d.Drive DISPENSE C30 SPS

Manual

Firmware version15.08.2019

Table of Content

1 Scope of Delivery

Product number: 900764-SPS

Scope of delivery: d.Drive Dispense C30 SPS
Valve (3-2) PTFE/PCTFE, ¼-28-UNF (pre-assembled)
24 V/DC power supply

Not included: Syringe
Fluidic connections
Adapter cable

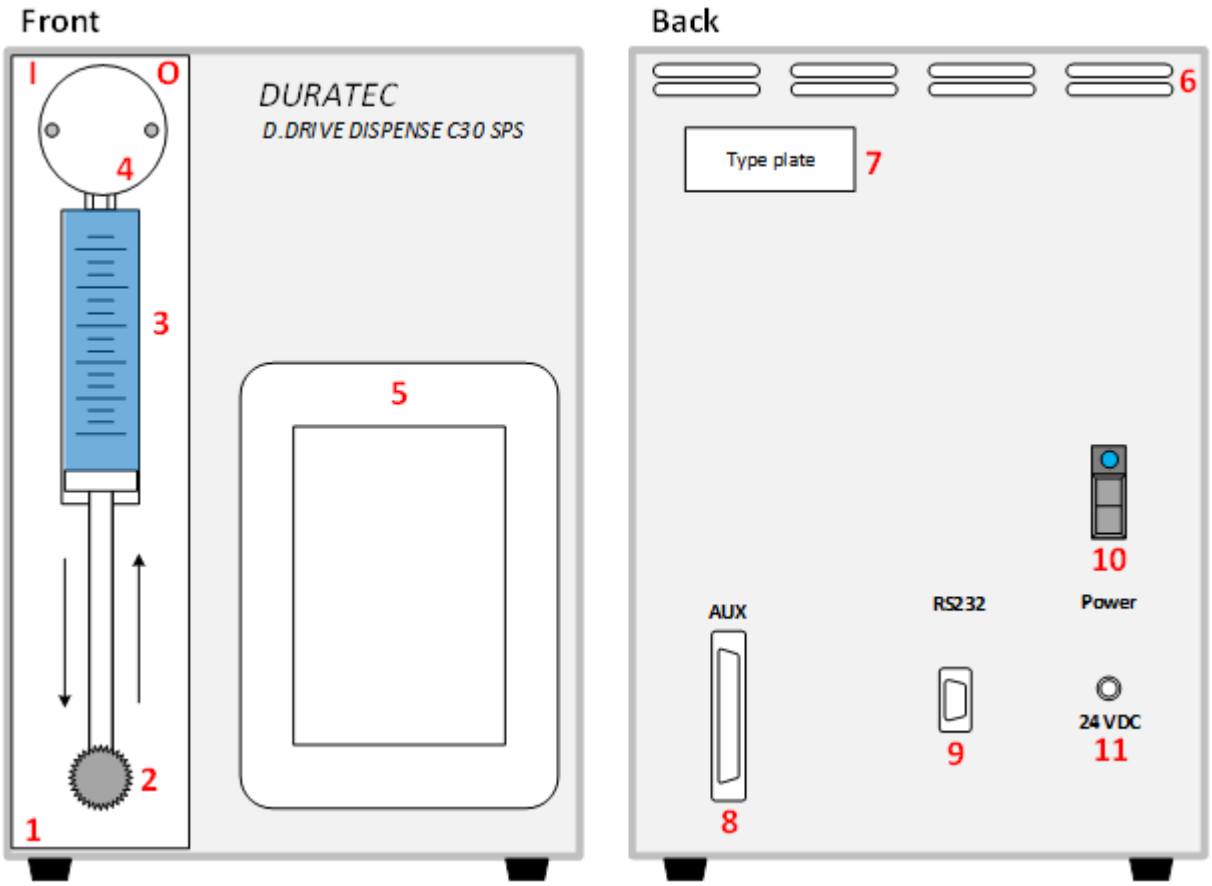
2 Technical Data

Technical specifications:

