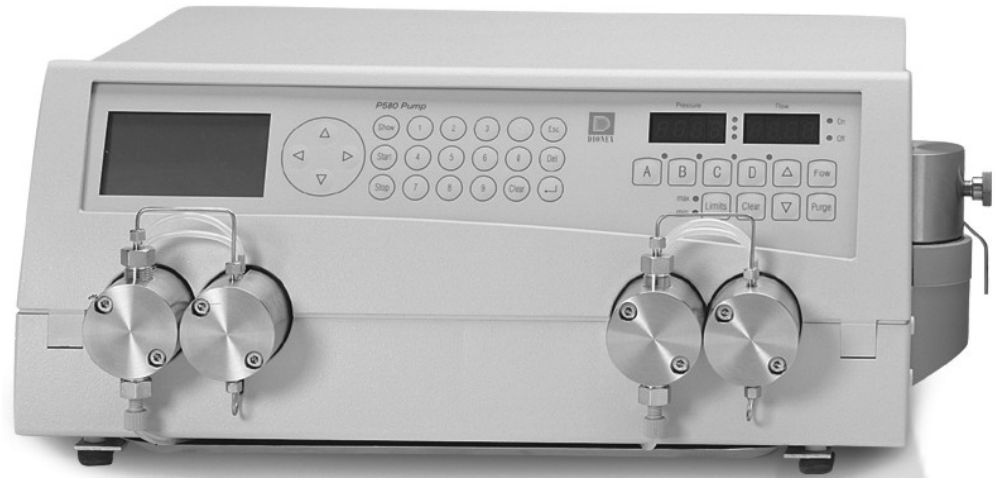
DIONEX

HPLC Pump Series P 580

Operating Instructions



Version: **1.44-C**

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Dionex Softron GmbH

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DIONEX

CE

Declaration of Conformity

Product: Pump
Type: **P580**

Dionex Softron GmbH herewith declares conformity of the above products with the respective requirements of the following regulations:

- EN 50081-1 : 1992:
  Electromagnetic Compatibility (EMC) - Generic emissions standard
  Part 1: Residential, commercial and light industry
- EN 50082-1 : 1992:
  Electromagnetic Compatibility (EMC) - Generic immunity standard
  Part 1: Residential, commercial and light industry
- EN 61000-3-2 : 1998
  Electromagnetic Compatibility (EMC)
  Part 3 / Section 2: Limits for harmonic current emissions

This declaration is issued for the manufacturer

Dionex Softron GmbH
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by the President, Dr. Peter Jochum.

January 16, 2001

Table of Contents

1 Introduction

1.1 About the Operating Instructions

The layout of this manual is designed to provide quick reference to the appropriate sections, according to the operation required. However, it is recommended that, before operating the **P 580**, this manual should be read thoroughly and completely in order to obtain full understanding of the instrument.

Please note: As the device configuration may vary (e.g. for pumps without gradient option), not all descriptions necessarily apply to the delivered instrument.

At various points throughout the manual, messages of particular importance are indicated by **Note**, **Caution** or **Warning** whose relevance is as follows:

Please note: Indicates general information to assist you in obtaining optimum performance.

Important: Indicates that failure to take note of the accompanying information may result in damage to the instrument.

Warning: Indicates that failure to take note of the accompanying information may result in personal injury.

This manual is provided "as is". Any effort has been made to supply complete and accurate information, all technical specifications and programs have been developed with utmost care. However, Dionex assumes no responsibility and will not be liable for any errors, omissions, damage, or loss that might result from any use of this manual or the information contained therein. We appreciate your help in eliminating any errors which may appear in this document.

The information contained in this document is subject to change without notice.

1.2 Unpacking and Checking Contents

All electrical and mechanical components of the P580 pumps are carefully tested before the instrument is shipped. After unpacking, please check the delivery on evident mechanical damages which might have occurred during transport. Immediately report any damages to both, the transport corporation and Dionex as the shipping insurance will compensate for the damage only if reported without delay.

To unpack the unit, proceed as follows:

- Place the box on the floor and remove the white accessories pack and the power cable.
- Pull out the unit, slowly and carefully. Place the unit on a table.

⚠ **Important:** To prevent the unit from falling, hold the unit itself on both sides, not the packaging material.

- Now remove the packaging material and the polythene bag.

Please note: Retain all original packaging material in a safe place. It is the optimum packaging for shipping the unit (e.g. for repair). Shipping the unit in any other packaging automatically nullifies the warranty. All materials used for the packaging can be recycled.

Check-off the contents of the accessory pack against the list in section 8.1. In section 2.3, you will find a list of alternative equipment.

Please note: After unpacking, please check the delivery on evident mechanical damages which might have occurred during transport. Immediately report any damages to both, the transport corporation and Dionex as the shipping insurance will compensate for the damage only if reported without delay.

1.3 Warranty

The standard warranty coverage for this unit is in accordance with the conditions of sale. The warranty has a duration of one year from the invoice date and covers materials and labor, ex-works. Please note that wear parts cannot be covered by the warranty.

The warranty coverage shall become invalid in any case identified as resulting from inappropriate use, service or the implementation of non-specified spare parts. Similarly, the warranty coverage shall be invalidated in the event of inappropriate shipment, packaging or failure to remove aggressive or damaging solvent residues.

1.4 Intended Use

Depending on the model, the **P 580** pump is intended for the operation exclusively in analytical or preparative HPLC systems. The pump can be operated either in *stand-alone* mode or via the ***CHROMELEON*** data system.

Please note that the unit may only be operated within its technical specifications (see chapter 7)!

Dionex assumes no liability for material or immaterial damage resulting from misuse of the unit.

2 Overview

2.1 Unit Description

The high precision pumps of the series **P 580** are high-quality modules for the HPLC analysis. Whether as binary high-pressure gradient system **P 580A HPG** with the optional solvent selector "2 from 4" or as quaternary low-pressure gradient pump **P 580A LPG** with the integrated degasser - the technical specifications of the **P 580** series fulfill the high requirements in reproducibility of the delivery rate, zero-pulsation, operational reliability and economic efficiency.

The patented *isokinetic pre-compression* allows a precise and zero-pulsation flow. With flow rates ranging from 1µl/min to 10ml/min (analytical version) and operating pressures up to 50.0 MPa (500 bar), the **P 580** is suitable for both regular and micro HPLC.

The programming possibility of the **P 580** pump, which allows time programs for gradient and flow parameters and the control via relay and motorized witching valve, provides high flexibility, even in **stand-alone** operation. The **P 580** pump can be controlled via the ***CHROMELEON*** data system offering a high degree of system integration.

All parts contacting media are manufactured from stainless steel, PCTFE, PEEK, sapphire etc., which results in **excellent resistance** against most solvents and buffers.

2.2 Principle of Operation

The **P 580** gradient pump is a zero-pulsation, serial dual piston pump with electronic compressibility compensation. The two pump heads of the **P 580** are serially connected, i.e. the solvent passes both pump heads - working and equilibration pump head - successively.

Continuous delivery is achieved as follows: The working piston delivers at the appropriate flow rate while simultaneously filling the serially connected equilibration head. The latter serves as a reservoir and conveys, while the working piston carries out the suction stroke. The characteristic feature of the patented isokinetic pre-compression is the 120 degree overlapping phase of the delivery strokes of working and equilibration piston. When delivering compressible liquids without controlled pre-compression, the pulsation increases with increasing operating pressure, since part of the delivery stroke is required for the compression of the solvent in the pump head.

Pulsation during the pre-compression phase is reduced to a minimum by velocity modulation of the drive. The highly constant delivery is ensured by a patented secondary control system (automatic compressibility compensation). The flow rate is always kept constant in relation to the atmospheric pressure. For user input, see section 3.9.

Switching on the model **P 580 LPG** automatically activates the integrated **Online Degasser**. It serves to continually degas the solvents via special polymer membranes permeable to gas, but not to liquids. The online degasser thus guarantees optimum operation regarding reproducibility and pulsation reduction.

2.3 Supported Configurations

The HPLC pump **P 580** is available in various configurations. The pump is suitable for numerous laboratory environments. In addition to the isocratic and the quaternary low-pressure gradient pump with an integrated degasser, a binary high-pressure gradient system is available, optionally equipped with the solvent selector "2 from 4". If required, the binary high-pressure gradient system can be expanded to a quaternary high-pressure gradient system by connecting an additional high-pressure gradient slave pump. Additional flexibility is offered by the dynamic mixing chamber with variable volume that can be adjusted to individual requirements.

The following list gives you an overview of the currently available models. If you have any questions, please contact the Dionex Sales Department or your Distributor.

Model	Part-No.	Configuration	Gradient Configuration
P 580A	5025.0010	Stainless steel 1.4571	isocratic pump, analytical
P 580P	5025.0020	Stainless steel 1.4571	isocratic pump, semi-preparative
P 580A LPG	5025.0015	Stainless steel 1.4571	quaternary low-pressure gradient pump, analytical
P 580A HPG	5025.0016	Stainless steel 1.4571	binary high-pressure gradient pump, analytical
P 580P HPG	5025.0025	Stainless steel 1.4571	binary high-pressure gradient pump, semi-preparative

3 Installation

3.1 Positioning the Unit

To position the **P 580** pump, proceed as follows:

- Place the unit on a firm and vibration-free surface.
- Do not expose the unit to temperature fluctuations.
- Do not expose the unit to direct sunlight.
- Do not expose the unit to high humidity.
- For safety reasons, the solvent reservoir containers should be placed on the container tray on the **P 580** pump.
- The surface must be solvent-resistant.

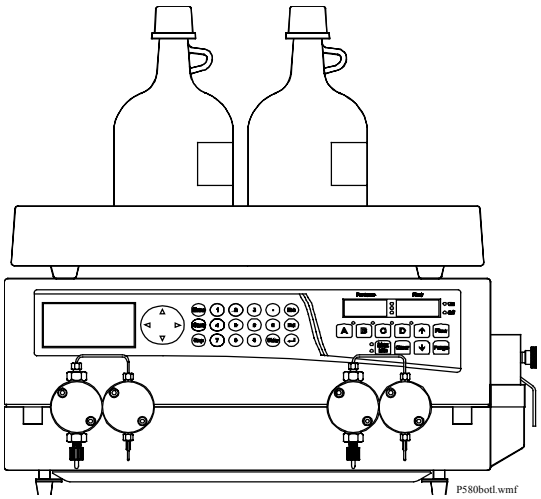


*Fig. 1: **P 580** with container tray*

Notes: The **P 580** pump may be placed on top of the Autosampler **GINA 50**.

When the pump is in operation, the stainless steel tray below the housing should be drawn out to catch any liquid that may escape from the pump heads.

3.2 Electrical Connections

3.2.1 General Hints

Unless otherwise specified, Dionex instruments are factory-set for operation at 230V/50Hz. If the local voltage differs from this setting, the voltage selector on the rear of the unit (next to the power socket, see fig. 2 and fig. 4) must be adjusted. To do this, proceed as follows:

- Disconnect the power cord.
- Draw out the fuse cartridge using a small screwdriver (fig. 2).
- Draw out the small voltage selector board from the power socket housing.
- Place the board (with the label up) below the drawing showing the required setting in fig. 3.
- Turn the board so that the voltage value on the board corresponds to the drawing in fig. 3.
- Adjust the plastic tab (without turning the board) as shown in fig. 3. Ensure that the tab locks into place.

- Slide the voltage selector board into the power socket housing, as shown in fig. 3.
- Now, replace the fuse cartridge.
- Finally, check whether the correct voltage is set.

⚠ **Important:** Choose one of the settings shown in fig. 3 (100V or 230V). Other settings are not supported.

⚠ **Important:** When installing the instrument for the first time, check the proper mains and earth connection of the unit. For minimum interference effects, all components of the analysis system should be connected to the same mains output.

STOP **Warning:** Prior to changing the voltage or replacing the fuse, **you must disconnect the power cord**.

3.2.2 Replacing the Fuse

- Disconnect the power cord!
- Draw out the fuse cartridge using a small screwdriver (fig. 2).
- Replace the fuses.

⚠ **Important:** Use only fuses of the type specified in fig. 2 (min. nominal voltage 250V) or listed in the Accessories/Original Spare Parts List. If the voltage selector is set to 100V, use 1A-fuses. For 230V you will need 0.5A-fuses.

- Replace the fuse cartridge.

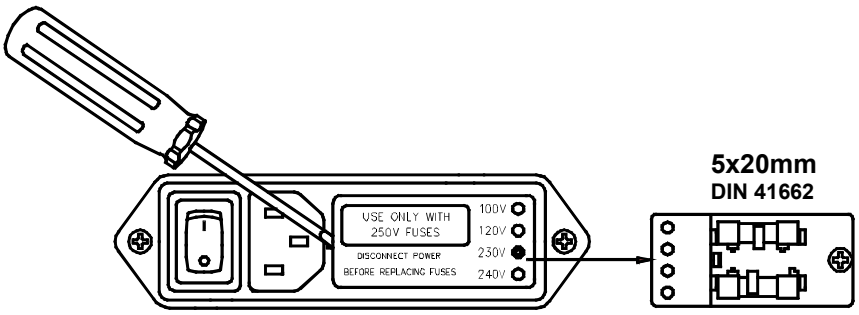
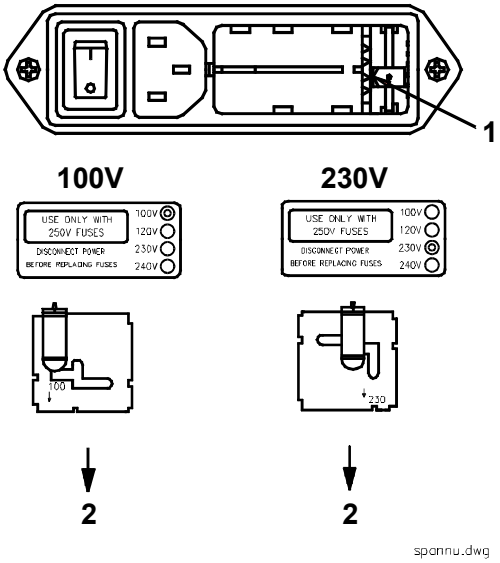


Fig. 2: Voltage selector and fuse replacement



1 Insert direction: Arrow on arrow
2 Insert voltage selector board in this direction

Fig. 3: Mains filter

3.3 Rear Panel Connectors

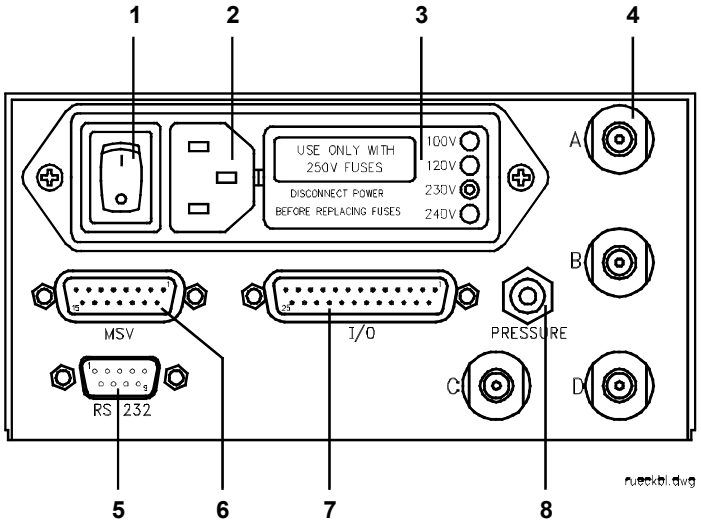


Fig. 4: Rear Panel Connections

No.	Description
1	Power switch
2	Mains connection
3	250V-fuses (0.5A for 230V, 1A for 100V), voltage selector (100V/230V)
4	Solvent connections A - D, depending on the model
5	RS 232: interface for data system connection
6	MSV: Motorized switching valve control
7	I/O: Input/Output for external control
8	PRESSURE: for external display of the pump pressure

3.3.1 RS-232-Interface

The **P 580** pump can be controlled with the ***CHROMELEON*** data system. Control is via a RS-232-interface. This interface has a 9-pin male connector on the rear of the instrument (Fig. 4).

Please note: For this connection, use only the connecting cables supplied by Dionex Softron. This ensures trouble-free operation of the connection. The following cables are available:

- 9-pin connection: "Null modem cable", part no.: 1310.2260
- 25-pin connection: "RS unit cable", part no.: 8914.0103A (shipped with the RS-T-piece)

Please note: For controlling the pump with ***CHROMELEON***, the pump is connected directly to the PC.

