Dosistar Grainy LV 12/24V Version

User manual

Hardware Rev: 2.0
Software Rev: 1.2
Software: Dezember 2013

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Introduction

The dosing computer Dosistar Grainy LV is a control unit for driving electrical pumps.
It is used for dosing and measuring liquids in agricultural environments.
The main functions of the device are:
- Driving of electrical pumps and controlling their flow rate
- Flow measurements with external sensors
- Variable control through multiple inputs/outputs
- Two different dosing functions
    - **Normal dosing:** controlling the flow rate at stable and adjustable values
    - **Charge dosing:** dosing of a variable amount (1…999litres) at stable and adjustable flow rates
- Protective functions:
    - Dry running protection
    - Self-protection functions against over current and over temperature

Navigating the menu

While switching on the device hardware and software revision numbers are shown for a brief moment:
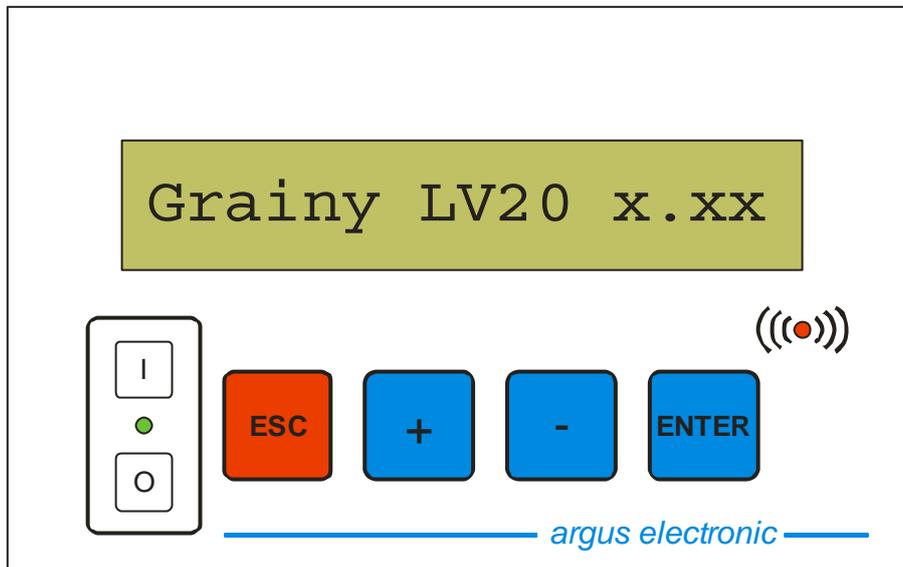
After switching on the device automatically enters the main menu, the display reads:

```
c1 142l/h start
```

To reach the different menu entries of the currently active menu level press the
+ **-** keys.

With the **ENTER** key one enters the currently chosen menu entry or confirms set values.

With the **ESC** key you go back to the previous menu level or you abort the current action.

The device saves which mode was used last (normal dosing or charge dosing), and will automatically enter the corresponding submenu upon restart.

