

Smartline

▶ SmartMix Manual

V5350A



Table of contents

Overview	4
Features	4
Scope of delivery	4
SmartMix mixer	4
Accessories and spare parts	5
Checking the scope of delivery	5
Intended use	5
Safety	6
Protective measures	6
Target group	6
What expertise should users have to safely operate an HPLC system?	6
Symbols and labels	6
Installation	6
Packaging and transport	6
Overview SmartMix mixer	7
Mounting on the pump	8
Installation in the LPG system	8
Installation in the HPG system	9
Maintenance and care	10
Opening the SmartMix mixer	10
Exchanging the filter system	10
Replacing the cartridge	11
Product range	12
Device, accessories, and spare parts	12
Troubleshooting	13
Technical data	13
Legal information	14
Warranty conditions	14
Declaration of conformity	15

Overview



The KNAUER SmartMix mixers are solvent mixers that are suitable for high-performance liquid chromatography (HPLC). The liquids are mixed statically in the SmartMix mixer.

Features

The direction of flow has no influence in SmartMix technology. For this reason, the SmartMix mixer can be used for low-pressure gradient systems (LPG) as well as for high-pressure gradient systems (HPG).

The SmartMix mixer is specially designed for the application of the following mixtures of solvents:

- Water-acetonitrile mixture
- Water-methanol mixture
- Buffer-salt solution mixture

The SmartMix mixer is available in two versions:

- Analytical version
- Micro version

Both versions can be used for pressures up to 1000 bar. Wetted materials are stainless steel, PEEK and Teflon.

To adapt the mixture volume, two versions of cartridges can be inserted in the SmartMix mixer.

- Analytical cartridge (350 μ l mixture volume)
- Micro cartridge (100 μ l mixture volume)

The dimensions of the cartridges are identical, so that a switch from the analytical cartridge to the micro cartridge is possible.

Scope of delivery

SmartMix mixer

- SmartMix mixer
- Red or black PEEK blind plug
- Manual

Accessories and spare parts

- Analytical cartridge
- Micro cartridge
- Mounting kit:
 - two filler caps made of stainless steel
 - four Phillips-head screws
 - four washers
 - four hexagon screws
- Spare filter kit:
 - three filter inserts
 - PEEK sealing ring

Use original parts and accessories

- ▶ Only use original parts and accessories made by KNAUER or a company authorized by KNAUER.

Checking the scope of delivery

1. Check whether the supplied devices and accessories are complete.
2. If a part should be missing, inform the technical support of KNAUER.

Intended use

HPLC High-performance liquid chromatography (HPLC) is a method for separating substance mixtures and for determining substances and measuring their concentration.

The device or device system is suited for high-performance liquid chromatography. It is used for analyzing substance mixtures that can be dissolved in a solvent or a solvent mixture.

Laboratory use:

- Biochemistry analyses
- Chiral analyses
- Food analyses
- Pharmaceutical analyses
- Environmental analyses

Checking intended use

- ▶ Only use the device for applications that fall within the range of the intended use.

Safety

Protective measures

Only perform maintenance tasks described in this manual. All other maintenance tasks are to be performed exclusively by KNAUER or a company authorized by KNAUER.


Target group

What expertise should users have to safely operate an HPLC system?

- Completed qualification as chemical laboratory technician or comparable vocational training
- Fundamental knowledge of liquid chromatography
- Knowledge regarding substances that are suitable only to a limited extent for use in liquid chromatography

Symbols and labels

Explanations of symbols and labels on the system

Symbol	Explanation
	<p>For your own safety, read the operating instructions and always observe the warnings and safety information on the device and in the operating instructions!</p>

Installation

Packaging and transport

At the factory, the HPLC devices are carefully and safely packed for the transport into special shipping boxes.

Checking for signs of damage during transport

- ▶ Check the device for signs of damage during transport. If the shipment is incomplete or damaged, inform the manufacturing factory within three workdays. Also inform the freight carrier about any transport damage.