3.3.2 I/O-Connector

The digital I/O-connector of the HPLC pump **P 580** (see fig. 4) offers the possibility to connect an autosampler or a hand-operated valve, for example. This connector supplies the digital inputs **Start**, **Stop** and **Hold** as well as three relay outputs. The relay output **Operable Out** is closed as soon as the HPLC pump is not ready to operate, i.e. in the event of an error or if the instrument is switched off. Controlling the relays R1 and R2 is via pump programming (see section 4.4.6) or the data system. In addition, ***CHROMELEON*** offers the possibility to control the **Operable Out** relay.

The functions of the digital inputs **Start** and **Stop** correspond to the same keys on the pump´s keypad (see section 4.1). The signal **Hold** interrupts the current gradient program and stops the flow.

Wire	Pin	Signal	Remark
1	1		marked wire / do not use!
2	14		do not use!
3	2		do not use!
4	15		do not use!
5	3		do not use!
6	16		do not use!
7	4		do not use!
8	17		do not use!
9	5		do not use!
10	18	RELAY 3 OUT	Operable Out / zero potential
11	6	RELAY 3 OUT	Operable Out / zero potential
12	19	RELAY 1 OUT	zero potential
13	7	RELAY 1 OUT	zero potential
14	20	RELAY 2 OUT	zero potential
15	8	RELAY 2 OUT	zero potential
16	21		do not use!
17	9		do not use!
18	22	HOLD IN	
19	10	HOLD IN	
20	23	STOP IN	
21	11	STOP IN	
22	24	START IN	
23	12	START IN	
24	25		do not use!
25	13		do not use!

Fig. 5: 25-pin I/O Connector

⚠ **Important:** Do **not** use the wires 1-9, 16-17 or 24-25!

⚠ **Important:** Maximum switching voltage of the relays is 24V. 100mA must not be exceeded.

3.3.3 Pressure Output

The **P 580** features an analog output for recording the operating pressure of the pump (**PRESSURE**, see fig. 4). The pressure output is set to 2mV/bar. For monitoring the pump pressure, it is possible to connect a recorder, or a ***CHROMELEON*** A/D converter.

Pin Assignment 2-pin Connector	
• Inner tip:	Signal (pressure)
• Outer ring:	GND

3.3.4 Motorized Switching Valve (MSV)

It is possible to connect a **MSV-6** (e.g. for column switching) to the **P 580**. The corresponding connection is located on the rear of the pump (see Fig. 4). The control of the motorized switching valve is via pump programming or via the ***CHROMELEON*** data system.

⚠ **Important:** Use only the **MSV-6** motorized switching valve!

3.4 Fluidic Connections

⚠ **Important:** The pump is primed with 2-propanol. When operating the **P 580** pump for the first time, make sure that the solvents you use are miscible with 2-propanol. Otherwise, use appropriate intermediate steps.

3.4.1 Connecting Solvent Supply

When connecting the pump and the solvent storage containers, please note the following:

- The supplied solvent tubes must be connected to the threaded adapters (A to D, depending on the model) on the rear of the instrument.
- Threaded adapters that are not required must be closed with one of the supplied blind plugs.

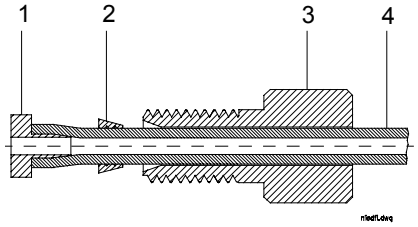
⚠ **Important:** To draw solvents from the supply containers, only use suction tubes with filter frits. Thus you will prevent contaminations from reaching the HPLC system.

Please note: Please check the suction frits for permeability. Especially when working with aqueous solvents, algae and other microorganisms can grow and be deposited on the filter frits. Therefore use new solvents regularly. Rinse the containers thoroughly before using them again.

Please note: For small flow rates, the low-flow connecting tube (part no.: 5025.2515) can be used for connecting the left-hand pump head and the proportioning valve. Refer to section 6.11 for further details.

3.4.2 Connections in the Low-Pressure Section

Solvent connections on the low-pressure inlet side of the pump are realized with the following components:



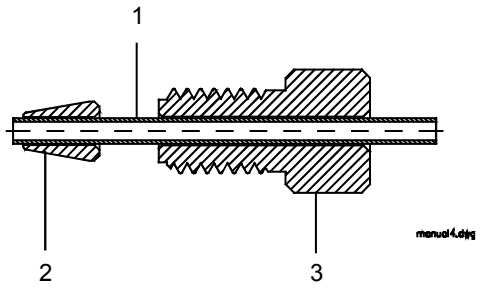
No.	Description	Part No.
1	Support flange	5 pieces each are included in the PEEK Fitting Set, Part no. 6025.2511
2	Clamp ring	
3	Knurled fitting	
4	PTFE-tube	

Fig. 6: Solvent connections on low-pressure side

⚠ **Important:** Do not over tighten fitting connections (hand tighten). If necessary, tighten leaking connections.

3.4.3 Connections in the High-Pressure Section

On the model **P 580**, all capillary connections are supplied with fitting screws and ferrules:



No.	Description
1	Capillary tube
2	SR-7 Ferrule
3	FS-7 Fitting screw

Fig. 7: Fitting screw and ferrule

The following capillaries are used in the instruments:

Part No.	Description
5025.2002 5025.2202	Capillary pump head - mixing chamber (P 580A LPG, P 580A) or Capillary pump head - mixing chamber (P 580P LPG, P 580P)
5025.2004	Capillary pump outlet - Rheodyne valve (all types)
5025.2006	Capillary equilibration piston - working piston (all types)
5025.2007 5025.2207	Capillary T-piece - mixing chamber (P 580A HPG) or Capillary T-piece - mixing chamber (P 580P HPG)
5025.2013 5025.2213	Capillary pump head, left - T-piece (P 580A HPG) Capillary pump head, left - T-piece (P 580P HPG)
5025.2014 5025.2214	Capillary pump head, right - T-piece (P 580A HPG) Capillary pump head, right - T-piece (P 580P HPG)

⚠ **Important:** Do not overtighten fitting connections (handtighten plus an approx. ¼ turn). If necessary, tighten leaking connections.

⚠ **Important:** Only use the ready-made capillary tubes included with the pump. Only use capillary tubes that are cleaned inside! If necessary, shorten the capillary tubes with the "cutting tool for capillary tubes" (part no. 2140.0001). Never use a file to do this! Contaminants or filings (even minute parts) can cause damage in the HPLC system (pump, injection valve, etc.).

⚠ **Important:** To connect the capillary tubes to an injection or switching valve, use the ferrules and fitting screws in the accessories included with the valve. Read the installation notes from the valve manufacturer!

Please note: Refer to section 3.6 to find detailed information on the installation of a high-pressure gradient system.

Please note: For mixing the gradient, a dynamic mixing chamber with a volume of 200µl is integrated in the high-pressure part of the pump. To meet individual requirements, Dionex offers mixing chambers with variable volumes for flow rates above 3.5 ml/min. Please contact Dionex for further information.

3.4.4 Piston Seal Rear Flushing

The model **P 580** has a rinsable rear-seal flushing chamber (piston seal rear flushing). To supply the chamber with rinsing liquid, proceed as follows:

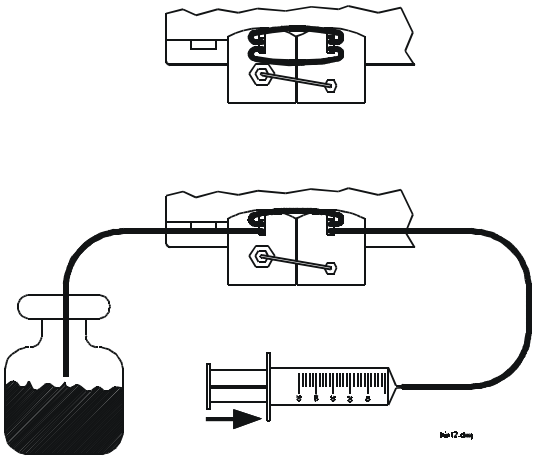


Fig. 8: Non-continuous piston seal rear flushing (from above)
top: view pump operation
bottom: filling piston rear flushing

- Unfasten the upper silicone tube that connects the two pump heads and attach the free end to the plastic syringe (supplied with accessories) filled with rinsing liquid. You can also use a longer silicone tube (see fig. 8).
- Attach a piece of silicone tube (supplied with accessories) to the free pump head connector and place the free end in a glass.
- Ensure that the rinsing liquid does not contain buffer salt.
- The pump must be rinsed at least once a day. Using a high pressure pump requires rinsing both pump block in series.

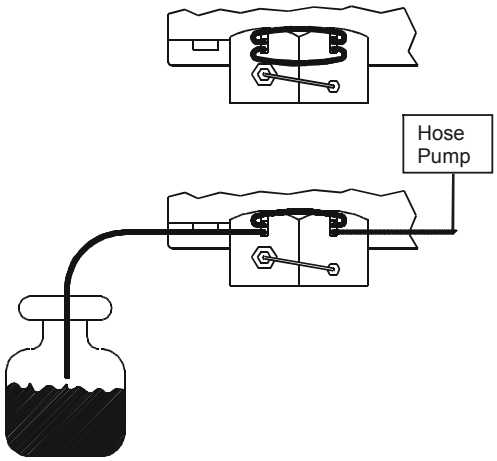


Fig. 9: Continuous piston seal rear flushing (from above)
top: view pump operation
bottom: filling piston rear flushing

- Especially when using saliferous solvents, the piston seals must be rinsed continuously to increase their durability.
- Use the silicone tube (supplied with the accessories) to connect a hose pump instead of the plastic syringe (see above) to the free end.
- Ensure a sufficient amount of rinsing liquid for delivery.
- Especially when using saliferous solvents do not pump the liquid in circles!

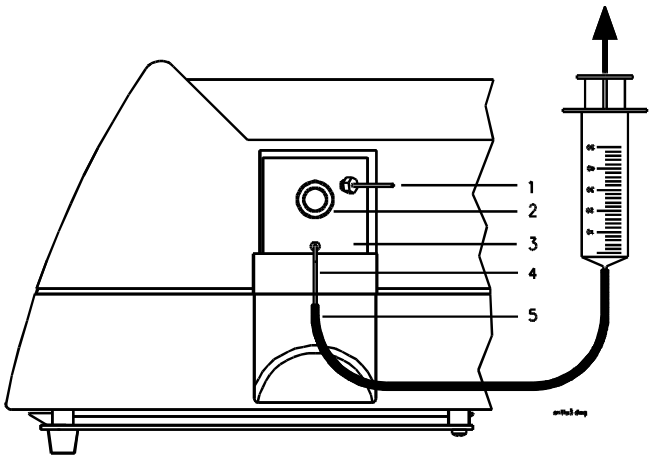
As an alternative, continuous piston rear flushing can also be achieved by means of hydrostatic pressure. Connect the free end of the pump head to the silicone tube (supplied with the accessories) to a container with rinsing liquid. Building up enough pressure is by placing the container at a higher level, e.g. onto the pump. As a flow of approx. 100 ml per day will be sufficient for continuous flushing, it can be limited correspondingly via appropriate measures.

With continuous piston rear flushing via hydrostatic pressure also ensure a sufficient amount of rinsing liquid for delivery.

⚠ **Important:** The rinsing liquid must be miscible with the solvent, otherwise the tightness of the pump may be impaired.

⚠ **Important:** The pump should not be operated for longer periods without rinsing, as this may damage the piston seals and the piston.

3.4.5 Purging the Pump



No.	Description
1	Pump outlet
2	Purge valve screw
3	Mixing chamber
4	Outlet segment of the mixing chamber
5	Silicone tube and syringe (Accessories)

Fig. 10: Purging the pump (view from right)

When purging the pump, please note the following:

- Attach a piece of silicone tube (accessory) to the outlet segment of the pressure sensor. Fasten the other end of the tube to a plastic syringe (accessory).
- Set the flow to 1ml/min while the flow is off (LED Flow Off).
- Loosen the purge valve screw by **one** turn.
- Open the corresponding dosing valve and use the syringe to draw in the solvent.
- The dosing valves are opened as follows:

⇒ Ensure that the pump is disconnected from the ***CHROMELEON*** data system (see sections 4.6).
⇒ Go to the main menu (see section 4.4.5).
⇒ Now you can open the respective valves by pressing the buttons A to D:
⇒ **A** Valve "A"
⇒ **B** Valve "B"
⇒ **C** Valve "C"
⇒ **D** Valve "D"
⇒ Please note that only one valve may be open at a time.
⇒ Reconnect the pump to ***CHROMELEON*** using the "Connect" command, as necessary.

- When all tubes are sufficiently filled with the solvent, you can press the "Purge" button on the front panel (see also section 4.4.3.4).
- Close the purge valve screw again. Ensure that the purge valve screw is not too tight (it is better to slightly tighten it later if there is leakage).

⚠ **Important:** Do not use any tools to tighten the purge valve screw! If the purge valve screw is too tight, the seal cap may be destroyed.

⚠ **Important:** The purge valve screw should only be opened or closed when the system pressure is down.

3.5 Low-Pressure Gradient System (LPG)

Warning: Disconnect the power cord before opening the instrument! Do not touch any electronic components! On the degasser switching power supply board (see fig. 11, no. 2), parts may carry current!

Important: Depending on the configuration, equipment and position of the modules can differ from the illustration below:

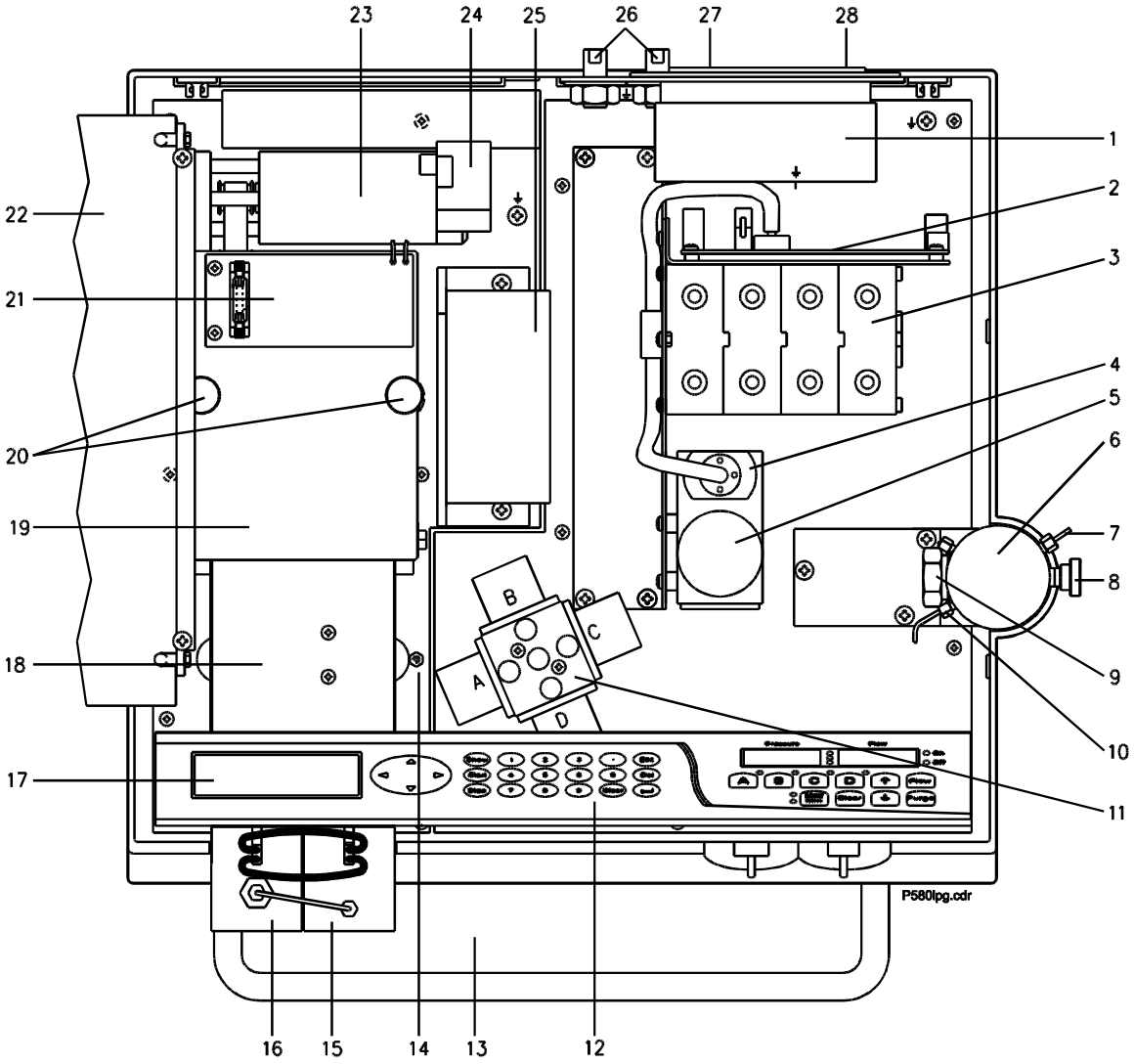
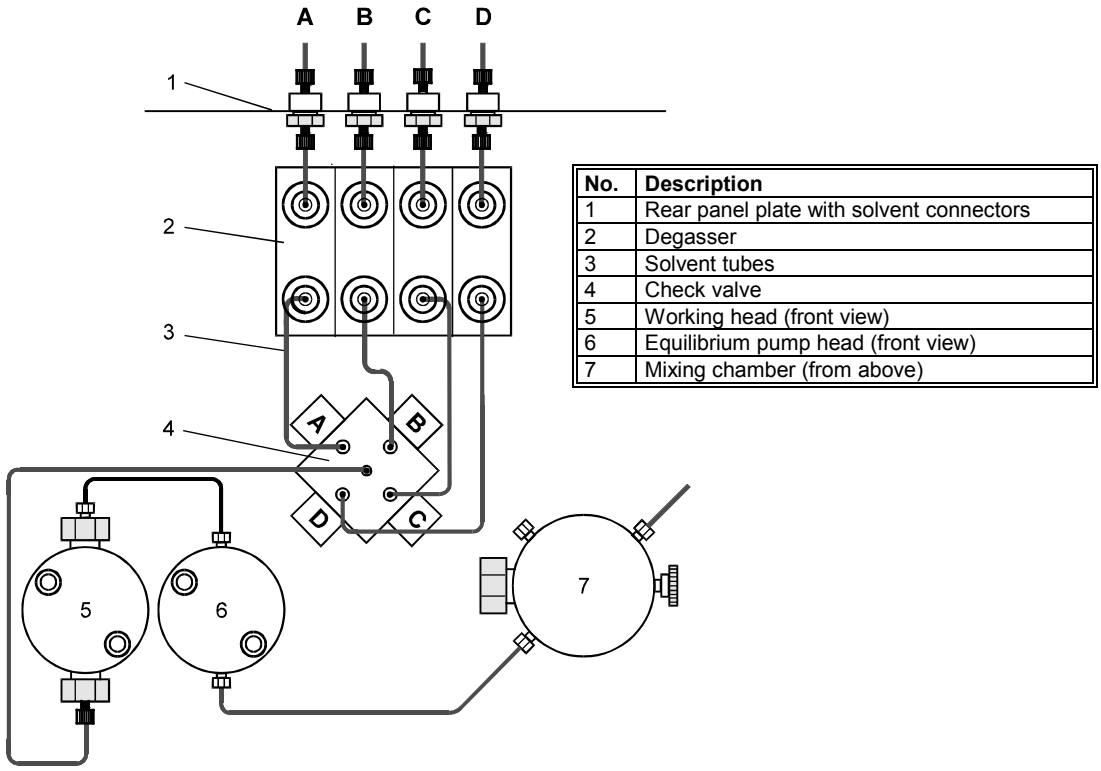