Overview of the Dosistar Grainy LV's menu structure

```
* dosing *        ← ESC

        ENTER →        c1 142l/h start
                            [+] [-]
                       change customer?
                            [+] [-]
                       change flow?
                            [+] [-]
                       cust.consumption
    [+] [-]                 [+] [-]
                       overall consump.
                            [+] [-]
                       charge dosing

* options *       ← ESC

        ENTER →        choose flowmeter
                            [+] [-]
                       change flowmeter
                            [+] [-]
                       calibration?
                            [+] [-]
                       manual function
                            [+] [-]
                       control param.
                            [+] [-]
                       alarm level
```
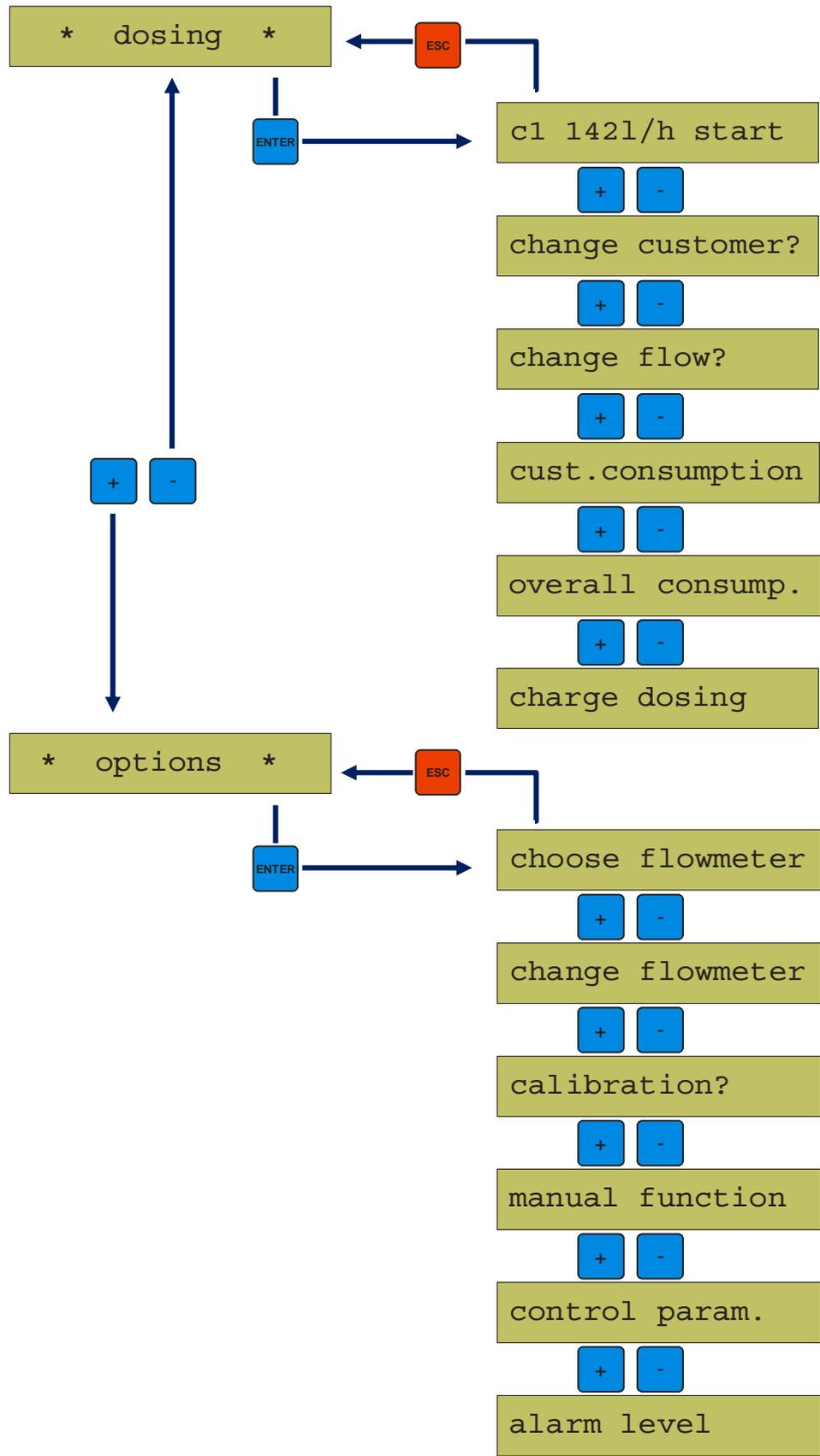
Operating the device

Normal function

Immediately after switching on the device pressing [ENTER] once will bring you to the

dosing menu `c1 142l/h start`
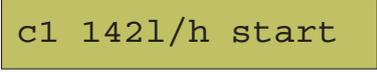
Customer number and set flow rate are displayed.

