



Ingenieurbüro CAT
M. Zipperer GmbH

Service Instructions

DP 200-Pump



Contents:

1	User Instructions	3
1.1	Important Instructions for your safety	3
1.2	Danger symbols and levels in this operating manual.....	4
2	General safety warnings and instructions.....	5
2.1	Warning signs on the device	6
3	Cleaning and Maintenance.....	7
3.1	Cleaning the pumphead	8
4	Exchange of a pump head	9
5	Checking the volume.....	10
5.1	Procedure of checking	10
6	Adjustment of a pump (calibration).....	12
6.1	Return to factory calibration	13
6.2	Changing of the calibration value via interface	13
7	Dismantling and Disposal.....	14
7.1	Dismantling	14
7.2	Disposal	14
8	Transport and Storage	14
8.1	Transport/Storage	14
8.2	Return for repair or calibration.....	15
9	Technical Data	16
9.1	Chemical resistance:.....	16
	Declaration on the Absence of Health Hazards	16

1 User Instructions

1.1 Important Instructions for your safety



The DP 200 pump has been constructed according to state-of-the-art technology and recognized safety instructions. However, risks may still arise during installation, operation and maintenance.

To maintain the proper safety and operational functions of the instrument, the user has to follow the instructions and safety guidelines in this manual.







- Every user must read and understand this manual completely before use. Only instructed users may operate the instrument. Failure to do so can result in serious injury or death.
- Follow general instructions for hazard prevention and general safety instructions, e.g. wear protection clothing, eye protection and gloves.
- Every user must read and understand this manual completely before use. Failure to do so can result in serious injury or death.
- Comply with all safety and accident-prevention regulations applicable to laboratory work.
- Follow general instructions for hazard prevention and general safety instructions, e.g. wear protection clothing, eye protection and gloves.
- This operating manual is part of the product. Thus, it must always be easily accessible.
- This instruction sheet does not purport to address all of the safety problems which might result from the use of this device, chemicals, reagents, apparatus or equipment employed in any specific test or protocols. It is the responsibility of the user to consult their authorized safety advisors and establish appropriate health and safety practices and then determine the application of regulatory limitations prior to use.
- Enclose this operating manual when transferring the device to another place.
- If this manual is lost, please request another one. Please contact your dealer or

Ingenieurbüro CAT
M. Zipperer GmbH
Wettelbrunner Str. 6
D-79282 Ballrechten-Dottingen
Tel.: ++49-(0)7634-5056-800
Fax: ++49-(0)7634-5056-801
www.cat-ing.de
info@cat-ing.de





1.2 Danger symbols and levels in this operating manual

The safety instructions in this manual appear with the following danger symbols and danger levels:

Danger symbols:







	Hazard point		Electrical shock
	Risk of fire		Explosion
	Bio hazard		Chemical hazard



Danger levels:

	Will lead to severe injuries or death
	May lead to severe injuries or death
	May lead to light to moderate injuries
	May lead to material damage


