Operating Instructions

smartBOX – eco-PEN controller

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## Contents

1 General information ................................................................. 23  
   1.1 The smartBOX ................................................................. 23  
   1.2 Intended Use of Unit ........................................................ 23  
   1.3 Scope of delivery ............................................................ 24  
2 Safety instructions ................................................................. 25  
   2.1 General safety information .............................................. 25  
   2.2 Dangers for the operator .................................................. 25  
   2.3 Electrical safety instructions ............................................ 25  
   2.4 Safety Instructions for Auxiliary and Operating Materials .... 25  
3 About your dispensing unit ....................................................... 26  
4 Installation ............................................................................ 27  
   4.1 Hardware Setup ............................................................... 27  
   4.2 Software Update ............................................................. 33  
5 Operation ............................................................................ 34  
   5.1 Service menu ................................................................. 34  
   5.2 Status menu ................................................................. 35  
   5.3 Alarm .......................................................................... 35  
6 Programming JR/VR 3000 robot series ....................................... 36  
   6.1 Pre-setting of smartBOX – Program specific settings ....... 36  
   6.2 Pre-setting of smartBOX – General dispenser settings ....... 39  
   6.3 Pre-setting of smartBOX – Point teaching ....................... 40  
7 Maintenance and Cleaning ...................................................... 44  
8 Disposal ........................................................................... 44  
9 Technical data ..................................................................... 44  
10 Declaration of Conformity ..................................................... 45
1 General information

Dear customer,

Thank you for choosing our smartBOX for control of our eco-PEN. To ensure proper operation, please carefully read the following pages for correct operating and maintenance instructions. Keep these instructions handy for future reference. If you require further information or if you have any questions please contact us directly at:

Phone: +49 8166 6784 -0
Email: info@dosieren.de

1.1 The smartBOX

The digital eco-PEN valve controller series smartBOX can be set-up with different options specifying various technical differences. Therefore the following manual deals only with our smartBOX.

The digital dispenser smartBOX is used for precise control of preeflow® eco-PEN volumetric dispensing valves type: eco-PEN300/330/450/600/700 in combination with VR/JR3000 dispensing robots.

1.2 Intended Use of Unit

The device is designed and constructed for commercial use only. It is only to be used for dispensing liquid and paste materials such as adhesives, lubricants, various pastes, grease, oil, silicone and other similar materials. Any other use is considered improper. If this device is used for other purposes, personal injury or damage to property may result.

The manufacturer assumes no responsibility for consequences resulting from improper use of the unit.

Non-intended use, which would also void the warranty, includes:

- Changes to the device not expressly recommended in the operating instructions
- Modifications to the unit and its components
- Use of incompatible or damaged spare parts
- Use of non-approved accessories or auxiliary equipment
- Exceeding the approved and recommended pressures
1.3 Scope of delivery
The following accessories are included with the smartBOX:

- operating instructions
- smartBOX controller
- input power cord 230 V AC (Item no. 504576)
- PCB board (in ESD box) (Item no. 504609)
- internal PCB cord (included in 504609)
- PCB mounting bolts (included in 504609)
- I/O cord to JR/VR 3000 robots (Item no. 504608)
- retaining plate with screws and washers (only with green smartBOX) (Item no. 502901)
- USB pen drive (Item no. 503659)

NOT included:
- mounting plate (only JR3200 option) (Item no. 502914)
2 Safety instructions

2.1 General safety information

⚠️ WARNING
If this device is used for purposes other than those described in this operating manual, personal injury or damage to property may result. Only use the device in accordance with the enclosed instructions.

2.2 Dangers for the operator

⚠️ CAUTION
Read the operating instructions carefully before use. Always wear suitable protective clothing and eye wear.

Smoking or open flames are strictly prohibited when dispensing any type of flammable liquid or paste.

This device is intended for indoor use only.

2.3 Electrical safety instructions

⚠️ WARNING
Before opening the dispensing unit, disconnect it from the power supply by disconnecting the input power cord.

Failure to disconnect input power may risk electrical shock.