Overview SmartMix mixer

Legend

- A PEEK blind plug (red or black)
- B Mixer lid
- C Inlet to the pump
- D Mixer housing
- E Mounting boreholes
- F Micro cartridge inside the SmartMix
- G Outlet to the column

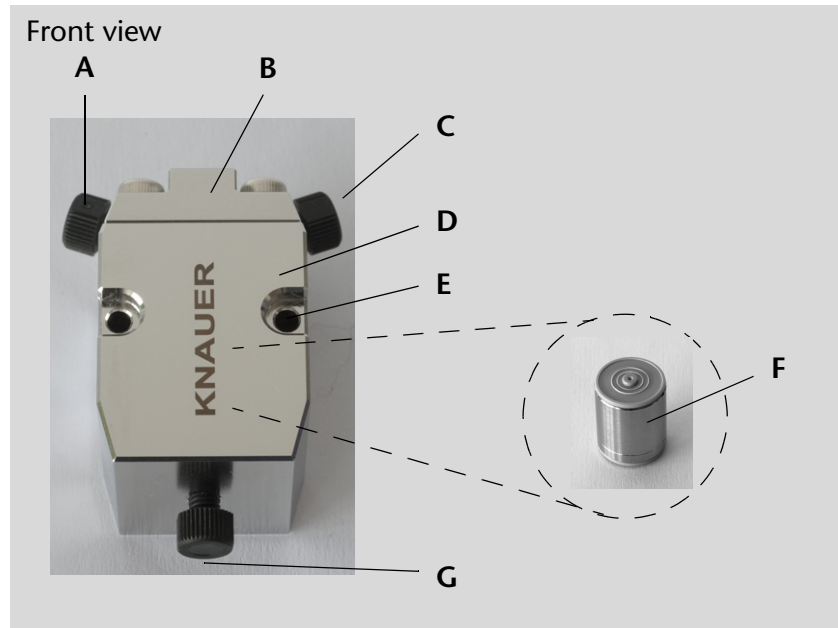


Fig. 1 SmartMix mixer with micro cartridge

The SmartMix mixer consists of three subassemblies: Mixer lid (C), mixer housing (D), cartridge (F).

To differentiate the installed cartridges, the SmartMix mixer is supplied with different PEEK blind plugs:

- The analytical version with the analytical cartridge has a black blind plug.
- The micro version with the micro cartridge has a red blind plug.

ATTENTION! Avoid leaks!

Before the first use, always replace the red or black PEEK blind plug in the LPG system by a metal screw fitting (mounting kit Z5350A). Otherwise, there may be a leak.

Mounting on the pump

The SmartMix mixer is secured with two screws on the housing of the pump.

Legend

- A Metal screw fitting as blind plug
- B Assembly screws for SmartMix mixer
- C Capillary to pump
- D Inlet for piston back-flushing
- E Front panel
- F Pump head
- G Pressure sensor and venting valve
- H Mixing chamber
- I Capillary to tube

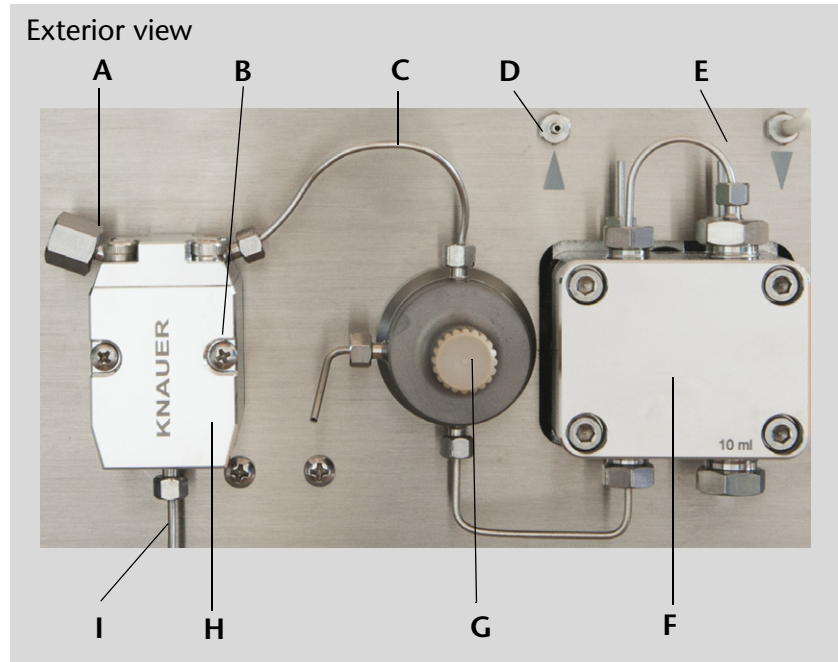


Fig. 2 Mounting SmartMix mixer on the pump

1. Mount the SmartMix mixer to the front panel (E) of the pump by two Phillips-head screws (B).
2. Tighten the screws with a Phillips screwdriver (PH1 × 80).

Installation in the LPG system

For use in a low-pressure gradient system, the SmartMix mixer is mounted according to fig. 3.