Pressing [ENTER] again starts the pump. The dosing process begins. The display now shows the customer number (c1…c9) the current flow rate and the amount consumed by said customer

`c1 148l 55l/h`
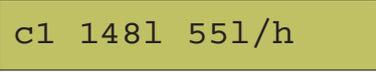
Pressing [ENTER] or [ESC] ends the dosing process.

The Pump stops if the contact D2 (remote control) closes during an active dosing process. The display then reads:

`standby D2 152L`

where the amount shown ist he total consumption over all customers. Once the contact opens, dosing automatically resumes with the set flowrate.

If contact D1 is opened the message `D1 open` will be shown.

The pump stops and the alarm relay and the red LED ((•)) will switch periodically. The Pump will not restart when contact D1 is closed. The warning must be

acknowledged by pressing [ESC]. The device then returns to the main menu.

During dosing flowmeter impulses are measured constantly for the calculation of flow rate and consumption. If there are no impulses for a certain time the pump stops to prevent damage from dry running. In this case the display reads:
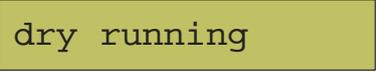
`dry running`

The alarm relay and the red LED ((•)) switch periodically. The dry running error

message can be acknowledged with [ESC]. The device then returns to the main menu.

During active dosing pressing [+] [-] will adjust the set flow rate. The display will show the new set value for several seconds:

`set: 288l/h`

Pre-setting the flow rate

In order to prevent unintentionally too high or too low flow rates at the beginning of the dosing process it is possible to adjust the set value before the dosing starts:
- navigate to the following menu item and confirm:

    `change flow?` **+** [ENTER]

- The last used set value is displayed

    `flow 115l/h`

- With [+] [-] it is now possible to enter a new set point for the flow rate.

Press [ENTER] to confirm the new value. The next dosing will now, automatically and without delay, adjust the flow rate to the new set value.

Management of customer consumptions

The device has memory space to store the consumption of 9 different customers (C1…C9). The pumped amount will be summed up and saved. In the menu

```
show amount
```
the total amount for each customer can be displayed and deleted.

```
change customer?
```
Choosing a customer can be done in the menu.
During the dosing the current customer number will be displayed on the left side of the display.

Displaying and deleting of customer consumptions

- Navigate to the following menu item and confirm.

```
cust.consumption
```
+ `ENTER`

- The current customers amount is shown

```
K1 Menge: 354L
```

- To display other customers and their respective amounts press `+` `-`.
  Leave the menu with `ESC` **or**

- Press `ENTER` to delete the current customers amount.
- For safety the display prompts

```
delete??
```

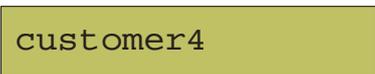- Pressing `ENTER` deletes the chosen customers amount. Pressing `ESC` cancels the current action.

The maximum consumption for a single customer can be up to 99999 liters.

Choosing a Customer

- Navigate to the following menu and confirm:

-
```
change customer?
```
+ [ENTER]

- Cycle through the customers with [+] [-].

-
```
customer4
```
+ [ENTER] will choose the currently displayed customer.

Total consumption

Total consumption accumulates the total amount of liquid pumped by all customers up to a total amount of 999999 liters. To display the total consumption navigate to the following menu item and confirm:

```
overall consump.
```
+ [ENTER]

The display now shows the sum over all customers.

```
sum 22372L
```

Pressing [ENTER] again will delete the displayed amount. The deletion itself is password protected. When being prompted:

```
Code : xxx
```

use the [+] [-] keys to enter the correct, manufacturer specified number and confirm it with [ENTER].

ATTENTION: Deleting the total consumption will also delete all customer specific amounts.

Charge dosing

The device can automatically dose charges between 1 and 999 liters with adjustable flow rates. Charge dosing can be started either manually by pressing the ENTER key or remotely with the contact D2.