Maintenance of the unit only by authorized and approved personnel. The unit may only be operated by a trained and authorized electrical personnel.

Operate the device exclusively within the maximum permitted rated power / settings.

2.4 Safety Instructions for Auxiliary and Operating Materials

⚠️ NOTICE
For details on proper handling and safety precautions, for materials to be dispensed ALWAYS check the Material Safety Data Sheet (MSDS).
3 About your dispensing unit

1 Display
2 Operating controls
3 eco-PEN connector port
4 I/O port
5 Main Power input
6 Fuse 2 amp
7 Main power switch

Operating Instructions smartBOX
4 Installation

4.1 Hardware Setup

Step 1  Open the robot on the backside.

Step 2  Remove the cover under the worktable.

Step 3  Remove the marked screw.
Step 4  Disconnect the home sensor of the X-axis and let the cord fall inside the robot housing.

Step 5  Unscrew the marked screws on the left and right side of robot front cover.

Step 6  Remove the robot front cover from main body of the robot housing. Then pull the drawer with the control unit about 10 cm out of the housing.
Step 7  Remove the marked screws from the main PCB board.

Step 8  Mount the 4 mounting bolts instead of the screws which were removed.

Step 9  Mount the PCB and attach it with the screws which were removed previously.
Step 10  Mount the connector on the robot backside at position I/O-MT.

Step 11  Connect the two connectors to the PCB.
Step 12 Close the robot housing – following step 6 to 1 in reverse order.

Step 13 Mount the retaining plate to the side mounted terminal box.

Step 14 Remove the top cover screws and use them for fixing the smartBOX cover.

Step 15 Mount the smartBOX and fix it with the screws from Step 14.
Step 16  Connect the I/O cord from smartBOX to robot.

Step 17  Connect the eco-PEN valve to the smartBOX.
4.2 Software Update

To extend the robot software with the functions of the smartBOX, a firmware update must be installed.

Please follow these steps:

• Switch OFF power to the robot.
• Plug in the USB pen drive to frontside MEMORY port.
• Switch ON power to the robot.
• The update of robot firmware starts automatically.
• Wait until update is finished. Therefore observe the teach- and startbox.
• Switch OFF power to the robot.
• **Unplug the USB pen drive.**

Now the system is ready for operation.
5 Operation

5.1 Service menu

To enter the service menu hold the UP and DOWN Button pressed while powering up the smartBOX.

Use UP and DOWN, ESC and ENTER to navigate through the menu and change settings.

- **Firmware**: Shows the actual installed firmware version
- **Ser.Nr.**: Shows the serial-number of the smartBOX
- **Language**: setting of language for boot welcome
- **Statmenu**: **YES** - after booting process, the smartBOX display switch automatically after 3 sec. to the STATUS Menu
  
  **NO** – after booting process, the smartBOX display stays in smartBOX screen.
- **Dispense**: **YES** – smartBOX has normal function incl. dispensing
  
  **NO** – Although dispensing is active in the robot settings, the ecoPEN valve does not dispense – needed for TEST RUN for running the Robot program without dispensing
- **Save**: save the actual settings and leave the SERVICE Menu
- **I/O-Monitor**: open the test menu for I/O-test with JR/VR3000 robot series
- **Test menu**: service and test – password detected
5.2 Status menu

connected eco-PEN type

Dispensing result OK / Not OK (depends on robot settings) see individual program settings

eco-PEN status:
- STOP (Dispense ON)
- STOP (Dispense OFF)
- eco-PEN is dispensing
- eco-PEN suck back is running

5.3 Alarm

If the smartBOX does not get any encoder feedback from eco-PEN Motor, for example if Encoder is broken or the motor is blocked, because of a defective eco-PEN pump, the display shows following ERROR message:

Check the eco-PEN valve. If something is blocked or if the motor or encoder is defect, press ESC to Restart the smartBOX.
6 Programming JR/VR 3000 robot series

The following information covers the smartBOX specific settings on the robot side.
For more information regarding programming please also refer to the original manual.

