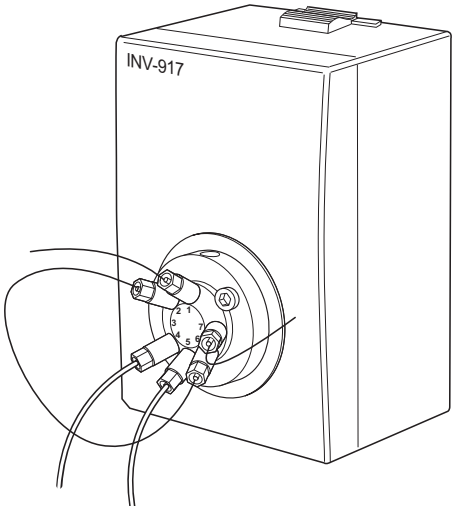
GE Healthcare

Valve INV-917

Instructions



ÄKTA

Important user information

All users must read this entire manual to fully understand the safe use of Valve INV-917.

Important!

Valve INV-917 is intended for research use only, and should not be used in any clinical or in vitro procedures for diagnostic purposes.

Safety notices

This manual contains warnings and cautions concerning the safe use of the product. See definitions below.

WARNING!

WARNING! The WARNING symbol and notice highlight instructions that must be followed to avoid personal injury. Do not proceed until all stated conditions are clearly understood and met.

CAUTION!

The Caution! sign highlights instructions that must be followed to avoid damage to the product or other equipment. It is important not to proceed until all stated conditions are met and clearly understood.

Note

A Note is used to indicate information that is important for trouble-free and optimal use of the product.

Recycling

This symbol indicates that the waste of electrical and electronic equipment must not be disposed as unsorted municipal waste and must be collected separately. Please contact an authorized representative of the manufacturer for information concerning the decommissioning of equipment.

WARNING!

WARNING! This is a Class A product. In a domestic environment, it might cause radio interference, in which case the user might be required to take appropriate measures.

WARNING!

WARNING! All repairs should be done by personnel authorized by GE Healthcare. Do not open any covers or replace parts unless specifically stated in the instructions.

CE Certification

This product complies with the European directives listed below, by fulfilling corresponding harmonized standards. A copy of the Declaration of Conformity is available on request.

The CE logo and corresponding declaration of conformity, is valid for the instrument when it is:

-used as a stand-alone unit, or

-connected to other CE-marked GE Healthcare instruments, or

-connected to other products recommended or described in this manual, and

-used in the same state as it was delivered from GE Healthcare except for alterations described in this manual.

Note: The Declaration of conformity is valid only for systems that are marked with the CE logo:

CE

1 Introduction

Valve INV-917 is a motorised rotary 7-port valve. The valve is used in ÄKTA™ design systems. It is powered from P-900 series system pump, and controlled from UNICORN™ control system.

The valve has 3 positions used for:

- loading a sample loop
- injecting the sample onto the column
- washing the system pump.

In ÄKTAmicro™ system, INV-917 is also used as a Flow direction valve.

Features:

- Smooth flowpath minimises eluent or sample "memory effect".
- Flow rates up to 10 ml/min.
- All wetted parts are plastic PEEK.

1.1 Safety

WARNING! When using hazardous chemicals, take all suitable protective measures, such as wearing protective glasses and gloves resistant to the chemicals used. Follow local regulations and instructions for safe operation and maintenance of the system.

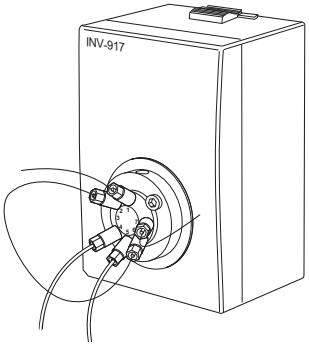
1 Introduction

2 Installation

2.1 Unpacking

CAUTION! Before connecting valve INV-917 ensure the power is switched OFF at the system pump or the complete system.

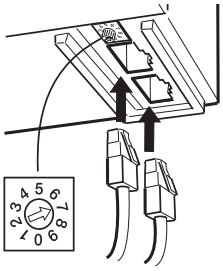
Unpack the valve and check the items against the packing list. Inspect the items for obvious damage which may have occurred during transportation.



2.2 Installing the valve

1 Connect the valve with two UniNet cables (or a termination plug) as a part of the UniNet 2 chain.

2 Set the ID-switch at the bottom to the required valve number 0 to 9. In ÄKTAmicro, the Injection valve has ID no. 1 and the Flow direction valve ID no. 2.