Fig. 11: Open model ***P 580 LPG*** *from above*

1	Mains filter	10	Mixing chamber inlet	20	Knurled screws
2	Degasser board and switching	11	Proportioning valve	21	Motor board
	power supply board	12	Keypad (rear: keypad board)	22	Main board
3	Degasser vacuum chamber	13	Stainless steel tray with leak sensor	23	Drive motor
4	Degasser pump	14	Retaining screw, main board	24	Encoder
5	Degasser motor	15	Equilibration pump head	25	Transformer
6	Mixing chamber	16	Working pump head	26	Solvent connectors A - D
7	Pump outlet	17	LCD display (rear: LCD board)	27	Voltage selector
8	Purge valve screw	18	Pump block	28	Power switch
9	Pressure sensor retaining screw	19	Cover, camshaft		

Connections of the Integrated Online Degasser

The integrated online degasser is connected to the low-pressure side, i.e. the suction side of the pump. See the following diagram for an overview:



No.	Description
1	Rear panel plate with solvent connectors
2	Degasser
3	Solvent tubes
4	Check valve
5	Working head (front view)
6	Equilibrium pump head (front view)
7	Mixing chamber (from above)

Fig. 12: Solvent tube connections to the Degasser (low-pressure gradient system)

⚠ **Important:** Do not connect the Degasser with the pump outlet. Otherwise, the degasser membrane may get punctured!

⚠ **Important:** When connecting the solvent tubes, ensure that the connectors are free of contaminants. Even with minute particles, air can enter the Degasser, thus reducing the unit's effectiveness.

⚠ **Important:** Keep in mind that when purging the HPLC pump (short-term rinsing the system with increased flow rate, see section 3.4.5), the flow rate increases considerably! If the maximum flow is exceeded, gas bubbles may form.

⚠ **Important:** After switching on the pump, the integrated online degasser requires approx. 12 minutes to reach the optimum vacuum. Please note that a sufficient period must be allowed until the pump delivers with maximum degassing performance.

3.6 High-Pressure Gradient System (HPG)

The **HPG** models are optimized for forming binary high-pressure gradients. The pumps deliver extraordinarily precise gradients. The pump housing contains two complete pressure pump blocks. If solvent supply is controlled via the optional solvent selector (as shown below), the pump can deliver two solvents on each pressure pump set in a high-pressure gradient system.

Please note: The two pressure pump blocks can be rinsed independently.

Please note: The position of the switching or shut-off valves and other modules may differ from the representation in fig. 13:

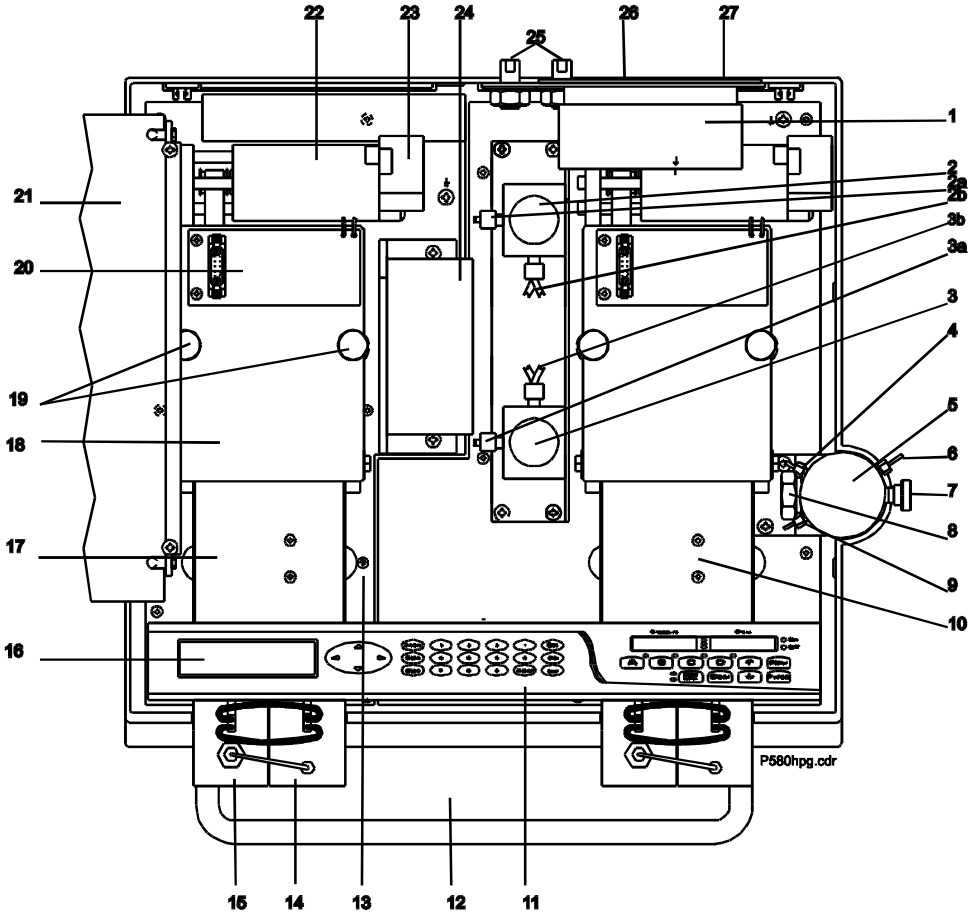
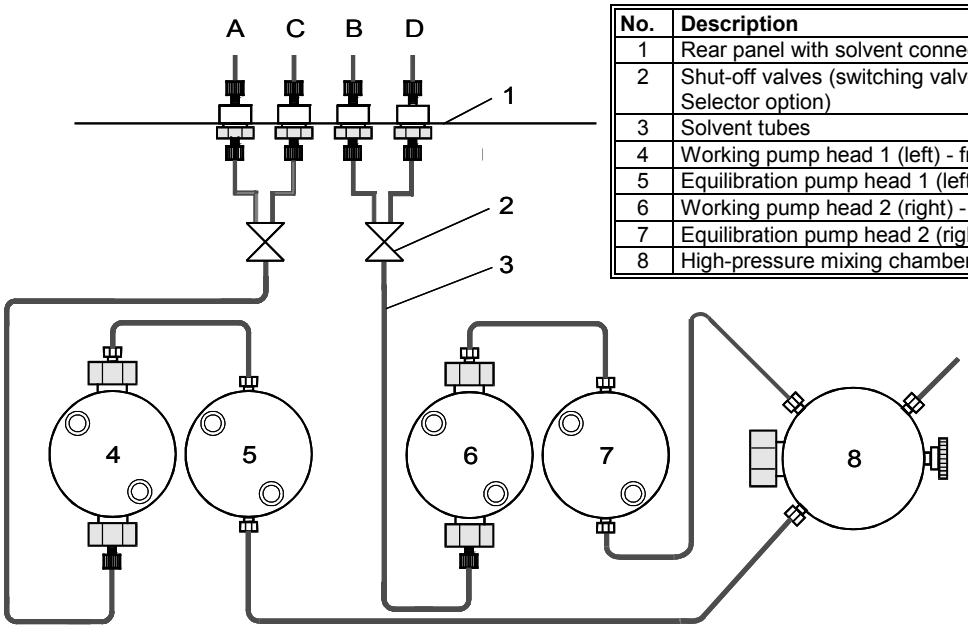


Fig. 13: open model ***P 580A HPG*** *(view from above)*

1	Power supply	7	Purge valve screw	17	Pump block 1 (left)
2	Selector valve, pump block 1 (left)	8	Retaining screw, pressure sensor	18	Cover, camshaft
2a	Valve inlet, solvents B, D	9	Mixing chamber inlet for	19	Knurled screws
2b	Valve outlet, solvents B, D		pump block 1 (left)	20	Motor board
3	Selector valve, pump block 2 (right)	10	Pump block 2 (right)	21	Main board
3a	Valve inlet, solvents A, C	11	Keypad (rear: keypad board)	22	Drive motor
3b	Valve outlet, solvents A, C	12	Stainless steel tray with leak sensor	23	Encoder
4	Mixing chamber inlet for pump bl. 2	13	Retaining screw, main board	24	Transformer
	(right); or with T-piece: blind plug	14	Equilibration pump head	25	Solvent connectors A - D
5	Mixing chamber	15	Working pump head	26	Voltage selector
6	Pump outlet	16	LCD-display (rear: LCD board)	27	Power switch

Fluidic Connections of the High-pressure Gradient System



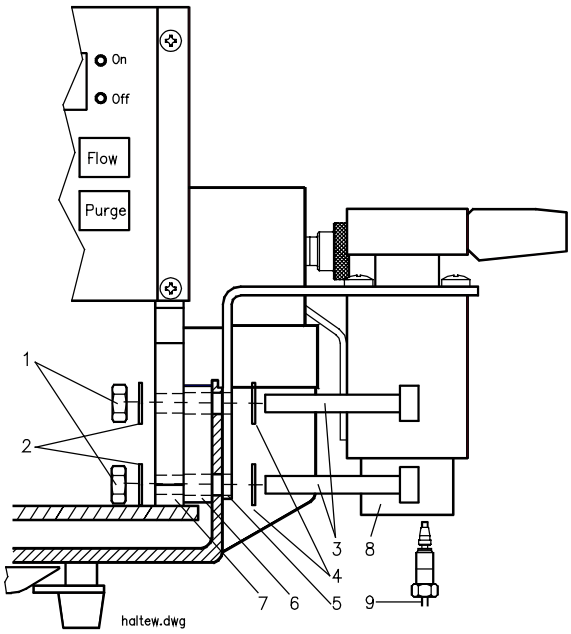
No.	Description
1	Rear panel with solvent connectors A - D
2	Shut-off valves (switching valves with Solvent Selector option)
3	Solvent tubes
4	Working pump head 1 (left) - front view
5	Equilibration pump head 1 (left) - front view
6	Working pump head 2 (right) - front view
7	Equilibration pump head 2 (right) - front view
8	High-pressure mixing chamber - from above

Fig. 14: Fluidic connections of the high-pressure gradient system

⚠ **Important:** The optional Solvent Selector "2 from 4" allows HPG models to deliver specific combinations of binary high-pressure gradients. Follow the instructions given in section 4.5.

3.7 Installing the Optional Syringe Loading Sample Injector

To install a hand-operated sample injector, the " Sample Injector Installation Kit " (part no. 5025.0505) is available from Dionex. Mount the injector to the **P 580** housing, as shown below:



No.	Description
1	M5 Nut
2	S5 Retaining washer
3	I-M5x30 Screw
4	A5 Washer
5	Mounting angle for sample injector
6	Supporting rectangle block
7	Support column P 580
8	Syringe loading sample injector
9	Capillary tube connection

Fig. 15: Installing the optional syringe loading sample injector

Proceed as follows:

- Disconnect the pump from the mains.
- Remove the top cover of the housing (see section 6.3).
- Remove the two blank plugs on the right side of the lower housing section.
- Insert the supporting rectangle block between the support column and the housing wall.
- Fasten the mounting angle for the syringe loading sample injector with the two I-M5x30 screws to the housing. Use the supplied washers on either side, as shown in fig. 15. To tighten, use the supplied hex key (size 4).
- Remove the handle assembly from the sample injector.
- Fasten the sample injector from below to the mounting angle. Ensure that the connecting cable points to the pump housing side.
- Place the handle assembly on the mounting angle, and tighten it with the hex key.
- Fasten the capillary tube to the syringe loading sample injector and to the pump outlet.

⚠ **Important:** Use the Rheodyne fitting set to fasten the capillary tube to the sample injection valve (see Fig. 15)!

- Connect the sample injector cable to the I/O output of the pump.

Please note: It is also possible to mount the sample injection valve horizontally. In this case, use the two additional bore holes of the mounting angle. When mounting the injector horizontally, ensure that no air bubbles can reach the system via the syringe.

Important: Use syringes with the correct needle (0.028" x 2", see Operating Instructions of the Syringe Loading Sample Injector).

Important: If using a syringe loading sample injector from a different manufacturer, use the appropriate accessories. For further information, please contact the Dionex Service.

3.8 Installation under *CHROMELEON*

3.8.1 Required *CHROMELEON* Modules

A prerequisite for controlling the HPLC pump **P 580** with ***CHROMELEON*** is the corresponding ***CHROMELEON*** Control Option.

3.8.2 Installation in the *CHROMELEON* Installation Program

Proceed as follows to install the HPLC pump **P 580** in the ***CHROMELEON*** installation program:

- Start the ***CHROMELEON*** Server and then the ***CHROMELEON*** Installation program.
- Choose the timebase to which you wish to assign the **P 580**.
- Choose "**Add Device...** " from the Edit menu or the Context menu of the right mouse button.
- Select "**Dionex P 580**" from the displayed list of supported instruments. Confirm by pressing "**OK**".

The now displayed tab dialog boxes show the configuration of the pump **P 580**. These settings usually do not require alterations. However, it is important to check whether the settings correspond to the current installation environment. If necessary, change the settings.

Tab Dialog Box "General"

The "**General**" tab allows you to define instrument and hardware parameters such as the installation name and serial communication port.

Option	Description
Device Name	Instrument name under which the HPLC pump is identified in the installation environment (default: Pump).
Serial Communication / Port	Serial PC-port to which the pump is connected. The current port settings are displayed, but cannot be edited (baud rate, data bits, parity, stop bits and handshake).
Demo Mode	Demo mode: on/off.

Tab Dialog Box "Error Levels"

The "Error Levels" tab serves for classifying errors in specific error levels. The default settings should not be altered.

Tab Dialog Box "Head Type & Limits"

Use this tab to define the head types, the pump type and the limits for the flow rate and the system pressure.

