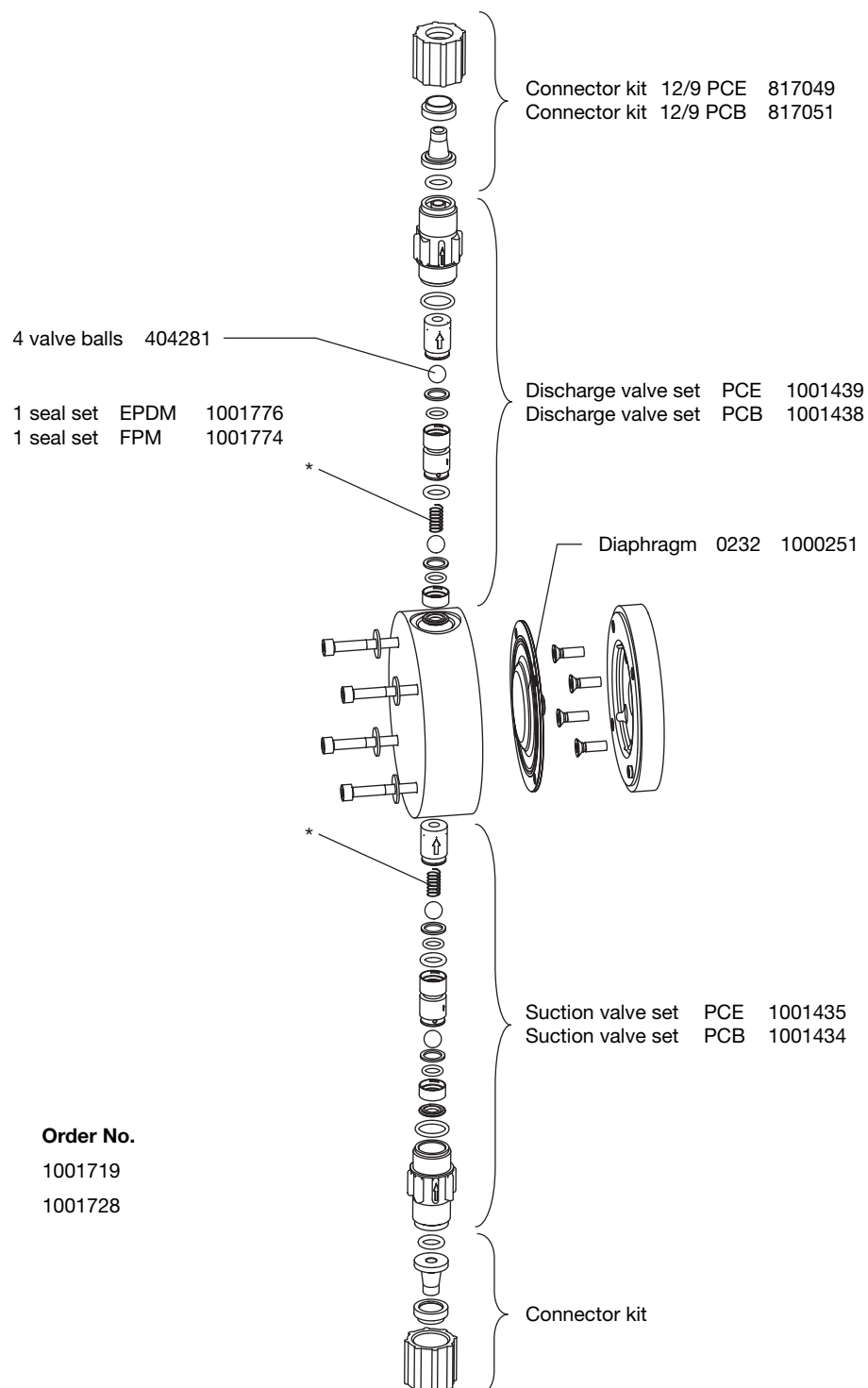
| Type        | Material | Order No. |
|-------------|----------|-----------|
| 0708 (1008) | NPE      | 1001716   |
| 0413 (0713) | NPE      | 1001717   |
| 0220 (0420) | NPE      | 1001718   |
| 0708 (1008) | NPB      | 1001725   |
| 0413 (0713) | NPB      | 1001726   |
| 0220 (0420) | NPB      | 1001727   |

The listed items are included in the spare parts kit.  
\* Customer accessories

Subject to technical alterations.

60\_07-104\_00\_22-04\_2

**Liquid end 0232**  
**NP without coarse/fine bleed**



**Spare parts kits for:**

| Type | Material | Order No. |
|------|----------|-----------|
| 0232 | NPE      | 1001719   |
| 0232 | NPB      | 1001728   |

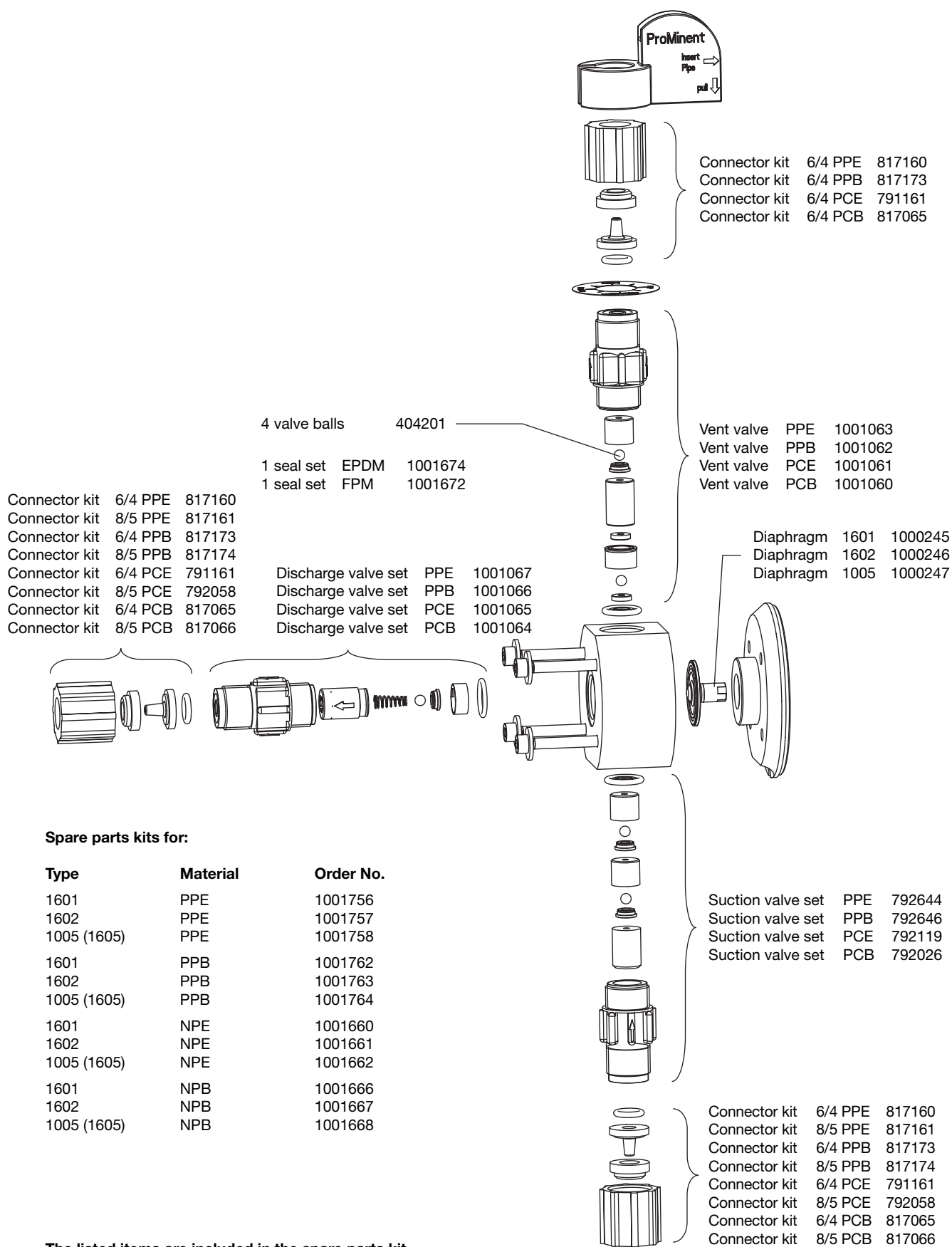
The listed items are included in the spare parts kit.

\* Customer accessories

Subject to technical alterations.

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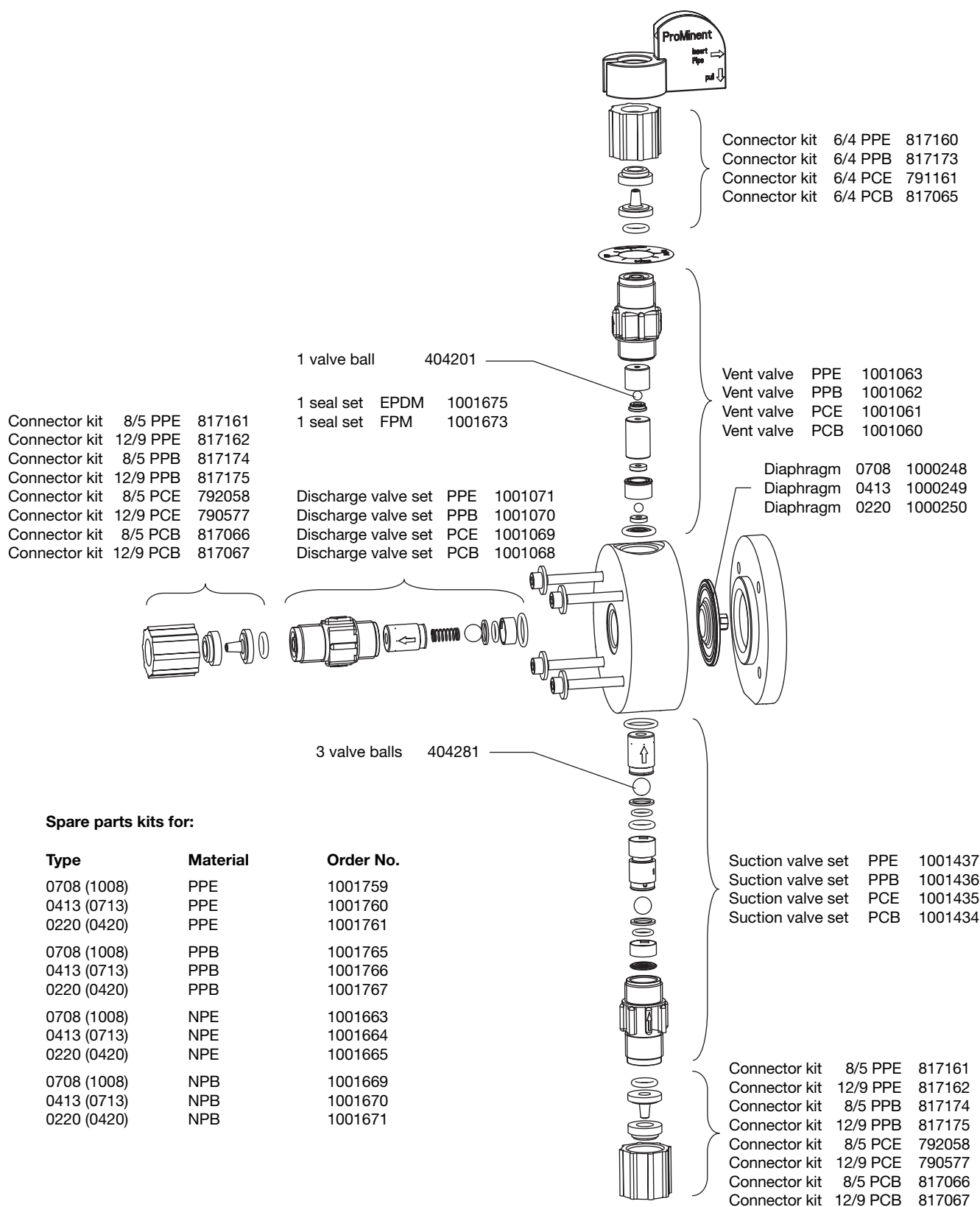
## Liquid end 1601 - 1005 (1605) PP / NP self-degassing



The listed items are included in the spare parts kit.

Subject to technical alterations.

**Liquid end 0708 (1008) - 0220 (0420)**  
**PP / NP self-degassing**



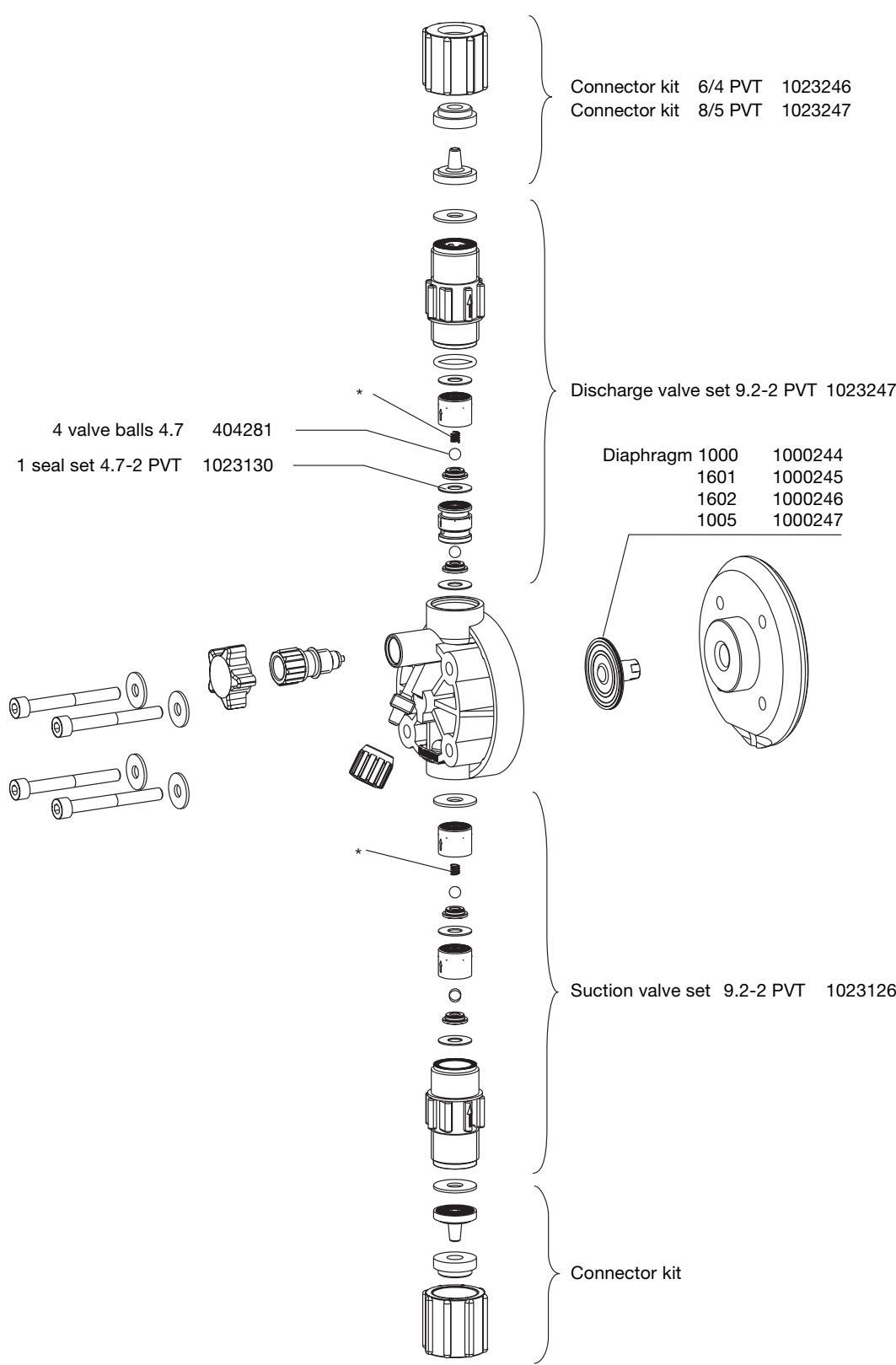
**Spare parts kits for:**

| Type        | Material | Order No. |
|-------------|----------|-----------|
| 0708 (1008) | PPE      | 1001759   |
| 0413 (0713) | PPE      | 1001760   |
| 0220 (0420) | PPE      | 1001761   |
| 0708 (1008) | PPB      | 1001765   |
| 0413 (0713) | PPB      | 1001766   |
| 0220 (0420) | PPB      | 1001767   |
| 0708 (1008) | NPE      | 1001663   |
| 0413 (0713) | NPE      | 1001664   |
| 0220 (0420) | NPE      | 1001665   |
| 0708 (1008) | NPB      | 1001669   |
| 0413 (0713) | NPB      | 1001670   |
| 0220 (0420) | NPB      | 1001671   |

The listed items are included in the spare parts kit.

Subject to technical alterations.