Power supply:	24 V/DC (via table power pack)
Dimensions:	W135 x H200 x D130/170 mm
Weight:	Approx. 3kg
Stroke length:	3 cm
Syringe volume:	25 µl to 12.5 ml (wetted parts out of borosilicate glass/PTFE)
Valve:	3/2 way with ¼-28 UNF (wetted parts out of PTFE/PCTFE)
Step resolution:	181.490
Time for full stroke:	1.0 sec – 1h
Max. Pressure:	6 bar (depending on syringe size)
Dose accuracy:	According to DIN ISO 8655-5
RS-232-Port:	Connection to PC
I/O-Port:	Connection to SPS

3 Device description

The d.Drive DISPENSE C30 SPS is a compact and very precise pump module, designed for liquid-handling applications covering a range from 250 nl to 12.5 ml. In the standard configuration the wetted parts are made of borosilicate glass, PTFE and PCTFE and therefore suitable for various media (aqueous, organic, aggressive, highly viscous, gaseous).
Operation and control of this dispenser can optionally be performed via a touch panel (manually), a PC supported by RS232 or via SPS together with an I/O interface



1	Centris syringe module	**6**	Ventilation slits
2	Syringe fixing screw	**7**	Type plate
3	Syringe	**8**	AUX port (I/O interface for SPS)
4	Valve	**9**	RS232 interface
5	Touch panel	**10**	On/off switch
I	Valve input port	**11**	Power socket for 24 V/DC
O	Valve output port		

3.1 General functions

INIT Initialize syringe drive (valve is set to input port and syringe drives to top).

PRIME Rinse / Fill of flow channels (syringe pick up media from input port and dispenses to output port. When controlled by serial resp. I/O interface this cycle is performed once. When controlled by touch panel paths are rinsed until STOP button is pressed).

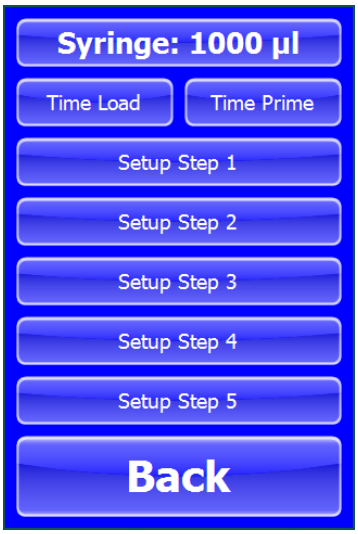
LOAD Fill syringe with total volume.

STEP 1-5 Dispense defined part volume over defined time.

Operation and control of this dispenser can optionally be performed via touch panel, RS232 or I/O interface. RS232 commands can be found in section 6.2.2.

3.2 Settings

3.2.1 Setup



Syringe	Syringe size [µl]
Time Load	Time to pick-up [Seconds] for LOAD and PRIME
Time Prime	Time Rinse Dispense [Seconds]
Setup Step 1-5	Navigates to setup for corresponding step. See 3.2.2

These parameters can also be setup via RS232 interface.

3.2.2 Setup Step x

In order to be able to specify the dosing process even better when dispensing, you can set the following parameters

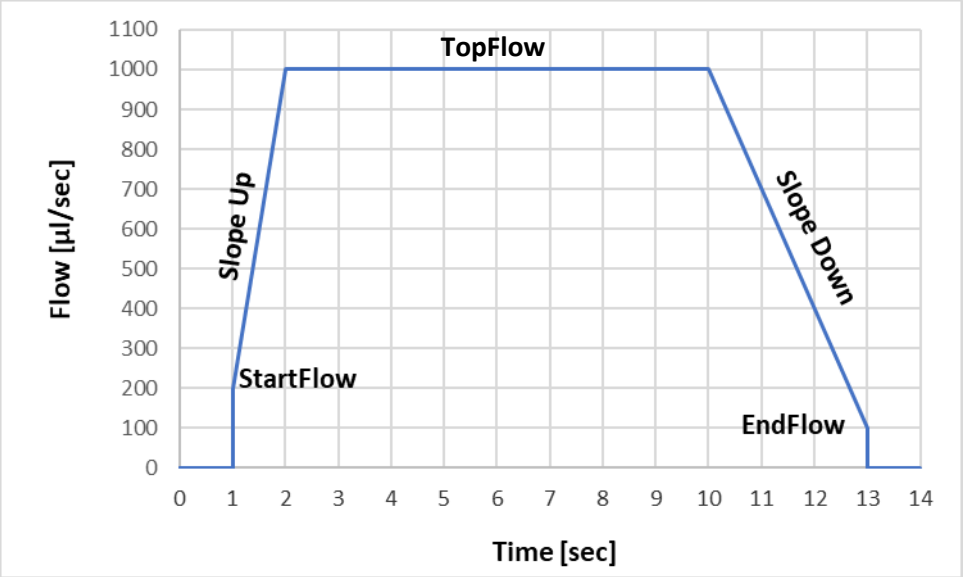
Start Flow Starting flow rate [µl/sec] in range of: 0.004408 ... 0.176318 * syringe volume