2

General safety warnings and instructions

	<p>⚠ DANGER Risk of explosion</p> <ul style="list-style-type: none"> Do not operate the device in the vicinity of highly flammable or explosive substances. The instrument is not explosion-proof. Do not use this device for processing any substances which could generate an explosive atmosphere. Do not use this device to process any explosive or highly reactive substances.
	<p>⚠ DANGER Electric shock as a result of penetration of liquid.</p> <ul style="list-style-type: none"> Do not allow any liquids to penetrate the inside of the power supply Switch off the device and disconnect the power plug before starting cleaning or disinfection work. The On/Off Switch on the device does not disconnect the device from the power source. Only plug the device back in if it is completely dry, both inside and outside.
	<p>⚠ WARNING Electric shock due to damage to device or mains cable</p> <ul style="list-style-type: none"> Only connect the power supply to the mains supply if the device and the mains cable are undamaged Only use devices that have been properly installed or repaired. In case of danger, disconnect the device from the mains supply by pulling the power plug from the mains socket or by using the isolating device intended for this purpose (e.g. emergency stop switch)
	<p>⚠ WARNING Damages to health due to infectious liquids and pathogenic germs.</p> <ul style="list-style-type: none"> When handling infectious liquids and pathogenic germs, observe the national regulations, the biological security level of your laboratory, the material safety data sheets and the manufacturer`s application notes. Wear personal protective equipment For comprehensive regulations about handling germs or biological material of the risk group II or higher, please refer to the “Laboratory Biosafety Manual” in its respectively current valid version from the World Health Organisation
	<p>⚠ WARNING Damages to health due to corrosive and noxious substances</p> <ul style="list-style-type: none"> Always check the pump for leaks and air bubbles. Special attention should be directed to determine that all push-ons, threaded connections and suction tubes are firmly in place before beginning operation. Leaking solutions may endanger persons and materials Observe the nationally prescribed safety environment when working with hazardous, toxic and pathogenic samples. Pay particular attention to personal protective equipment (gloves, clothing, goggles, etc.), extraction, and the safety class of the lab. Decontaminate the device and the accessories before storage and shipping. Only employ the instrument for the purpose intended by the manufacturer, and particularly within the resistance limits of the instrument. If in doubt, contact your supplier, or the manufacturer's factory representative at the phone number shown at the front page of this operating instruction.
	<p>⚠ WARNING Risk of fire</p> <ul style="list-style-type: none"> Do not use this device to process any highly flammable liquids

	<p>⚠CAUTION Poor safety due to inadequate fixing of the unit</p> <ul style="list-style-type: none"> • Ensure that the unit is firmly attached to a solid stand.
	<p>⚠CAUTION Poor safety due to incorrect accessories and spare parts.</p> <p>The use of accessories and spare parts other than recommended by Ingenieurbüro CAT, M. Zipperer GmbH may impair the safety, function and precision of the device. Ingenieurbüro CAT, M. Zipperer GmbH cannot be held liable or accept any liability for damage resulting from the use of incorrect or non-recommended accessories and spare parts, or from the improper use of such equipment.</p> <ul style="list-style-type: none"> • Only use accessories and spare parts recommended by Ingenieurbüro CAT, M. Zipperer GmbH

2.1 Warning signs on the device

	<p>⚠WARNING This symbol indicates to read the instruction manual carefully prior to operation of the instrument. Please mark points which require special attention in your field of application so they are not overlooked. Disregarding of warnings may result in impairment of serviceability as well as impairment of the user.</p>
---	--

3 Cleaning and Maintenance



Surface and operating elements may be cleaned with a mild dishwashing detergent (water and a standard dishwashing detergent) and a soft, non-fuzzing moist cloth. Do not use a wet cloth.

Use only a small amount of dishwashing detergent. Do not use chlorine bleach or other chlorine-based cleaning products with metallic components under any circumstances. These will damage the surface of the instrument. If you use any other cleaning method please make sure that the intended method does not cause any damage to the instrument.

The pumphead must be cleaned as follows to assure proper functioning and continued accuracy.

- ***immediately***, if the motor becomes sticky or jammed.
- ***daily, after use of these liquids***
 - Solutions prone to crystallisation
 - Alkaline solutions, aromatics, chlorinated hydrocarbons scintillation liquids
 - inorganic solutions such as buret reagents
- ***periodically***, to increase the lifetime of the instrument
- ***always*** after long term storage

3.1 Cleaning the pumphead

	<p>▲WARNING</p> <p>Be careful to avoid any personal injury from used chemicals. While and even after dispensing liquids, the instrument, the filling and the discharge tubes contain the used reagent. Make sure, that during cleaning and maintenance you avoid splashing chemicals. Wear face screens, protective gloves and protective clothes.</p>
	<p>▲WARNING For a maximum of protection from health hazards caused by contaminated instruments clean and decontaminate the instrument carefully before returning. See also Chapter 8.2</p>
	<p>NOTICE The ceramic parts are subject to binding or freezing if stored after improper cleaning.</p>
	<p>NOTICE The DP 200 is a measuring instrument and designed to provide high accuracy. To maintain this accuracy we recommend that this instrument be tested at regular intervals, especially after any mishandling (such as hitting or dropping) of the instrument. The manufacturer for a small fee provides testing of the instrument. Under §4 of the Weights and Measuring Standards of 12.08.88 Germany, it is required that regular testing and inspections be performed when the DP 200 is used as a medical instrument.</p>