Liquid end 1000-1005 (1605)  
PVT with bleed

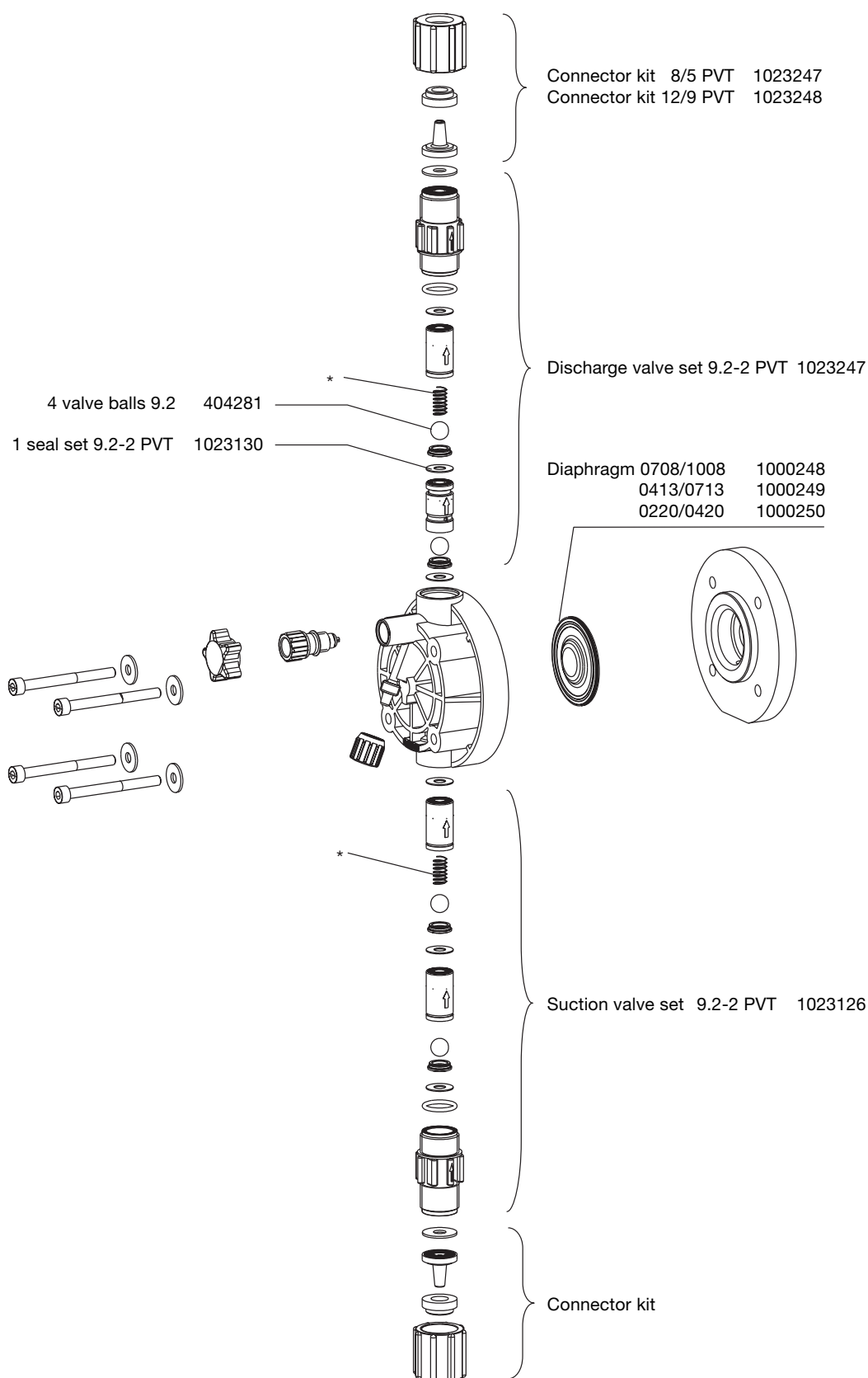


The listed items are included in the spare parts kit.  
\* Customer accessories

Subject to technical alterations.



**Liquid end 0708 (1008) - 0220 (0420)  
PVT with bleed**

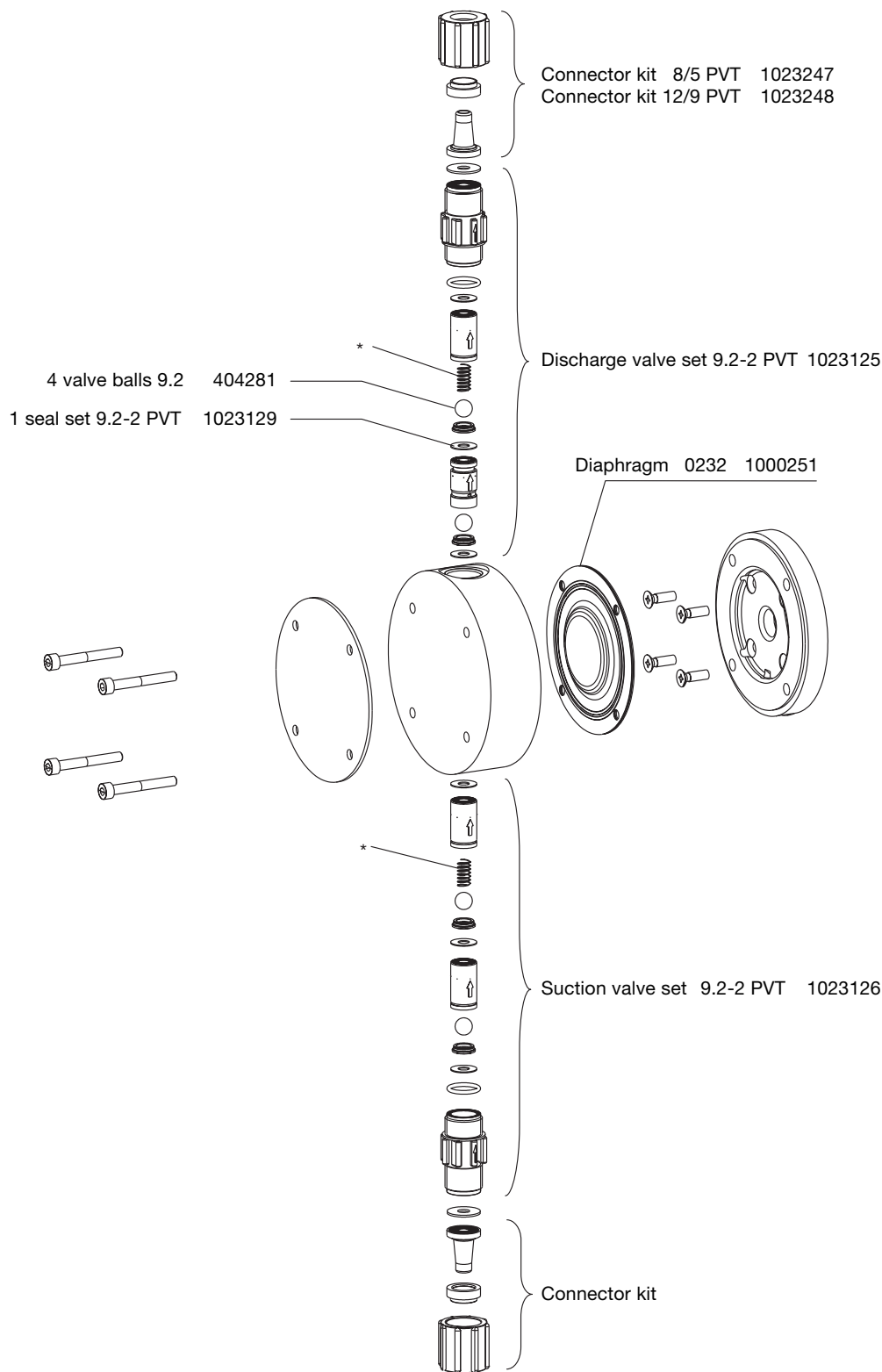


The listed items are included in the spare parts kit.

\* Customer accessories

Subject to technical alterations.

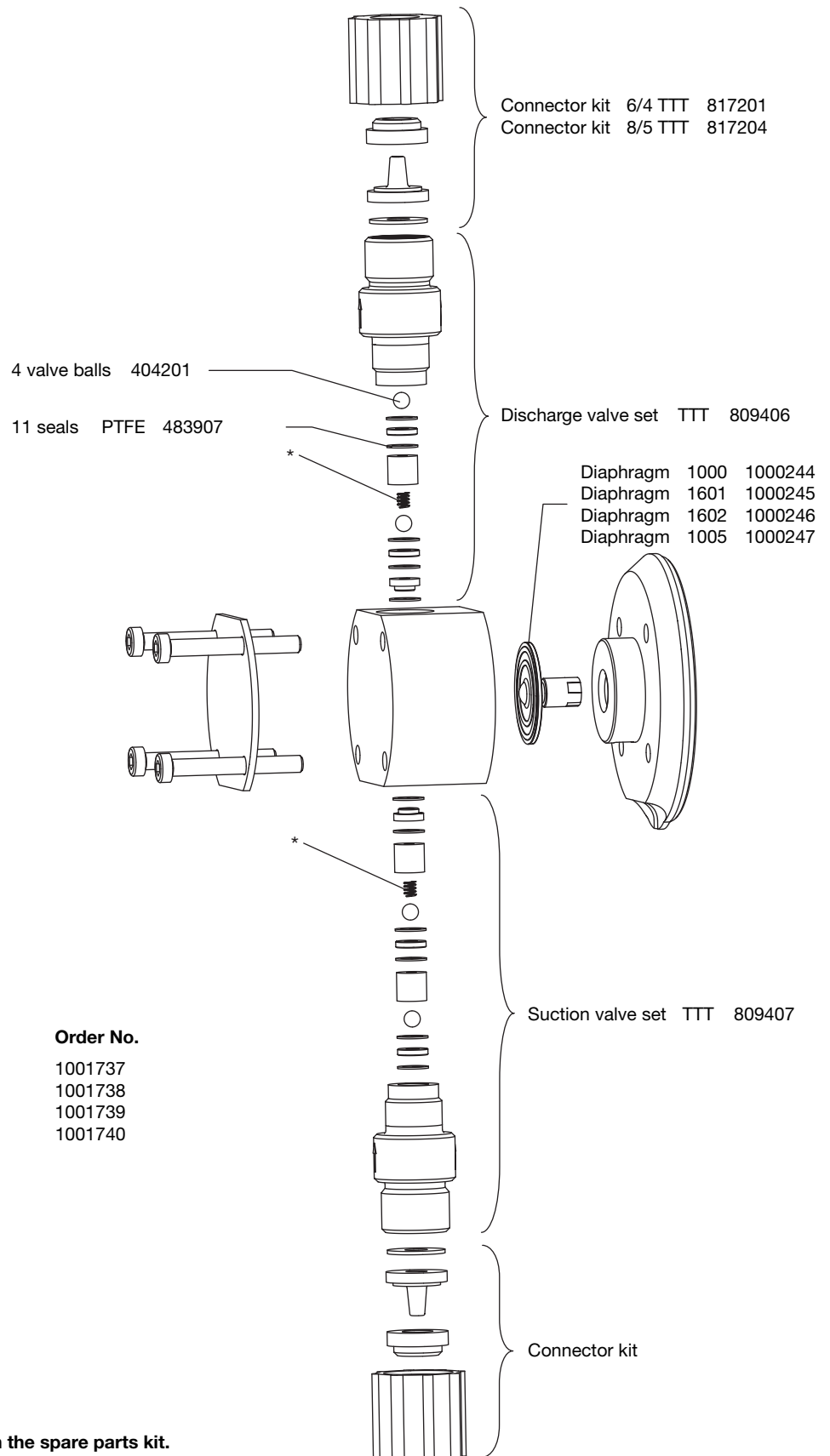
Liquid end 0232  
PVT without bleed



The listed items are included in the spare parts kit.  
\* Customer accessories

Subject to technical alterations.

Liquid end 1000 - 1005 (1605)  
TT



Spare parts kits for:

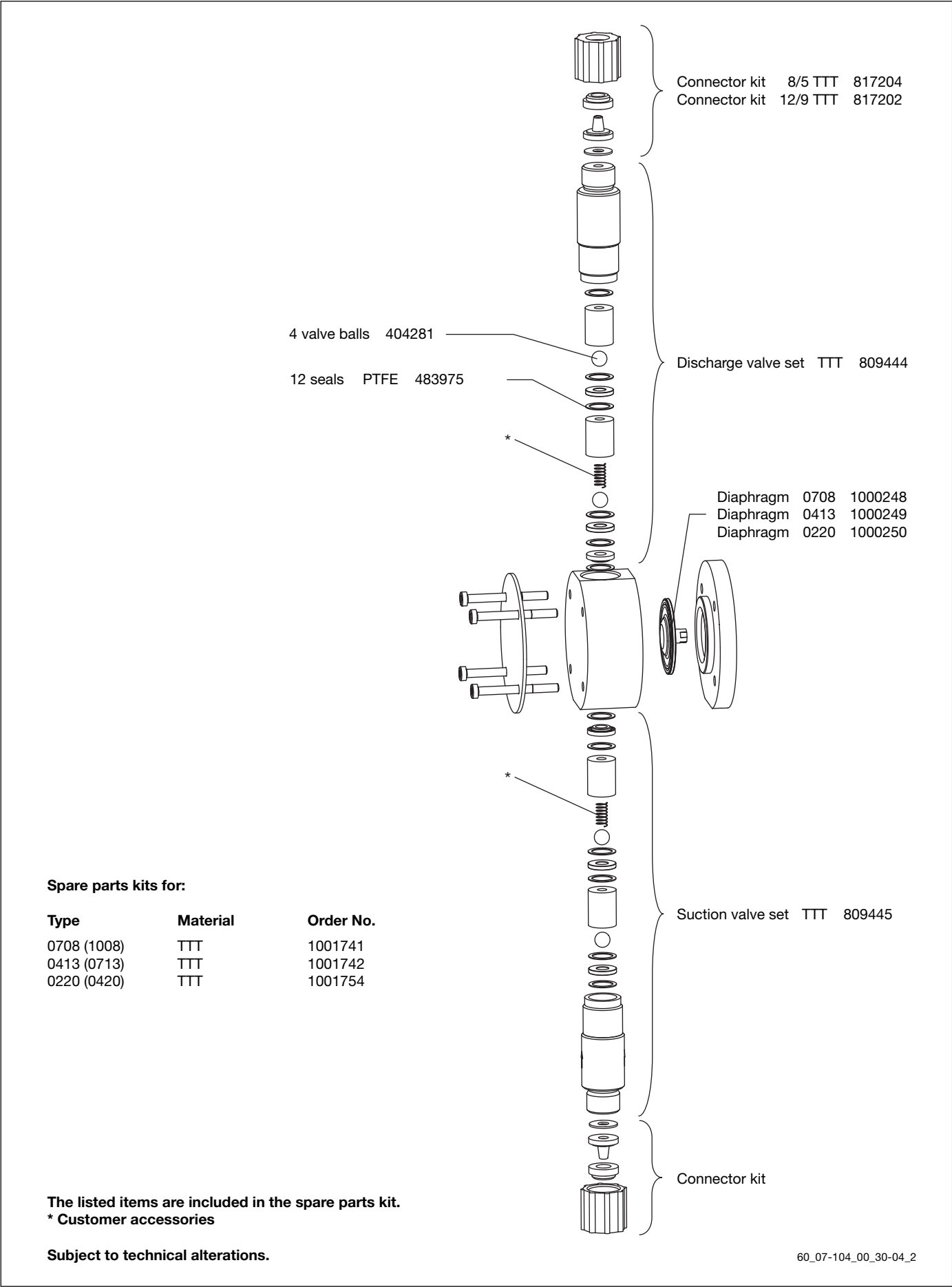
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|-------------|----------|-----------|
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| 1601        | TTT      | 1001738   |
| 1602        | TTT      | 1001739   |
| 1005 (1605) | TTT      | 1001740   |

The listed items are included in the spare parts kit.  
\* Customer accessories

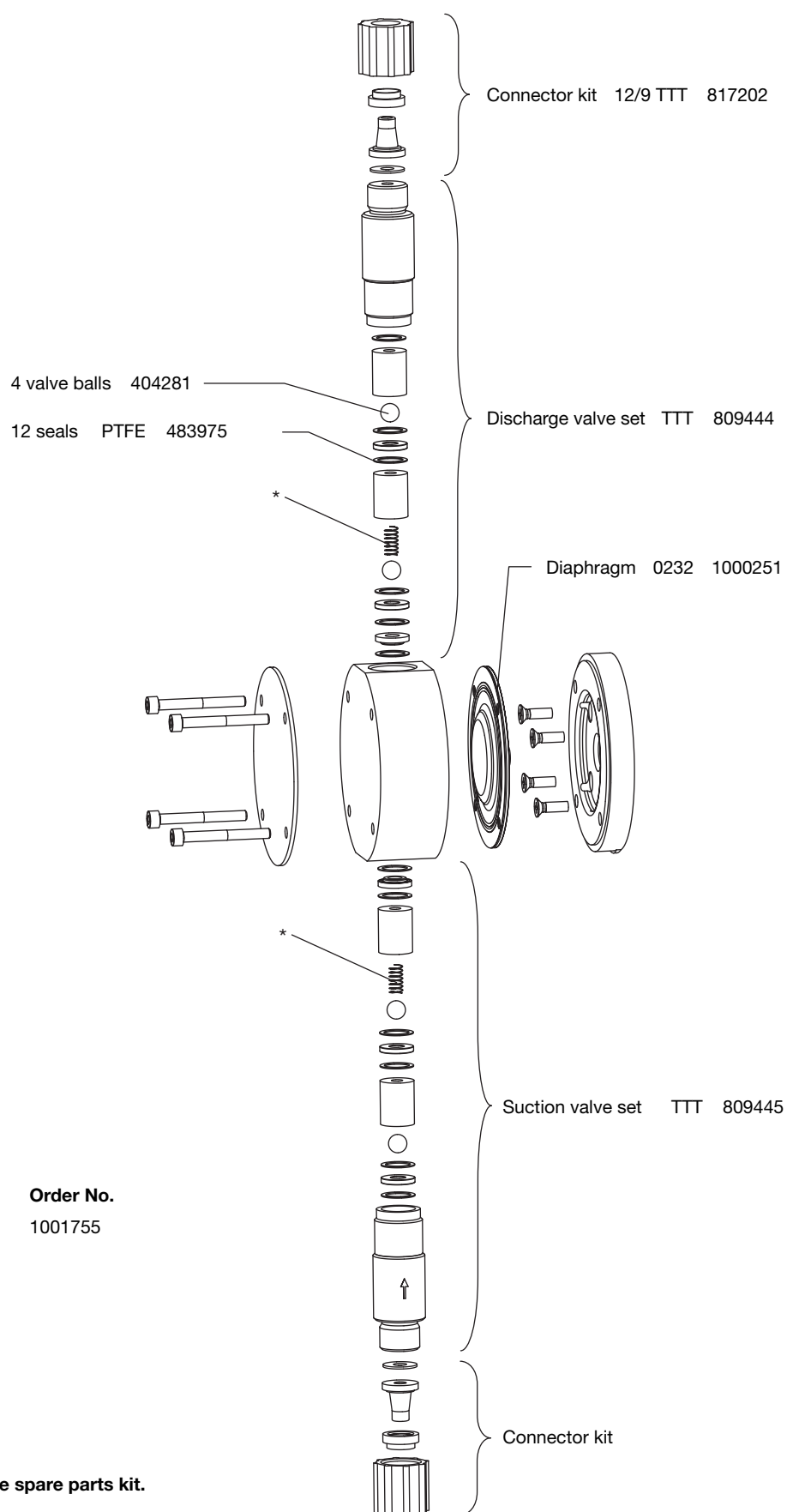
Subject to technical alterations.