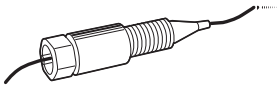


Note: All valves must have different numbers.

3 Mount the valve vertically, in the way it is shown in the user documentation of your ÄKTA liquid chromatography system.

4 Apply an identification number from the labels supplied. The number should be the same as that of the rotary switch at the bottom of the valve. Place the number so that it is easily readable from the front.

5 Connect the tubing.



6 For example, when using INV-917 in the ÄKTAmicro system, connect the tubing as follows:

Port	Connect to
1	Column inlet
2	Sample loop
3	Injection port
4	Waste
5	Waste
6	Sample loop
7	Outlet of the pump

Note: The ÄKTAmicro system has two Valve INV-917. One is used as an injection valve, and the other one as a flow direction valve. Refer to the system documentation for detailed information on the tubing configuration.

3 Operation

The valve is controlled from UNICORN. The instructions are found in ***System Control: Manual:Flowpath.*** When used as an Injection valve, use the instruction ***InjectionValve.*** When used as a Flow direction valve, use ***FlowDirectionValve.***

The valve can be set in 3 positions:

Injection valve

- LOAD (home position)
- INJECT
- WASTE

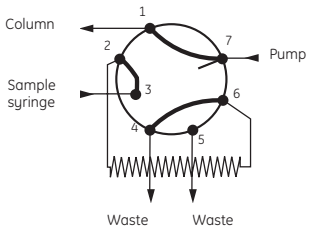
Flow direction valve

- Position 1
- Position 2 (home position)
- Position 3

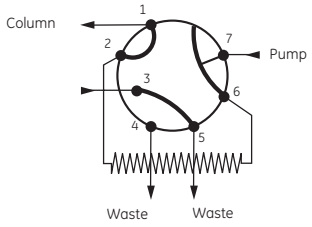
If the valve is not activated, it is in its home position.

The illustrations below show the connections in an ÄKTAmicro system when used as injection valve.

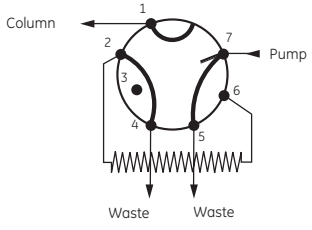
LOAD



INJECT



WASTE



3.1 Manual sample loading

The sample loop can be loaded with a syringe. Connect Superloop with the bottom tubing connected to port 2 and the upper tubing to port 6.

For smaller volumes use a injection needle together with the injection fill port as described below.

Note: The thread is left-handed.

1 Mount the sample loop between ports 2 and 6.

2 Loosely thread the injection fill port screw into Injection valve port 3.

3 Attach the injection needle (o.d. 0.7 mm) to the sample syringe.

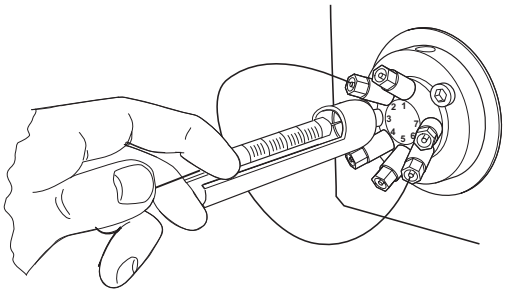
4 Pass the injection needle through the hole in the syringe holder.

5 Insert the injection needle to the bottom of the injection fill port.

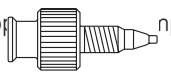
6 Tighten the fill port until the nozzle has formed a seal around the needle tip.

7 Fit the syringe holder on the fill port.

For large volumes, use a luer female / 1/16" male union connected to port 3.



Two techniques can be used for filling the sample loop: partial and complete filling.



Type of filling	Volume to load
Partial filling	Max 50% of the sample loop volume
Complete filling	2 to 5 times the sample loop volume

3.1.1 Partial Filling

Partial filling is used when high recovery is required. Partial filling allows the injected volume to be changed without changing the loop and does not waste sample.

Partial filling is achieved as follows:

1 Set Injection valve to position LOAD.

2 Load the syringe with a large volume of buffer (5 times the loop volume).

3 Fill the sample loop carefully with buffer.

4 Set the Injection valve to position INJECT and then take out the syringe.

Note: If the syringe is taken out when the Injection valve is in position LOAD, self drainage will occur and air will enter the sample loop.

5 Load the syringe with the required volume of sample. No more than half (50%) a loop volume of sample should be loaded into the loop.

6 Insert the syringe in position 3 on the Injection valve. Set the Injection valve to position LOAD.

Note: Do not load the sample before the valve is in position LOAD.