Select the appropriate head type for your pump from the combo box. Activating "High Pressure Gradient" is reserved for **P 580 HPG** models. This setting allows selecting the double flow mode.

Flow	Description
Range	Shows the currently valid flow rate range of the system. The range depends on the pump type and the installed pump heads.
Minimum	Lower limit of the valid flow rate range
Maximum	Upper limit of the valid flow rate range

Pressure	Description
Range	Shows the currently valid pressure range of the system
Minimum	Lower limit of the valid pressure range
Maximum	Upper limit of the valid pressure range

Tab Dialog Box "Relays/Inputs"

The "**Relays / Inputs**" tab lists available relays and remote inputs.

Option	Description
P580_OperableOut	OperableOut/Relay 3
P580_Relay1	Relay1
P580_Relay2	Relay2
P580_MotorValve	Motor Switch Valve

⚠ **Important:** Ensure that the checkboxes corresponding to the relays/remote inputs are activated. Otherwise, these inputs will not be available in ***CHROMELEON***.

Tab Dialog Box "Solvents"

The "Solvents" tab determines the number and names of the solvents connected to the pump.

Option	Description
Number of Solvents	Number of connected solvents (max. 4).
Solvent Names	Enter the name of each connected solvent (max. 30 characters). The name will appear in the gradient display of an online control panel and in the report output.

Finally, save the changed server configuration. Close the ***CHROMELEON*** Installation program.

3.9 Selecting Solvent Types for Automatic Precompression Control

For commonly used HPLC solvent types, precompression values of the **P 580** are already preset at the factory (see also section 2.2). Entering numerical precompression values manually is therefore **not required** for the **P 580**! The operator simply specifies the solvent types that the pump will deliver. If the **P 580** is connected to ***CHROMELEON***, the solvent types are selected in the data system (see 3.9.1). Otherwise, the types are selected on the front panel of the pump (see 3.9.2). For HPG-systems, it is recommended to determine a custom solvent type for each available solvent channel.

This information applies to all **P 580 HPG** models:

For high-pressure gradient systems, the precompression control of the pump is activated automatically after the user specifies the currently used solvent types in ***CHROMELEON*** (see 3.9.1) or via the front-panel keypad (see section 3.9.2) in stand-alone operation. Custom solvent types allow optimizing precompression settings for the currently used solvents.

This information applies to the models **P 580A** and **P 580 LPG**:

Precompression control for isocratic and low-pressure gradient systems is fully automatic. Use the default solvent type setting "Automatic". For information how to check this setting, see the sections 3.9.1 and 3.9.2.

⚠ **Important:** In contrast to high-pressure gradients, individual solvent types cannot be used for setting the precompression on the models **P 580 LPG** and **P 580A**. The reason for this is that the compressibility behavior of the delivered mixture can differ considerably from that of the individual components.

3.9.1 Selecting Solvent Types in *CHROMELEON*

To select the appropriate solvent types in ***CHROMELEON***, proceed as follows:

- On the Control Panel (e.g. "P580Full" supplied with ***CHROMELEON***), choose the "Flow..." command from the "Control" menu.
- For the **HPG**-models, assign each available solvent (A, B, C, D, depending on the model) the appropriate solvent type from the "Type" list on the "Flow System" tab.
- For the models **P 580 LPG** and **P 580A**, choose the solvent type "Automatic" (see notes in section 3.9).
- Confirm your input by pressing "OK".

⚠ **Important:** For optimum results, the solvent type settings of the **HPG** pumps must be adjusted to the actual solvents by using the commands "Learn" and "Freeze". Follow the instructions below. If **HPG** pumps are operated in the "Automatic" mode, strong pulsation will result. The "Automatic" mode is reserved for **isocratic** and **LPG** pumps. Do not use this mode for operating **HPG** pumps!

For optimum results, proceed as follows to set custom solvent types on **HPG** models:

- Deliver the desired solvent (A, B, C or D) at 100% (flow 1ml/min, at approx. 10.0 MPa/100 bar system pressure).

⚠ **Important:** The solvent **must** be delivered at 100%. Otherwise, the precompression value cannot be set correctly!

- In the ***CHROMELEON*** control panel, choose the "Flow..." command from the "Control" menu.
- On the "Flow System" tab, assign the "Custom" solvent type.
- Choose "Learn" from the list of commands available for the pump. During this phase, the pump optimizes the precompression setting.
- Wait approx. 10 minutes (at 1ml/min) and then select the command "Freeze" to save the optimum precompression setting.

⚠ **Important:** During the "Learn" phase, the counterpressure should be at the maximum operating pressure. If the pressure is lower than 2.5 MPa/25 bar during this phase, correct precompression settings cannot be ensured. An error message will be displayed. In this case, increase the counterpressure, e.g. by increasing the flow rate. Wait again for approx. 10 minutes before saving the precompression value by pressing "Freeze".

3.9.2 Selecting Solvent Types on the Instrument

In stand-alone operation, proceed as follows to select the appropriate solvent types on the front panel:

- Deliver the desired solvent at 100%.
- Choose "Diagnosis" from the main menu. Press ↵ (Enter) again in the " Diagnosis" view to reach the menu item "Solvent Types".
- Use the arrow keys △, ▽ to select the desired solvent channel (A - D).
- With the model **P 580 HPG**, use the arrow keys ◁, ▷to select the appropriate solvent type.
- If working with the models **P 580 LPG** or **P 580A**, choose the solvent type "Automatic" (see notes in section 3.9).
- Repeat the above steps for each required solvent (A - D, depending on the model).
- Press ↵ (Enter) to save the solvent type assignment.

⚠ **Important:** For optimum results, the solvent type settings of the **HPG** pumps must be adjusted to the actual solvents by using the commands "Start" ("Learn") and "Stop" ("Freeze"). Follow the instructions below. If **HPG** pumps are operated in the "Automatic" mode, strong pulsation will result. The "Automatic" mode is reserved for **isocratic** and **LPG** pumps. Do not use this mode for operating **HPG** pumps!

For optimum results, proceed as follows to set custom solvent types on **HPG** models:

- Deliver the solvent (A, B, C or D) at 100% (flow 1 ml/min, at approx. 10.0 MPa/100 bar system pressure).

⚠ **Important:** The solvent **must** be delivered at 100%. Otherwise, an error message will be displayed.

- Choose "Diagnosis" from the main menu. Press ↵ (Enter) again in the "Diagnosis" view to reach the menu item "Solvent Types".
- Use the arrow keys ◁, ▷ to select the solvent type "Custom".
- Press "Start" ("Learn"). The pump now determines the optimum precompression setting.
- Wait for approx. 10 minutes (at 1ml/min). Then choose "Stop" ("Freeze") to save the "Custom" solvent setting. In the "Solvent Types" menu, this status is indicated by the star symbol "*" next to the "Custom" solvent type.

⚠ **Important:** After pressing "Start", the counterpressure should be at the maximum of the usual operating pressure. If the pressure is below 2.5 MPa/25 bar during this phase, correct precompression settings cannot be ensured. In this case, the following error message will appear on the display:

```
      Internal error

Freeze not possible at
current counterpressure or
compressibility
```

- If this error message appears, increase the counterpressure, e.g. by increasing the flow rate. Wait again for approx. 10 minutes before saving the precompression value by pressing "Stop".

⚠ **Important:** Here, the functionality of the "Start" and "Stop" buttons differs from the usual functionality in gradient programming. Defining custom solvent types is not possible while a gradient program is active. Therefore, terminate the gradient program prior to defining custom solvent types.

4 Operation

4.1 Front Panel Display and Control Elements

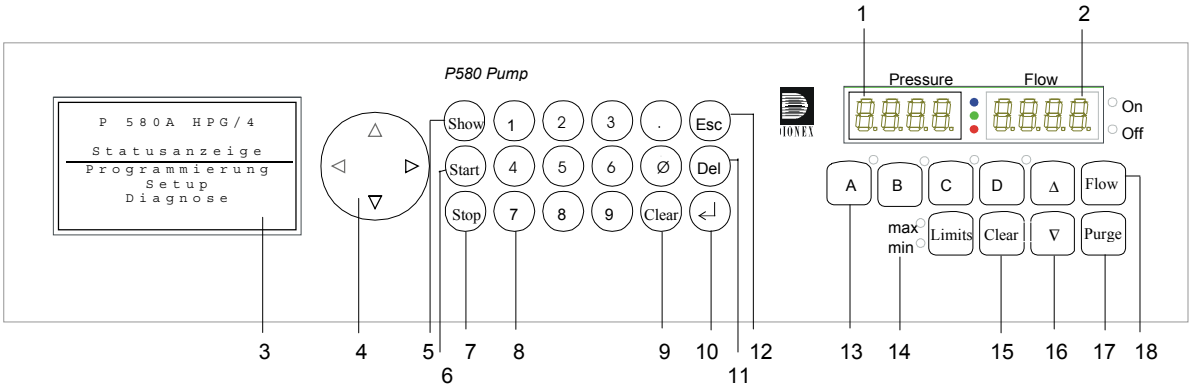


Fig. 16: Display and Control Elements on the Front Panel

No.	Element	Function	Comment
1	**Pressure Display**	shows the current pressure, shows the upper and lower pressure limit, shows the portion of the selected mixing channel	
2	**Flow Display**	shows the current flow rate	
3	**LCD-Display**	shows the current status, the individual menus, the programs and the individual program steps	
4	△ ▽ ◁ ▷	move the cursor to the desired position or scroll the display in the LCD display	
5	**Show**	shows the current pump status, , toggles between main menu and status display	
6	**Start**	starts the selected program	P[1]
7	**Stop**	immediately stops the running program	P
8	**Numeric keypad**	allows direct input of numerical values	
9	**Clear**	resets the last entry that is not yet confirmed, , deletes an active error message (e.g. maximum pressure shutdown)	
10	**↵ (Enter)**	confirms the input, proceeds to the next edit field in programming mode	
11	**Del**	deletes the active program step, deletes the selected program	P
12	**Esc**	allows changing to the superordinate menu	
13	**A, B, C, D**	activates the display or input of individual mixing channels (corresponding LED is active). Pressing a button for approx. 2sec sets the corresponding portion to 100%.	
14	**Max, Min**	activates the pressure display/input of the upper and lower pressure limit (corresponding LED is active)	
15	**Clear**	resets the last entry that is not yet confirmed, deletes an active error message (e.g. maximum pressure shutdown).	
16	Δ ∇	enable the user to change the values in the Pressure and Flow displays in single steps	
17	**Purge**	switches the Purge function on and off	
18	**Flow**	starts (LED **Flow On**) and stops (LED **Flow Off**) the flow	

[1] P: Not available in manual operation

4.2 Safety Measures

⚠ **Important:** When operating the HPLC system, always ensure that the *minimum pressure shutdown* is set. This prevents damage resulting from leakage. Furthermore, dry running is prevented.

⚠ **Important:** The pump must never be operated without rear flushing for a longer period of time (see 3.4.4), otherwise the piston seals and the piston may be damaged.

⚠ **Important:** For optimum compressibility compensation, ensure to select the appropriate solvent types delivered by the pump prior to operating the **P 580**. Please follow the instructions in section 3.9.

⚠ **Important:** The pump must never run dry! Damage to the pistons or the piston seals would result.

⚠ **Important:** Buffers and solutions forming peroxides should be rinsed out after operation.

⚠ **Important:** Before switching from buffer to organic solution, the pump must be rinsed thoroughly with water.

⚠ **Important:** When switching to another solvent, ensure that the new solvent is miscible with the one contained in the pump. Otherwise, the pump can be damaged, e.g. by flocculations!

🛈 **Please note:** When interrupting operation for longer periods, follow the notes in section 6.12.

⚠ **Important:** If the pump flow is interrupted for longer periods, the lamps in any connected UV- or RF-detectors must be switched off to prevent evaporation in the flow cell.

4.3 Choosing the Solvents

Depending on the model, wetted parts of the **P 580** are manufactured from stainless steel, PEEK, sapphire, ruby, ceramics, etc. See also section 7.

Use only standard HPLC solvents. Note the special properties of the solvents, e.g. viscosity, boiling point, UV-absorption (UV/VIS detector), refractive index (refractive index detector), dissolved gas (degasser).

Chemical Resistance to PEEK

Medium	Concentration	Temperature	Duration	Resistance	Notes
Acetaldehyde	techn. pure	23		+	
Acetone	100	23	7 days	+	
Ammonium hydroxide	28	23	7 days	+	
Ammonium sulphate		23		+	
Amyl acetate	100	23		+	
Amyl alcohol	techn. pure	23		+	
Benzaldehyde		23	7 days	+	
Benzene	100	23	7 days	+	
Benzene/Benzene mixture		60	42 days	+	
Benzoic acid		23		+	
Borax		60		+	
Brake fluid		60		+	
Bromine		23		-	
Butane		23		+	
Butanol	100	23		+	
Calcium hydroxide		23		+	
Carbon dioxide	100	23		+	
Carbon tetrachloride	100	23		+	
Chloric gas		23		+	
Chlorine (liquid)		23		-	
Chlorobenzene	100	23		+	
Chloroform	100	23		+	
Chromic acid	40	23		+	
Citric acid		23		+	
Copper(II) sulphate		23		+	
Cyclohexane	100	23		+	
Cyclohexanol	100	23		+	
Cyclohexanone		23		+	
Detergent	ready for use	23		+	
Diethyl ether	100	23	7 days	+	
Diisopropyl ether	100	23		+	
Dimethylformamide	100	23	7 days	+	
Dioctylphthalate		23		+	
Dioxan		23		+	
Ethanoic acid	96	23	7 days	+	
Ethanol	96 (Vol.)	23	7 days	+	
Ethyl acetate	100	23		+	
Ethylene glycol		23		+	
Ferric chloride		23		+	
Formaldehyde	30	23		+	
Formic acid	95	104	42 days	+	
Fruit juice		23		+	
Gear lubricant oil		150		+	
Glycerin		23		+	
Heptane	100	23	7 days	+	
Hydraulic fluid		60		+	
Hydrochloric acid	37	23		+	
Hydrofluoric acid		23		-	
Hydrogen peroxide	30	23	7 days	+	
Hydrogen sulphide		23		+	
Kerosene (Paraffin)		23		+	

Medium	Concentration	Temperature	Duration	Resistance	Notes
Lactic acid		23		+	
Magnesium chloride		23		+	
Methanol	100	23		+	
Methyl ethyl ketone	100	23		+	
Methylisobutylcetone	100	23		+	
Milk		23		+	
Motor oil		150		+	
Nitric acid	40	23	7 days	+	
Nitric acid	65	23	7 days	+	
Nitrobenzene	100	23		+	
Nutrient fat		23		+	
Paraffin oil		60		+	
Perchlorethylene	100	23		+	
Phenol	diluted	23		+	
Phenol	conc.	23		-	
Potassium dichromate		23		+	
Potassium hydroxide		23		+	
Potassium nitrate		23		+	
Potassium permanganate		23		+	
Propane		23		+	
Propyl alcohol		100		+	
Pure benzene		60		+	
Salad oil		23		+	
Silicone oil		160		+	
Sodium chloride		23		+	
Sodium hydrogen carbonate		23		+	
Sodium hydroxide	40	23	7 days	+	
Sodium hydroxide	30	130		+	
Sodium thiosulphate		23		+	
Sulphur dioxide		23		+	
Sulphuric acid	40	130		+	
Sulphuric acid	50	23	7 days	+	
Sulphuric acid	98	23		-	dissolved
Toluol	100	23	7 days	+	
Trichloroethylene	100	23	7 days	+	
Water		23		+	
Xylene	100	23		+	
Zinc chloride		23		+	

4.4 Stand-alone Operation

4.4.1 Switching on the Pump

Switching on the pump. The following message temporarily appears on the LCD display:

```
      P 580A HPG/4


Firmware Rev.   x.xx
Offset DMS      xxxx
```

In addition to the model (here: analytical high-pressure gradient pump with 4 solvents), the display shows the firmware version and the offset value of the pressure display. After approx. 5sec., the status display appears.

4.4.2 Status Display

The status display indicates the current operating settings of the pump. You can also view this display by choosing the item "Status Display" from the main menu (see section 4.4.5).

```
          Status
   %A    %B    %C    %D
 100.0   0.0   0.0   0.0

 Flow           Pressure
 1.000ml/min      20bar
├────   |
Time: 0.00 min   Pgm  1
```

In addition to the currently set mixing ratio, the display indicates the flow rate in milliliters per minute and the current pump pressure. The horizontal bar(s) below the flow rate indicate(s) the current precompression. The time in minutes refers to the run time of the current program. If the pump is operated in manual mode, the run time is not displayed. In the lower right corner, you can see the currently active program number.