Slope Up Acceleration in range of 1…40 (1 = slow / 40 = fast)

Top Flow Dosing flow rate [µl/sec]: Syringe size **(Syringe)** / dispense time (**Time 1-5**)

Slope Down Slowdown of dose in range 1…40 (1 = slow / 40 = fast)

End Flow End flow rate [µl/sec] in range of: 0.004408 ... 0.176318 * syringe volume

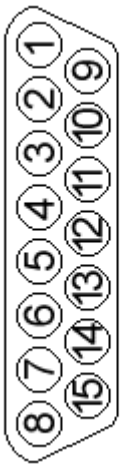


These parameters can also be setup via RS232 interface.

3.3 I/O interface (pump side)

Pin-assignment:

1: Action Start
2: Action Bit 0
3: Action Bit 1
4: Action Bit 2
5: BUSY
6: ERROR
7: 24V-DC SPS
8: 24V-DC Centris-module
9: GND SPS
10: GND SPS
11: GND SPS
12: GND SPS
13: GND SPS
14: GND SPS
15: GND Centris-module



4 Operation

The device can be operated in 3 different ways:

- touch panel (front)
- RS232 interface (rear connection - SUB D 9-pin)
- I / O port (rear connection - SUB D 15-pin)

Safety note: Keep away from the moving parts of the dispenser while the instrument is in operation. Do not attempt to remove valves, syringes, or tubing while the syringe drive mechanism is in motion. The dosing device must never be moved when it is in operation.

If liquid is accidentally spilled, switch off the device and wipe it with a suitable disinfectant or a suitable chemical. Take into account the properties of the spilled liquid and apply the necessary safety measures.

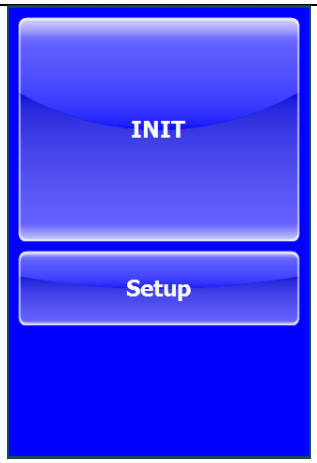
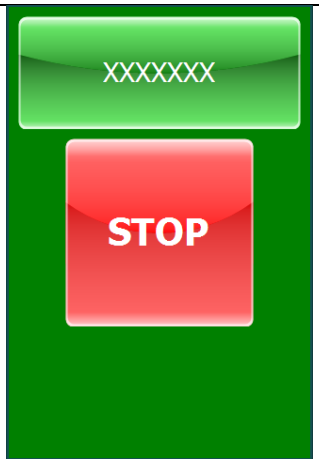
4.1 General workflow

1. Turn on device
2. Initialize device **[INIT]**
3. Set device parameters **[Setup]** (if not already done)
4. Fill/rinse fluidic path **[PRIME]** (if not already done)
5. Pickup medium into syringe **[LOAD]**
6. Dosing **[STEP 1-5]**
7. Step 6 can be carried out several times in succession, the device automatically fills the syringe respectively
8. By triggering the stop function **[STOP]**, the currently executed action is aborted immediately

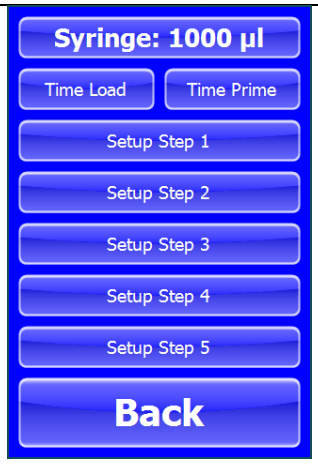
4.2 Control via Touch Panel

By pressing the according key buttons, the actions are carried out directly or the selection and setting window for parameterizing the device opens.