7 Gently load the syringe contents into the loop.

8 Leave the syringe in position. The sample will be injected onto the column when the valve is switched to INJECT in the method.

3.1.2 Complete filling

In this method an excess of sample is used to ensure that the sample loop is filled completely, allowing reproducible sample volumes. In preparative applications the sample volume should be at least 2 times the volume of the sample loop. For analytical reproducibility a sample volume 5 times the volume of the sample loop should be used. With complete filling the sample volume can only be changed by changing the loop size.

Complete filling is achieved as follows:

1 Set valve to position LOAD.

2 Load the syringe with sample (2-5 times the loop volume).

3 Gently load the syringe contents into the loop.

4 Leave the syringe in position. The sample will be injected onto the column when the valve is switched to INJECT in the method.

Note: If the syringe is taken out before the sample is injected onto the column, self drainage will occur and the loop will be emptied.

3.1.3 Emptying the sample loop

When emptying the sample loop a buffer volume of approximately 5 times the sample loop volume should be used to flush the loop and ensure that all sample is injected into the column.

3.2 Storage

Overnight: The valve can be left filled with a buffer.

Weekend or long term storage: Flush the valve with water and then fill it with 20% ethanol.

4 Maintenance

4.1 Periodic maintenance

Period	Action
Every 12 months or when required	Change channel plate and distribution plate

4.2 Cleaning-in-place

Pump a cleaning or sanitizing agent through the valve. The standard recommendation is to pump 1 M NaOH at 1 ml/min for 30 minutes and then wash out with buffer.

4.3 Changing channel plate and distribution plate

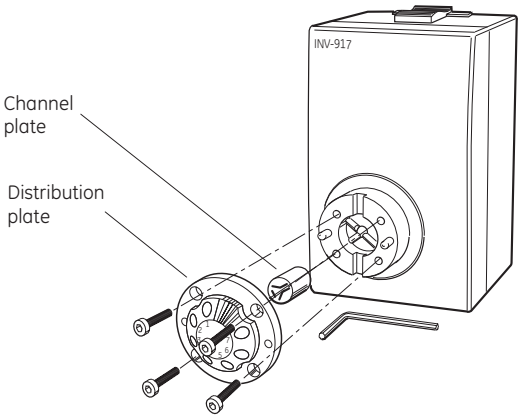
A replacement kit, Valve Kit INV–917, is available (see ordering information in Reference Information).

1 Ensure that the valve is in position 1 and then disconnect it from the pump.

2 Remove the 4 screws on the front using the supplied 3 mm Allen key Loosen each one equally in turn so the distribution plate comes off parallel to the valve body.

3 Slide the screws out

4 Remove the distribution plate containing the ports.



5 Remove the old channel plate and insert a new one.

6 Remount a new distribution plate so that the port numbers on the plate, 1 to 7, are horizontal. Using the Allen key, tighten the 4 screws in turn, a little at a time, until the distribution plate is fixed to the valve body.

Note: The distribution plate is springloaded which creates some resistance when tightening the screws.

4.4 Recycling

This symbol indicates that the waste of electrical and electronic equipment must not be disposed as unsorted municipal waste and must be collected separately. Please contact an authorized representative of the manufacturer for information concerning the decommissioning of equipment.

5 Troubleshooting

If the suggested actions do not correct the fault, call GE Healthcare.

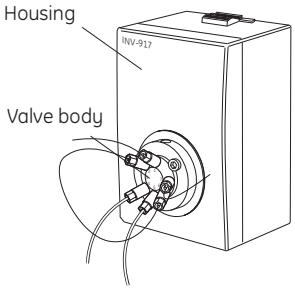
Fault	*Action*
The valve is not switching	1 Check the connection to the pump. The valve should be connected to the UniNet 2 socket, not the UniNet 1 socket. 2 Check the ID-switch on the valve. The ID number is shown in the flow scheme in System Control in UNICORN. 3 Check the UniNet cable and replace if required.
The valve is switching to wrong position	The valve parts may have been incorrectly assembled after replacement. • Check that the port numbers on the plate 1 to 7 are horizontal.
External leakage	Check the tubing connections. Tighten or replace if required.
Internal leakage	Internal leakage is easy to detect at the small hole on the underside of the valve body. • Internal valve parts may be worn. Change channel plate and distribution plate according to section 4.
High back pressure (clogging)	1 Do cleaning-in-place according to the instructions in section 4. 2 Change channel plate and distribution plate according to section 4.
Other faults	Contact GE Healthcare.

6 Reference information

6.1 Description

The valve consists of two main parts:

- Housing which encloses the motor and electronics.
- Valve body with a rotating central core.