Legend

- A Metal screw fitting
- B Inlet to the pump
- C Mixer lid
- D Mixer housing
- E Outlet to the column

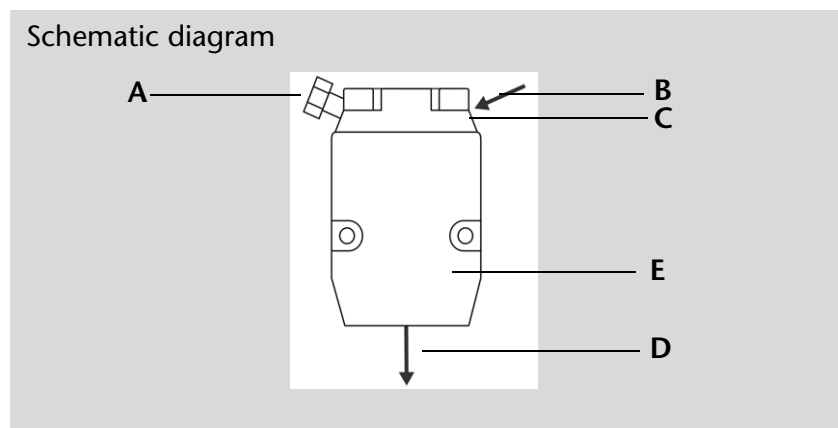


Fig. 3 Installation SmartMix mixer in the LPG system

1. Close the left connection in the LPG system with the metal screw fitting (A). Tighten the screw with a size 10 wrench.

ATTENTION! Avoid possible leaks!

Before the first use, always replace the red or black PEEK blind plug in the LPG system by a metal screw fitting (mounting kit Z5350A). Otherwise, there may be a leak.

2. Connect the capillary leading to the pump by the right inlet to the pump (B) on the mixer lid (C).
3. Connect the capillary leading to the column with the outlet to the column (E).

Installation in the HPG system

For use in a high-pressure gradient system, the SmartMix mixer is mounted according to fig. 4.

Legend

- A Inlet to the pump A
- B Inlet to the pump B
- C Mixer lid
- D Mixer housing
- E Outlet to the column

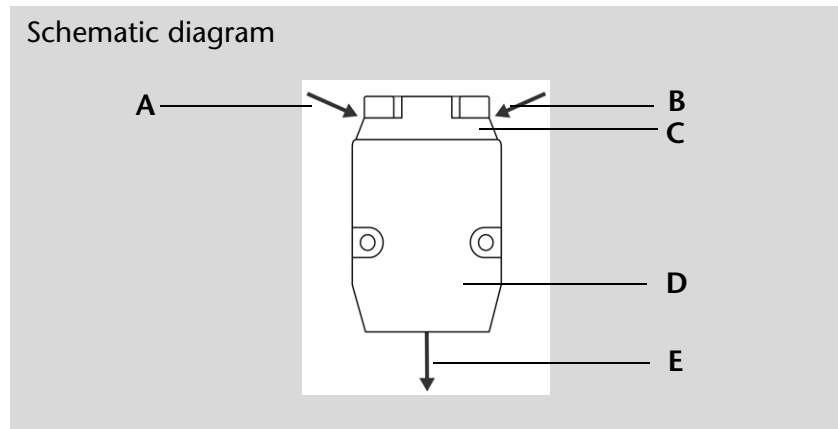
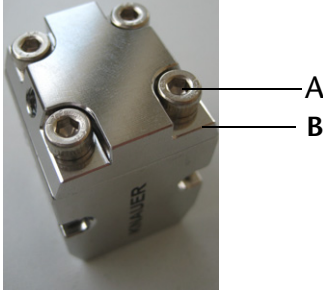


Fig. 4 Installation SmartMix mixer in the HPG system

1. Two pumps are used in the HPG system. Connect the SmartMix mixer to the bottom pump.
2. Connect the capillaries from pump A and pump B with the two inlets to the pumps (A and B) on the mixer lid (C).
3. Connect the capillary leading to the column with the outlet to the column (E).