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Liquid end 0708 (1008) - 0220 (0420)  
TT



Liquid end 0232  
TT



Spare parts kits for:

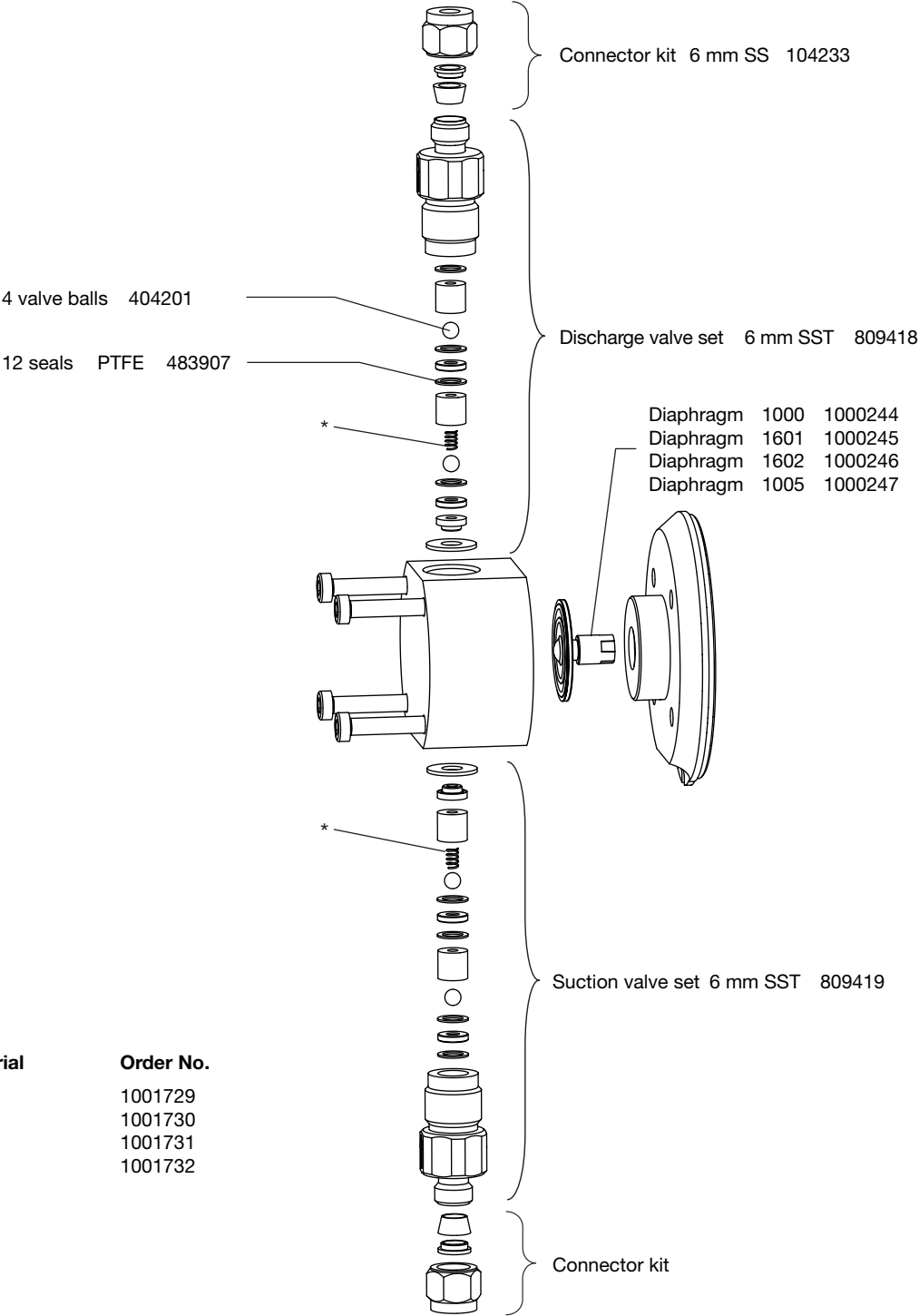
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The listed items are included in the spare parts kit.  
\* Customer accessories

Subject to technical alterations.

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Liquid end 1000 - 1005 (1605)  
SS



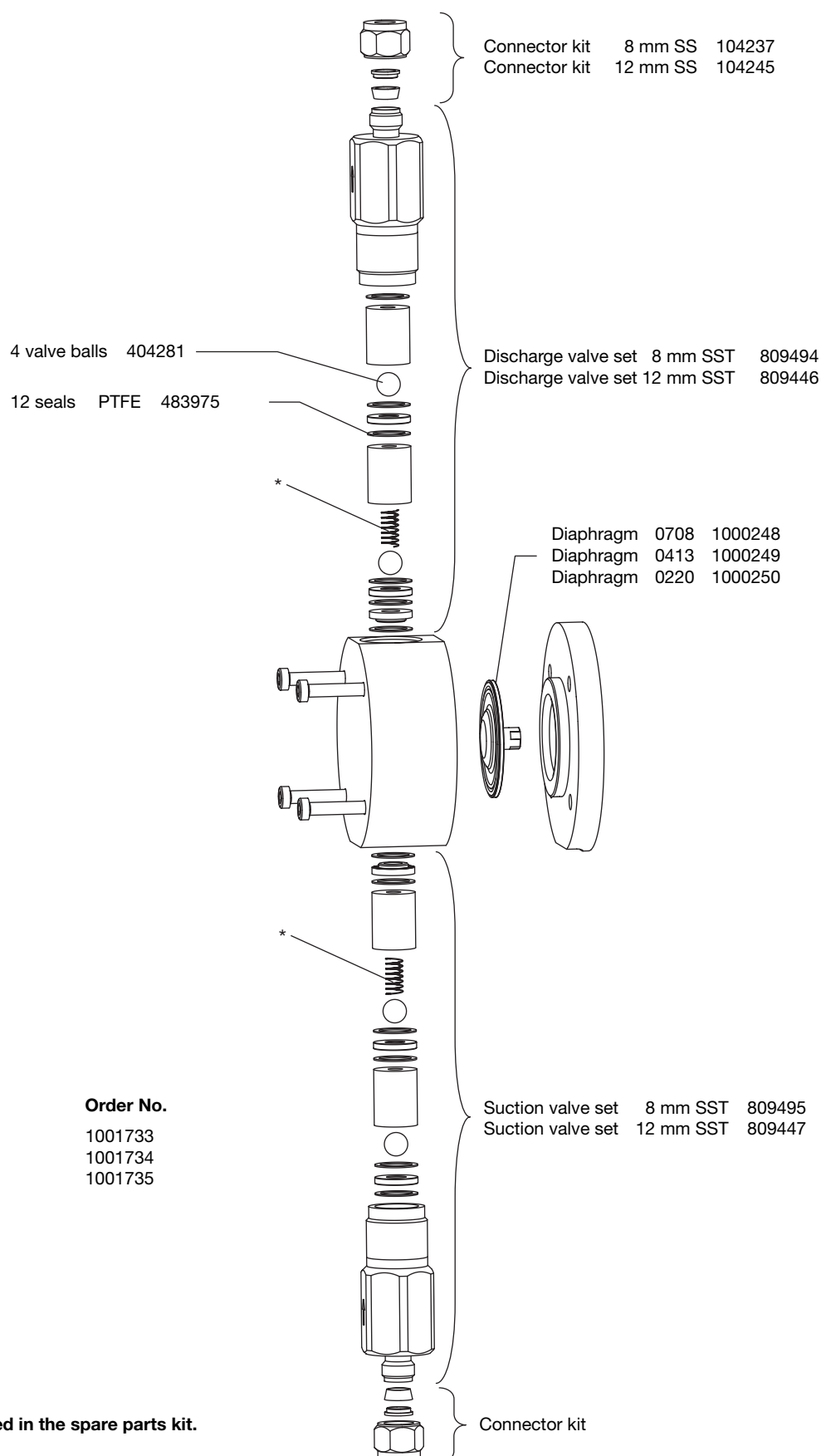
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| 1601        | SST      | 1001730   |
| 1602        | SST      | 1001731   |
| 1005 (1605) | SST      | 1001732   |

The listed items are included in the spare parts kit.  
\* Customer accessories

Subject to technical alterations.

Liquid end 0708 (1008) - 0220 (0420)  
SS



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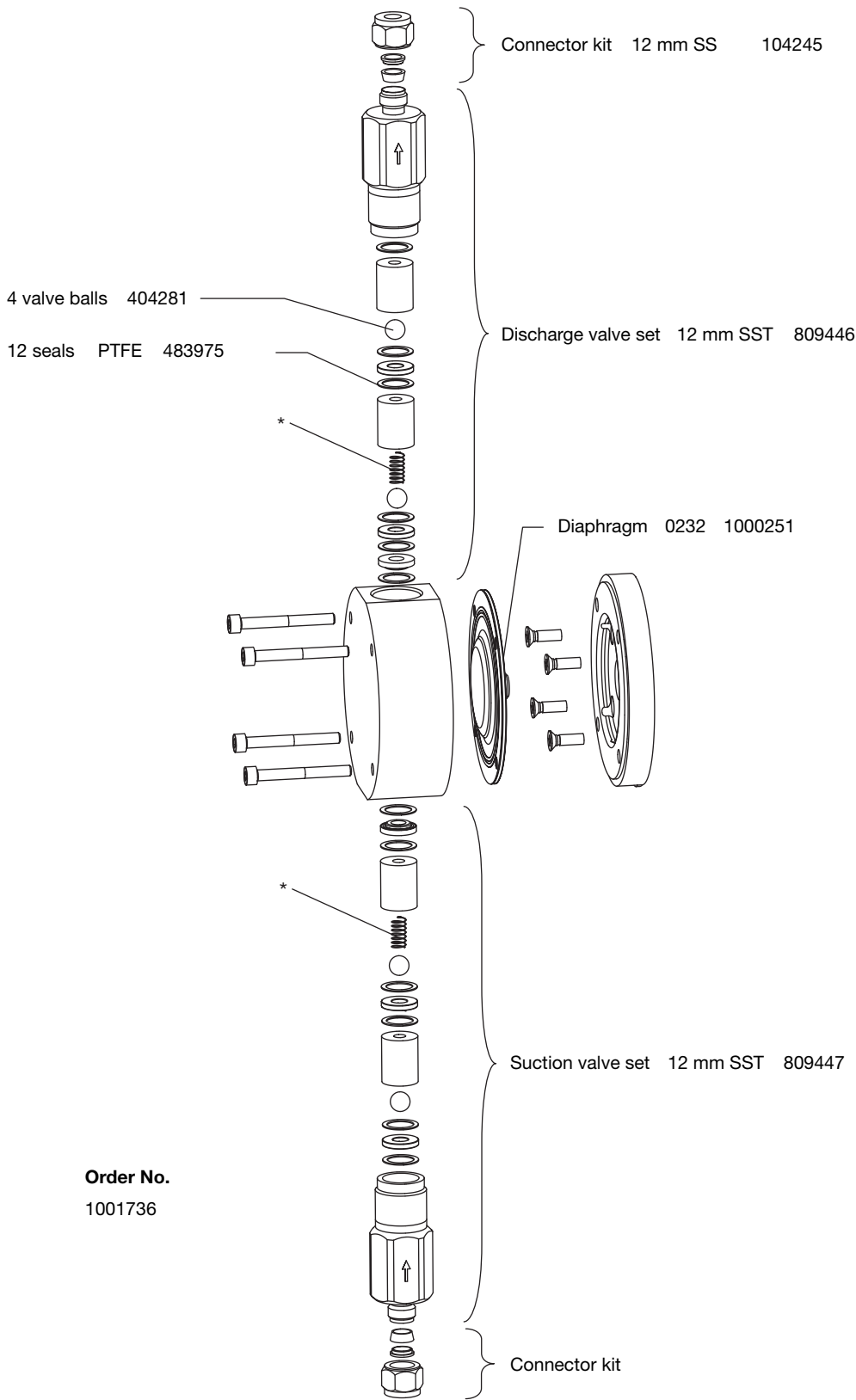
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|-------------|----------|-----------|
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| 0413 (0713) | SST      | 1001734   |
| 0220 (0420) | SST      | 1001735   |

The listed items are included in the spare parts kit.  
\* Customer accessories

Subject to technical alterations.

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Liquid end 0232  
SS



Spare parts kits for:

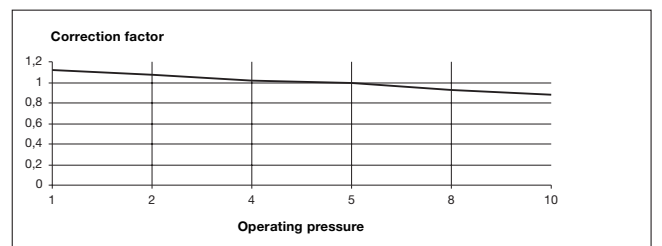
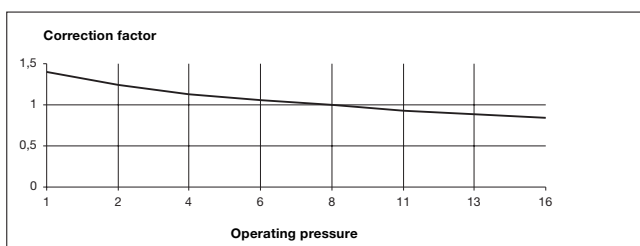
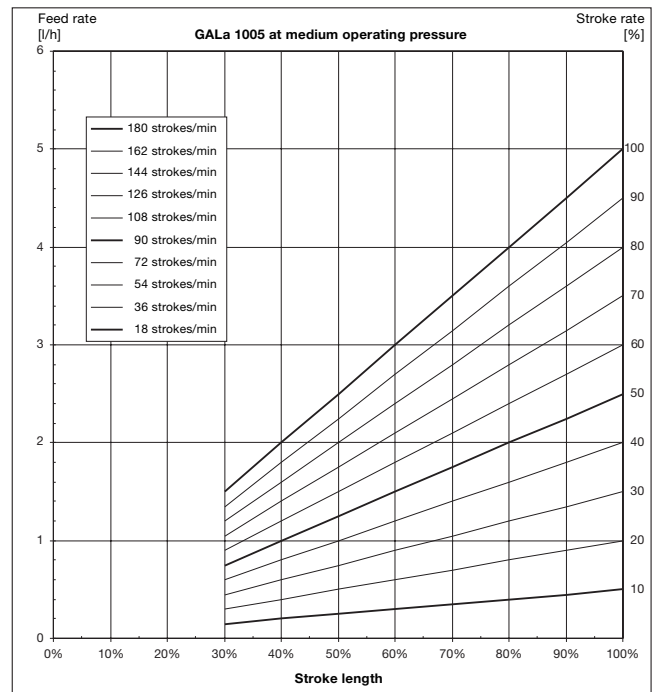
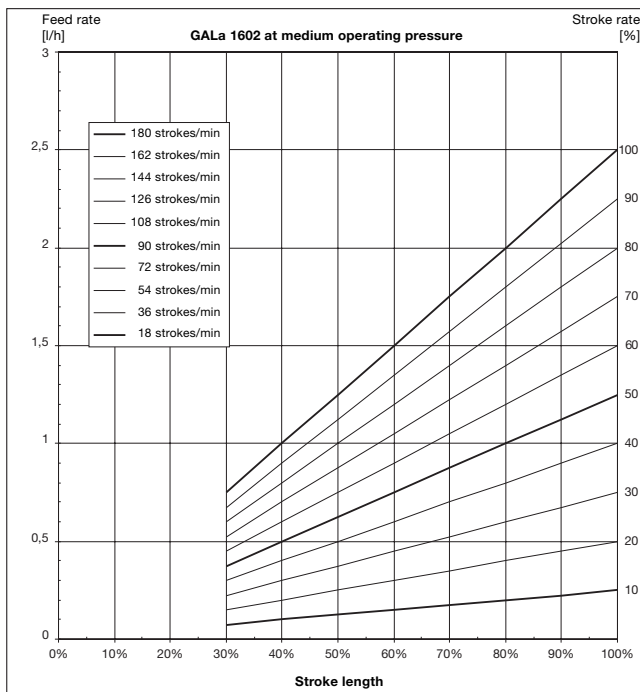
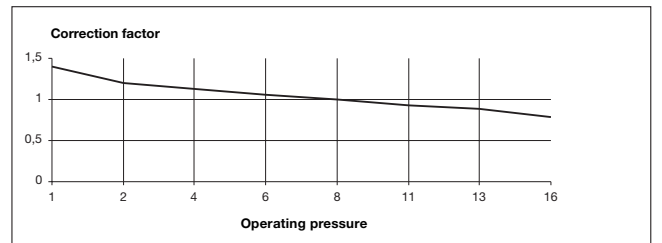
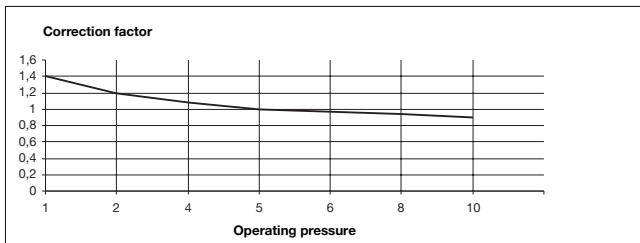
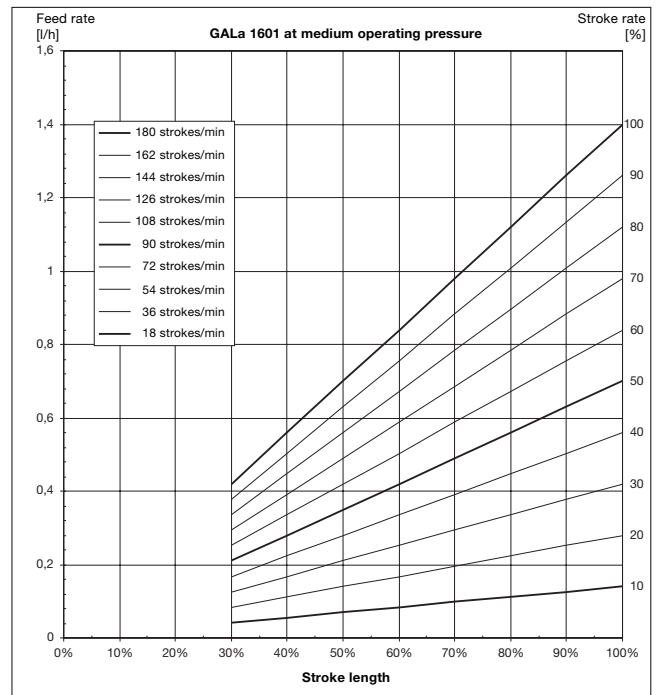
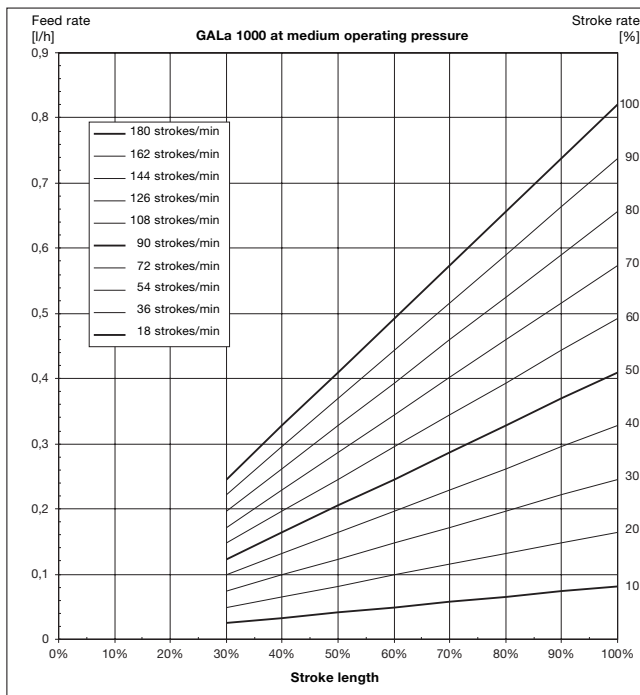
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The listed items are included in the spare parts kit.  
\* Customer accessories