Please note: The bar indicating the current precompression shows 0 to 100% precompression, from left to right. If, for example, water is delivered at 10.0Mpa (100bar), 1/6 of the bar should be covered. When system conditions are stable, precompression should also be stable. A suddenly increasing precompression value is an indication of air in the system. Only during gradient steps, a temporarily varying precompression value is normal, due to the changed solvent properties.

- Press **ESC** or **Show** to move from the status display to the main menu (see section 4.4.5).
- Press the **Start** button to start the currently active program (see section 4.4.6).

4.4.3 Manual Input

Please note: In this mode, the buttons required for programmed operation (**Start**, **Stop**, **Del**, see section 4.4.6) are not available. For a description of the keypad, see fig. 16: *Display and Control Elements*.

After switching on the pump, flow rate input is enabled. Use the numeric keypad to enter the required flow rate.

4.4.3.1 Flow Rate (adjustable in steps of 0.001 ml/min)

- By pressing **Flow**, you can start delivery with the currently set flow rate (LED **Flow On** active). Pressing the button again stops the flow (LED **Flow Off** active), the flow rate setting is kept.
- After pressing **Flow**, you can use the arrow buttons Δ, ∇ to change the flow rate even during operation.
- For discrete input of the desired flow rate during operation, you can use the numeric keypad. However, the entered value must be confirmed with ↵ **(Enter)**. Until the input is confirmed, the LED **Flow On** will blink.
- Press one of the **Clear** buttons to undo the last, not yet confirmed input.

Please note: During operation, the pump immediately changes the flow rate according to the entered value.

4.4.3.2 Mixing Ratio (0.1 to 100%, adjustable in Steps of 0.1%)

- Use the buttons **A**, **B**, **C**, **D** to display the mixing ratio of the individual channels on the "Pressure" display. The corresponding LED will be on. It is not necessary to explicitly enter the portion of **A**, as this portion is calculated from the difference of the other partial flows.
- Use the arrow buttons Δ and ∇ to change the mixing ratio in single steps, even during operation.
- Use the numeric keypad for the discrete input of the desired mixing ratio during operation. However, the entered value must be confirmed with ↵ **(Enter)**.
- To use only one channel (100% mixing ratio), simply press the corresponding button (**A**, **B**, **C**, **D**) for approx. 2sec. The other channels are simultaneously set to 0%.
- Press one of the **Clear** buttons to undo the last, not yet confirmed input.

Important: To change the mixing ratio, the portions of **B**, **C** and **D** must be entered explicitly. If the total exceeds 100%, the values are corrected as follows: increasing the portion of **B** decreases the other portions in the following order: **A**, **C** and **D**. Similarly, increasing the portion of **C** first decreases the portion of **A**, **B** and then **D** (see section 4.5 for special notes on HPG-models).

Please note: The pump immediately changes the mixing ratio during operation.

Please note: To display the current pressure again in the pressure display, press the **Max/Min** button, until neither **Max** nor **Min** LED are lit.

4.4.3.3 Pressure Limit (0 to 50Mpa/500 bar, adjustable in Steps of 0.1Mpa/1bar)

Use the **Max/Min** button to determine the maximum or minimum pressure limit:

- **Max** (LED **Max** is on): If the operating pressure of the pump exceeds the limit shown in the Pressure display, the pump flow is switched off. Thus, e.g. columns can be protected from excessive operating pressures.
- **Min** (LED **Min** is on): If the operating pressure of the pump is below this limit, the pump flow is stopped. This prevents dry running of the pump or continued delivery in the event of a leak.
- With the arrow buttons Δ and ∇ you can change the displayed pressure limit settings (either LED **Max** or **Min** is active).
- For a discrete input of the desired pressure limits, you can also use the numeric keypad. However, the entered value must be confirmed with ↵ **(Enter)**. The respective LED (**Max** or **Min**) must be active during the input.
- With the **Clear** buttons you can undo the last, not yet confirmed input.

Please note: During operation, the set pressure limits become immediately active.

Please note: To view the current system pressure in the pressure display, press the **Max/Min** button, until neither **Max** nor **Min** LED are lit.

If the operating pressure of the pump reaches values outside the set pressure range, the pump performs the following steps:

- The flow is stopped (LED **Flow Off** is on, the LEDs **A**, **B**, **C**, **D**, **MIN** and **MAX** blink),
- the error status is indicated on the LCD display,
- the error is reported to ***CHROMELEON***, as necessary.

Example: When the pressure is below the specified limit, the following error message appears:

```
    Internal Error
Low-pressure shutdown




    CLEAR or FLOW
```

Following a pressure limit shut-down, proceed as follows:

- Confirm the error by pressing **Flow** to immediately resume operation (LED **Flow On** is active).
- Confirm the error with one of the **Clear** buttons. Remedy the cause of the excessive or low pressure (see section 5). The pump is then ready to operate again. The pump can be restarted by pressing the **Flow** button (LED **Flow On** is active).

Please note: In ***CHROMELEON***, confirm the error via the displayed dialog window.

4.4.3.4 Purge

Use the **Purge** button to activate the *Purge* function, i.e. to temporarily deliver with a high flow rate (e.g. to rinse an air bubble out of the suction tube). To activate the *Purge* function, proceed as follows:

- Press the **Purge** button to start rinsing with the currently set mixing ratio.
- Press the **Purge** button again to deactivate the function.

⚠ **Important:** Use the *Purge* function only with the purge valve open. Otherwise, the sudden pressure increase could destroy sensitive columns or cause leakage in the HPLC system.

⚠ **Important:** Using the *Purge* button you can rinse only small air bubbles out of the system. To remove larger amounts of air from the suction tube, use a syringe to draw the air via silicone tubing to the purge outlet (see section 3.4.5).

4.4.4 LCD Display Menu Structure

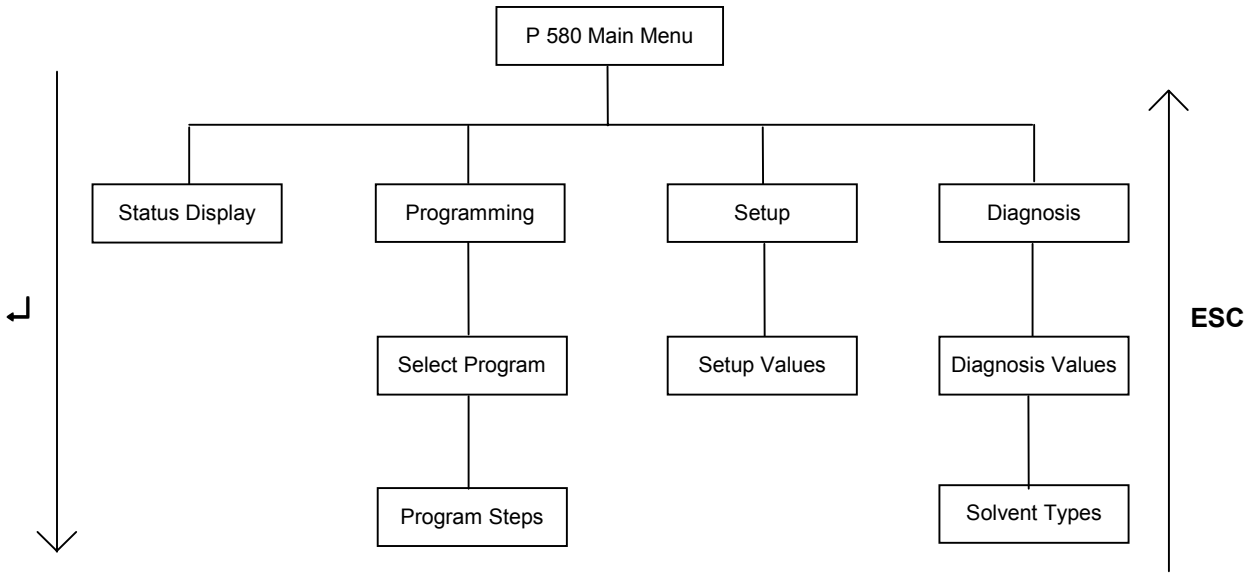
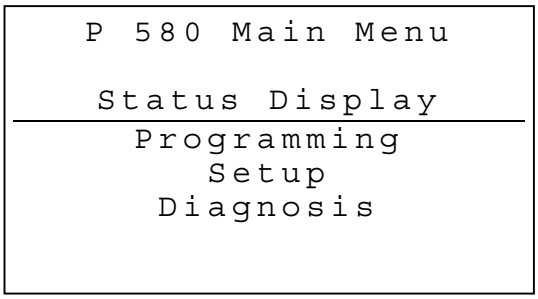


Fig. 17: Menu Structure

- Press ↵ (**Enter**) in the main menu to access the underlined submenu. Press **Esc** to return to the main menu.

4.4.5 Main Menu

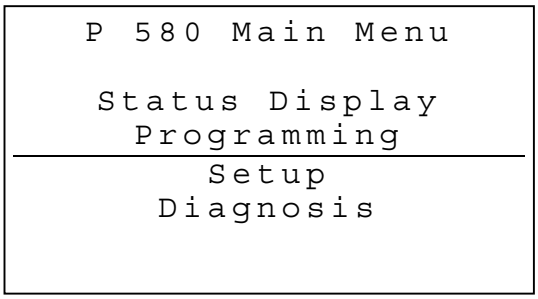
- In the Status display, press **ESC** or **Show** to view the main menu:



- Use the arrow buttons △and ▽to select the individual menu items. The selected item is underlined.
- Press ↵ (**Enter**) to change to the selected menu item. Press **Esc** to return to the main menu from one of the submenus.

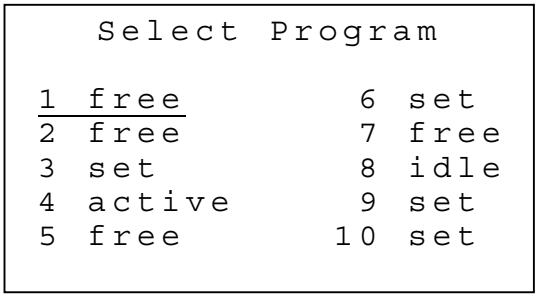
4.4.6 Programming

- Choose the item "Programming" from the main menu to change to the programming mode.



Please note: The possibilities described here are intended for stand-alone operation. If the **P 580** is connected with ***CHROMELEON***, the pump is controlled via the data system (see section 4.6).

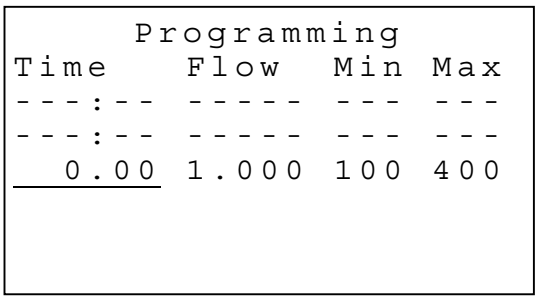
The programming mode allows you to enter 10 different operating programs and to save them under a free number. Each program can comprise a maximum of 40 program steps. The programs are stored even if the pump is switched off. In this mode, you can edit, delete and overwrite previously stored programs. In this mode, only the left-hand keypad is active.



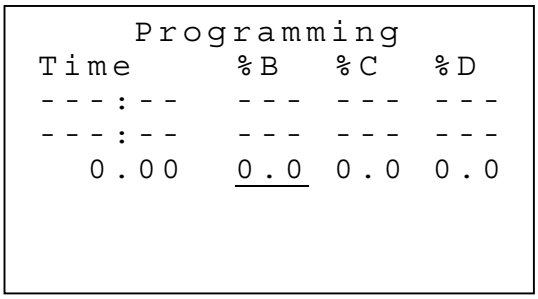
- Use the arrow buttons △ ▽ ◁ ▷ to select the desired program number for the program. The currently selected program is underlined. The status "set" marks the programs created in the programming mode. Pressing the key "1" activates a "set" program. The "active" program is then performed by pressing the **Start**-key. "Free" program locations are available for creating new programs.
- Pressing the key "2" defines a set program as the flush program (indicated by the program type "idle"). This program is started automatically after the active program is completed. To prevent starting the flush program immediately after the first sample, the start impulse for the next sample should arrive before the end of the currently active program. When using the flush program, it is therefore recommended to enter longer program times for the analysis samples than in the control program for the autosampler. As soon as the sampler finishes the last sample, and the pump does not receive a new start impulse, the flush program is started.

Please note: The **Start** and **Stop** commands can also be selected in other modes, e.g. while the Status display or the main menu are shown. However, the commands always apply to the currently activated program under "Programming".

- Press **Del** to delete the selected program. The status "set" now changes to "free".
- Confirm the program number by pressing ↵ (**Enter**) to access the programming mode.

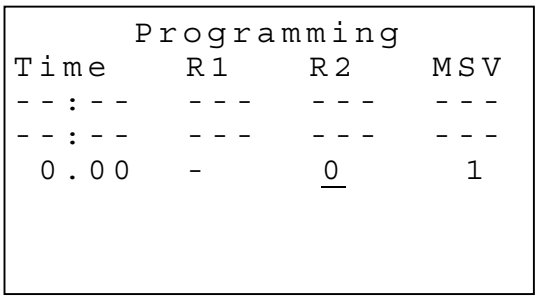


- The currently editable program line is underlined. To enter a new program line or to edit an existing program line, scroll the display to move to the desired cell via the arrow buttons △, ▽,◁ and ▷. Move to the Time column via the buttons △ and ▽. Use the buttons ◁ and ▷ to reach the other fields.
- Use the numeric keypad to enter values.
- Press one of the **Clear** buttons to undo the last, not yet confirmed value.
- After entering a value, confirm your input by pressing ↵ (**Enter**). The cursor then moves to the next input field in the active line.
- To correct the values in a program line, overwrite them and confirm by pressing ↵ (**Enter**).
- To delete the current program line, press **Del** while the "Time" field is underlined.
- After completing the last column (Max) and pressing ↵ (**Enter**), you can enter the desired mixing ratio. In the programming mode, the portion of solvent **A** cannot be entered directly, but is the difference of the three other solvent portions from 100%: A[%] = 100 % - B[%] - C[%] - D[%]. If the entered percentages exceed a total of 100%, the mixing ratio is automatically corrected.



Please note: For high-pressure gradient systems with the optional solvent selector, please note the supported combinations of high-pressure gradients (see section 4.5).

- After entering the mixing ratio, it is possible to specify the status of the two relays (R1 and R2) and the motorized switching valve (MSV). If a relay or the MSV is not addressed, the corresponding columns must be marked by "-" (default setting). In the case of the two relays, "0" indicates the status "Off", and the entry "1" indicates the status "On". For the MSV, "0" switches to "Load", the input "1" switches to "Inject".



Please note: After processing the last program step, the pump continues delivery with the current settings. To automatically stop the pump flow upon program completion, add the last program step with the flow 0.00 to the program.

Important: Programs are freely editable, even during their execution. However, do not edit the currently performed program step. This may lead to incorrect results.

Please note: Gradients are entered by defining the corner points. Linear ramps are automatically executed on the basis of the set points. Combined flow/% gradients are also supported.

Important: Bevor a previously created program (Status: "set") can be performed, the program must be activated (Status: "active"). Choose the program with the arrow keys, then press the key "1".

- The activated program can be started by pressing **Start**. This is also possible while the status display is shown. During the program run time, the LED **Flow On** is lit.
- Press **ESC** to change to the Status display. This allows you to view the entire current data of the active gradient program (partial flows, flow rate, pressure, program time, program number).

- Press **Stop** to immediately stop a running program. Delivery is continued with the current settings and the program time stops in the Status display.
- To stop delivery together with the program, press **Stop** and then **Flow**, so that the **Flow Off** LED is active. The pump then stops.

⚠ **Important:** Before you can stop the pump flow (**Flow Off**), the current program must be terminated by pressing the **Stop** button.

- After completing a program, press **Esc** to select a new program or to change to another item from the main menu.

4.4.7 Gradient Programming Example

The example below shows a binary gradient (%A: water, %B: acetonitrile). This typical application for a gradient pump serves to separate 16 PAH´s of the "EPA Priority Pollutant List". Please note that the system must be equilibrated at the start time (=injection time). Resetting the conditions to the start values must be performed after completing an analysis.