Initialize / execute functions

		
Start window	Main window for execution of functions	Stop function XXXX: displays currently executed step

Setup / Parameterizing

		
Setup selection, clicking opens corresponding input dialog	Input dialog for parameter for each step	Input dialog for values

4.3 Control via RS232 Interface

For control via RS232 interface connect the RS232 interface on back side of the dispenser with a suitable cable to your PC. The RS232 protocol can be found in the attachment.

4.4 Control via I/O Interface - PCS

Individual commands (INIT, PRIME, LOAD and STEP1-5) are controlled via 24V signals from the PCS using BCD coding. The status is returned via 24V signals to the PCS.

Status	**Meaning**
BUSY	Command is being executed
ERROR:	Syringe module error detected

The controller and PCS are synchronized via Action Start and BUSY signal.

Syringe volume, dosing volume, loading time and delivery time are defined via ACSII commands to the RS-232 interface. The description of this can be found in the appendix.

For input commands and status return optoelectronic couplers enable the conversion of analog signals to TTL and vice versa together with the galvanic separation of the different electronic levels.

Synchronization:

1. PCS sets bit 0 / bit 1 / bit 2
2. PCS sets Action Start
3. Controller sets BUSY
4. PCS deletes Action Start
5. after executing the action, the controller deletes BUSY

Input
Action Start
Action Bit 0
Action Bit 1
Action Bit 2

Output
BUSY
ERROR

Assignment of actions: (BCD coding)

Action	**Bit 0**	**Bit 1**	**Bit 2**
INIT	0	0	0
PRIME	1	0	0
LOAD	0	1	0
STEP 1 (Volume / time)	1	1	0
STEP 2 (Volume / time)	0	0	1
STEP 3 (Volume / time)	1	0	1
STEP 4 (Volume / time)	0	1	1
STEP 5 (Volume / time)	1	1	1

0: no electric current / open
1: 24V-Signal from PLC

5 Maintenance and Care

In order to always be able to guarantee optimal functioning of the dosing module, the system should be regularly serviced and maintained. The type, scope and frequency depend strongly on the area of application as well as the dosing and environmental conditions.

5.1 Cleaning of the Fluid Path

When the dosing device needs to be cleaned depends on the use of the instrument, i.e. how long it has been in operation, number of cycles and what types of chemicals are used.

We recommend cleaning the device daily. The tubing and syringes should be rinsed and primed at the end of each experiment and / or shift. Rinse the dosing device for cleaning with deionized water, ethanol or with 10% chlorine bleach in deionized water. Do not use alkaline or acidic cleaning solutions.

Important! If the device is not in use for a long time, syringes and hoses should remain filled with deionized water. This is especially important when using buffers or other salt solutions that could accumulate or crystallize in the system. If buffers or other saline solutions remain in the fluid path overnight, crystals can form and damage the tip of the syringe plunger.

5.2 Cleaning Surfaces

The housing of the device is moderately resistant to chemicals. However, some chemicals can discolor the surface of the device.

If spilled liquid gets on the outside of the instrument, wipe it off immediately. Clean the area in question with a damp cloth and water and soap. Then dry the area. Make sure that the liquid does not get inside the device.

5.3 Periodic Maintenance

Syringes and valves are the most stressed parts. These should be replaced at the latest when there are visible leaks or dosing inaccuracies.

5.4 Syringe Exchange

Please empty the system completely before replacing.

5.4.1 Disassembly of the Syringe

1. Unscrew the knurled syringe fixing screw completely
2. Unscrew the syringe from the valve
3. Remove the ball end of the syringe from the capture mechanism



5.4.2 Assembly of the Syringe

1. Carefully insert the ball end of the syringe into the capture mechanism
2. Slightly lift the capture mechanism and the syringe barrel and screw the syringe into the valve
3. Tighten the syringe fixing screw, making sure that the syringe ball end is fully secured in the capture mechanism



5.5 Exchange of the Valve

1. First remove the syringe and tubing.
2. Loosen the valve fixing screws and remove the valve.
3. Install the new valve on the dosing module, make sure that the pin of the drive shaft is seated in the notch of the valve and that the drill holes of the valve are located above the threaded holes on the front plate.
4. Mount the syringe and tubing again.