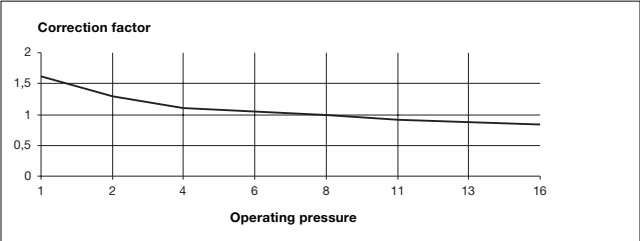
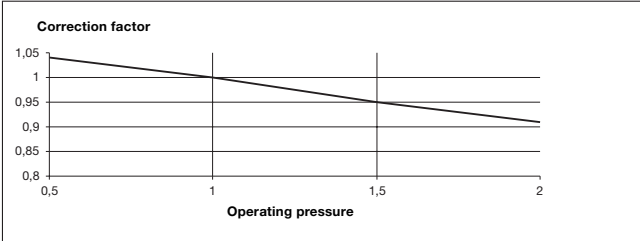
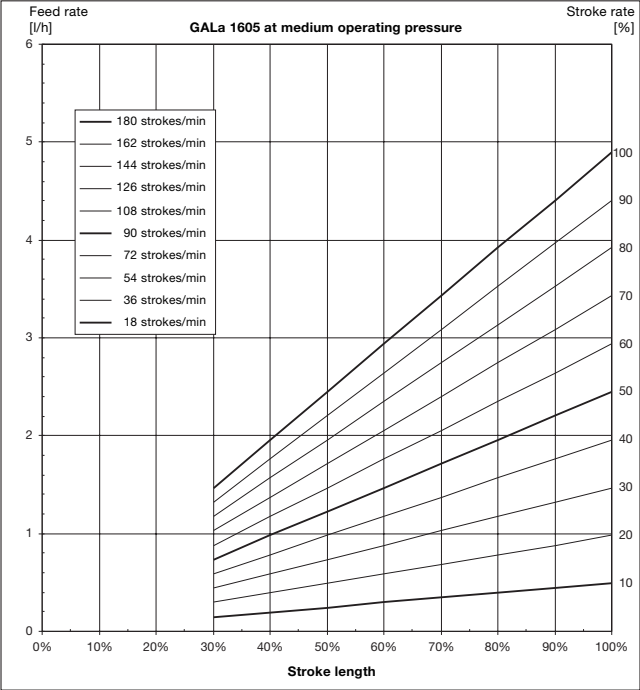
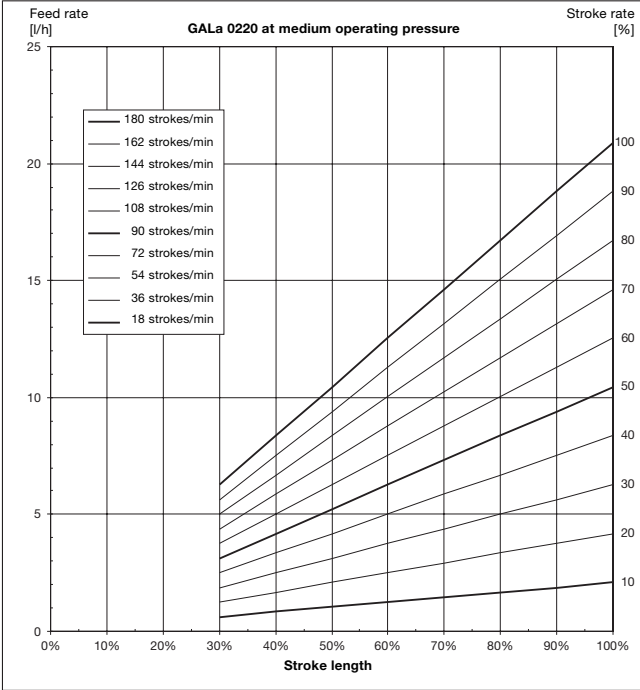
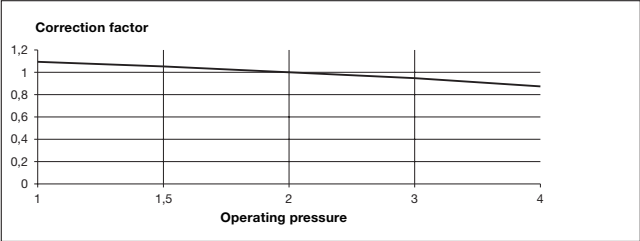
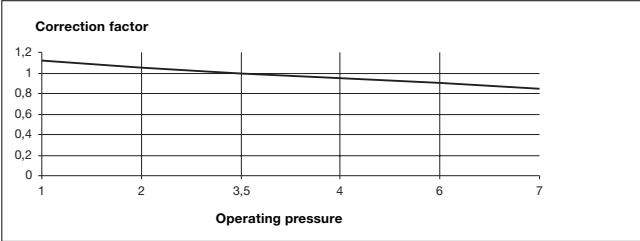
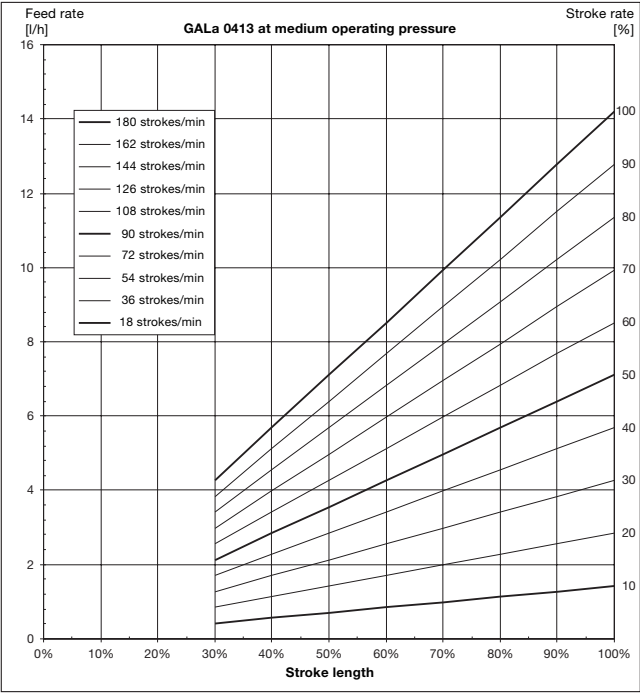
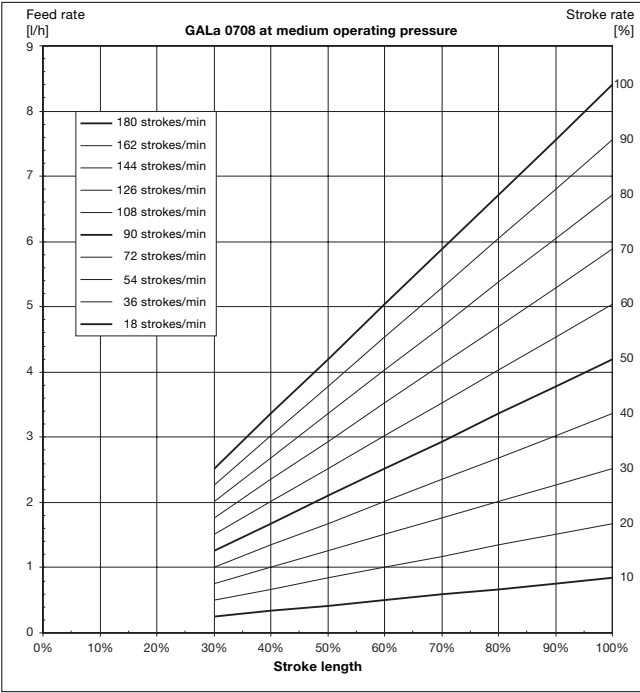
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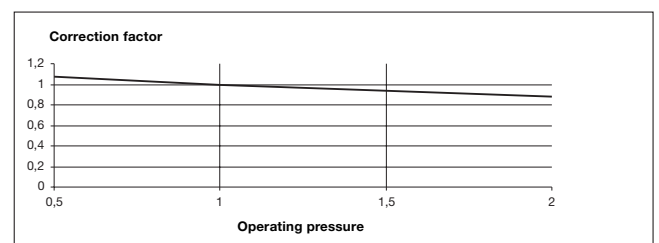
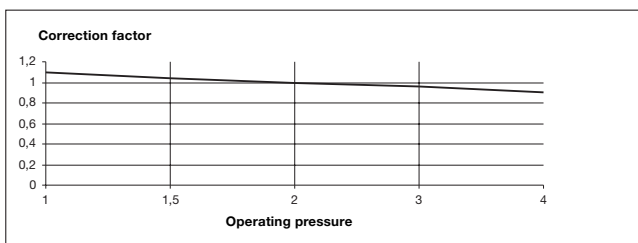
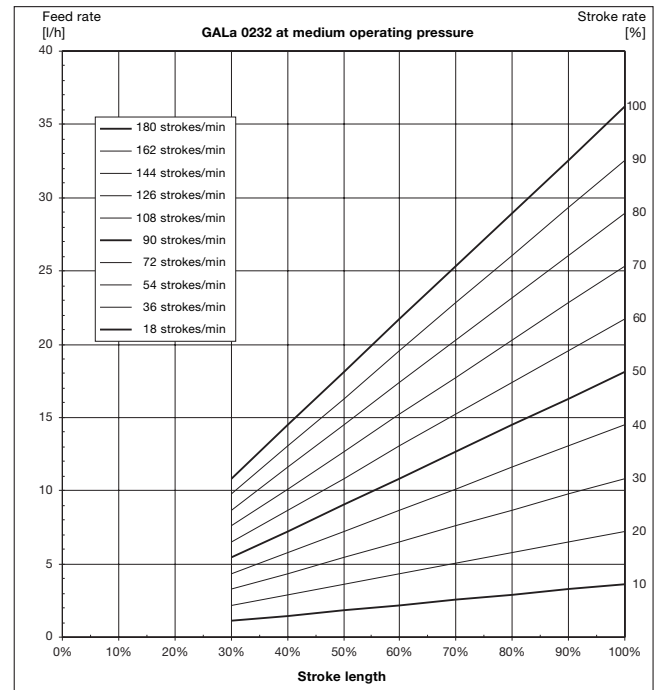
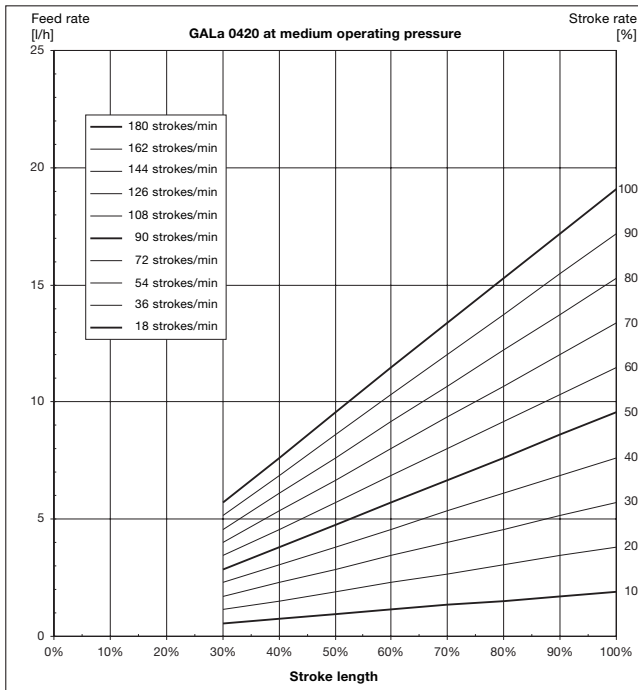
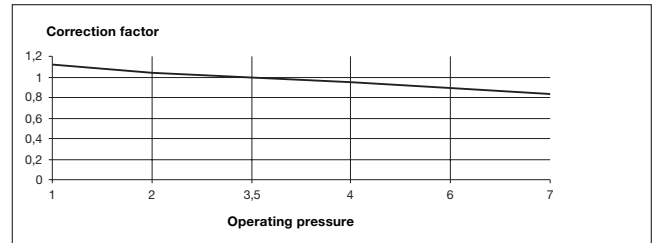
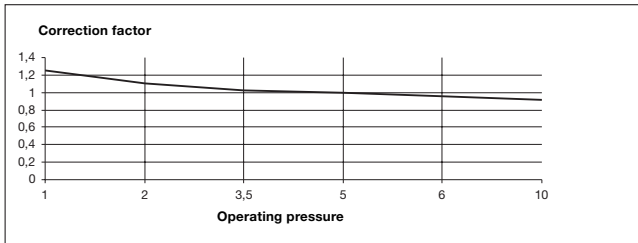
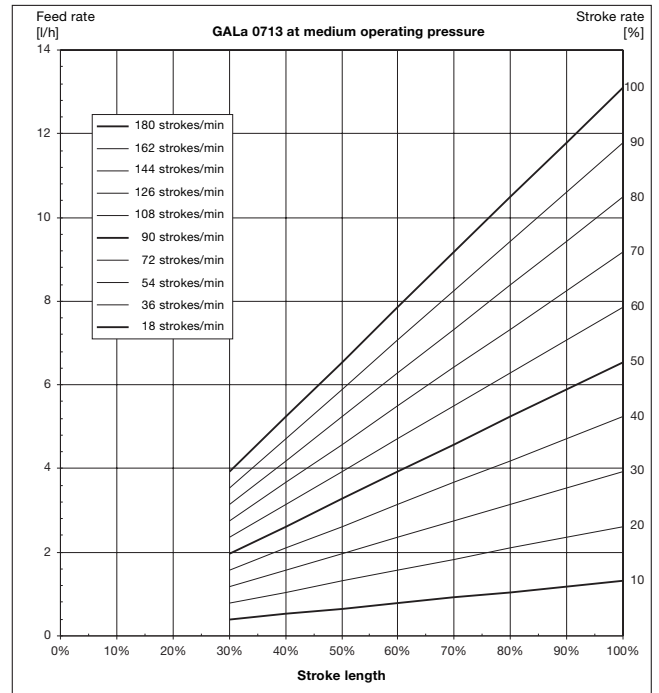
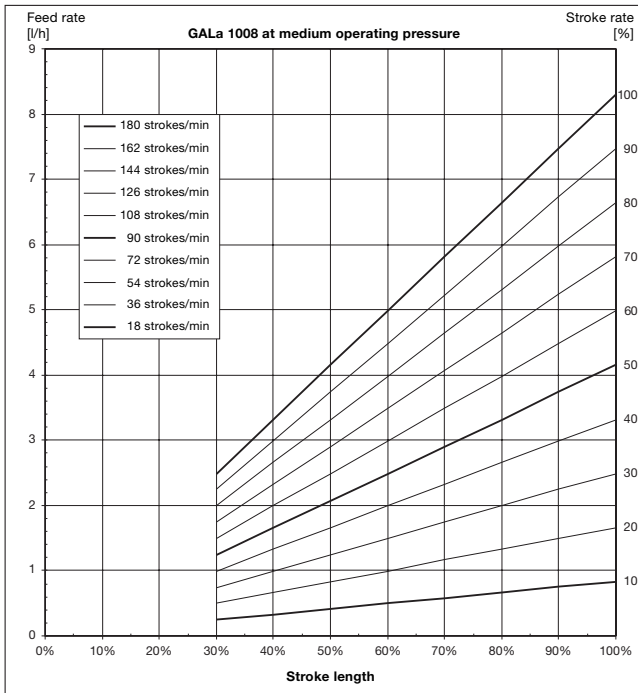
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Feed rate settings diagrams





## EC Declaration of Conformity

We,

**ProMinent Dosiertechnik GmbH**  
**Im Schuhmachergewann 5 - 11**  
**D - 69123 Heidelberg**

hereby declare that, on the basis of its functional concept and design and in the version brought into circulation by us, the product specified in the following complies with the relevant, fundamental safety and health stipulations laid down by EC regulations.

Any modification to the product not approved by us will invalidate this declaration.

Product description : ***Metering pump, series Gamma L***

Product type : ***GALa***

Serial number : ***see type identification plate on device***

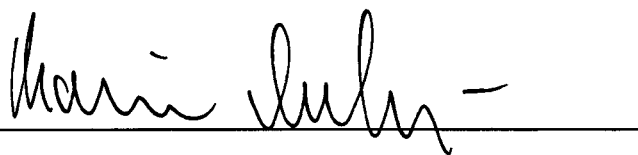
Relevant EC directives : ***EC - machine directive 98/37/EC***  
***EC - low voltage directive 73/23/EEC***  
***EC - EMC - directive (89/336/EEC) subsequently 92/31 EEC***

Harmonised standards used,  
in particular : ***DIN EN 292-1, DIN EN 292-2, DIN EN 809***  
***DIN EN 60335-1, DIN EN 60335-2-41, DIN EN 50106***  
***DIN EN 50081-1/2, DIN EN 55011, DIN EN 61000-3-3***  
***DIN EN 50082-1/2, DIN EN 61000-4-2/3/4/5/6/11***

National standards and other  
technical specifications used,  
in particular : ***DIN VDE 0700 T1***  
***DIN VDE 0700 T41***  
***DIN VDE 0700 T500***  
***IEC 1000-3-3, IEC 1000-4-2/3/4/5/6/11***

Date/manufacturer's signature :

***02. Nov 99***



The undersigned :

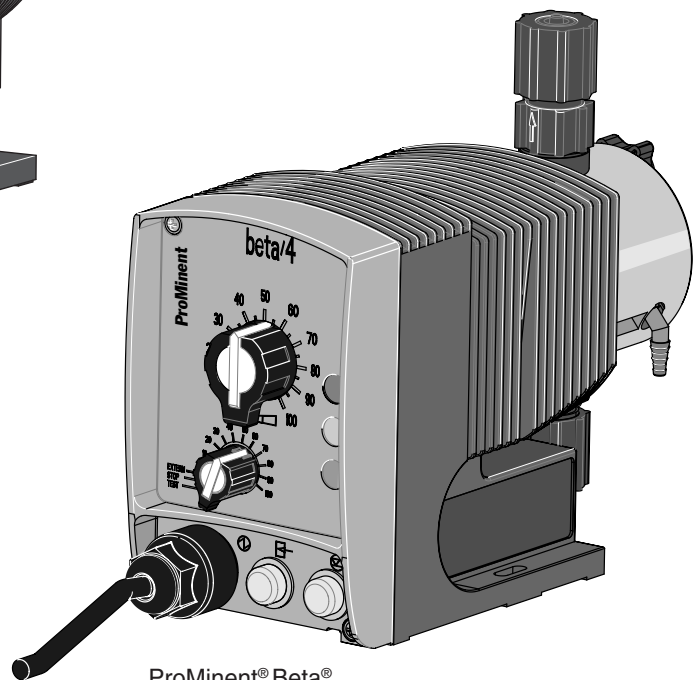
***Dr. Rainer V. Dulger, Executive Vice President R&D and Production***

# General Operating Instructions

## ProMinent® Solenoid Metering Pumps



ProMinent® gamma/ L



ProMinent® Beta®

Two sets of operating instructions are required for the safe and correct use of the metering pumps:

The product specific operating instructions manual (e. g. for Beta)  
and the “ProMinent® Solenoid Metering Pumps General Operating Instructions Manual”.