Cleaning procedure:

1. Hold the discharge tube over any designated dispensing receptacle and dispense the remaining reagent (select "*Manual*", enter a flowrate and press *Start*).
2. Put the suction tube into cleaning solution designated for that purpose
3. Clean the instrument by pumping. We recommend pumping a minimum volume of 50 times the amount of the stroke volume through the pump for a good cleaning.
4. Insert the suction tube into distilled water (or other liquids for sterilisation) for rinsing.

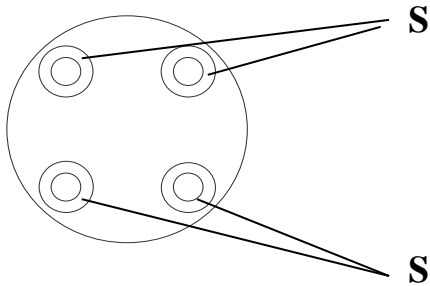
Type of pumphead	Stroke volume	Min. cleaning volume
20	20 µl	1 ml
200	200 µl	10 ml
300	350 µl	20 ml

4 Exchange of a pump head

NOTICE	The narrow clearance between the ceramic parts requires skilled handling. Do not apply force as this could damage the parts.
NOTICE	Do not try to exchange pistons from one pump to the other. Piston and cylinder form 1 pair and must always stay together.

To exchange the pump head execute the following steps:

- a. Undo the four Allen screws (S) on the pump head with a 3 mm Allen key screwdriver
- b. carefully pull out the pump head by approx. 10 mm and
- c. tilt the pump head for approx. 45° downwards and
- d. allow the drive pin on the end of the piston to slide out of the orbital drive ball.



To put the pump head back into position please follow these steps in reverse sequence. It is advisable to insert the piston about half way in the cylinder to start the assembly. At the end of this operation we recommend to check the calibration of the pump and if needed run re-calibration (see position 5 below).

5 Checking the volume

In line with ISO 9000 “Monitoring of Testing Apparatus” and GLP or when using a medium with different density and viscosity other than distilled water there is a possibility to calibrate the pumps. For adjustment of the unit please see chapter 6.

5.1 Procedure of checking

1. Fill the pump with distilled water, using the Manual mode, dispense the water into a separate vessel until there are any bubbles are in the dispensing tube left.
2. Dispense 5 ml into a vessel.
3. Weigh the dispensed quantity with a precision balance.
4. Calculate the volume, taking the temperature into account.
5. Repeat step 2-5 at least 10 times.
6. Calculate the accuracy A% and coefficient of variation CV% by means of the formulas of the statistical computation.

Calculations:

Mean value $\bar{m} = \frac{\sum m_i}{n}$ m_i : results of weighing, n : number of weighing

Mean $\bar{V} - Z$ Z : volume Z : Correction factor

Accuracy $A \% = \frac{\bar{V} - V_0}{V_0}$ V_0 : Nominal volume

Coefficient of variation $CV \% = \frac{100 s}{\bar{V}}$ s : Standard deviation of the results of weighing m_i

A detailed description of this test procedure you find e.g. in DIN EN ISO 8655-6.

Table 1: Correction factors Z ($\mu\text{l}/\text{mg}$ at 1013 hPa, abstract of EN ISO 8655-6)

Temperature °C	Correction factor Z	Temperature °C	Correction factor Z
15,0	1,00090	23,0	1,00247
15,5	1,00098	23,5	1,00259
16,0	1,00106	24,0	1,00272
16,5	1,00114	24,5	1,00284
17,0	1,00123	25,0	1,00297
17,5	1,00132	25,5	1,00310
18,0	1,00141	26,0	1,00323
18,5	1,00150	26,5	1,00336
19,0	1,00160	27,0	1,00350
19,5	1,00170	27,5	1,00364
20,0	1,00180	28,0	1,00378
20,5	1,00190	28,5	1,00393
21,0	1,00201	29,0	1,00408
21,5	1,00212	29,5	1,00422
22,0	1,00223	30,0	1,00437
22,5	1,00236		