Example:

- Step 1: Time = 0 min
  Total flow = 1ml/min, Solvent A = 45 %, Solvent B = 55 %
  Maximum pressure = 20 MPa (200 bar), Minimum pressure = 2.0 MPa (20 bar)
- Step 2: Time = 6 min
  Total flow = 1ml/min, Solvent A = 45 %, Solvent B = 55 %
- Step 3: Time = 12min
  Total flow = 1ml/min, Solvent A = 20 %, Solvent B = 80 %
- Step 4: Time = 15min
  Total flow = 1ml/min, Solvent A = 0 %, Solvent B = 100 %
- Step 5: Time = 28 min
  Total flow = 1ml/min, Solvent A = 0 %, Solvent B = 100 %

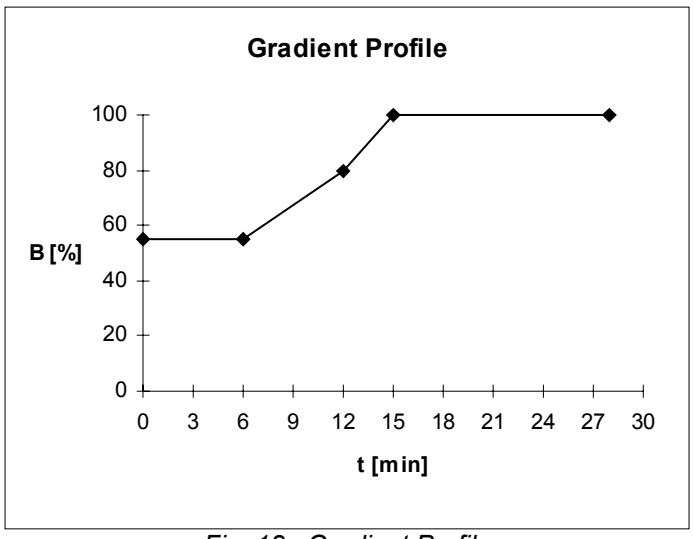


Fig. 18 : Gradient Profile

Program Step 1:

```
      Programming
Time   Flow   Min   Max
--:--   ---   ---   ---
--:--   ---   ---   ---
 0.00  1.000   20   200
```

```
      Programming
Time      %B   %C   %D
--:--     ---  ---  ---
--:--     ---  ---  ---
 0.00    55.0  0.0  0.0
```

Program Step 2:

```
      Programming
Time   Flow   Min   Max
--:--   ---   ---   ---
 0.00  1.000   20   200
 6.00  1.000   20   200
```

```
      Programming
Time      %B   %C   %D
--:--     ---  ---  ---
 0.00    55.0  0.0  0.0
 6.00    55.0  0.0  0.0
```

Program Step 3:

```
      Programming
Time   Flow   Min   Max
 0.00  1.000   20   200
 6.00  1.000   20   200
12.00  1.000   20   200
```

```
      Programming
Time      %B   %C   %D
 0.00    55.0  0.0  0.0
 6.00    55.0  0.0  0.0
12.00    80.0  0.0  0.0
```

Program Step 4:

```
      Programming
Time    Flow   Min  Max
 6.00   1.000   20  200
12.00   1.000   20  200
15.00   1.000   20  200
```

```
      Programming
Time      %B   %C   %D
 6.00    55.0  0.0  0.0
12.00    80.0  0.0  0.0
15.00   100.0  0.0  0.0
```

Program Step 5:

```
      Programming
Time    Flow   Min  Max
12.00   1.000   20  200
15.00   1.000   20  200
28.00   1.000   20  200
```

```
      Programming
Time      %B   %C   %D
12.00    80.0  0.0  0.0
15.00   100.0  0.0  0.0
28.00   100.0  0.0  0.0
```

The entire program has the following appearance:

```
      Programming
Time    Flow   Min  Max
00.00   1.000   20  200
06.00   1.000   20  200
12.00   1.000   20  200
15.00   1.000   20  200
28.00   1.000   20  200
```

```
      Programming
 Time      %B   %C   %D
00.00     55.0 0.0  0.0
06.00     55.0 0.0  0.0
12.00     80.0 0.0  0.0
15.00    100.0 0.0  0.0
28.00    100.0 0.0  0.0
```

- Press **Esc** to return to the program list. Use the arrow keys to select the program you wish to perform. Press the key "1" to activate a previously edited ("set") program. The "active" program is executed by pressing the **Start**-button.
- Press **Esc** again to return to the main menu.

4.4.8 Setup

- The menu item "Setup" serves to display the current pump configuration.

Warning: **Do not change any values in the Setup menu!** Any settings must be performed by the Dionex Service. Wrong input will cause serious errors! Warranty coverage shall be invalidated in the event of inappropriate changes!

```
P 580 Main Menu

Status Display
Programming
Setup
Diagnosis
```

- In the event of an error, please write this information down for the Dionex Service.
- Press **Esc** to return to the main menu.

4.4.9 Diagnosis

The menu item "Diagnosis" displays information relevant for any service or repair work. Also, this menu allows changing the language setting for the display. In the submenu, the currently used solvent types can be specified.

```
P 580 Main Menu

Status Display
Programming
Setup
Diagnosis
```

- In the event of an error, please write the displayed information down for the Dionex Service:

```
      Diagnosis

Firmware Rev.   xxxx
Work Load:      xxxx
Uncalib.Press.  xxxx
Cursor up: Language
```

- The last line (language) allows you to change the language setting for the pump display between English and German via the arrow key △.
- In the Diagnosis menu, press ↵ (**Enter**) again to select the currently used solvents.

```
   Solvent Types

 A: Water
 B: Methanol
 C: Automatic
*D: Custom
```

- Proceed as described in section 3.9 to set the solvent types you are using.
- Press **Esc** to return to the main menu.

4.4.10 Operation after Power-Failure

After a power failure standalone instruments return to a reliable condition, the functions are no longer executed (e.g., the pump flow is stopped).

If, however, the HPLC system is operated under the ***CHROMELEON*** data system, the system can be programmed via a corresponding program file (PGM-File) in such a way that operation is started again as desired after the power failure (for further details please refer to the ***CHROMELEON*** Online Help and the ***CHROMELEON*** User Manual.)

4.5 Special Aspects of the High-Pressure Gradient System

The high-pressure gradient pumps **P 580A HPG** and **P 580P HPG** operate with two pressure pump sets integrated in a single housing. Operating the high-pressure gradient pumps is identical to operating the low-pressure gradient pump. However, please note the following items.

4.5.1 Supported Gradient Combinations

If using the optional Solvent Selector "2 from 4", the channels A and C are connected to the pump block 1 (left), and the channels B and D are connected to the pump block 2 (right), see fig. 13. The integrated Solvent Selector "2 from 4" supports the following combinations of binary high-pressure gradients:

Pump block 1 (left)	Pump block 2 (right)
Solvent A	Solvent B
Solvent A	Solvent D
Solvent C	Solvent B
Solvent C	Solvent D

In a specific time step, each pressure pump block delivers only one of the two channels (100%). It is not possible to specify a mixing ratio for the two channels connected to the same unit (A and C; B and D).

If a portion of the solvent A is set, and then a portion of C is entered, the portion of A is automatically reduced to 0%. The same applies to the channels B and D on the second pump set. If portions of B and C are specified (e.g. B=40%, C=60%), and then a portion of D=20% is entered, the portion of C is automatically increased to 80%. The same applies to all other channels.

4.5.2 Double Flow Mode

HPG-models support the double flow mode. This mode enables maximum flow rates of 20 ml/min (analytical version) or 100 ml/min (preparative version). In standalone operation, the double flow mode is available for each solvent combination and composition supported by the **HPG**-pump. The pump automatically calculates the flow maximum, so that each of the two pump blocks delivers a maximum of 10 ml/min (analytical version) or 50 ml/min (preparative version).

4.6 CHROMELEON Control

Please note: For details on installing the **P 580** in a ***CHROMELEON*** system configuration, refer to section 3.8 and to the ***CHROMELEON*** online Help and User Manual.

In ***CHROMELEON***, controlling the HPLC pump **P 580** can be performed in two ways:

- directly via the toolbar, the menu bar and the controls in the Control Panel.
- via time programs (PGM-File or command buttons)

Please note: During the control via the data system, the keypad of the instrument is locked. Control and programming the pump is now entirely via ***CHROMELEON***. The display will show the message "Remote Control Active".

The following commands are available to display and change current pump settings.

4.6.1 CHROMELEON Commands

- *Connect (Establish communication between data system and pump)*
- *Connected (Pump confirms connection to data system)*
- *Disconnect (Terminate communication with the pump)*
- *Flow (in ml/min)*
- *%A, %B, %C,%D, availability depending on the model (value; name; solvent type)*
- *Pressure Limits (upper and lower limit; current value)*
  If the values are outside these limits, the sample batch is aborted. Emergency handling is started.
- *Stop Flow*
- *Hold (interrupt program)*
- *Learn (begin Learn mode to define custom solvent type)*
- *Freeze (end Learn mode to define custom solvent type)*

4.6.2 Relays

Option	Description
P580_OperableOut	OperableOut/Relay 3
P580_Relay1	Relay1
P580_Relay2	Relay2
P580_MotorValve	Motor Switch Valve
Available Parameters:	
State	Indicates/sets status (on/off).
Duration	Indicates/sets opening/closing duration in seconds [sec].
On/Off	Turns relay on/off.

For further information on controlling the instrument via ***CHROMELEON***, please refer to the ***CHROMELEON*** User Manual and to the context-sensitive ***CHROMELEON*** Online Help.

5 Troubleshooting

5.1 List of the Most Frequently Problems

Problem	Cause	Remedial action
No function	Pump not connected to mains.	Connect power cable.
	Power switch off.	Switch on power.
	Blown fuse.	Replace fuse.
	Replacement fuse blows immediately.	Call service.
No flow	Leakage in the system.	Find leak, remedy.
	Double check valves incorrectly installed (not in flow direction) or defective.	Install double check valves correctly (see fig. 19), replace as necessary.
Baseline drift too strong	Column contaminated.	Rinse or replace column.
	System not sufficiently equilibrated.	Rinse system until equilibrated.
	Environment conditions unstable.	Ensure constant temperature and air humidity.
	Solvent is contaminated.	Replace solvent and check filter frits. In aqueous solvents, growth of microorganisms (cf. 3.4.1) is possible!
	Detector not warmed up.	Allow full detector warm-up time.
	Detector problem.	Refer to detector manual.
Strong noise	Solvent is contaminated.	Replace solvent.
	Lamp is too old.	Replace detector lamp.
	Air bubbles in the system.	Purge the system.
	Pressure fluctuations of the pump, pulsation.	Purge pump, check/replace check valves, as necessary. Degas solvents and check degasser. Check setting of (manual) precompression (see section 3.9).
Peak broadening	Capillary to detector is too long or has a large inside diameter.	Shorten capillary or use appropriate capillary.
	Column is overloaded or contaminated.	Rinse or replace column.
	Alteration of the solvent.	Use fresh solvent.

Problem	**Cause**	**Remedial action**
Analysis is not reproducible	Sample is unstable and decomposes. Gradient is not reproducible. Environment conditions are unstable.	Use new sample or change conditions. Check pump function and degassing (Exchange suction frits). Ensure constant temperature and air humidity (Use column thermostat).
Precompression display shows sudden fluctuation, at constant operating conditions	Air bubbles in the system.	Purge the system.
Pump displays message "Min. Pressure Shutdown" (see section 4.4.3.3)	Solvent supply is used up. Air bubble in suction tube. Solvent emits gas when mixing. Leakage in system, leaking fitting connection. Check valve defective.	Refill solvent and purge pump. Check filter frit, purge system. Degas solvent and check degasser. Find leak, tighten fitting connection. Clean, replace valve and purge pump, as necessary.
Pump displays message "Max. Pressure Shutdown" (see section 4.4.3.3)	Contaminations on column. Minute parts from vial septa block the system.	Rinse or replace column. Find blocked spot and clean. Use different septa. Check crimper setting.
Pump displays message "MSV not connected"	Connection to motorized switching valve is interrupted; or MSV is defective MSV switching is included in program steps, but no MSV is connected.	Check connection to MSV, replace MSV as necessary. Deactivate the MSV in the Programming menu by entering "-" in corresponding program lines (see section 4.4.6).
Poor degassing, degasser motor runs in short intervals	Leak in capillary or solvent tube connection Flow rate too high	Check capillary and solvent tube connections for tightness; tighten fitting connections. Reduce flow rate!
Degasser motor stops	Mains supply to pump is interrupted	Call service. **Do not touch** the degasser switching power supply!

Problem	**Cause**	**Remedial action**
Degasser motor runs without intervals	Leakage in system, leaking fitting connection.	Find leak, tighten fitting connection., check degasser.
Leak sensor detects leak (error message on display; LEDs **A, B, C, D, MAX, MIN** blink)	Leakage in system, leaking fitting connection.	Find leak, tighten fitting connection (see section 6.4).

5.2 CHROMELEON Error Messages

A complete list of ***CHROMELEON*** error messages for the **P 580** is included in the ***CHROMELEON*** Installation program on the tab dialog box "Error Levels". See also section 3.8.2.

Error Message	Cause	Remedial Action
"Driver and pump configuration don't match. Solvent type command discarded. Use the Chromeleon Installation Tool to adapt the driver configuration."	The selected solvent type cannot be entered, as the pump configuration was changed. The device driver settings no longer correspond to the current pump configuration.	Update the device driver settings with the current pump configuration: Double-click the **P 580** pump in the CHROMELEON Installation Tool and confirm settings by pressing "OK".
"The pump configuration has changed. Use the Chromeleon Installation Tool to update the driver configuration (double-click the pump name and press "OK")."	The pump configuration was changed. The device driver settings no longer correspond to the current pump configuration.	Update the device driver settings with the current pump configuration: Double-click the **P 580** pump in the CHROMELEON Installation Tool and confirm settings by pressing "OK".

6 Maintenance

6.1 General Notes

The model **P 580** is manufactured with high-quality components and materials, thus minimizing maintenance requirements. Please follow the warning notes marked "Caution" to prevent damage and unnecessary wear.

The surfaces, as well as the keypad and display are to a certain extent resistant to weak acids, alkali and organic solvents. Remove the solvents and other liquids immediately by absorbing them with a soft, lint-free cloth or paper (do not rub). If surfaces are exposed for longer periods, these liquids can cause damage!

You can carry out the maintenance work described below. Any repair work necessary beyond as well as regular checks to prevent soiling, wear etc. should be performed by the Dionex Service approximately once a year. This is e.g. to prevent dry running of the camshaft. If unexpected problems occur, please contact Dionex.

For further information on shutdown and shipment, refer to section 6.12.

⚠ **Important:** The unit must be shipped in the original packaging. Shipping the unit in any other packaging automatically nullifies the warranty! When shipping the instrument to Dionex please do not forget to include the "Service Return Form" with a description of the problem and the Decontamination confirmation.

STOP **Warning:** The **P 580** may not be operated with open case, except if this is specified in the instructions. The warning notes given in the instructions must be strictly followed!

STOP **Warning:** Please keep in mind that the fluidic components of the pump may be filled with toxic solvents. Therefore, you should purge the pump with an adequate solvent and wear protective clothing before starting maintenance or repair work on the pump.

⚠ **Important:** Use original Dionex Softron spare parts only. Should damage result from repairs with third party parts or accessories, Dionex assumes no liability!

6.2 Maintenance Intervals

When using buffer solutions we recommend visually checking the pump for tightness at least once a month (see section 6.5).

In addition, checks to prevent soiling, wear, etc. should be performed regularly once a year by the Dionex Service.

6.3 Removing the Unit Cover

Warning: Switch the instrument off and disconnect the power cord before you remove the cover! Components may carry current!

- Loosen the two knurled screws on the rear of the instrument.
- Slightly lift the cover on the back (1-2 cm).
- Slide the cover to the front, until the tabs at the front are released from the housing.
- Now lift and remove the cover.

6.4 Checking Tightness

- Check the pump for leaks every day. Tighten leaking tubing and capillary connections. Check the stainless steel tray below the unit for moisture. Remedy any leaks.

In the event that one of the built-in leak sensors detects a leak, the pump interrupts the current program and stops the flow (the LED **Flow Off** is lit). The LEDs **A**, **B**, **C**, **D**, **MIN** and **MAX** blink. The following error message appears on the LCD display:

```
    Internal Error
Sensor detected leak



    CLEAR or FLOW
```

Proceed as follows:

- Press one of the **Clear** buttons on the keypad (pressing **Flow** resumes operation).
- Wait until the pressure is down.
- Switch off the pump. Disconnect the power cord.
- Check whether solvent is leaking from the pump heads. If this is the case, tighten the tube and capillary connections. Dry the components. If necessary, replace the piston seals.
- Draw out the stainless steel tray as far as possible from under the housing. Dry the tray and the leak sensor attached to it.
- Replace the stainless steel tray.
- If no errors are reported after the pump is switched on again, operation can be resumed.