6.1 Pre-setting of smartBOX – Program specific settings

Always execute the following procedure as a first step when creating a new dispensing program.

Switch to teaching mode.

Choose a program number and navigate to the following menu.

MENU / INDIVIDUAL PROGRAM SETTINGS / DISPENSE CONDITION:

Page 1:

<table>
<thead>
<tr>
<th>PROGRAM 26</th>
<th>1/2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wait Time at Start</td>
<td>0.2 sec</td>
</tr>
<tr>
<td>Wait Time at Stop</td>
<td>0.3 sec</td>
</tr>
<tr>
<td>Return Type</td>
<td>Invalid</td>
</tr>
<tr>
<td>eco-PEN Models</td>
<td>eco-PEN450</td>
</tr>
<tr>
<td>Flow Rate Conv. Coef.</td>
<td>0.06</td>
</tr>
<tr>
<td>Flow Rate Adj. Value</td>
<td>100 %</td>
</tr>
<tr>
<td>Flow Rate Max. (ml/min)</td>
<td>6</td>
</tr>
<tr>
<td>Waiting Time to Suckback</td>
<td>0.15 sec</td>
</tr>
<tr>
<td>Suckback Amount</td>
<td>50</td>
</tr>
<tr>
<td>Suckback Amount Unit</td>
<td>ul</td>
</tr>
<tr>
<td>Suckback Speed</td>
<td>1.2</td>
</tr>
<tr>
<td>Suckback Speed Setting Unit</td>
<td>ml/min</td>
</tr>
</tbody>
</table>

Page 2:

<table>
<thead>
<tr>
<th>PROGRAM 26</th>
<th>2/2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dispense Amount Display</td>
<td>Valid</td>
</tr>
<tr>
<td>Dispense Amount Decision</td>
<td>Valid</td>
</tr>
<tr>
<td>Decision Threshold</td>
<td>10 %</td>
</tr>
<tr>
<td>Flow Rate Calibration</td>
<td></td>
</tr>
</tbody>
</table>
Wait Time at Start
Dispensing time executed before the robot starts to move. This option might be useful to get your material flowing evenly, especially for material with high viscosity. Please also see the diagram below for explanation.

Wait Time at Stop
Wait time after the robot movement in order to stop the material flow and allow to equalize the outlet pressure to prevent unwanted material deposition. Please also see the diagram below for explanation.

Return Type
Retract movement of the robot after reaching the end of a dispense line. This is a feasible option to lay down excess material in a controlled way in order to get accurate dispense line ends.
- Z up only: A retract movement in the z-axis only
- XY moving after Z up: A retract movement in the z-axis followed by a retract movement in the XY axis
- XYZ simultaneous: Retract movement of all three axis

Specify the desired distances and speed for the retract movement as well as the desired wait time after the retract movement via:
Z return Height,
XY return dist.,
Return line speed and
Wait time after return.
**eco-PEN Models**
Select the eco-PEN you are using in this program. It is recommended to execute auto recognition.

**Flow Rate Conv. Coef.**
Conversion coefficient for flowrate calibration. This value is specific to the eco-PEN model and must not be changed by the user unless within the calibration routine.

**Flow Rate Adj. Value**
Adjustment value used to compensate for changes in the flowrate caused by a change of the dispensing material or wear of the eco-PEN.

**Flow Rate Max. (ml/min)**
Highest acceptable flowrate for the selected eco-PEN model.

**Waiting Time to Suck back**
Wait time between forward and backward rotation (suck back) of the eco-PEN.

**Suck back Amount**
Quantity of eco-PEN suck back.

**Suck back Amount Unit**
Unit for the eco-PEN suck back in [µl], [ml] or [g].

**Suck back Speed**
Rotation speed for the backward rotation of eco-PEN.

**Suck back Speed Setting Unit**
Unit for eco-PEN suckback in [ml/min], [µl/s] or [%].

**Dispense Amount Display**
Valid: The dispensed amount (measured via the eco-PEN rotational encoder steps) gets shown in the display of the teaching pendant after the dispensing is finished.