6 Appendix

6.1 Accessories & Spare Parts

Product number	Description	Max. Pressure
900760-005	Valve (3-2) PTFE/PCTFE	6 bar
900760-C30-25	25µl Syringe H-XE (PTFE Sealing)	6 bar
900760-C30-50	50µl Syringe H-XE (PTFE Sealing)	6 bar
900760-C30-100	100µl Syringe H-XE (PTFE Sealing)	6 bar
900760-C30-250	250µl Syringe H-XE (PTFE Sealing)	6 bar
900760-C30-500	500µl Syringe H-XE (PTFE Sealing)	6 bar
900760-C30-1000	1000µl Syringe H-XE (PTFE Sealing)	6 bar
900760-C30-2500	2500µl Syringe H-XE (PTFE Sealing)	6 bar
900760-C30-5000	5000µl Syringe H-XE (PTFE Sealing)	4 bar
900760-C30-12500	12500µl Syringe H-XE (PTFE Sealing)	2 bar

6.2 RS232 Protocol

6.2.1 Interface Parameters

Baudrate: 9600
Parity: N
Databits: 8
Stopbits: 1

6.2.2 RS232 Protocol

Set Parameters:

Set syringe volume: SSV = <n> <CR> in which
<n> : 25 to 12500 (µl)
<CR>: Carriage Return (Ascii 13)

Set dose volume STEP 1: SV1 = <n> <CR> in which
<n> : Volume in µl, decimal places are separated by a period (**Example: 20.0 equals 20.0 µl**)
<CR>: Carriage Return (Ascii 13)

Set dose volume STEP 2: SV2 = <n> <CR> in which
<n> : Volume in µl, decimal places are separated by a period
<CR>: Carriage Return (Ascii 13)

Set dose volume STEP 3: SV3 = <n> <CR> in which
<n> : Volume in µl, decimal places are separated by a period
<CR>: Carriage Return (Ascii 13)

Set dose volume STEP 4: SV4 = <n> <CR> in which
<n> : Volume in µl, decimal places are separated by a period
<CR>: Carriage Return (Ascii 13)

Set dose volume STEP 5: SV5 = <n> <CR> in which
<n> : Volume in µl, decimal places are separated by a period
<CR>: Carriage Return (Ascii 13)

Set dosing time STEP 1: ST1 = <n> <CR> in which
<n> : seconds for full stroke, range 1 ... 3600
<CR>: Carriage Return (Ascii 13)

Set dosing time STEP 2: ST2 = <n> <CR> in which
<n> : seconds for full stroke, range 1 ... 3600
<CR>: Carriage Return (Ascii 13)

Set dosing time STEP 3: ST3 = <n> <CR> in which
<n> : seconds for full stroke, range 1 ... 3600
<CR>: Carriage Return (Ascii 13)

Set dosing time STEP 4: ST4 = <n> <CR> in which
<n> : seconds for full stroke, range 1 ... 3600
<CR>: Carriage Return (Ascii 13)

Set dosing time STEP 5: ST5 = <n> <CR> in which
<n> : seconds for full stroke, range 1 ... 3600
<CR>: Carriage Return (Ascii 13)

Set loading time LOAD: STL = <n> <CR> in which
<n> : seconds for full stroke, range 1 ... 3600
<CR>: Carriage Return (Ascii 13)

Set loading and dispensing time PRIME: STP = <n> <CR> in which
<n> : seconds for full stroke, range 1 ... 3600
<CR>: Carriage Return (Ascii 13)

Query Parameters:

Query syringe volume: GSV <CR> in which
<CR>: Carriage Return (Ascii 13)
Response: 25 to 12500 (µl)

Query dose volume STEP 1: GV1 <CR> in which
<CR>: Carriage Return (Ascii 13)
Response: volume in µl, decimal places are separated by a period