As the channel plate is turned by the motor, different ports are connected. Valve switching is controlled from UNICORN by reading the actual position of the channel plate.

The smooth geometry of the valve assures that solvent or sample "memory effect" is virtually non-existing. The valve rotates the shortest way to the next position (max. 180°).

The material used in the switching parts ensures both long mechanical and chemical lifetime.

The valve housing contains no user replaceable items.

6.2 Technical specifications

Operating data

Max flow rate	10 ml/min
Max pressure	35 MPa (350 bar, 5075 psi)
Back pressure	< 100 kPa at 10 ml/min with water
Leakage	< 0.1 µl/min at 35 MPa
pH stability range	1 to 13, 1 to 14 (< 1 day exposure)
Viscosity	Max. 3 cP
Switch time	< 260 ms between two adjacent positions
Operating life time	> 50 000 cycles, two adjacent positions
Environment	+4 to +40 °C, 20 to 95% relative humidity 84 to 106 kPa (840 to 1060 mbar) atmospheric pressure

Physical data

Internal volume	
Pos 1 LOAD	
Port 1 to 7	1.5 µl
Port 2 to 3	1.2 µl
Port 4 to 6	1.5 µl
Pos 2 INJECT	
Port 1 to 2	1.2 µl
Port 3 to 5	1.5 µl
Port 6 to 7	1.2 µl
Pos 3 WASH	
Port 2 to 4	1.5 µl
Port 5 to 7	1.5 µl
Flow channel diameter	0.3 mm
Valve principle	Motor controlled valve
Functions	Switching 3 positions controlled from UNICORN
Degree of protection	IP 43
Wetted materials	PEEK (polyetheretherketone)
Chemical resistance	The wetted parts are resistant to organic solvents and salt buffers commonly used in chromatography of biomolecules, except 100% ethyl acetate, 100% hexane and 100% tetrahydrofuran (THF)
Power requirement	32 V DC ±10% from the system
Power consumption	Up to 9 W
UniNet 2 address	0 to 9
Inlet and outlet tubing	UNF 10 to 32 Fingertight, narrow-head connector for tubing (or sleeve) with 1/16" outer diameter
Dimensions,	
H × W × D	135 × 80 × 120 mm
Weight	1.2 kg
EMC Standards	This product meets the requirements of the EMC Directive 2004/108/EC through the harmonized standard IEC/EN 61326–1:1997 + A1:1998 (emission and immunity).

Safety standards

This product meets the requirement of the Low Voltage Directive (LVD) 2006/95/EC through the following harmonized standards:

- EN61010-1
- IEC 61010-1
- CAN/CSA-C22.2 No. 61010-1
- UL61010-1

Note: The declaration of conformity is valid for the instrument when it is

- used in laboratory locations
- used in the same state as it was delivered from GE Healthcare except for alterations described in the user manual
- connected to other CE labelled GE Healthcare instruments or other products as recommended.

6.3 Accessories and spare parts

Item	Quantity per pack	Code no.
Valve INV-917 including one UniNet cable (fill port, needle and syringe holder are not included)	1	18-1147-23
Injection kit INV-907 incl. fill port, needle and syringe holder	1	18-1110-89
Valve kit INV-917 including channel plate and distribution plate	1	18-1147-56
Sample loops		
1 µl	1	18-1147-15
10 µl	1	18-1147-16
100 µl	1	18-1147-17
Cable UniNet, 0.7 m	1	18-1109-74
Mounting bracket	1	18-1109-11
Stop plug, 1/16"	5	18-1112-52
Union Luer female/1/16" male	2	18-1112-51
Union Luer 1/16" female/M6 male	6	18-1112-57
Union M6 female/1/16" male	8	18-1112-58
Fill port, INV-907	1	18-1127-66
PEEK tubing, i.d. 0.15 mm, o.d. 1/16"	2 m	18-1156-59
PEEK tubing, i.d. 0.25 mm, o.d. 1/16"	2 m	18-1120-95
Tefzel™ tubing, i.d. 0.25 mm, o.d. 1/16"	2 m	18-1121-36
Fused silica tubing kit i.d. 0.10 mm	1	18-1147-13
Fused silica tubing kit i.d. 0.15 mm	1	18-1147-14
Fingertight, narrow-head connector, PEEK, 1/16"	10	18-1147-10
Sleeve for 18-1147-10, o.d. 1/16", i.d. 305 µm	10	18-1156-63
Sleeve for 18-1147-10, for i.d. 0.10 mm capill.	10	18-1147-11
Sleeve for 18-1147-10 for i.d. 0.15 mm capill.	10	18-1147-12

For local office contact information, visit
www.gelifesciences.com/contact

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