**The two are valid only when read in conjunction with one another.**

**Please read through operating instructions manual carefully before use. Do not discard.**

**The guarantee is void if the equipment is subject to misuse.**

**Publishing details**

General Operating Instructions ProMinent® Solenoid Metering Pumps  
© ProMinent Dosiertechnik GmbH, 2003

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**We reserve the right to make technical changes.**

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## **General instructions for use**

Please read the following instructions for use carefully. They will help to get the most use out of the operating instructions manual.

The following are particularly highlighted in the text:

- Numbered points
- Instructions

Operating instructions:

### ***NOTE***

**Notes are intended to make your work easier**

and safety instructions:



### ***WARNING***

**Describes a potentially hazardous situation. If not avoided may result in fatal or severe injury.**



### ***CAUTION***

**Describes a potentially hazardous situation. If not avoided, could result in slight or minor injury or damage to property.**



### ***IMPORTANT***

**Describes a potentially damaging situation. If not avoided may result in damage to property.**

## 1 Safety



### WARNING

- Metering pumps can start to operate as soon as they are connected to the mains power supply.  
Ensure that no hazardous media can leak out.  
If you have not done so, press the Stop/Start button or disconnect the metering pump from the mains immediately.
- The metering pump cannot be switched off.  
In the case of an electrical accident, disconnect the power cable from the mains power supply.
- Disconnect the power cable from the mains power supply before working on the metering pump.
- Always depressurise liquid end before working on the metering pump.
- Always empty and rinse the liquid end before working on the metering pump if used with hazardous or unknown feed chemicals.
- Pumps for radioactive media may not be sent by post.



### CAUTION

- It is not permitted to assemble and install ProMinent® metering pumps with non-genuine parts which have not been checked and recommended by ProMinent. It can endanger people and property in circumstances for which we are not liable.
- Note the resistances of pump materials when metering aggressive media (see ProMinent® resistance list in the Product Catalogue or at [www.prominent.de](http://www.prominent.de)).
- If fitting a different liquid end size, the pump must be reprogrammed at the factory.
- Note all national directives which apply to the installation.

## 2 Assembly and hydraulic installation



### WARNING

- The metering pumps must be commissioned precisely in accordance with the instructions in the operating instructions manual.
- Assembly and installation of ProMinent® pumps with non-original parts that have not been checked and recommended by ProMinent.
- Always depressurise lines before working on the metering pump. Empty and rinse out the liquid end.
- Never operate the metering pump against a closed stop valve on the discharge side. The discharge line could rupture.
- Empty any water out of the liquid end upstream before commissioning, or rinse out with a suitable solvent, if you are using media which may not come into contact with water (see p.14, "Dewatering liquid end").
- Note all national directives which apply to the installation.

### 2.1 Assembly of the metering pump



### IMPORTANT

- Once installed, the metering pump must not vibrate.
- Priming and discharge valves must be vertical (bleed valve in the case of self-bleeding liquid end).
- Ensure easy access for operation and maintenance.

The metering pump must be mounted with the pedestal resting on a firm horizontal surface.

## 2.2 Installing hoses

### NOTE

Installation instructions for tubing system, see section 2.3.

### 2.2.1 Installation of non self-bleeding pumps



### CAUTION

- Once fitted, hoses must not be kinked or subject to mechanical stress.
- When metering extremely aggressive or hazardous media we recommend bleeding with return feed into the supply tank and shut off valves on the discharge and intake sides.
- To ensure the durability of the connections, always use correctly-sized circlips and hose nozzles.
- Always use original hoses of the specified diameter and wall thickness.
- Do not exceed the maximum admissible pump priming pressure (see product-specific operating instructions).
- Ensure operating pressure for the metering pump and the tubing system does not exceed the maximum admissible level (see product-specific operating instructions and your system documentation).

### NOTE

Fit tubing so that the metering pump and the liquid end can be removed sideways if necessary.

PP, NP, PV, TT versions

### Fit hoses to plastic valves (see Fig. 1)

- ▶ Cut ends of hoses straight across
- ▶ Pull the union nut (2) and the circlip (3) over the hose (1)
- ▶ Push the end of the hose (1) over the nozzle (4) as far as the stop, widen if necessary
- ▶ Ensure that the O-ring (5) or flat seal is seated correctly in the valve (6)

### NOTE

With the PV design, the FPM flat seal has one point as distinct from the EPDM flat seal.

- ▶ Fit the tubing (1) with the nozzle (4) to the valve (6)
- ▶ Clamp the hose connector: tighten the union nut (2) while pressing onto the tubing (1)
- ▶ Retighten the hose connector: pull briefly on the hose (1) connected to the liquid end and tighten the union nut (2) once more.

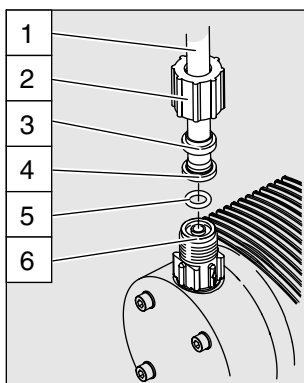


Fig. 1

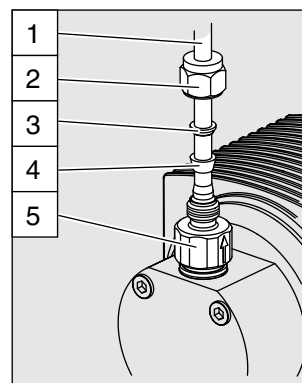


Fig. 2

SS version

### Fit stainless steel pipe connectors to stainless steel valves (see Fig. 2)

- ▶ Push union nuts (2) and circlips (3, 4) approx. 10 mm onto the tube (1)
- ▶ Insert the tube (1) into the valve (5) up to the stop
- ▶ Tighten the union nuts (2).

### Fit hoses to stainless steel valves



#### **IMPORTANT**

Fit only PE or PTFE hoses to stainless steel valves.

- Insert an additional stainless steel reinforcement sleeve into the PE or PTFE hose.

### 2.2.2 Installation of self-bleeding pumps (SEK type)



#### **CAUTION**

- Note all installation and safety instructions for standard pumps.
- Do not exceed maximum values for priming lift, priming pressure and viscosity of the metering medium.
- The intake side tubing cross sections should not exceed the tubing cross section.

A return line is connected as well as the priming and discharge lines. It is attached to the bleed valve to the top of the liquid end (red sleeve, see Fig. 3).

#### **NOTE**

The discharge valve in the SEK type is on the front of the liquid end

### Installation of the return line

#### **NOTE**

In the case of admission pressure on the intake side, the pressure in the return line should be the same or greater.

Admission pressure in the return line limits the bleed function.

It is possible to operate with admission pressure in the return line and atmospheric pressure on the intake side.

- Attach the hose to the return hose nozzle and/or to the bleed valve of the self-bleeding liquid end (PVC hose, soft, 6x4 recommended)
- Feed the free end back into the supply tank.
- Cut the return line so that the end does not reach the feed chemical.

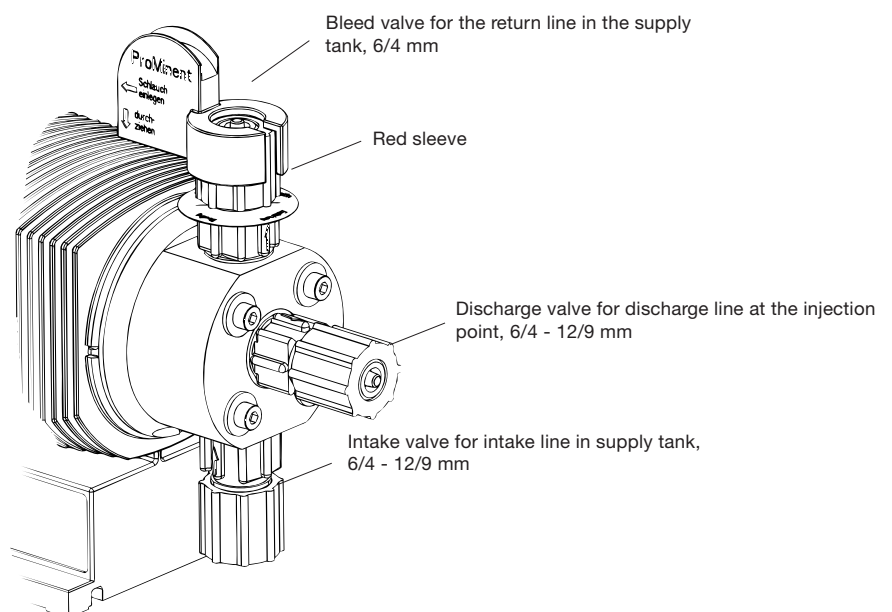


Fig. 3

## 2.3 Installation instructions for intake system



### IMPORTANT

- Fit a pressure gauge connector to enable checking of the pressure-ratios in the tubing system near the intake connector and of the discharge connector.
- Connect pipes to the pump ensuring that there are no forces exerted on the pump, e.g. movement, weight or line expansion.  
Always use a flexible length of tubing to connect steel pipes to plastic liquid ends.

Sample installation

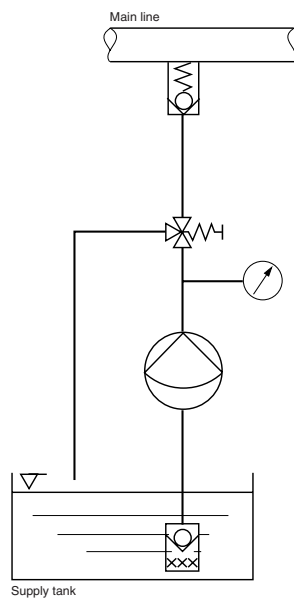
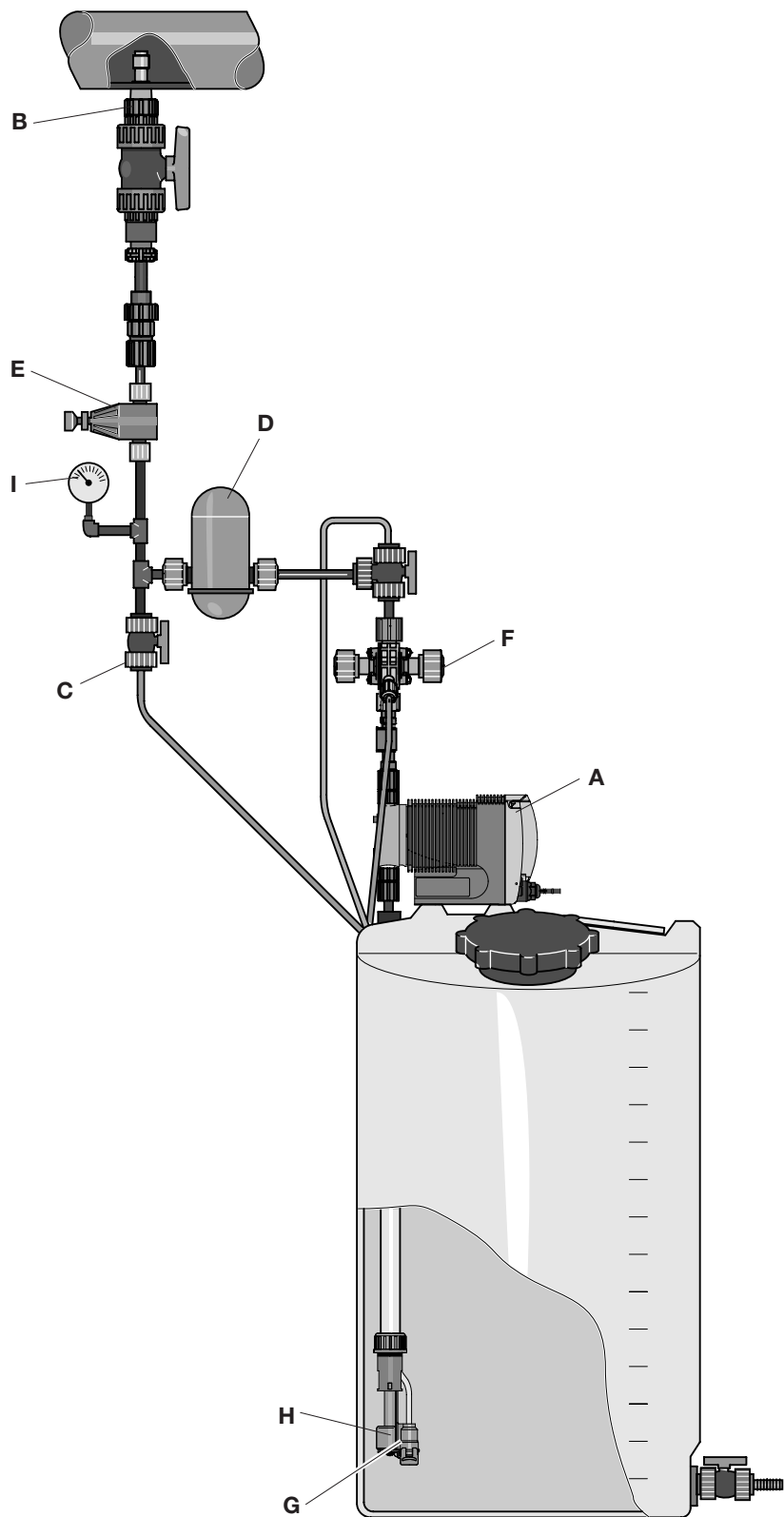


Fig. 4

General key:

|  |   |  |                          |
|--|---|--|--------------------------|
|  | Metering pump   |  | Foot valve with strainer |
|  | Discharge valve   |  | Dirt pan                 |
|  | Adjustable ball check valve<br>(also used as pressure relief valve) |  | Float switch             |
|  | Multifunction valve   |  | Float valve              |
|  | Check valve   |  | Pressure gauge           |
|  | Solenoid valve  |  | Filling equipment        |
|  | Ball check valve  |  | Siphon container         |



| System components                      | Function   | Application   |
|--|--|---|
| Metering pump* A                       | Meters a defined quantity of fluid into a system; Actuation: manual or automatic (external signal)   | Variable feed rate and external actuation enables optimum adaptation to metering applications.  |
| Injection valve* B                     | Non-return valve (return flow impeder)<br><br>Generates back pressure  | ... to prevent return flow and mix. in the discharge line in closed tubing systems.<br>... to create a defined back pressure in tubing system with atmospheric pressure outlet.   |
| Stop valves C                          | Separate the tubing system into zones (operating zones)  | ... to stop system parts for aintenance, conversion or repair work.   |
| Pulsation dampener, Accumulator D      | Smoothes pulsations in the tubing (discharge side), creates a low pulsation flow   | .. to limit pressure loss in long lines.<br>... to generate a continuous flow/metering.<br>... to avoid interfering line vibrations.  |
| Ball check valve* E                    | Generates a defined back pressure (adjustable)   | ... in the case of intake systems with atmospheric pressure outlet, to guarantee problem-free pump operation.<br>... when using a pulsation dampener  |
| Multifunction valve* F                 | Generates a defined back pressure<br><br>Prevents siphoning<br><br>Priming aid<br><br>Relief mechanism for discharge line<br>Opens an overflow line if the preset pressure limit is exceeded | ... to guarantee problem-free pump operation in intake system with atmospheric pressure outlet.<br>... in the case of positive pressure differential between the intake line and the discharge line.<br>... when commissioning pump against pressure.<br>...e.g. for repairs<br>...as safety device to protect the metering system from overload by the metering pump |
| Pressure relief valve*                 | Opens an overflow line if the preset pressure limit is exceeded  | ...as safety device to protect the metering system from overload by the metering pump   |
| Float switch G                         | Indicates the liquid level in the supply tank (two stage version (with early warning) or single stage)   | ...for problem-free system operation.<br>...to indicate that the tank is being changed and/or the supply tank is being topped up.<br>...to protect the metering system from running empty.  |
| Foot valve* H                          | Non-return valve (return flow impeder)<br><br>With integrated sieve as coarse filter empty   | ... to protect the intake line from running (e. g. when the tank is being changed).<br>... to protect the metering pump from coarse particles.  |
| Pressure gauge I (gen. pressure meter) | Indicates the prevailing pressure e. g. at the discharge connector of the metering pump  | ... to detect the prevailing operating pressure in the discharge line.<br>... essential for adjusting the ball check valve and/or the pressure relief valve.  |
| Vacuum tank                            | Smoothes the pulsations in the tubing (intake side), generates a low pulsation flow<br>Priming aid   | ... to reduce pressure loss in long intake lines.<br>... as priming aid with a vacuum pump.   |
| Filter                                 | Filters coarse particles out of the intake flow  | ... to protect metering pump and equipment from soiling and increased wear and tear.  |
| Solenoid valve                         | Automation-compatible stop valve<br>Actuation: e.g. electrical, linked to the metering pump power supply   | ... as safety device to lock (seal) the discharge line when the system is shut down.  |



## IMPORTANT

\* Not absolutely tight seal. Use a stop valve or a solenoid valve for this purpose.

### 2.3.1 Notes on the intake side installation



#### IMPORTANT

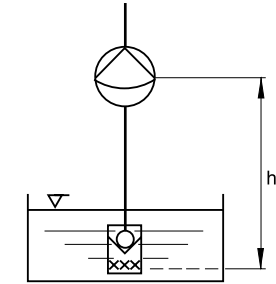


Fig. 5

- Do not exceed the maximum metering pump admission pressure on the intake side (see product-specific operating instructions manual).
- Always use curved rather than angled joints for bends.
- Never use thin-walled hoses.
- Keep intake line as short as possible.
- The intake line should be rising to prevent air pockets forming.
- Take into account acceleration pressures in long intake lines.
- Height  $h$  (see illustration) should not be more than the preset pump suction lift  $P$  divided by the density  $\rho$  of the feed chemical:  $h \text{ (in m)} = P \text{ (in mWS)} / \rho \text{ (in g/cm}^3\text{)}$ .
- Measure the cross section and the length so that the vacuum generated by the suction does not reach the vapour pressure of the feed chemical (cavitation Fig. 6). Excessive vacuum on the intake side is indicated in extreme cases by an interrupted fluid column or incomplete return stroke.
- Avoid inatking contaminants.
  - ▶ e.g. fit a dirt pan (mesh width 100-400  $\mu\text{m}$  depending on the chemical and metering pump type).
  - ▶ Always connect intake lines some way above the floor of the tank and/or deposits.