Invalid: Dispensed amount does not show up.

**Dispense Amount Decision**
Valid: The dispensed amount (measured via eco-PEN encoder steps) is checked for being in the acceptable range. A status message (OK/NOK) will be shown on the smartBOX display after dispensing.

Invalid: No tolerance check is performed.
Decision Threshold  
Tolerance (± [%]) for dispense amount measurement via the eco-PEN Encoder steps

Flow Rate Calibration  
Starts the calibration procedure of the flowrate either by weight or volume.

6.2 Pre-setting of smartBOX – General dispenser settings

Navigate to the following menu:

MENU / DISPENSER SETTINGS

<table>
<thead>
<tr>
<th>Dispenser Settings</th>
<th>I/O-Function Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purge Switch</td>
<td>Invalid during run</td>
</tr>
<tr>
<td>Purge by ex. Signal</td>
<td>Invalid during run</td>
</tr>
<tr>
<td>Automatic purge</td>
<td>Invalid</td>
</tr>
<tr>
<td>Purge Dispense Amount</td>
<td>100</td>
</tr>
<tr>
<td>Purge Dispense Amount Unit</td>
<td>µl</td>
</tr>
<tr>
<td>Purge Flow Rate</td>
<td>2.5</td>
</tr>
<tr>
<td>Purge Flow Rate Unit</td>
<td>ml/min</td>
</tr>
</tbody>
</table>

I/O-Function Assignment  
Not relevant for smartBOX settings. For detailed information please refer to the original robot manual.

Purge Switch  
Defines when the Purge Button on the Startbox is active.

Purge by ex. Signal  
Defines if an external signal for the Purge function should be used.

Automatic purge  
If you have a dispensing material with limited "pot time" due to curing you can use the Automatic purge function to purge material in fixed intervals during standby.

Purge Dispense Amount  
Defines the quantity of material per purge cycle

Purge Dispense Amount Unit  
Defines the unit for the purge quantity ([ml], [µl], [sec])

Purge Flow Rate  
Defines the flowrate when using the Purge function

Purge Flow Rate Unit  
Defines the unit of the flowrate used by the Automatic Purge function
6.3 Pre-setting of smartBOX – Point teaching

For detailed instructions regarding the teaching process please also read the original robot manual.

First move the robot axis to the desired coordinate by using the JOG-Keys and press ENTER to get into the point menu.

You have the following point types available:

![Select Point Type 1/2](image1)

- Point Dispense
- Start of Line Dispense
- Line Passing
- CP Arc Point
- End of Line Dispense
- Wait Start Point
- PTP Point
- CP Start Point
- CP Passing Point
- CP Stop Point
- CP End Point
- PTP Evasion Point

![Select Point Type 2/2](image2)

- Circle Start Point
- Circle Center Point
- X Needle/4-Axis TCP Measure Point 1
- Y Needle/4-Axis TCP Measure Point 2
- Single Camera Shoot Point
- Double Camera Shoot Point 1
- Double Camera Shoot Point 2
- Standby Point on Camera Error
The following description only covers the smartBOX specific Point Types. For all other point types please also read the original robot manual.

6.3.1 Point Dispense

Dispensing a certain quantity on a point without movement of the robot axis.

You have to specify the following parameters:

**Setting unit:** Choose whether you want to specify the quantity by volume ([µl], [ml]), time ([msec], [sec]) or weight ([mg], [g])

**Dispense Amount:** Specify the quantity in the unit chosen before

**Setting unit:** Choose whether you want to specify the flowrate by percentage of the max. flowrate ([%]) or directly ([ml/min])

**Flowrate:** Specify the flowrate in the unit chosen before

6.3.2 Line Dispensing

Dispensing during axis movement of the robot. The minimum information is a “Dispense Line Start” followed by a “End of Line Dispense”. Direction changes can be performed by inserting a “Line passing” for sharp corners or “CP Arc Point” for arc movements as shown in the following picture.
**Start of Line Dispense**

You have to specify the following parameters:

**Line Dispense Setting Unit** Choose whether you want to specify the speed/quantity by axis speed ([mm/s]), volume ([µl], [ml]) or weight ([mg], [g])

-> Enter the numeric value of the speed/quantity chosen before

**Setting Unit** Chose whether you want to specify the flowrate by percentage of the max. flowrate ([%]) or directly ([ml/min])

-> Enter the numeric value of the flowrate chosen before

If you specify a volume or weight as well as a flowrate the movement speed of the robot axis will be set automatically so that it matches the specified amount.