If the leak sensor still reports an error, perform the following steps:

- Ensure that the power cord is disconnected.
- Remove the cover from the **P 580**.
- Loosen the inner retaining screws (see fig. 11) of the electronics main board, lift and tilt the board to the outside.
- Check the capillary and tubing connections. In the event of leaks, tighten connections.
- Tilt the main board back into place and fasten it.
- Replace the top cover of the housing. Fasten the top cover to the rear panel using the knurled screws.

- Reconnect the power cord. Switch on the pump.
- If the pump is controlled via data system, reconnect the pump to ***CHROMELEON*** via the "Connect" command.

Warning: The instrument may not be operated while the cover is removed! Some components may carry current! If you cannot find the cause of a leak, please contact the Dionex Service.

6.5 Visually Checking the Piston Seals for Tightness

Each piston has two piston seals. These piston seals prevent that the eluent runs into the piston rear flushing chamber or over the piston into the instrument. Proceed as follows to visually check the pump for leaking piston seals:

- Unfasten one of the upper silicone tubes connecting the pump head bushing of the two pump heads and attach the silicone tube which is supplied with the accessories to the free capillary. Fill the two tubes using a syringe.
- While operating the pump, check the liquid level in both tubes. If the level remains unchanged, the piston seals seal tight. With a rising or falling level, one or several of the pistons seals are leaking. If so, replace all four piston seals and as well the supporting rings as described in section 6.7.3.

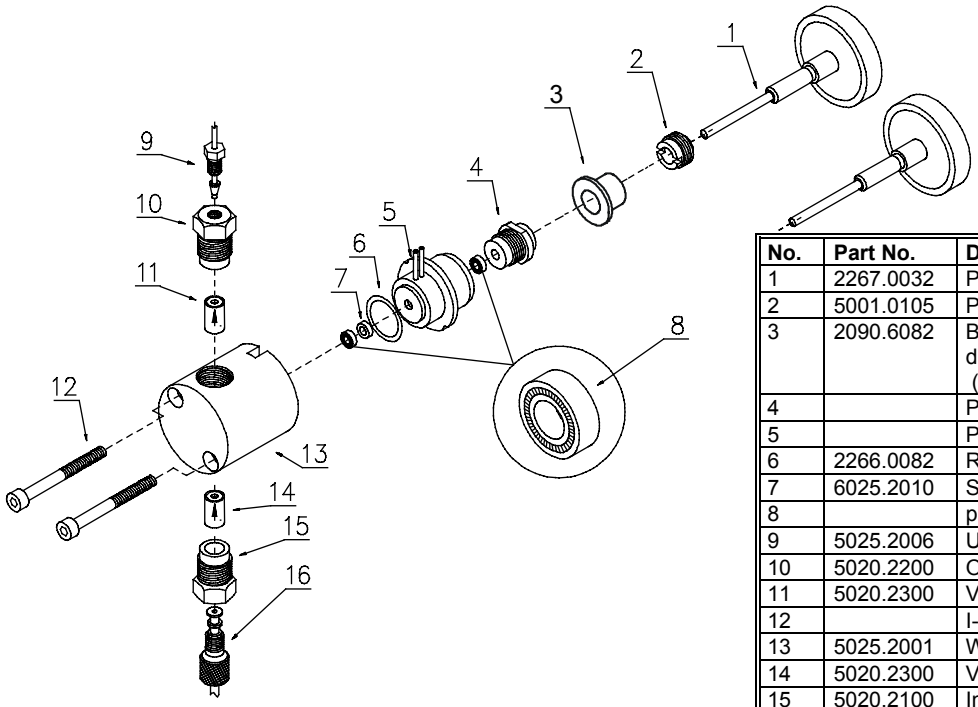
6.6 Double Check Valve Replacement

This information applies to all **P 580** models.

On the working pump head of the **P 580**, there are two double check valves, inlet valve and outlet valve. The inlet valve is mounted to the pump head from below and the outlet valve from above. When removed, you can recognize the inlet valve by the inner thread which ends in a planar surface, while the outlet valve has a conical cavity for the capillary connection. To remove one or both valves, proceed as follows:

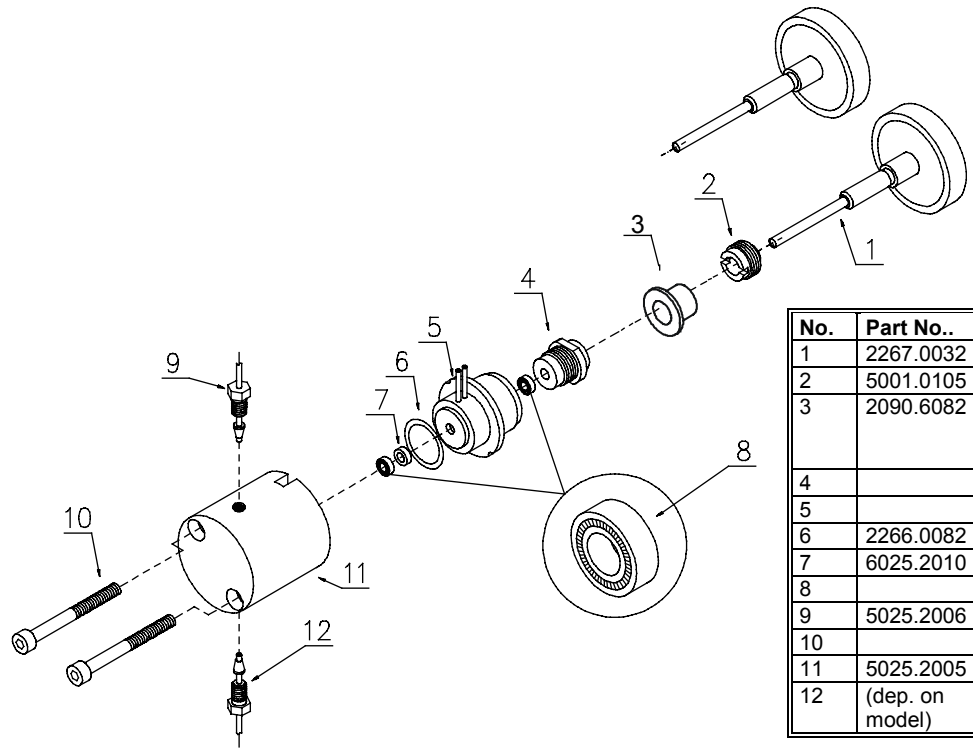
- Rinse toxic solutions from the pump, as necessary.
- Set pump flow to 0. Wait until the pressure in the system is reduced.
- Unscrew the suction tube at the pump inlet and the U-tube at the outlet.
- Unscrew the corresponding valve cartridge with a spanner, size 13mm.
- Insert the new valve cartridge. Ensure that you insert the cartridge in the correct solvent flow direction, indicated by an arrow on the cartridge (see fig. 19a). Tighten the valve.
- Now, attach the removed U-tube to the outlet valve. Hand-tighten and then tighten by a ¼ turn with a spanner, size 4mm.
- Screw the suction tube to the inlet valve again. Take care to avoid cross-threading.
- To avoid contaminations entering the HPLC system, the pump must be thoroughly rinsed prior to use (at least 30ml HPLC water or purely organic solution). Open the purge valve to prevent the rinsing liquid from entering the HPLC system.
- Test the pump for tightness and, if necessary, tighten leaking connections.

6.7 Pistons and Piston Seals



No.	Part No.	Description
1	2267.0032	Piston unit
2	5001.0105	Piston retaining screw
3	2090.6082	Bushing with attached draining device (packing unit: 5 pcs)
4		Piston seal retaining screw
5		Pump head bushing
6	2266.0082	Ring seal (pack. unit: 10 pcs)
7	6025.2010	Support ring and
8		piston seal 1/8"
9	5025.2006	U-tube connection, top
10	5020.2200	Outlet valve
11	5020.2300	Valve cartridge
12		I-M4x40 screw
13	5025.2001	Working pump head
14	5020.2300	Valve cartridge
15	5020.2100	Inlet valve
16	(dep. on model)	Connecting tube

Fig. 19a: ***P 580*** *Working pump head*



No.	Part No..	Description
1	2267.0032	Piston unit
2	5001.0105	Piston retaining screw
3	2090.6082	Bushing with attached draining device (packing unit: 5 pcs)
4		Piston seal retaining screw
5		Pump head bushing
6	2266.0082	Ring seal (pack. unit: 10 pcs)
7	6025.2010	Support ring and
8		piston seal 1/8"
9	5025.2006	U-tube connection, top
10		I-M4x40 screw
11	5025.2005	Equilibration pump head
12	(dep. on model)	Capillary tube to mixing chamber

Fig. 19b: ***P 580*** *Equilibration pump head*

This information applies to all **P 580** models.

To exchange the piston seals, perform the following steps described in the sections below:

- Pump Head Removal
- Cleaning the Pistons
- Piston Seal Removal
- Piston Seal and Pump Head Replacement

6.7.1 Pump Head Removal

- Draw out the stainless steel tray from under the housing as far as possible to catch any solvent that may be leaking.
- If necessary, rinse toxic solutions from the pump.
- Set the pump flow to 0. Wait until the system pressure is down.
- Remove all capillaries and connections from the pump heads.
- Loosen the Allen screws of the two pump heads and carefully draw from the pump heads.
- Carefully draw the seal-rear flushing chamber (including the seal, see fig. 19a/b) from the piston.
- Before you can loosen the piston retaining screw (see fig. 19a/b, no. 2), pull off the bushing with attached draining device (see fig. 19 a/b, no. 3) to the front.
- Use the slotted screwdriver which is part of the accessories to loosen the piston retaining. Pull out the piston to the front.

6.7.2 Cleaning the Pistons

You can reach the pistons via the pump heads from the front. Opening the unit housing is not necessary. Proceed as follows:

- Remove the pump head and, if necessary, the piston as described in section 6.7.1.
- Clean the piston.

⚠ **Important:** For cleaning the piston, use a household scouring cleanser only when you have completely removed the piston. Otherwise, the cleanser may stick to the piston and reach the system. Do not use any waxy scouring cleanser.

- After carefully rinsing the piston, rub the piston several times with a dry and lint-free paper towel to remove any cleanser from the pistons.
- Apply some thin-bodied, resin-free oil **only** to the **metal** part of the piston unit.
- When replacing the piston, ensure correct centering.

6.7.3 Piston Seal Removal

Each piston has two piston seals. One seal is located in each pump head, and the other is located in the piston seal rear flushing chamber. Replace the seals in intervals of approx. 4 months. Proceed as follows:

- Use a disassembled piston to remove the piston seal from the pump head (see fig. 19a/b). Insert the inlet and outlet valve cartridges the wrong way into the disassembled working pump head (arrows now pointing to opposite direction than in fig. 19a). On the equilibration pump head, close the bore hole with a blind plug. Insert the piston tip into the piston seal.

Due to the pressure, the seal will be loosened. In general, this seal can still be used for the rear seal flushing chamber. Do not forget to remove the inlet and outlet valve cartridges and to re-insert them in the right direction (see arrows in fig. 19a). If it is not possible to remove the piston seal in this way, use the tool available from Dionex Softron (pointed screw) or a M4 screw (e.g. used for holding the pump heads). Insert the screw into the seal. Remove the seal. However, this procedure **destroys** the piston seal!

⚠ **Important:** Together with the piston seal on the high-pressure side of the pump, always exchange the support ring (spare parts kit: P 580 piston seal/support ring, part no. 6025.2010)! This is to prevent leakage.

- To remove the piston seal in the rear flushing unit, you must first remove the retaining screw (no. 4 in the fig. 19a/b) on the rear of the pump head bushing.

6.7.4 Piston, Piston Seal, and Pump Head Replacement

- Position the piston and tighten the piston retaining screw using the slotted screwdriver which is part of the accessories.
- Push the busing with attached draining device (see fig. 19 a/b, no. 3) onto the shaft. Ensure the correct orientation as described in figure 19.
- Assemble the rear flushing chamber: Insert the first piston seal into the pump head bushing. Hand-tighten the retaining screw.

⚠ **Important:** When mounting the piston seals, ensure that the open sides of both piston seal springs point away from the pump housing (as shown in fig. 19).

- Slide the complete pump head bushing onto the piston unit into the pump block.
- Slide the ring seal, the new support ring and the second piston seal onto the pump head bushing. Again, ensure the correct orientation of the piston seal (see fig. 19).
- Slide the pump head onto the pump head bushing, until the second piston seal is correctly in place. Please ensure the correct orientation of the working pump head (left part of the pump block, see fig. 18). See the notes below.

⚠ **Important:** If you do not insert the piston seal in the way described above, but into the disassembled pump head, it may get jammed and thus become useless!

⚠ **Important:** On the left side (suction side), the working head is installed. It can be recognized by the two large bore holes for the inlet and outlet valves. Ensure that the centered bore hole for the outlet valve as well as the connecting pieces for the rear flushing unit point upwards, see fig. 19.

- Tighten the pump heads with the I-M4x40 screws.
- Insert the inlet and outlet valves into the working pump head. In contrast to the inlet valve, the outlet valve (top) has a conical cavity for the capillary connection. The inlet valve (bottom) has a planar surface for the suction tube connection.
- Attach the capillary connections: hand-tighten and then tighten by a ¼ turn with a spanner, size ¼".
- Attach the suction tube to the inlet valve again. Take care to avoid cross-threading.

- To avoid contaminations entering the HPLC system, the pump must now be thoroughly rinsed (minimum 30ml HPLC water or pure organic solution). Open the purge valve to prevent rinsing liquid from entering the HPLC system.
- Test the pump for tightness and, if necessary, tighten leaking connections.

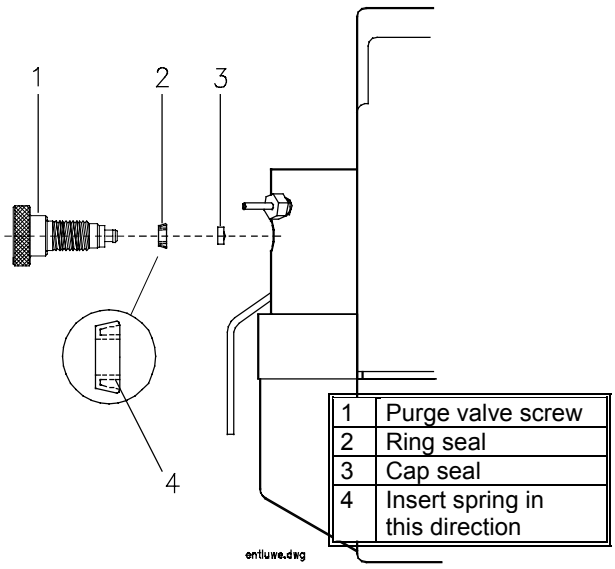
6.8 Mixing Chamber with Pressure Sensor

This information applies to all **P 580** models.

⚠ **Important:** Do **not** loosen the retaining screw of the pressure sensor! In any event of errors on the pressure sensor, contact the Dionex Service!

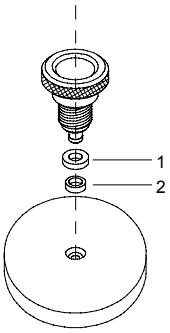
6.9 Purge Valve Seal Replacement

This information applies to all **P 580** models.



1	Purge valve screw
2	Ring seal
3	Cap seal
4	Insert spring in this direction

Fig. 20: Removing the purge valve screw



1	Ring seal
2	Cap seal

Fig. 21: Cap seal assembly

- Rinse toxic solutions from the pump.
- Set the pump flow to 0. Wait until the system is without pressure.
- Remove the purge valve screw from the mixing chamber unit.
- Use a small, flat screwdriver to remove the plastic cap seal from the purge valve screw. Remove the ring seal.
- Prior to assembly, the purge valve screw must be cleaned with a solvent in an ultrasonic bath.
- Place the new ring seal (Part no.: 2266.0311) onto the purge valve screw. Insert in the correct direction (see fig. 20).
- Place the new cap seal (Part no.: 6005.1301) into the cavity of the "Assembly tool for cap seal" (included in the standard accessories).
- Now, press the purge valve screw onto the cap seal until it locks into place. Ensure that the screw is pressed onto the cap seal at the right angle.
- Screw the purge valve screw into the mixing chamber unit the first resistance is felt.
- Now tighten the purge valve screw by an approx. ¼ turn. Do not overtighten.
- Finally, check the purge valve for tightness. If necessary, tighten the purge valve screw again.

⚠ **Important:** Do not use any tools when tightening the purge valve screw! If the purge valve screw is too tight, the cap seal can be destroyed!

6.10 Degasser

This information applies to the model **P 580A LPG**.

- Clean the solvent tubes regularly.

Warning: Do **not** open the vacuum chamber of the degasser. Do **not** remove the silicone tubes to the vacuum pump!