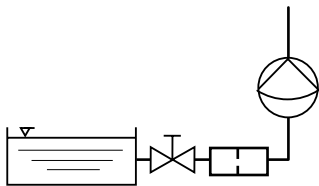


Fig. 6

- In the case of slightly gaseous feed chemicals (hydrogen peroxide, chlorine bleach, ...)
  - ▶ If necessary have the intake lines falling to prevent sucking in air bubbles (Fig.7)
  - ▶ Fit the pump with suction side intake.

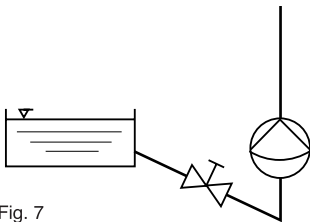


Fig. 7

#### NOTE

- Prevent the intake lines from running empty:  
Fit a foot valve to the end of the intake lines if the pump is situated higher than the maximum liquid level in the supply tank (Fig. 5):
  - ▶ Cut the free end of the intake line so that the foot valve is suspended just above the base of the tank. In the case of feed chemicals containing contaminants or deposits, make sure that the foot valve is suspended sufficiently high above the tank floor and/or deposit.
- Use a siphon line to prime the pump if using deep tanks with no pipe connector at the base:
  - ▶ Fit filling equipment (Fig. 8) or siphon equipment (Fig. 9) for the siphon line (intake line).

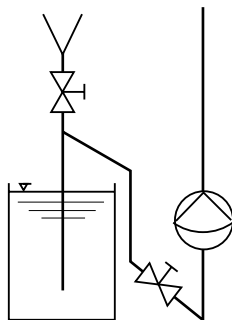


Fig. 8

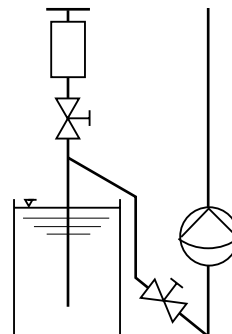


Fig. 9



## 2.3.2 Notes on the intake side installation

### IMPORTANT

- The maximum admissible operating pressure must not be exceeded by the peak pressures which occur with every metering stroke.
  - ▶ Use a pulsation dampener or fit wider diameter tubing when working with a long discharge line. Read the operating instructions manual for the pulsation dampener carefully when fitting.
  - ▶ A pressure relief valve with a return flow into the supply tank is recommended as an overload protection for the discharge line, e.g. a ProMinent® multifunction valve (Fig. 10).

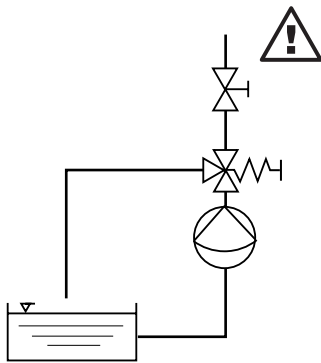


Fig. 10

- Prevent reflux into the main line.  
This would cause unwanted mixing in the discharge line.  
Fit a discharge valve to the injection point (Fig. 11).

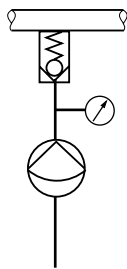


Fig. 11

- Dampen pulsations in the feed flow caused by acceleration forces generated by the tubing dimensions.  
If acceleration forces are not dampened the result can be:
  - cavitation on the intake and discharge sides of the pump leading to feed rate fluctuations, pressure surges, valve knocking and excessive wear and tear
  - the maximum admissible operating pressure on the discharge side of the pump being exceeded leading to mechanical damage to the pump, knocking valves and leaks.

## 2.3.3 What not to do when installing

### IMPORTANT

Avoid the following when installing:

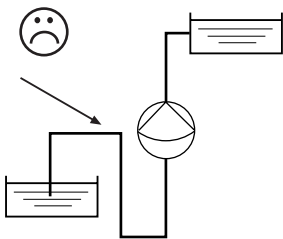


Fig. 12

- Fault: Intake lines cannot be bled  
Cause: Air pocket (arrow) in the intake line  
Remedy: Avoid air pockets or fit as in example 16.

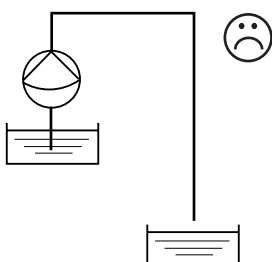


Fig. 13

- Fault: Uncontrolled feed chemical flow when the line is full  
Cause: Siphoning effect caused by discharge line being too low  
Remedy: Interrupt discharge line as in example 17.

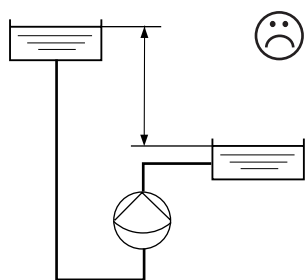


Fig. 14

**Fault:** Feed chemical is being forced through the liquid end  
**Cause:** too much pressure suction side admission due to negative pressure differential between discharge and intake  
**Remedy:** Fit as in example 17 or 18.

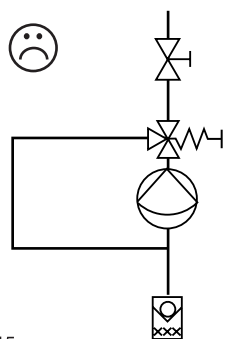


Fig. 15

**Fault:** The intake line can rupture.  
**Cause:** The overflow line which can be stopped with a foot valve is feeding back into the intake line.  
**Remedy:** Fit as in example 10.

**Fault:** The metering pump is metering the feed chemical in a circuit  
**Cause:** The overflow line is feeding back into the intake line and the multifunction valve cannot close again after opening.  
**Remedy:** Fit as in example 10.

### 2.3.4 Special installation instructions



#### **IMPORTANT**

**Avoid overfeed caused by positive pressure differential between discharge and intake sides:**

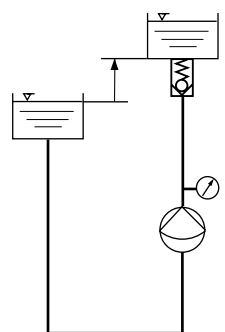


Fig. 16

- Arrange the tubing so that the end of the discharge line is higher than the liquid level in the supply tank

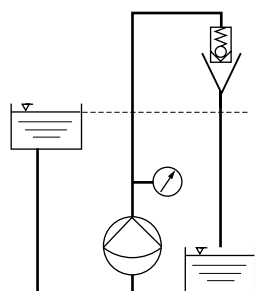


Fig. 17

- or:
- Fit the discharge line outlet of the pump so that it is higher than the liquid level in the supply tank

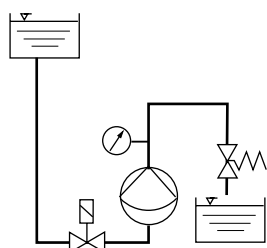


Fig. 18

- or:
- Fit an adjustable ball check valve in the discharge line and a check valve in the intake line of the pump - must be closed when the pump is at rest (ideally a solenoid valve).

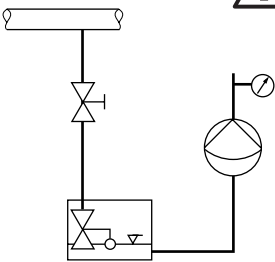


## IMPORTANT

Changeable pressure-ratios transferred from the extraction line and/or the supply tank to the intake line can lead to uncontrolled pump feed rates. Make sure that the pressure on the intake line remains constant:

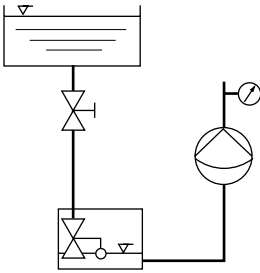
- If priming from pressurised lines, use an interim tank with a float valve.

Fig. 19



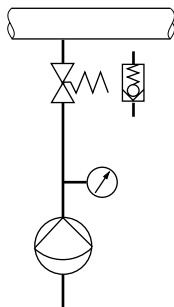
- If priming from a high intake level, use an interim tank with a float valve.

Fig. 20



- Avoid 'through suction' when metering into a main line in which there is a vacuum. Install a multifunction valve, a ball check valve (DHV-RM) or a discharge valve in the discharge line.

Fig. 21



## Fit a flushing assembly



## IMPORTANT

- The pump must be stopped when flushing is taking place.
- Maximum admissible flushing pressure: 2 bar.

Fit a flushing assembly if metering suspensions (see Product Catalogue section 1.9) to prevent deposits in the liquid end.

There are two flushing principles:

- intermittent flushing (metering is interrupted for rinsing)
- flushing after switching off the pump.

### Manually operated flushing assembly

### Automatically operated flushing assembly

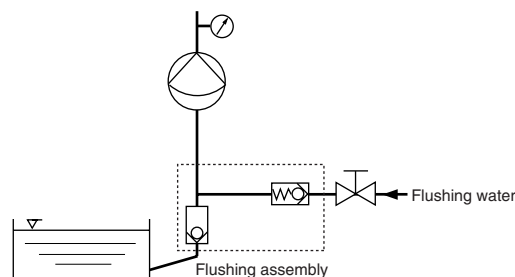


Fig. 22

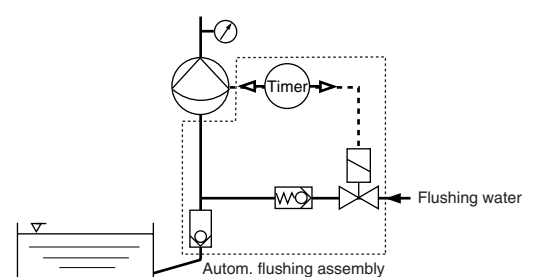


Fig. 23

### 3 Commissioning



#### WARNING

- Protect yourself when handling hazardous feed chemicals.
- If using with media which may not come into contact with water, remove all traces from the liquid end before installation.  
(Procedure, see below. The liquid end may contain traces of water from the factory tests.)
- After long periods out of commission the metering pump cannot be guaranteed to be absolutely reliable as the feed chemical can crystallise in the valves and on the diaphragm. You must carry out regular checks on the valves and the diaphragm (see product-specific operating instructions).
- Check pump connections for tightness.
- Check suction valve and pressure valve for leakages and retighten, if required!
- Check liquid end for leakages and retighten liquid end screw, if required!
- Check that coarse and fine bleed valves are closed are (See also "Fine bleeding").

#### NOTE

- Set the stroke length only while the pump is running.
- The metering pump should prime at 100 % stroke length as the priming lift is dependent on the lift volume if the liquid end is empty. If the metering pump has to prime at a lower stroke length and does not do so, select a correspondingly lower priming lift.
- **SEK type:** The suction lift corresponds to the priming lift because with gaseous media some gas always remains inside the liquid end.
- Retighten liquid end screws after 24 hours in operation).

Screw tightening torque:

Liquid end  $\varnothing$  70 mm: 2,5 to 3 Nm

Liquid end  $\varnothing$  90 mm and  $\varnothing$  100 mm: 4,5 to 5 Nm

#### *Emptying liquid end*

**Remove all water if working with media which cannot come into contact with water:**

- ▶ Rotate the pump until the discharge connector is pointing downwards
- ▶ Let the water run out of the liquid end
- ▶ Blow out from above through the intake connector using suitable equipment or with compressed air.

#### *Filling liquid end*



#### WARNING

**Protect yourself when handling hazardous feed chemicals.**

**In this method, some feed chemical will emerge from the discharge valve.**

#### **Liquid ends without coarse/fine bleed valves:**

- ▶ Connect the intake line to the liquid end, but not the discharge line
- ▶ Connect a short, transparent hose section to the discharge valve
- ▶ Switch on the metering pump and run at maximum stroke length and stroke rate until the liquid end is full and contains no bubbles (some feed chemical will be visible in the short hose section.)
- ▶ Switch off the metering pump
- ▶ Connect the discharge line to the liquid end.

The metering pump is ready to run.

**Liquid ends with coarse/fine bleed valves:**

- ▶ Connect the intake and discharge line to the liquid end
- ▶ Connect the return line
- ▶ Open the bleed valve by turning the star knob anti-clockwise;  
This opens the passage for coarse bleeding via the return line
- ▶ Switch on the metering pump and run at maximum stroke length and stroke rate until the liquid end is full and contains no bubbles (some feed chemical will be visible in the return line or the discharge line)
- ▶ Close the bleed valve (turn clockwise)
- ▶ The metering pump will stop.

The metering pump is ready to run.

**NOTE**

- If metering gaseous feed chemicals you should feed a constant partial flow of the metering volume back into the supply tank. The return flow should amount to approx. 20 % of the metering volume.
- The feed chemical must be low-viscosity and contain no suspended solids.
- The return line should end above the liquid level. The fine bleed valve then acts as a vacuum breaker. This prevents the supply tank from being sucked dry if a vacuum occurs in the discharge line.

*Fine bleeding*

In the case of slightly gaseous feed chemicals the liquid end can be continuously bled via the fine bleed valve if equipped with coarse/fine bleeding.

Open fine bleed valve (see Fig. 24):

- ▶ Pull off the knob (A) of the coarse/fine bleed valve (B)
- ▶ Turn the screw (c) in the coarse/fine bleed valve with a screwdriver approx. 1 turn anticlockwise.

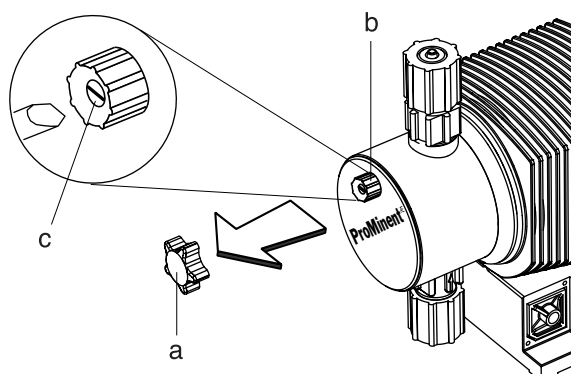


Fig. 24

**In the case of self-bleeding metering pumps (SEK type):****NOTE**

**The discharge connector on this liquid end is horizontal - the bleed connector is at the top. (The bleed connector is marked with a red band on delivery. (see Fig. 3))**

- ▶ Switch on the metering pump and run at maximum stroke length and stroke rate until the liquid end is full and contains no bubbles (some feed chemical will be visible in the return line or the discharge line)
- ▶ Switch off the metering pump.

The metering pump is ready to run.

### 3.1 Set precise metering

#### **NOTE**

- Choose the largest possible stroke length for gaseous media.
- Select the largest possible stroke rate to ensure good mixing.
- For reproducibility in the case of proportional metering set a stroke length of at least 30 % (SEK type: not less than 50 %).

#### **Diagram for setting the feed rate**

##### **General notes about stroke length and stroke rate**

- ▶ Open at the page with the diagram for your pump type (see product-specific operating instructions manual)
- ▶ Determine the correction factor. Mark the operating pressure for your application in the diagram entitled "Correction factor depending on operating pressure"
- ▶ Trace a vertical line from the defined value up to the curve and then horizontally to the left and read off the correction factor
- ▶ Divide the required feed rate by the defined correction factor and mark this value (l/h) on the "l/h" axis in the diagram entitled "Feed rate depending on stroke length and stroke rate"
- ▶ Trace a horizontal line from this point to the left. Trace another vertical line from the intersections with the straight lines for the variable stroke rate down to the "Stroke length" axis
- ▶ Set the metering pump to one of the stroke rates and the associated stroke length determined in this way.

The measurements for determining the pump capacity for the relevant diagrams have been conducted using water and the stroke length correction factor has been set at 70 %.

## 4 Accessories



### CAUTION

It is not permitted to assemble and install ProMinent® metering pumps with non-genuine parts which have not been checked and recommended by ProMinent. This can endanger people and property in circumstances for which we are not liable.

### Float switches

2-stage with 2 m connection cable.

### Fault-indicating relay

indicates faults

### Fault indicating and pacing relay

indicates faults and supplies pulses for other devices.

### Signal cable

Universal-signal 5-core / 2, 5 and 10 m

External contact cable 2-core / 2, 5 and 10 m

### Foot valves

with suction filter and non-return valve for connection to end of the intake line.

### Discharge valves

with spring-loaded non-return valve for metering in open or closed systems and for attaching discharge line.

### Injection lances

for metering into large pipe cross sections and for preventing blockages of crystallising media.

### Multifunction valve

for fitting directly to pump head with the following functions:

ball check valve, pressure relief valve, priming aid, relief of discharge line

### Back pressure valves

For reproducible metering at low operating pressure or as overflow bypass valve.

### Accumulators

for pulsation dampening in the case of e.g. long discharge lines.

### Feed monitors

for monitoring the feed rate. After a preset number of un-acknowledged metering strokes a fault is indicated and the metering pump is switched off.

### Suction lances

with foot valve and float switch for disposable drums or supply tanks.

### Flushing assembly

for flushing and cleaning liquid end, discharge line and discharge valve.

Manual or automatic, timer clock controlled versions.

### Supply tank

from 35 to 1000 l capacity with locking screw cap and all necessary accessories.

### Manual/electric stirrers

for mixing and batching metering solutions

### Consoles

for stable pump assembly.

## Warranty claim form

Please copy and send with the pump!  
**In the case of failure of the metering pump within the warranty period  
please clean the pump  
and send it back with a completed warranty claim.**



Please complete in full.

### Warranty claim for pump

**No.**

Company: ..... Phone No.: ..... Date: .....  
Address: .....  
Person responsible (customer): .....  
Order-No.: ..... Delivery-Date: .....  
Pump-type/Identcode: ..... Serial. No.: .....

Short description of fault .....  
.....  
.....

#### Type of fault

##### 1 Mechanical fault

- ☐ Atypical wear and tear
- ☐ Consumables
- ☐ Breakage/other damage
- ☐ Corrosion
- ☐ Damage in transit

##### 3 Leakage

- ☐ Connectors
- ☐ Liquid end

##### 2 Electrical fault

- ☐ Loose connector, e.g. plug or cable
- ☐ Controls (e. g. switch)
- ☐ Controller

##### 4 No feed or poor feed

- ☐ Diaphragm faulty
- ☐ Other

#### Application conditions:

Where used/description of equipment: .....  
Accessories used: .....

Commissioned (Date): .....  
Run-time (approx. operating hours ): .....