**Line Passing**

Change of direction during a Line Dispensing. Please also refer to the picture above. You have the following options:

**Dispense Output** Choose whether you want to continue (ON) or stop the dispensing (OFF) when passing the set point

The following two options are only necessary if you specified an axis speed ([mm/s]) on the Start of Line Dispense. Please also see the picture below for explanation.

**Line Speed** Specify the axis speed in [mm/s] to which the axis should change when passing the set point

**Keep / Change**

Keep: Choose this option if you want the line width to be constant (the flowrate will be increased/decreased automatically based on change in axis speed)

Change: Choose this option if you don't want the line width to be constant. No change of the flowrate specified on the line start will be performed.
**CP Arc Point**

Performs an arc movement using the specified coordinate as a radius. Please also refer to the picture above. Note: A CP Arc point always needs a Start of Line dispense/Line passing before and a Line passing/End of Line dispense after the CP Arc Point. Otherwise a point type error will occur.

**End of Line Dispense**

Set this point to the coordinate where you want to stop the line dispensing. Please also refer to the picture above.
7 Maintenance and Cleaning

The smartBOX is maintenance-free. Any required repairs must be performed by an authorized repair center or only by sending the unit back to VIEWEG GmbH.

To clean the unit and the housing, use only dry or damp cloths and never use cleaning fluids such as gasoline, thinners or any other flammable or corrosive liquid.

8 Disposal

At the end of its service life, dispose of the controller in accordance with the applicable local regulations.

- Electrical parts cannot be disposed along with household waste.

According to Directive 2012/19/EU on Waste Electrical and Electronic Equipment (WEEE), electrical equipment must be returned to the collection points set up for this purpose in order to be reused.

9 Technical data

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outer dimensions (W x H x D)</td>
<td>270 x 80 x 80 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>approx. 0,80 kg</td>
</tr>
<tr>
<td>Power supply</td>
<td>85 – 264 V AC 50/60 Hz</td>
</tr>
<tr>
<td>Internal voltage</td>
<td>24 V DC</td>
</tr>
<tr>
<td>Display</td>
<td>2,4 “TFT</td>
</tr>
<tr>
<td>Compatible robot types</td>
<td>VR3000 series VIEWEG</td>
</tr>
<tr>
<td></td>
<td>JR3000 series JANOME</td>
</tr>
<tr>
<td>Compatible eco-PEN valves</td>
<td>eco-PEN300</td>
</tr>
<tr>
<td></td>
<td>eco-PEN330</td>
</tr>
<tr>
<td></td>
<td>eco-PEN450</td>
</tr>
<tr>
<td></td>
<td>eco-PEN600</td>
</tr>
<tr>
<td></td>
<td>eco-PEN700</td>
</tr>
</tbody>
</table>
CE Declaration of Conformity

- EC Low Voltage Directive 2014/35/EU
- EC Directive Electromagnetic Compatibility 2014/30/EU

We hereby declare that the product named below complies with the provisions of the above-mentioned directives and, due to its design and construction, as well as the version marketed by us, complies with the applicable regulations and the relevant provisions.

Product: eco-PEN Valve Controller
Type: smartBOX

Manufacturer: VIEWEG Dosier- und Mischtechnik
Gewerbepark 13
85402 Kranzberg
Germany
Tel.: +49 8166 6784 -0
Fax: +49 8166 6784 -20

The following harmonised European standards have been applied:

- DIN EN ISO 61000-6-3 Interference emissions
- DIN EN ISO 61000-6-2 Interference immunity

Till Vieweg, Managing Director
Kranzberg, January 2020