- Note the operating noise of the degasser. As soon as the operating vacuum is reached, the vacuum pump is automatically switched on and off at intervals. If the vacuum pump runs without pauses (or clearly over 50% of the time), check the system for possible leaks.
- When connecting the solvent tubes, ensure that the connectors are free of contaminants. Even with minute particles, air can enter the degasser, reducing the unit's effectiveness.
- When replacing solvents, ensure that solvents are miscible. Solvents that are not miscible must be replaced step by step, by mixing with an intermediate solvent.
- After operation, thoroughly rinse with alcohol (can stay in the degasser).
- During longer periods of inactivity and when using saliferous buffers (due to risk of salt crystallization in the gas separation membrane and thus reduction of degassing performance!), rinse with de-ionized water, then rinse with methanol (or 2-propanol).

6.11 Low-Flow Connecting Tube Replacement

If the pump is operated with flow rates lower than 2 ml/min, the tube between the proportioning valve and the pump head (ID = 1.5mm) can be replaced by a low-flow connecting tube (ID=1.0mm, Part no.: 5025.2515). This will lower response times in gradient operation. Proceed as follows to replace the tube:

- If necessary, rinse toxic solutions from the pump.
- If the pump is connected to the ***CHROMELEON*** data system, terminate the communication with the data system via the "Disconnect" command of the *Online Control* window in ***CHROMELEON*** (see the ***CHROMELEON*** Online-Help or Manual).
- Switch off the pump. Disconnect the power cord!
- Loosen the retaining screws on the pump's top cover and remove the top cover (see section 6.3).
- Loosen the inner retaining screws (see fig. 11) of the main board, lift and tilt the board to the outside.
- Remove the connecting tube between the proportioning valve and the inlet valve.
- Now, the low-flow tube can be inserted. Tighten the connections only partly. Take care the PEEK seal of the tube is exactly parallel to the tube. Avoid cross-threading! Hand-tighten the connections. Do not use any tools to do this!
- Tilt the main board back, and tighten the retaining screw.
- Replace the unit cover and fasten.
- Reconnect the power cord and switch on the pump.
- Purge the pump (see 3.4.5).
- If necessary, use the "Connect" command to reconnect the pump to the ***CHROMELEON*** data system (see ***CHROMELEON*** Online Help or Manual).

6.12 Pump Shut-Down

To shut down the **P 580** (e.g. for interrupting operation for longer than 12 hours or for shipment), please take note of the following:

⚠ **Important:** The pump should never run dry! Otherwise, damage to the pistons or the piston seals may result.

⚠ **Important:** For transport or for longer interruptions, the pump must be filled with methanol (or a similar alcohol, e.g. 2-propanol, ethanol). If the solvents in the pump are not miscible with water, replace the solvents by adequate steps. Do not forget to fill the piston seal rear flushing chamber (see 3.4.4).

⚠ **Important:** Buffers or solvents forming peroxide must be rinsed out after an analysis. Alternatively, the pump can be operated at a low flow rate (0.05-0.1ml/min). This reduces the equilibration time of the column and the lamps of the connected UV or RI detectors when resuming operation.

⚠ **Important:** Before switching from aqueous buffer solutions to an organic solvent, the pump must be rinsed thoroughly with water.

⚠ **Important:** When switching to other solvents, ensure that the new solvent is miscible with the solvent still contained in the pump. Otherwise, the pump may be damaged!

🛈 **Please note:** As a guide for completely rinsing the **P 580** (incl. degasser), approximately 30ml rinsing volume per solvent channel are required. At a flow rate 3 ml/min, this means that each channel must be rinsed for a minimum of 10 min.

⚠ **Important:** If the pump flow is interrupted for longer periods, the lamps in any connected UV- or RF-detectors must be switched off to prevent evaporation of the solvents in the flow cell.

🛈 **Please note:** The unit must be shipped in the original packaging. Shipping the unit in any other packaging automatically nullifies the warranty!

7 Technical Information

Flow rate range	*Analytical version*: 0.001 ml/min ... 10 ml/min *Preparative version*: 0.005 ml/min .. 100 ml/min (HPG)
Displacement volume, working piston	*Analytical version*: 79.2 µl per stroke *Preparative version*: 477.8 µl per stroke
Piston diameter	*Analytical version*: 3.175 mm *Preparative version*: 7.8 mm
Gradient formation	Low-pressure gradient: quaternary High-pressure gradient: binary (with optional "Solvent Selector": from 4 solvents) Flow gradient can be combined with solvent gradient
Mixing chamber	Standard volume: 0.2 ml; other volumes available upon request
Maximum operating pressure	*Analytical version*: max. 50.0 MPa (500 bar), temporarily 100.0 MPa (1000 bar) *Preparative version*: max. 15.0 MPa (150 bar),
Safety features	Minimum/Maximum pressure shut-down (selectable), Time monitoring of pump function, Leak sensors
User Input/Display	Keypad (30 buttons), 8-line LCD-display (21 characters), 11 LEDs, solvent-resistant. Programming during active program.
Remote Control	All functions controllable via RS-232-interface, permanent status transfer.
Service Reminder	Automatic, load-dependent (work load).
Inputs/outputs	1 serial RS-232 interface 1 MSV-6 connection 3 relay outputs 3 relay inputs for Start, Stop, Hold 1 analog output for system pressure
Wetted parts	Stainless steel 1.4571, sapphire, ruby, ceramics, UHMW polyethylene, PCTFE, PTFE, PEEK, zirconium oxide ZrO_2, aluminium oxide Al_2O_3
Power requirements	100V / 230V ±10%, 50/60Hz.
Power consumption	Standby: 15W. Full load: 70W.
Dimensions	413 x 170 x 362 mm (w x h x d).
Weight	12.7 - 15.8 kg, depending on the model

Technical information: September 2000, subject to change without notice!

8 Accessories and Spare Parts

Spare parts and accessories are always maintained at the latest technical standard. Therefore, order numbers are subject to alteration. However, updated parts will always be compatible with the parts they replace.

8.1 Standard Accessories

The following standard accessories are part of the shipment. Accessory parts stated below without order no. are available in the corresponding spare part kits (→ section 8.3, page 61).

Models P 580A

Description	Part no.	Quantity
Accessories for Pump P 580, stainless steel, analytical, complete, including:	**5025.9010**	
Power cord (220 V), 3 x 0.75mm^2, 2m or	1310.7031	1
Power cord (125 V), 3 x AWG18, 2m	1310.7032	
(depending on the country-specific requirements)		
P 580 I/O connecting cable, 25-pin	8025.9001	1
Remote input - pressure output cable	8005.9001A	1
Fuse 0,5A (5 x 20 mm), for 230V		2
Fuse 1A (5 x 20 mm), for 100V		2
Silicone wash tube (2.80x1.30 EDxID), 1 m		3
Suction tube P 580 ID=1.5 mm, with teflon solvent filter	5025.2520	2
Capillary connecting tube stainless steel,	5020.9110	1
1/16", ID=0.25 mm, 1 m, complete		
Connecting tube prop. valve - pump head left, ID=1.0 mm	5025.2515	1
Knurled fitting 1/8", PEEK		1
Clamp ring, PEEK (for tubing 3x1.5)		1
Support flange, PEEK (for tubing 3x1.5)		1
Plastic syringe 12 ml		1
Tool for analytical pump	5007.9301	1
Cap seal for purge valve screw	6005.1301	2
Teflon solvent filters (10 pcs)	2200.0011	1
Wire label, 3mm, white "A"	2175.1012	1
Wire label, 3mm, white "B"	2175.1022	1
Wire label, 3mm, white "C"	2175.1032	1
Wire label, 3mm, white "D"	2175.1042	1
Operating Instructions P 580 English	4820.2550	1
Container for Accessories	2309.1100	1

Models P 580A HPG and P 580A LPG

Description	Part no.	Quantity
Accessories for Pump P 580, gradient, stainless steel, analytical, complete, including:	**5025.9015**	
Power cord (220 V), 3 x 0.75mm^2 or	1310.7031	1
2m Power cord (125 V), 3 x AWG18, 2m	1310.7032	
(depending on the country-specific requirements)		
P 580 I/O connecting cable, 25-pin	8025.9001	1
Remote input - pressure output cable	8005.9001A	1
Fuse 0,5A (5 x 20 mm), for 230V		2
Fuse 1A (5 x 20 mm), for 100V		2
Silicone wash tube (2.80x1.30 EDxID), 1 m		1
Suction tube P 580 ID=1.5 mm, with teflon solvent filter	5025.2520	2
Capillary, stainless steel, 1/16", ID=0.25 mm, 1 m, complete	5020.9110	1
Connecting tube prop. valve - pump head left, ID=1.0 mm	5025.2515	1
Knurled fitting 1/8", PEEK		1
Clamp ring, PEEK (for tubing 3x1.5)		1
Support flange, PEEK (for tubing 3x1.5)		1
Plastic syringe 12 ml		1
Tool for analytical pump	5007.9301	1
Cap seal for purge valve screw	6005.1301	2
10 Teflon solvent filters	2200.0011	1
Wire label, 3mm, white "A"		1
Wire label, 3mm, white "B"		1
Wire label, 3mm, white "C"		1
Wire label, 3mm, white "D"		1
Operating Instructions P 580 English	4820.2550	1
Container for Accessories	2309.1100	1

Model P 580P and P580P HPG

Description	Part no.	Quantity
Accessories for Pump P 580, stainless steel, preparative, complete, including:	**5025.9020**	
Power cord (220 V), 3 x 0.75mm^2, 2m or	1310.7031	1
2m Power cord (125 V), 3 x AWG18, 2m		
(depending on the country-specific requirements)		
P 580 I/O connecting cable, 25-pin	8025.9001	1
Remote input - pressure output cable	8005.9001A	1
Fuse 0,5A (5 x 20 mm), for 230V		2
Fuse 1A (5 x 20 mm), for 100V		2
Silicone wash tube (2.80x1.30 EDxID), 1 m		1
Suction tube P 580, preparative, without frits	6007.9300	4
Capillary tube, stainless steel, 1/16", ID=0.70, 1 m, complete	5005.9100	1

Description	Part no.	Quantity
Plastic syringe 12 ml		1
Tool for preparative pump	5007.9302	
Cap seal for purge valve screw	6005.1301	2
Wire label, 3mm, white "A"		1
Wire label, 3mm, white "B"		1
Wire label, 3mm, white "C"		1
Wire label, 3mm, white "D"		1
Suction tube P 580 ID=1.5 mm, with teflon solvent filter (P 580P HPG only)	5025.2520	2
Operating Instructions P 580 English	4820.2550	1
Container for Accessories	2309.1100	1

8.2 Optional Accessories

Part no.	Description	Comment
5025.0500	Option: Injection valve, stainless steel, with accessories	
709.8125.20	RH8125 Injection valve, complete	for stainless steel pumps
709.3725	RH3725i, Injection valve, preparative	for preparative pumps
713.80865	Syringe, 500µl	for preparative pumps
713.80565	Syringe, 50µl	
2140.0001	Capillary cutting tool	
1310.2260	Zero-modem cable	
8914.0103A	RS unit cable (9-pin - 25-pin)	

8.3 Spare Parts

Models P 580A, P 580A LPG, P 580A HPG; P 580P, P 580P HPG

Part no.	Description
8025.9001	P 580 I/O connecting cable, 25-pin
1310.7031	Power cord (220V) 3 x 0.75 mm^2 gray or black, 2 m
1384.0308	Magnetic stirrer 8x3mm, PTFE
2073.0161	Knurled screw M3 x 16 DIN 464 A2 for housing
2116.2702	Pressure spring VD-186 (only up to S/N 9805XXX)
2116.0901	Tension spring
2146.1051	Spanner ¼" x 5/16"
2146.1052	Spanner 12 x 13 mm
2200.0011	Teflon solvent filters (10 pcs)
2266.0082	Ring seal DR-8 (O-ring) (10 pcs)
2266.0304	Piston seal, 1/8"
6025.2010	Kit: P 580 piston seal/PEEK support ring
2266.0311	Ring seal, purge valve screw
2266.2021	Seal, mixing chamber
2266.2022	Gasket, pressure sensor
2267.0032	Piston unit, 1/8"
2282.9185	Stainless steel tray, 290 x 185 mm
5001.0105	1/8" Piston retaining screw
5001.0114	Slotted screwdriver for piston unit 1/8"
5025.2006	U-tube, top, stainless steel, complete
5005.1800A	U-tube, top, stainless steel, complete for double check valves (for preparative pump only)
5020.2100	Inlet double check valve, complete
5020.2200	Outlet double check valve, complete
5020.2300	Valve cartridge
5020.9110	Capillary tube, stainless steel, 1/16", ID=0.25 mm, 1 m, complete
5025.1220	Coupling
5025.2001	Pump head, left, stainless steel
5025.2005	Pump head, right, stainless steel
5025.2010	Pump head bushing, complete
5025.2030	Purge valve screw, complete
5025.2041	Mixing motor, complete
5025.2050	Mixing chamber, complete
5025.2114	Board for humidity sensor, assembled
5025.2520	Suction tube P 580, ID=1.5 mm with Teflon eluent filter
6005.1301	Cap seal for purge valve screw
8025.2050	Pressure Sensor P580, complete
5025.2002	Capillary tube, pump head (left block) - mixing chamber (P 580A, P 580A LPG and HPG)
5025.2202	Capillary tube, pump head (left block) - mixing chamber (P 580P, P 580P HPG)
5025.2004	Capillary pump outlet - Rheodyne valve (all types)
5025.2006	Capillary equilibration piston - working piston (all types)
5025.2007	Capillary T-piece - mixing chamber (P 580A HPG)

Part no	Description
5025.2207	Capillary T-piece - mixing chamber (P 580P HPG)
5025.2013	Capillary pump head, left - T-piece (P 580A HPG)
5025.2213	Capillary pump head, left - T-piece (P 580P HPG)
5025.2014	Capillary pump head, right - T-piece (P 580A HPG)
5025.2214	Capillary pump head, right - T-piece (P 580P HPG)
6025.9002	Fuses P580, Kit Europe including: 10 off fuses, 0.5A, slow, 5x20 mm (RS only!) 5 off fuses, 1A, slow, 5x20 mm (RS only!) 10 off fuses, 4A, slow, 6.3x32 mm, 250V
6025.2511	PEEK Fitting Set (for tubing 3x1,5) including:5 5 off knurled fittings 1/8" PEEK 5 off clamp ring PEEK 5 off supporting flange 2m PTFE tubing
6000.0010	Plastic Syringe and Tubing Kit including: 5 off plastic syringe, 12 ml 3m silicone tubing OD 2.80 x ID 1.30
6025.2512	Connecting Tubing Kit P 580A including: Connecting tubing PH left - valve / PH right - valve, ID = 1.5 Connecting tubing valve B/D - rear panel B/D, 18 cm

Additional Spare Parts for Model P 580A LPG

Part no.	Description
6025.2540	Connecting Tube Kit Degasser - Prop. Valve including: Connecting tube degasser A - prop. valve A Connecting tube degasser B - prop. valve B Connecting tube degasser C - prop. valve C Connecting tube degasser D - prop. valve D Wire label 3 mm white, "A" Wire label 3 mm white, "B" Wire label 3 mm white, "C" Wire label 3 mm white, "D"
6025.2541	Connecting Tube Kit Rear Panel - Degasser P580 including: Connecting tube rear panel A - degasser A Connecting tube rear panel B - degasser B Connecting tube rear panel C - degasser C Connecting tube rear panel D - degasser D Wire label 3 mm white, "A" Wire label 3 mm white, "B" Wire label 3 mm white, "C" Wire label 3 mm white, "D"
5025.2514	Connecting tube, prop. valve - pump head, left, ID=1.5 mm
5025.2515	Connecting tube, prop. valve - pump head, left, ID=1.0 mm
5025.2520	Suction tube P 580, ID=1.5 mm
6025.2530	Proportioning valve service kit
6025.2531	Proportioning valve mounting kit
5025.5000	Degasser unit with 4 channels

Additional Spare Parts for Model P 580A HPG

Part no.	Description
5020.9110	Capillary tube, stainless steel, 1/16" ID=0.25 mm, 1m, complete
6025.2510	Connecting Tube Kit (ID = 1.5) P580 HPG including:
	Connecting tube pump head, left - valve/pump head, right - valve
	Connecting tube valve A/C - rear panel A/C
	Connecting tube 10 cm rear panel - valve
	Wire label 3 mm white, "A"
	Wire label 3 mm white, "B"
	Wire label 3 mm white, "C"
	Wire label 3 mm white, "D"
5025.2611	3-way valve, wired, A/C
5025.2612	3-way valve, wired B/D

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