Customer:

Project-No.:

Date:

☐ diagram included:**Pump**

|                                       |             |       |
|---------------------------------------|-------------|-------|
| Type                                  | –           | ..... |
| Feed rate                             | l/h         | ..... |
| Stroke rate                           | Strokes/min | ..... |
| Stroke length                         | %           | ..... |
| Valve spring pressure, suction side   | bar         | ..... |
| Valve spring pressure, Discharge side | bar         | ..... |

**Medium**

|  |                   |               |
|--|-------------------|---------------|
| Description/concentration                | – / %             | ..... / ..... |
| Suspended solids content/particle size   | % / mm            | ..... / ..... |
| Material solid/hardness class            | – / (Mohs scale)  | ..... / ..... |
| Dynamic viscosity                        | mPa s (cP)        | .....         |
| Density                                  | kg/m <sup>3</sup> | .....         |
| Vapour pressure at operating temperature | bar / °C          | ..... / ..... |

**Equipment, intake side**

|                              |                          |                                      |
|------------------------------|--------------------------|--------------------------------------|
| Pressure in the suction tank | bar                      | .....                                |
| Set width, intake line       | DN / mm                  | ..... / .....                        |
| Suction lift, min./max.      | m                        | ..... / .....                        |
| Intake height, min./max.     | m                        | ..... / .....                        |
| Length of intake line        | m                        | .....                                |
| Number of angles/valves      | – / –                    | ..... / .....                        |
| Pulsation dampener           | <input type="checkbox"/> | Accumulator with diaphragm .... ltr. |
|                              | <input type="checkbox"/> | Accumulator ..... ltr.               |

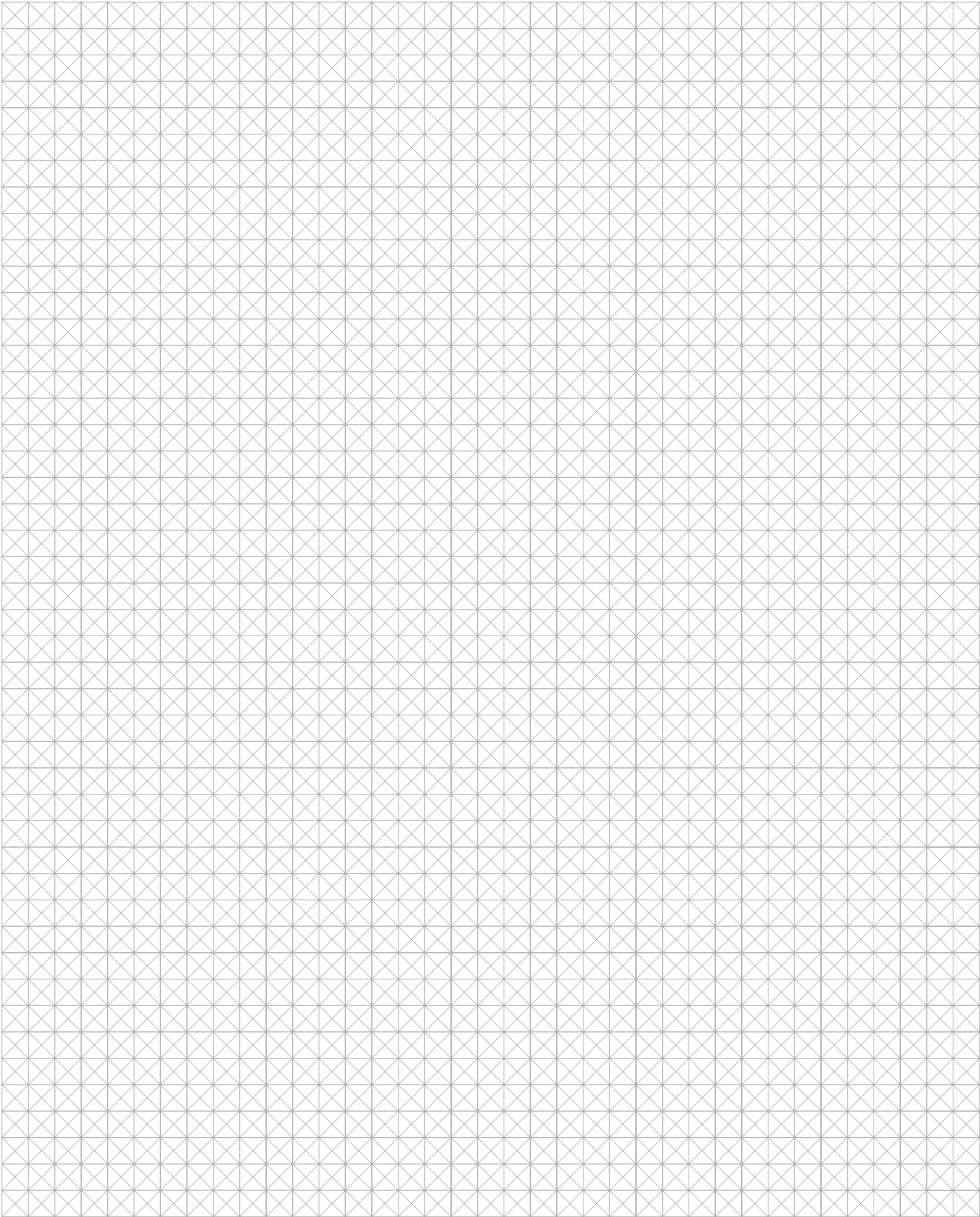
**Equipment**

|                                   |                          |                                      |
|-----------------------------------|--------------------------|--------------------------------------|
| Static system pressure, min./max. | bar                      | ..... / .....                        |
| Set width discharge line          | DN/mm                    | .....                                |
| Length of discharge line          | m                        | .....                                |
| Feed lift                         | m                        | .....                                |
| Number of angles/valves           | – / –                    | ..... / .....                        |
| Pulsation dampener                | <input type="checkbox"/> | Accumulator with diaphragm .... ltr. |
|                                   | <input type="checkbox"/> | Accumulator ..... ltr.               |

Diagram of system

Customer: .....

Project-No.: ..... Date: .....



## Safety declaration form

**A completed form must always be returned with the equipment!**

**This declaration must only be completed and signed by an authorized member of the technical staff!**

The equipment or its parts will only be repaired or serviced if it is accompanied by a correctly completed and signed safety declaration form. The work could be delayed if no form is returned.

### Legally binding declaration

**We hereby assure that:**

**1. The enclosed equipment**

Type: \_\_\_\_\_

Serial No.: \_\_\_\_\_

is free from any

- ☐ toxic
- ☐ corrosive
- ☐ microbiological
- ☐ carcinogenic
- ☐ explosive
- ☐ radioactive substances
- ☐ or other substances that may be harmful to health.

**2. The equipment was thoroughly cleaned before being shipped.**

**3. There is no hazard due to residual contamination.**

**4. The details given in this form are correct and complete.**

Company / Institute: \_\_\_\_\_

Street: \_\_\_\_\_ Postcode, Town: \_\_\_\_\_

Tel: \_\_\_\_\_ Fax: \_\_\_\_\_

Surname, First name: \_\_\_\_\_ Position: \_\_\_\_\_

Date: \_\_\_\_\_

\_\_\_\_\_  
Legally binding signature

\_\_\_\_\_  
Company stamp

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info@prominent.ie

ProMinent Italiana S.R.L. **(Italy)**  
Tel.: +39 0471 920000  
info@prominent.it  
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ProMinent Japan Ltd. **(Japan)**  
Tel.: +81 3 32073470  
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ProMinent Korea Co. Ltd. **(Republic of Korea)**  
Tel.: +82 31 7018353  
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ProMinent Office Kazakhstan **(Kazakhstan)**  
Tel.: +7 3272 504130  
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ProMinent Office Kaunas **(Lithuania)**  
Tel.: +370 37 325115  
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ProMinent Fluid Controls (M) Sdn. Bhd.  
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Tel.: +60 3-905 77 224  
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ProMinent Fluid Controls de México, S.A. de C.V.  
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Tel.: +52 (442) 2189920  
venfas@prominent.com.mx

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www.prominent.nl

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ProMinent Portugal Controlo de Flúidos, Lda.  
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www.proshield.co.uk

ProMinent Fluid Controls (Far East) Pte. Ltd.  
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ProMinent Slovensko s.r.o. **(Slovak. Republ.)**  
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promsa@mweb.co.za

ProMinent Gugal S.A. **(Spain)**  
Tel.: +34 972 287011/12  
prominent@prominentSpain.com  
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ProMinent Doserteknik AB **(Sweden)**  
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info@prominent.se  
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Tomal AB **(Sweden)**  
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www.tomal.se

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info@prominent.ch  
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ProMinent Fluid Controls (Thailand) Co. Ltd.  
**(Thailand)**  
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pfc@prominent.co.th  
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ProMinent Office Kiev **(Ukraine)**  
Tel.: +380 44 2696933  
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ProMinent Fluid Controls, Inc. **(USA)**  
Tel.: +1 412 7872484  
sales@prominent.cc.us  
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## Vertretungen weltweit / Distributors Worldwide

Argentina · Bahrain · Bolivia · Botswana · Chile · Columbia · Costa Rica · Croatia · Cuba · Cyprus · Denmark · Egypt · El Salvador · Guatemala · Hong Kong · Indonesia · Iceland · Iran · Ireland · Israel · Jordan · Kenya · Kuwait · Macedonia · Malta · Namibia · New Zealand · Nigeria · Norway · Oman · Pakistan · Panama · Paraguay · Peru · Philippines · Qatar · Romania · Russia-Ural Region · Saudi Arabia · Senegal · Serbia/Montenegro · Slovenia · Sudan · Syria · Tanzania · Tunisia · Turkey · Turkmenistan · Uganda · Uruguay · United Arab Emirates · Venezuela · Vietnam · White Russia · Zimbabwe

Anschriffennachweise erhalten Sie durch: / Addresses of distributors are available from: ProMinent Dosiertechnik GmbH, Germany

### Ergänzungsanleitung für ProMinent® gamma/ L und ProMinent® Sigma-Ausführungen mit Stromausgang

Je nach Identcode-Merkmal „Relais“ kann die Pumpe mit der Baugruppe „Stromausgang 4-20 mA mit Relais“ ausgerüstet sein (nicht möglich bei Pumpenversion mit Relais oder PROFIBUS®):

- „C“ = Stromausgang 4-20 mA mit Störmelderelais abfallend
- „D“ = Stromausgang 4-20 mA mit Störmelderelais anziehend
- „E“ = Stromausgang 4-20 mA mit Taktgeberrelais anziehend

Zum Nachrüsten die Baugruppe „Stromausgang“ an der gleichen Stelle wie das Relaismodul seitlich in den Pumpenfuß montieren (siehe „Einbauanleitung für Nachrüstsatz Relais“). Dann ist das Identcode-Merkmal „Relais“ = C realisiert.

#### Technische Daten

|                           |               |                        |      |
|---------------------------|---------------|------------------------|------|
| Stromausgang: Bürde max.: | 300 Ohm       | Relais: Spannung max.: | 24 V |
| Kontakt:                  | potenzialfrei |                        |      |

Das Signal I des Stromausgangs signalisiert die aktuelle rechnerische Dosiermenge der Pumpe nach folgenden Formeln:

$$I(4...20) = 16 \times F/F_{\max} \times L/100 + 4$$

- I = Ausgangsstrom in mA
- f = Hubfrequenz in Hübe/min
- L = Hublänge in %
- f<sub>max</sub> = Maximalfrequenz in Hübe/min

In den Betriebsarten „Contact“ und „Batch“ ist f die in der Daueranzeige „Hubfrequenz“ eingestellte Hubfrequenz.

Nur bei Identcode-Merkmal „Steuerungsvariante“ = 2 oder 3 (Analogeingang): Der Bereich des Stromausgangs folgt demjenigen des Analogeingangs: einstellen des Analogeingangs auf den Bereich 0 ... 20 mA (SET - ANALG) führt beim Stromausgang ebenfalls zu einem Bereich 0 ... 20 mA.

Nur gamma/ L: Die Verarbeitungsart „Curve“ des Analogeingangs ist nicht möglich.

In den Zuständen „Stop“ (durch Störung oder Bedienung) oder „Pause“ gibt der Stromausgang einen Strom von 4 mA (0 mA) ab.

### Supplementary operating instructions for ProMinent® gamma/ L and ProMinent® Sigma with power output

Depending on the „Relay“ identcode characteristic the pump can be fitted with the „4-20 mA power output with relay“ assembly (not available for pump with relay or PROFIBUS®):

- „C“ = 4-20 mA output with 1 fault indicating relay N/C
- „D“ = 4-20 mA output with 3 fault-indicating relays N/O
- „E“ = 4-20 mA outputs with pacing relay N/O

To retrofit the „Power output“ assembly, mount in the same position as the relay module on the side of the pump pedestal (see „Installation instructions for relay retrofit kit“). The equipment now complies with identcode characteristic „Relay“ = C.

#### Technical data

|                          |            |                       |      |
|--------------------------|------------|-----------------------|------|
| Power output: load max.: | 300 Ohm    | Relays: voltage max.: | 24 V |
| contact:                 | zero volts |                       |      |

Signal I of the power output signals the current, valid mathematical pump metering volume in accordance with following formula:

$$I(4...20) = 16 \times F/F_{\max} \times L/100 + 4$$

- I = Output current in mA
- f = Stroke rate in strokes/min
- L = Stroke length in %
- f<sub>max</sub> = max. frequency strokes/min

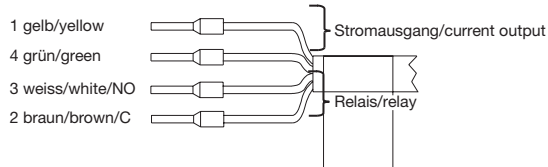
In the „Contact“ and „Batch“ operating modes f is the stroke rate set in the „Stroke rate“ permanent display.

Identcode characteristic „control variant“ = 2 or 3 (analogue input) only: The power output range corresponds to that of the analogue input: set the analogue input to the range 0 ... 20 mA (SET - ANALG) the power output range is also 0 ... 20 mA.

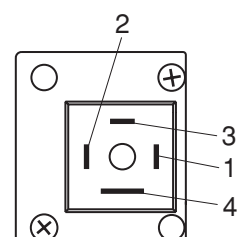
gamma/ L only: The analogue input processing type „Curve“ is not possible.

In the „Stop“ (due to fault or operation) or „Pause“ modes the power output emits a current of 4 mA (0 mA).

#### Belegung Kabel und Buchse: / Cable and socket configuration:



- 1: Strom +      Current +
- 4: Strom -      Current -
- 2: Relais C      Relay C
- 3: Relais NO      Relay NO



### Complément au mode d'emploi ProMinent® gamma/ L et ProMinent® Sigma exécutions avec sortie analogique

Suivant le code d'identification "relais" la pompe peut être équipée d'une "sortie analogique 4-20 mA avec relais sortie" (non possible dans la version avec relais ou "PROFIBUS®):

"C" = sortie analogique 4-20 mA avec relais alarme retombant

"D" = sortie analogique 4-20 mA avec relais d'alarme montant

"E" = sortie analogique 4-20 mA avec relais tact

Pour la carte "sortie analogique" le montage est identique au kit relais alarme monté sur le côté de la pompe (voir notice de montage pour kit Relais). Le code d'identification du signal "Relais" = C est alors réalisé.

#### Caractéristiques techniques

|                                   |                |                         |      |
|-----------------------------------|----------------|-------------------------|------|
| Sortie analogique : Charge max. : | 300 Ohm        | Relais : Tension max. : | 24 V |
| Contact :                         | hors potentiel |                         |      |

Le signal I de la sortie analogique signale la quantité dosée actuelle à calculer d'après les formules suivantes :

$$I(4...20) = 16 \times F/F_{\max} \times L/100 + 4$$

I = courant de sortie en mA

F = fréquence d'impulsion en imp/min

L = longueur de course en %

f<sub>max</sub> = Fréquence maximale en impulsions/mn

Pour les modes de fonctionnement "contact" et "batch" f est indiqué dans l'affichage permanent "fréquence d'impulsion".

Uniquement pour code d'identification "variantes de commande" = 2 ou 3 (signal analogique) : la plage du signal analogique en sortie est proportionnelle au signal analogique programmé : réglage du signal analogique sur 0...20 mA (SET-ANALG) conduit à une plage du signal analogique de sortie également de 0...20 mA.

Uniquement pour gamma/ L : le mode de travail "curve" de l'entrée analogique n'est pas possible.

Dans les état "stop" (suite à un défaut ou à une intervention) ou "pause" la sortie analogique donne un signal de 4 mA (0 mA).

### Instrucciones complementarias para los tipos ProMinent® gamma/ L y ProMinent® Sigma con salida de corriente

Según la característica de código de identificación "Relais" la bomba puede estar equipada con el grupo "Salida de corriente 4-20 mA con relé" (no posible en la versión de bomba con relé o PROFIBUS®):

„C“ = Salida de corriente 4-20 mA con relé de aviso de avería en reposo

„D“ = Salida de corriente 4-20 mA con relé de aviso de avería en operación

„E“ = Salida de corriente 4-20 mA con relé secuenciador en operación

Para equipamiento posterior montar el grupo "Salida de corriente" en el mismo lugar que el módulo relé en el lado de la base de la bomba (ver "Instrucciones de montaje para conjunto de reequipamiento relé"). Entonces está realizada la característica de código de identificación "Relé" = C.

#### Datos técnicos

|                                  |               |                     |      |
|----------------------------------|---------------|---------------------|------|
| Salida de corriente: Carga máx.: | 300 ohmios    | Relé: Tensión máx.: | 24 V |
| Contacto:                        | sin potencial |                     |      |

La señal I de la salida de corriente señala la cantidad dosificada calculada actual de la bomba según las fórmulas siguientes:

$$I(4...20) = 16 \times f/f_{\max} \times L/100 + 4$$

I = Corriente de salida en mA

f = Frecuencia de carrera en carreras/min.

L = Longitud de carrera en %

f<sub>max</sub> = Frecuencia máx. en carreras/min.

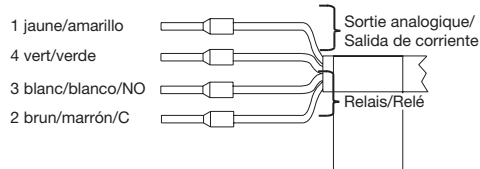
En los modos operativos "Contact" y "Batch" f es la frecuencia de carrera ajustada en la indicación continua "Frecuencia de carrera".

Sólo en la característica de código de identificación "Variante de control" = 2 o 3 (entrada analógica): la gama de la salida de corriente sigue a la gama de la entrada analógica: el ajuste de la entrada analógica en la gama 0 ... 20 mA (SET - ANALG) lleva en la salida de corriente también a una gama de 0 ... 20 mA.

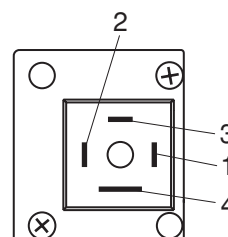
Sólo gamma/ L: el modo de elaboración "Curve" de la entrada analógica no es posible.

En los estados "Stop" (debido a defecto u operación) o "Pause" la salida de corriente suministra una corriente de 4 mA (0 mA).