Maintenance and care

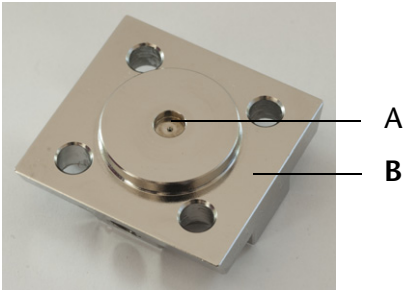
Opening the SmartMix mixer

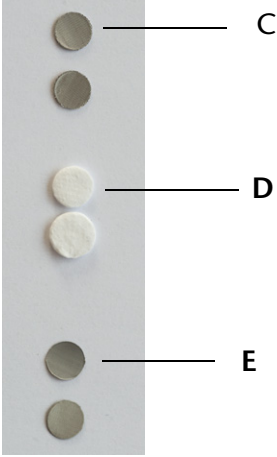
Opening the mixer lid of the SmartMix mixer	Steps	Figure
	<ol style="list-style-type: none"> 1. Screw out the four hexagon screws (A) of the mixer lid (B) with an Allen wrench (SW 3.0 × 150). 2. Lift off the mixer lid. 	<p>Exterior view</p>  <p>Fig. 5 Mixer lid</p>

Exchanging the filter system

Functional principle Several filter inserts are inserted into the SmartMix mixer in a specific order. They can be renewed as needed.

- Prerequisite**
- The SmartMix mixer has been removed.
 - The mixer lid of the SmartMix mixer is opened.

Replacing the filter system	Steps	Figure
	<ol style="list-style-type: none"> 1. Remove the filter system (A) in the mixer lid (B) with a pair of pointed tweezers. 	<p>Internal view</p>  <p>Fig. 6 Remove the filter system from the mixer lid</p>

Replacing the filter system	Steps	Figure
<p>Note: Observe the sequence when inserting the new filter inserts! Otherwise, the filters will plug up.</p>	<p>2. Insert the new filter system at position (A) in the following order:</p> <ul style="list-style-type: none"> - 2 units filter sieves 7 μm (C); order number: M1893 - 2 units glass-fiber filter (D); order number: 1894 - 2 units filter sieves 3 μm (E); order number: 1892 	<p>Sequence filter inserts from top to bottom</p>  <p>Fig. 7 Insert new filter system in the mixer lid</p>



F

Note: Put on the mixer lid with the screw fittings of the capillaries (F) as shown in the picture.

3. Put the mixer lid with the replaced filter system onto the mixer housing with the cartridge and the PEEK sealing ring.
4. Screw tight the four hexagon screws on the mixer lid with an Allen wrench (SW 3.0 \times 150).

Replacing the cartridge

The design of the cartridges is different, depending on the version of the SmartMix mixer (see fig. 8).

The micro cartridge (A) has a circumferential groove. The analytical cartridge has no groove (B).

Legend

- A Micro cartridge with circumferential groove
- B Analytical cartridge

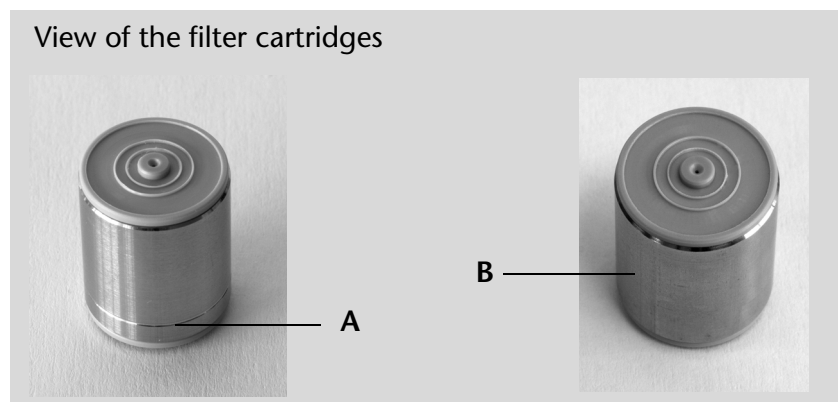


Fig. 8 Cartridges for different mixture volumes

- Prerequisite**
- The capillaries were loosened.
 - The SmartMix mixer has been removed.

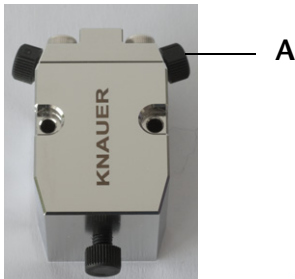
- Procedure**
- Loosen and lift off the mixer lid.
 - Remove the PEEK sealing ring.
 - Replace the cartridges.
 - Put PEEK sealing ring back on

Note: Do not use any metal tools to take the cartridge out of the housing. Otherwise, damage might be done to the seals of the cartridge.

1. Take the PEEK sealing ring, lying on the cartridge, off the cartridge. Check the PEEK sealing ring for any possible damage; replace sealing ring if necessary (filter insert kit A0164-1).
2. Take cartridge out of the housing.
3. Insert the new cartridge. The insertion direction does not matter. Do not remove the filters in the lid.
4. Place the PEEK sealing ring on the cartridge.