6 Adjustment of a pump (calibration)

Pumps with the above mentioned suffixes can be user calibrated. To do this you need a calibrated balance with a precise resolution of at least 0.1 mg as well as a thermometer for precise readout of temperature. For calibration use bi-distilled and degassed water. The calibration work should be done at $\pm 0.5^{\circ}\text{K}$ constant temperature in the limits between 20° and 25°C . To calibrate your pump please proceed according to the following steps:

1. Firmly mount and tighten sucking and dispense tubing to the pump head and connect the pump to the power supply
2. Fill the pump with degassed water and make sure that all bubbles have left the pump head. Use the Manual mode
3. Select "Setup" and enter the menu with Set value
4. Select "Calibration" with Set value
5. Select "Change Usercal. > Yes" with the + button and confirm with Set value
6. Confirm filling with Set value. Before you may fill again with the Start button.
7. Enter the amount of pump strokes which you decide to use. The instrument will recommend 25 pump strokes. If you wish to use another number of pump strokes please change using the + and - button. Confirm with Set value.
8. Enter the number of test cycles. The program will offer 3 but you can vary from 1 – 10. Confirm with Set value.
9. Please tare the balance at the beginning and make sure that the vessel on the balance is able to take the liquids you intend to dispense without the need to empty or to take the vessel away from the balance.
10. Start the first measuring cycle by pressing the "Start" key. After the measuring cycle enter the balance value in grams by using the + and – button.
11. After each measuring cycle zero the balance that you can read in precise figures the next following dispensing cycle.
12. After the last measurement cycle the average weight is displayed. Confirm with Set value
13. Enter the water temperature by using the + and – buttons. The instrument is now doing the automatic calibration itself. The display shows the smallest volume amount you can dose.
14. The pump is now new adjusted, Return to the main menu with Set value.

15. The display shows now the sign “cal!” as an indication for the user calibration.

6.1 Return to factory calibration

- 1 Select “Setup” and enter the menu with Set value
- 2 Select “Calibration” with Set value
- 3 Select “Change Usercal. > Reset” with the + button and confirm with Set value

6.2 Changing of the calibration value via interface

The calibration factor can be read out and changed via interface. So you have the facility to eliminate a systematic deviation without a complete calibration cycle.

The command RCX reads the actual calibration value. The pump sends an answer with two parameters: the first shows the step volume in nl, the second parameter shows the calibration status: 0 = no calibration, 1 = factory calibration, 2 = user calibration.


The command WCU sets a new user calibration value. For a volume of 11111 nl per step send the command: *adr,WCU,11111,1234* (*adr*: address No. of the pump)

When the stepvolume is set to zero, the pump returns to the factory calibration.

Command	Description	Parameters	Range	Example
RCX	Read Calibration	1.Stepvolume in nl 2.Calibrationmodus	Type 20: 500...2000 Type 200: 5000...20000 Type 300: xxx...xxx 0 = no calibration 1 = factory calibration 2 = user calibration	Send: 1,RCX,1 answer: 1,HS,OK,5624,1 step vol: 5624 nl factory calibration
WCU	Write user calibration	1.Stepvolume in nl 2. Security parameter 1234	0 = Reset user calibr. Return to factory calibr. Type 20: 500...2000 Type 200: 5000...20000 Type 300: xxx...xxx 1234	1,WCU,10000,1234

7 Dismantling and Disposal

7.1 Dismantling

	<p>▲WARNING</p> <p>Pumphead and tubing may contain reagents, which endanger persons and material. Make sure of cleaning pumphead and tubing according Chapter 2 before removing tubing.</p>
---	--

1. Switch the instrument off.
2. Disconnect the instrument from the mains.
3. Disconnect the tubing
4. Now the instrument may be removed from the working area.