#### Repérage câble et broche : / Ocupación de cable y clavija:




- 1: Sortie analogique +      Corriente +  
 4: Sortie analogique -      Corriente -
- 2: Sortie relais C          Relé C  
 3: Sortie relais NO        Relé NO



## Appendix C - Electrical certificate

# FORM 16 Certificate

|  |  |  |  |  |  |
|--|--|--|--|--|--|
| <b>NOTE</b>  | This is to be used for the purposes of section 10(c) and 239 of the <i>Building Act 1975</i> and/or sections 32, 35B, 43, 44 and 47 of the <i>Building Regulation 2006</i> .   |  |  |  |  |
| <b>1. Indicate the type of certificate</b><br>The stages of assessable building work are listed in section 24 of the <i>Building Regulation 2006</i> or as conditioned by the building certifier.<br><br>An aspect of building work is part of a stage (e.g. waterproofing).   | <input checked="" type="checkbox"/> <b>Aspect Certificate</b><br><b>Scope of the work</b><br>Scope of the work covered by the licence class under the <i>Queensland Building Services Authority Regulation 2003</i> for the aspect being certified, eg scope of work for a waterproofing licence is "installing waterproofing materials or systems for preventing moisture penetration". An aspect being certified may include "wet area sealing to showers".<br><div>Electrical</div>   |  |  |  |  |
| <b>2. Property description</b><br>The description must identify all land the subject of the application.<br><br>The lot & plan details (eg. SP / RP) are shown on title documents or a rates notice.<br>If the plan is not registered by title, provide previous lot and plan details.   | Street address (include no., street, suburb / locality & postcode)<br><div>Quarry Rd Aratula</div> <div>Postcode 4309</div><br>Lot & plan details (Attach list if necessary)<br><div></div><br>In which local government area is the land situated?<br><div>Scenic Rim Regional Council</div>  |  |  |  |  |
| <b>3. Building / structure description</b>   | Building description<br><div>Sewerage Treatment Plant</div>  | Class of building / structure<br><div>Sewerage Treatment Plant</div> |  |  |  |
| <b>4. Description of component/s certified</b><br>Clearly describe the extent of work covered by this certificate, e.g. all structural aspects of the steel roof beams.  | Description of components certified (tick as applicable).<br><input checked="" type="checkbox"/> Electrical wiring in accordance with AS 3000 Wiring Rules<br><input type="checkbox"/> Installation of 40% energy efficient lighting in accordance with Acceptable Solution 'A4' of superseded QDC MP4.1 (Publication date 16/11/2007) prior 1 <sup>st</sup> March 2009.<br><input type="checkbox"/> Installation of hard wired smoke alarms in accordance with BCA Part 3.7.2.  |  |  |  |  |
| <b>5. Basis of certification</b><br>Detail the basis for giving the certificate and the extent to which tests, specifications, rules, standards, codes of practice and other publications, were relied upon.   | Australian Standard AS 3000 Wiring Rules<br>Queensland Development Code MP401 <i>Sustainable buildings</i> (QDC MP4.1)<br>Building Code of Australia Volume 2 Part 3.7.2 <i>Smoke alarms</i> (BCA Part 3.7.2)<br>Australian Standard AS3786-1993 <i>Smoke Alarms</i>   |  |  |  |  |
| <b>6. Reference documentation</b><br>Clearly identify any relevant documentation, e.g. numbered structural engineering plans.  | N/A  |  |  |  |  |
| <b>7. Building certifier reference number and development approval number</b>  | Building certifier reference number<br><div>N/A</div>  | Development approval number<br><div>N/A</div>                        |  |  |  |
| <b>8. Building Certifier or competent person or QBSA licensee details</b><br><br>A competent person must be assessed as competent before carrying out the inspection.<br>The builder for the work cannot give a stage certificate of inspection.<br><br>A competent person is assessed by the building certifier for the work as competent to practice in an aspect of the building and specification design, because of the individual's skill, experience and qualifications. The competent person must be registered or licensed under a law applying in the State to practice the aspect.<br><br>If no relevant law requires the individual to be licensed or registered, the certifier must assess the individual as having appropriate experience, qualifications or skills to be able to give the help.<br><br>If the chief executive issues any guidelines for assessing a competent person, the building certifier must use the guidelines when assessing the person. | Name (in full)<br><div>Damien Peter Peppin</div><br>Company name if applicable<br><div>Town Services &amp; Storage Pty Ltd</div><br>Contact person<br><div></div><br>Phone no. business hours<br><div>3367 12 64</div><br>Mobile no.<br><div>0409 99 20 20</div><br>Fax no.<br><div></div><br>Email address<br><div>damienpeppin@optusnet.com.au</div><br>Postal address<br><div>P.O.Box 3708 South Brisbane</div> <div>Postcode 4101</div><br>Licence class<br><div>Electrical Contractor's</div><br>Licence number<br><div>65772</div><br>Date approval to inspect received from building certifier<br><div>20/12/2013</div> |  |  |  |  |
| <b>9. Signature of building certifier, competent person or QBSA licensee</b><br><br>Note: A building certifier must sign this form for temporary swimming pool fencing under section 239(2) (b) of the <i>Building Act 1975</i> .  | <input checked="" type="checkbox"/> <b>Aspect Certificate</b><br><br><input type="checkbox"/> A person who may under s43 give a QBSA licensee certificate for the aspect if it complies with the requirements for self assessable building work under the <i>Building Regulation 2006</i> s44.<br><br>Signature<br><div></div><br>Date<br><div>01/03/2014</div>   |  |  |  |  |



## Appendix D – Civil certificate

# Inspection Certificate / Aspect Certificate / QBSA Licensee Aspect Certificate

# 16

|  |  |   |
|--|--|---|
| <b>NOTE</b>  | This form is to be used for the purposes of section 10(c) and 239 of the <i>Building Act 1975</i> and/or sections 32, 35B, 43, 44 and 47 of the <i>Building Regulation 2006</i> .  |   |
| <b>1. Indicate the type of certificate</b><br><br>The stages of assessable building work are listed in section 24 of the <i>Building Regulation 2006</i> or as conditioned by the building certifier.<br><br>An aspect of building work is part of a stage (e.g. waterproofing). | <div> <input checked="" type="checkbox"/> <b>Inspection Certificate for</b><br/><br/> <input type="checkbox"/> Stage of building work (for single detached class 1a or class 10 building or structure)<br/>         (indicate the stage) _____<br/><br/> <input checked="" type="checkbox"/> Aspect of building work<br/>         (indicate the aspect) Civil Earthworks - Stage 1 _____       </div> <hr/> <div> <input type="checkbox"/> <b>QBSA Licensee Aspect Certificate</b><br/> <b>Scope of the work</b><br/>         Scope of the work covered by the licence class under the <i>Queensland Building Services Authority Regulation 2003</i> for the aspect being certified, e.g. scope of work for a waterproofing licence is "installing waterproofing materials or systems for preventing moisture penetration". An aspect being certified may include "wet area sealing to showers".<br/><br/> <div style="border: 1px solid black; height: 100px; width: 100%;"></div> </div> |   |
| <b>2. Property description</b><br>The description must identify all land the subject of the application.<br>The lot & plan details (eg. SP / RP) are shown on title documents or a rates notice. If the plan is not registered by title, provide previous lot and plan details.  | Street address (include no., street, suburb / locality & postcode)<br><div>Sawmill Road</div> <div>Aratula Qld</div> <div>Postcode 4309</div> <hr/> Lot & plan details (Attach list if necessary)<br><div>Lot 4 SP 121584</div> <hr/> In which local government area is the land situated?<br><div>Scenic Rim Regional Council</div>   |   |
| <b>3. Building/structure description</b>   | <b>Building/structure description</b><br><div>N/A</div>  | <b>Class of building / structure</b><br><div></div> |
| <b>4. Description of component/s certified</b><br>Clearly describe the extent of work covered by this certificate, e.g. all structural aspects of the steel roof beams.  | <div>Earthworks and wetland cells</div>  |   |

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DATE RECEIVED

REFERENCE NUMBER/S

Approved form 16  
Version 3, 11/11

**5. Basis of certification**

Detail the basis for giving the certificate and the extent to which tests, specifications, rules, standards, codes of practice and other publications, were relied upon.

Engineering Plans 486\_5\_5-0159-001 to 012

Compaction Certificates

The Water and Carbon Group – Pipeline Hydraulic Design Calculations

**6. Reference documentation**

Clearly identify any relevant documentation, e.g. numbered structural engineering plans.

Engineering Plans 486\_5\_5-0159-001 to 012

**7. Building certifier reference number and development approval number**

Building certifier reference number

Development approval number

OPW 12/0358

**8. Building Certifier, competent person or QBSA licensee details**

A competent person must be assessed as competent before carrying out the inspection. The builder for the work cannot give a stage certificate of inspection.

A competent person is assessed by the building certifier for the work as competent to practice in an aspect of the building and specification design, because of the individual's skill, experience and qualifications. The competent person must be registered or licensed under a law applying in the State to practice the aspect.

If no relevant law requires the individual to be licensed or registered, the certifier must assess the individual as having appropriate experience, qualifications or skills to be able to give the help.

If the chief executive issues any guidelines for assessing a competent person, the building certifier must use the guidelines when assessing the person.

Name (in full)

Gregory M Applin

Company name if applicable

Concept Engineering Design and Proj Mgmt

Contact person

Gregory M Applin

Phone no. business hours

3371 3229

Mobile no.

0414 768 109

Fax no.

N/A

Email address

greg@concepteng.com.au

Postal address

PO Box 881

Toowong Qld

Postcode 4066

Licence class

RPEQ

Licence number

6073

Date approval to inspect received from building certifier

**9. Signature of building certifier, competent person or QBSA licensee**

Note: A building certifier must sign this form for temporary swimming pool fencing under section 4 of Schedule 1 of QDC MP 3.4.

Signature

Date

14.02.2013

# Inspection Certificate / Aspect Certificate / QBSA Licensee Aspect Certificate

# 16

|  |  |   |
|--|--|---|
| <b>NOTE</b>  | This form is to be used for the purposes of section 10(c) and 239 of the <i>Building Act 1975</i> and/or sections 32, 35B, 43, 44 and 47 of the <i>Building Regulation 2006</i> .  |   |
| <b>1. Indicate the type of certificate</b><br><br>The stages of assessable building work are listed in section 24 of the <i>Building Regulation 2006</i> or as conditioned by the building certifier.<br><br>An aspect of building work is part of a stage (e.g. waterproofing). | <div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"> <input checked="" type="checkbox"/> </div> <div> <b>Inspection Certificate for</b><br/><br/> <input type="checkbox"/> Stage of building work (for single detached class 1a or class 10 building or structure)<br/>           (indicate the stage) _____<br/><br/> <input checked="" type="checkbox"/> Aspect of building work<br/>           (indicate the aspect) <b>Civil Earthworks – Stage 2</b> _____         </div> </div> <div style="margin-top: 20px;"> <input type="checkbox"/> <b>QBSA Licensee Aspect Certificate</b><br/> <b>Scope of the work</b><br/>         Scope of the work covered by the licence class under the <i>Queensland Building Services Authority Regulation 2003</i> for the aspect being certified, e.g. scope of work for a waterproofing licence is "installing waterproofing materials or systems for preventing moisture penetration". An aspect being certified may include "wet area sealing to showers".<br/><br/> <div style="border: 1px solid black; height: 100px; width: 100%;"></div> </div> |   |
| <b>2. Property description</b><br>The description must identify all land the subject of the application.<br>The lot & plan details (eg. SP / RP) are shown on title documents or a rates notice. If the plan is not registered by title, provide previous lot and plan details.  | <div style="border: 1px solid black; padding: 5px;"> <b>Street address (include no., street, suburb / locality &amp; postcode)</b><br/>         Sawmill Road<br/>         Aratula Qld <span style="float: right;">Postcode 4309</span> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> <b>Lot &amp; plan details (Attach list if necessary)</b><br/>         Lot 4 SP 121584       </div> <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> <b>In which local government area is the land situated?</b><br/>         Scenic Rim Regional Council       </div>   |   |
| <b>3. Building/structure description</b>   | <b>Building/structure description</b><br><div style="border: 1px solid black; padding: 5px; height: 100px;">         N/A       </div>  | <b>Class of building / structure</b><br><div style="border: 1px solid black; height: 100px;"></div> |
| <b>4. Description of component/s certified</b><br>Clearly describe the extent of work covered by this certificate, e.g. all structural aspects of the steel roof beams.  | <div style="border: 1px solid black; padding: 5px; height: 100px;">         Earthworks       </div>  |   |

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REFERENCE NUMBER/S

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Version 3, 11/11

**5. Basis of certification**

Detail the basis for giving the certificate and the extent to which tests, specifications, rules, standards, codes of practice and other publications, were relied upon.

Engineering Plans 486\_5\_5-0159-001 to 012

Compaction Certificates

**6. Reference documentation**

Clearly identify any relevant documentation, e.g. numbered structural engineering plans.

Engineering Plans 486\_5\_5-0159-001 to 012

**7. Building certifier reference number and development approval number**

Building certifier reference number

Development approval number

**8. Building Certifier, competent person or QBSA licensee details**

A competent person must be assessed as competent before carrying out the inspection.

The builder for the work cannot give a stage certificate of inspection.

A competent person is assessed by the building certifier for the work as competent to practice in an aspect of the building and specification design, because of the individual's skill, experience and qualifications. The competent person must be registered or licensed under a law applying in the State to practice the aspect.

If no relevant law requires the individual to be licensed or registered, the certifier must assess the individual as having appropriate experience, qualifications or skills to be able to give the help.

If the chief executive issues any guidelines for assessing a competent person, the building certifier must use the guidelines when assessing the person.

Name (in full)

Gregory M Applin

Company name if applicable

Concept Engineering Design and Proj Mgmt

Contact person

Gregory M Applin

Phone no. business hours

3371 3229

Mobile no.

0414 768 109

Fax no.

N/A

Email address

greg@concepteng.com.au

Postal address

PO Box 881

Toowong Qld

Postcode 4066

Licence class

RPEQ

Licence number

6073

Date approval to inspect received from building certifier

**9. Signature of building certifier, competent person or QBSA licensee**

Note: A building certifier must sign this form for temporary swimming pool fencing under section 4 of Schedule 1 of QDC MP 3.4.

Signature

Date

07.05.2013



## Appendix E – Plumbing certificate



# Inspection Certificate / Aspect Certificate / QBSA Licensee Aspect Certificate

# 16

|   |  |  |
|---|--|--|
| <b>NOTE</b>   | This form is to be used for the purposes of section 10(c) and 239 of the <i>Building Act 1975</i> and/or sections 32, 35B, 43, 44 and 47 of the <i>Building Regulation 2006</i> .  |  |
| <b>1. Indicate the type of certificate</b><br><br>The stages of assessable building work are listed in section 24 of the <i>Building Regulation 2006</i> or as conditioned by the building certifier.<br><br>An aspect of building work is part of a stage (e.g. waterproofing).        | <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <input checked="" type="checkbox"/> <b>Inspection Certificate</b> for<br/><br/> <input type="checkbox"/> Stage of building work (for single detached class 1a or class 10 building or structure)<br/>           (indicate the stage) _____<br/><br/> <input checked="" type="checkbox"/> Aspect of building work<br/>           (indicate the aspect) Plumbing and Drainage         </div> <div style="width: 50%; border-top: 1px solid black; padding-top: 10px;"> <input checked="" type="checkbox"/> <b>QBSA Licensee Aspect Certificate</b><br/> <b>Scope of the work</b><br/>           Scope of the work covered by the licence class under the <i>Queensland Building Services Authority Regulation 2003</i> for the aspect being certified, e.g. scope of work for a waterproofing licence is "installing waterproofing materials or systems for preventing moisture penetration". An aspect being certified may include "wet area sealing to showers".<br/><br/> <div style="border: 1px solid black; padding: 5px;">             Stage 1 Drainage<br/>             _____<br/>             _____<br/>             _____<br/>             _____           </div> </div> </div> |  |
| <b>2. Property description</b><br><br>The description must identify all land the subject of the application.<br><br>The lot & plan details (eg. SP / RP) are shown on title documents or a rates notice. If the plan is not registered by title, provide previous lot and plan details. | <div style="border: 1px solid black; padding: 5px;"> <b>Street address</b> <i>(Include no., street, suburb / locality &amp; postcode)</i><br/>         Sawmill Road, Aratula Qld<br/> <div style="text-align: right;">Postcode 4309</div> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> <b>Lot &amp; plan details</b> <i>(Attach list if necessary)</i><br/>         _____<br/>         _____       </div> <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> <b>In which local government area is the land situated?</b><br/>         Scenic Rim Regional Council       </div>  |  |
| <b>3. Building/structure description</b>  | <b>Building/structure description</b><br><div style="border: 1px solid black; height: 100px; width: 100%;"></div>  | <b>Class of building / structure</b><br><div style="border: 1px solid black; height: 100px; width: 100%;"></div> |
| <b>4. Description of component/s certified</b><br><br>Clearly describe the extent of work covered by this certificate, e.g. all structural aspects of the steel roof beams.   | <div style="border: 1px solid black; padding: 5px;">         All drainage work as per drawings and specifications.<br/>         _____<br/>         _____<br/>         _____<br/>         _____<br/>         _____       </div>   |  |

LOCAL GOVERNMENT USE ONLY

|               |  |                    |  |                                      |
|---------------|--|--------------------|--|--------------------------------------|
| DATE RECEIVED |  | REFERENCE NUMBER/S |  | Approved form 16<br>Version 3. 11/11 |
|---------------|--|--------------------|--|--------------------------------------|



**5. Basis of certification**

Detail the basis for giving the certificate and the extent to which tests, specifications, rules, standards, codes of practice and other publications, were relied upon.

AS 3500

Local Council Regulations

**6. Reference documentation**

Clearly identify any relevant documentation, e.g. numbered structural engineering plans.

**7. Building certifier reference number and development approval number**

Building certifier reference number

Development approval number

**8. Building Certifier, competent person or QBSA licensee details**

A **competent person** must be assessed as competent before carrying out the inspection. The builder for the work cannot give a stage certificate of inspection.

A competent person is assessed by the building certifier for the work as competent to practice in an aspect of the building and specification design, because of the individual's skill, experience and qualifications. The competent person must be registered or licensed under a law applying in the State to practice the aspect.

If no relevant law requires the individual to be licensed or registered, the certifier must assess the individual as having appropriate experience, qualifications or skills to be able to give the help.

If the chief executive issues any guidelines for assessing a competent person, the building certifier must use the guidelines when assessing the person.

Name (in full)

Matthew John Ostrofski

Company name if applicable

Tru-Flow Services Pty Ltd

Contact person

Matt Ostrofski

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Email address

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PO Box 2032

NORTH IPSWICH QLD

Postcode 4305

Licence class

Plumbing, Drainage &amp; Gas

Licence number

1199207

Date approval to inspect received from building certifier

**9. Signature of building certifier, competent person or QBSA licensee**

Note: A building certifier must sign this form for temporary swimming pool fencing under section 4 of Schedule 1 of QDC MP 3.4.

Signature

Date