Note: Put on the mixer lid with the screw fittings of the capillaries (A) as shown in the picture.

5. Put the mixer lid onto the mixer housing with the cartridge and the PEEK sealing ring.
6. Screw tight the four hexagon screws on the mixer lid with an Allen wrench (SW 3.0 × 150).



Product range

Device, accessories, and spare parts

Name	Order number
SmartMix mixer 350	A5350
SmartMix mixer 100	A5351
Analytical cartridge (350 µl)	A5356
Micro cartridge (100 µl)	A5355
Mounting kit: 2 filler caps made of stainless steel 4 Phillips-head screws 4 washers 4 hexagon screws	Z5350A
SmartMix filter insert kit: 3 filter units 1 PEEK sealing ring for the cartridge	A0164-1

Troubleshooting

Problem	Possible cause	Remedy
Filter clogged	The pump was switched off automatically, because Pmax was exceeded.	Exchange the filter system
	Pressure increase	Replace cartridge
	Filter system inserted wrong	Exchange the filter system
Unsteady baseline	Cartridge faulty	Replace cartridge
	Filter clogged	Exchange the filter system

Technical data

SmartMix mixer Flow rate

Gradient system	LPG	HPG
Analytical version	0.5–2.0 ml/min	< 5 ml/min
Micro version	0.1–0.5 ml/min	< 1.5 ml/min

Cartridge

Analytical cartridge	350 µl mixture volume
Micro cartridge	100 µl mixture volume

Legal information

Warranty conditions

The factory warranty for the device is valid for 12 months after the date of dispatch. All warranty claims shall expire in the event that any unauthorized changes are made to the device.

During the warranty period, any components with material or design-related defects will be replaced or repaired by the manufacturer free of charge.

This warranty excludes the following:

1. Accidental or willful damage
2. Damage or errors caused by third parties that are not contractually related to the manufacturer at the time the damage occurs
3. Wear parts, fuses, glass parts, columns, light sources, cuvettes and other optical components
4. Damage caused by negligence or improper operation of the device and damage caused by clogged capillaries
5. Packaging and transport damage

In the event of device malfunctions, contact:

Manufacturer

Wissenschaftliche Gerätebau
Dr. Ing. Herbert KNAUER GmbH
Hegauer Weg 38
14163 Berlin, Germany
Telephone: +49-(0)30-809727-0
Fax: +49-(0)30-8015010
E-mail: info@knauer.net
Internet: www.knauer.net

The packaging of our devices provides the best possible protection against transport damage. However, immediately inspect each delivery for visible signs of transport damage. If the shipment is incomplete or damaged, inform the manufacturer within three workdays. Also inform the freight carrier about transport damage.

Declaration of conformity

**Manufacturer name
and address** Wissenschaftliche Gerätebau
Dr. Ing. Herbert KNAUER GmbH
Hegauer Weg 38
14163 Berlin, Germany

SmartMix mixer Order number A5350, A5351

- DIN EN 60799 (June 1999) Electrical accessories - Cord sets and interconnection cord sets
- DIN EN 61010-1 (August 2002) Safety requirements for electrical equipment for measurement, control and laboratory use
 - Low voltage directive (2006/95/EC)
- DIN EN 61000-3-2 (March 2010) Electromagnetic compatibility (EMC) Part 3-2
EN 61000-3-2:2006 + A1:2009 + A2:2009
 - EMC standards (2004/108/EC)
- DIN EN 61326-1 (October 2006) Electrical equipment for measurement, control and laboratory use – EMC requirements
 - DIN EN 61326-1 Corrigendum 2 (April 2011)
- Directives for an environmentally sound use of electrical and electronic equipment
 - RoHS directive 2002/95/EC (February 2003) on the restriction of the use of certain hazardous substances in electrical and electronic equipment
 - WEEE directive 2002/96/EC (February 2003) on waste electrical and electronic equipment

Berlin, 2011-06-27



Dr. Alexander Bünz (Managing Director)

The mark of conformity has been applied to the rear panel of the device.



© Wissenschaftliche Gerätebau
Dr. Ing. Herbert Knauer GmbH
All rights reserved.
The information in this document
is subject to change without prior
notice.
Translation of the original German
edition of this device manual.
2011-06-27
Printed in Germany.

www.knauer.net

HPLC · SMB · Osmometry

Wissenschaftliche Gerätebau Phone: +49-(0)30-809727-0
Dr. Ing. Herbert Knauer GmbH Fax: +49-(0)30-8015010
Hegauer Weg 38 e-mail: info@knauer.net
14163 Berlin, Germany Internet: www.knauer.net