7.2 Disposal



Please dispose of used instruments and defective components at your local recycling collection point. Prior to disposal, sort according to materials: metal, glass, plastic, etc. Also be sure to dispose of the packing material in an environmental-friendly manner.

8 Transport and Storage

8.1 Transport/Storage

	<p>▲WARNING</p> <p>Pumphead and tubing may contain reagents, which endanger persons and material. Make sure of cleaning pumphead and tubing according Chapter 2 before removing tubing.</p>
---	--

Prior to transport:

Switch the instrument off and unplug the power supply.

Remove tubing and cables

Do not subject the instrument to mechanical shocks or vibration during transporting.

Place the instrument and its parts in its original packaging or another suitable container to protect it during transport. Close the packaging with adhesive tape.


In case you do not use the original packaging please mark the box with the following notes:

- Glass symbol (handle with care, fragile)
- Umbrella (keep dry)
- Content (list of content)

Store the instrument in a dry environment. Please observe the specified conditions of the ambient:

Ambient temperature: 5-40°C
Max. relative air humidity: 80%

8.2 Return for repair or calibration

	<p>▲WARNING For a maximum of protection from health hazards caused by contaminated instruments clean and decontaminate the instrument carefully before returning.</p>
---	--

We intend to give our staff a maximum of protection from health hazards caused by contaminated instruments. We therefore ask for your understanding that we cannot carry out any calibration / repair unless the

Declaration on the Absence of Health Hazards

is submitted completed and signed.

Please copy the declaration in the appendix and attach it completed and signed to the instrument when returned to your distributor or to the manufacturer.

Please provide us with the following supplementary information:

- Detected defect
- Media which the instrument has been used with

9 Technical Data



▲WARNING

The user has to determine, if the instrument is suitable for his specific application. If there are any further questions, contact your local dealer or the manufacturer.

Min volume	Type 20 : 1µl Type 200: 10µl Type 300: 20µl
Max volume	Typ 20: 50 ml Typ 200 : 500 ml Typ 300 : 750 ml
Min flow-rate	Typ 20: 0,02 ml/min Typ 200: 0,2 ml/min Typ 300: 0,3 ml/min
Max flow-rate	Typ 20: 4 ml/min Typ 200: 40 ml/min Typ 300 : 60 ml/min
Precision	EV <= 1 %
Accuracy	CV <= 0.5 %
Counter pressure	up to 6 bar, depends on viscosity, max flow rate and pumphead type
Interface	RS 485 Data transfer rate:1200, 2400, 4800, 9600 bd (Default:9600) Databits: 8 Bit Parity: no parity Stopbits: 1 Stopbit
Electrical power requirements	24V 2000 mA
Dimensions (W x H x D)	72 mm x 165 mm x 160 mm
Ambient temperature	5 - 40 °C
Max. air humidity	80 % relative humidity
Protection class (DIN 40050)	IP40
Protection class (DIN EN 61140)	Protection class I
Weight	1,6 kg

9.1 Chemical resistance:

The materials, which come into contact with the delivered medium, are either

Aluminium oxide (99,7% Al₂O₃) or

PVDF

These materials guarantee a high resistance against almost all aggressive media.

Declaration on the Absence of Health Hazards

Please copy this declaration and attach it completed and signed to the instrument

Device designation:.....

Serial No.:

The Undersigned hereby declares:

- ◆ That the instruments have been carefully cleaned and decontaminated before shipment.
- ◆ That the instruments pose no danger through bacteriological, chemical, radiological or viral contamination.
- ◆ To be authorised to make declarations on behalf of the Institution represented.
- ◆ That he / she is aware that shipment of contaminated instruments is a violation of law, and that he / she personally and the Institution represented may be held liable for any damages caused by contaminated instruments.
- ◆ For calibrating service only: minor repairs of a value up to € 30,-- + VAT will be carried out and invoiced without further queries (cross out if not applicable).

Sender:

Firm / Laboratory:

.....

Name

.....

Address:

Position

.....

Date, Signature

.....

Tel. for enquiry:

.....

.....

- ◆ In case of Return for Repair, please provide us with the following supplementary information:
Detected defect:

.....

Media which the instrument has been used with:

.....