Query dose volume STEP 2: GV2 <CR> in which
<CR>: Carriage Return (Ascii 13)
Response: volume in µl, decimal places are separated by a period

Query dose volume STEP 3: GV3 <CR> in which
<CR>: Carriage Return (Ascii 13)
Response: volume in µl, decimal places are separated by a period

Query dose volume STEP 4: GV4 <CR> in which
<CR>: Carriage Return (Ascii 13)
Response: volume in µl, decimal places are separated by a period

Query dose volume STEP 5: GV5 <CR> in which
<CR>: Carriage Return (Ascii 13)
Response: volume in µl, decimal places are separated by a period

Query dosing time STEP 1: GT1 <CR> in which
<CR>: Carriage Return (Ascii 13)
Response: seconds for full stroke, range 1 ... 3600

Query dosing time STEP 2: GT2 <CR> in which
<CR>: Carriage Return (Ascii 13)
Response: seconds for full stroke, range 1 ... 3600

Query dosing time STEP 3: GT3 <CR> in which
<CR>: Carriage Return (Ascii 13)
Response: seconds for full stroke, range 1 ... 3600

Query dosing time STEP 4: GT4 <CR> in which
<CR>: Carriage Return (Ascii 13)
Response: seconds for full stroke, range 1 ... 3600

Query dosing time STEP 5: GT5 <CR> in which
<CR>: Carriage Return (Ascii 13)
Response: seconds for full stroke, range 1 ... 3600

Query loading time LOAD: GTL <CR> in which
<CR>: Carriage Return (Ascii 13)
Response: seconds for full stroke, range 1 ... 3600

Query loading and dispensing time PRIME: GTP <CR> in which
<CR>: Carriage Return (Ascii 13)
Response: seconds for full stroke, range 1 ... 3600

Execute Commands:

Initialization INIT <CR> in which
<CR>: Carriage Return (Ascii 13)

Rinse flow channels: PRIME <CR> in which
<CR>: Carriage Return (Ascii 13)

Fill syringe: LOAD <CR> in which
<CR>: Carriage Return (Ascii 13)

Partial dosage start STEP1-5: SVT = <n> <CR> in which
<n> : 1…5 (respectively STEP)
<CR>: Carriage Return (Ascii 13)

Feedback:

Feedback : Echo of the command plus
<ACK> <CR> : command accepted
<NAK> <CR> : command not accepted
<ACK> <Wert> <CR> : queried value

6.2.3 New Commands Firmware 14.05.2019

Set Parameters:

Set StartFlow for STEP: SSF<x> = <n> <CR> in which
<x> : 1 to 5 (for Step)
<n> : 0.004408 ... 0.176318 * syringe volume [µl/sec]
<CR>: Carriage Return (Ascii 13)

Set Slope Up for STEP: SSU<x> = <n> <CR> in which
<x> : 1 to 5 (for Step)
<n> : 1 … 40
<CR>: Carriage Return (Ascii 13)

Set Slope Down for STEP: SSD<x> = <n> <CR> in which
<x> : 1 to 5 (for Step)
<n> : 1 … 40
<CR>: Carriage Return (Ascii 13)

Set EndFlow for STEP: SEF<x> = <n> <CR> in which
<x> : 1 to 5 (for Step)
<n> : 0.004408 ... 0.176318 * syringe volume [µl/sec]
<CR>: Carriage Return (Ascii 13)

Query Parameters:

Query StartFlow for STEP: GSF<x> <CR> in which
<x> : 1 to 5 (for Step)
<CR>: Carriage Return (Ascii 13)
Response: flow rate in µl/sec

Query Slope Up for STEP: GSU<x> <CR> in which
<x> : 1 to 5 (for Step)
<CR>: Carriage Return (Ascii 13)
Response: acceleration in range 1 ... 40

Query Slope Down for STEP: GSD<x> <CR> in which
<x> : 1 to 5 (for Step)
<CR>: Carriage Return (Ascii 13)
Response: deceleration in range 1 ... 40

Query EndFlow for STEP: GEF<x> <CR> in which
<x> : 1 to 5 (for Step)
<CR>: Carriage Return (Ascii 13)
Response: flow rate in µl/sec

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