Manual charge dosing

The terminals of D2 must not be connected.

- Navigate to the following menu item and confirm

  charge dosing **+** ENTER

- The display now reads:

  Charge: 652L

- Use + - to adjust the wanted amount and confirm with ENTER.
- Next you adjust the flow rate at which the desired amount should be dosed

  flow: 55l/h

- Adjust the flow rate with + - and confirm with ENTER.
- The display now reads

  c 652l ready

- Pressing ENTER again will now start the dosing.
- The display now shows the customer number the remaining amount of the current charge and the flow rate

  c1 633l 55l/h

- The pump automatically stops if the desired amount has been fully pumped.

- Pressing ENTER starts the charge dosing once again with the same settings.

- To leave the charge dosing menu press ESC

- During an active charge dosing pressing the ENTER key will pause and resume the dosing. When paused the display reads:

  enter to restart

Remote controlled charge dosing

For automated or remote controlled charge dosing a remotely controlled switch contact has to be connected to the terminals of S2. The Switch contact should be normally open. Closing the contact for a short amount of time (1sec) is sufficient to start the dosing process.

- Navigate to the following menu item and confirm

  `charge dosing` **+** [ENTER]

- The display now reads:

  `Charge: 652L`

- Use [+] [-] to adjust the wanted amount and confirm with [ENTER].
- Next you adjust the flow rate at which the desired amount should be dosed

  `flow: 55l/h`

- Adjust the flow rate with [+] [-] and confirm with [ENTER].
- The display now reads

  `c 652l ready`

- The device now waits until the switch contact on D2 is closed.
- If the contact closes, the dosing automatically starts and ends once the entire charge has been pumped.
- The display now shows the customer number the remaining amount of the current charge and the flow rate

  `c1 633l 55l/h`

- Every new impulse on D2 will dose another charge.

The Terminals of D2 may only be closed for the start of the dosing. If they are connected before or after the charge dosing the device will first wait for the contacts to be opened. The display will then read

  `! D2 closed !`

During charge dosing Input D1 is without function.
The amounts pumped will be summed up in the appropriate customer memory.

Managing flowmeter settings

The flowmeter measures the amount of liquid flowing through it and outputs impulses at intervals corresponding to the flow rate. The number of impulses per liter is the characteristic figure of the flowmeter. That figure is dependent of the flowmeter type and the viscosity of the liquid. The viscosity itself is dependent of the temperature. Therefore the flowmeter has to be calibrated before use.

Choosing a flowmeter

- Navigate to the following menu item and confirm

  `choose flowmeter` **+** [ENTER]

- Use [+] [-] to choose one of the saved flowmeters

  `DFM1 Imp/L: 754`

- Confirm your choice by pressing [ENTER] or discard all changes with [ESC].

Adjusting the calibration value of the flowmeter

- Navigate to the following menu item and confirm

  `flowmeter input` **+** [ENTER]

- Use [+] [-] to choose the flowmeter you want to adjust

  `DFM1 Imp/L: 754`

- The Display now shows the current calibration value:

  `Imp/l: 165`

- Use [+] [-] to adjust this value.

  Pressing [ENTER] saves the displayed value. To discard all changes press [ESC].

Calibrating the flowmeter

- Navigate to the following menu item and confirm:

`calibration?` **+** [ENTER]

- Use [+] [-] to choose the flowmeter you want to calibrate

`DFM1 Imp/L: 754`

- Choose the amount of liquid pumped during calibration (1L or 10L) with

`calibration 1l` **+** [+] [-] .

Confirm your selection with [ENTER].

- The display now reads:

`1L Start`

- Pressing [ENTER] again now starts the calibration.
- In order to pump the calibration amount as accurately as possible you can

adjust the power of the pump with [+] [-] during the entire calibration process.

`P: 23% 122Imp.`

Next to the motor power in percent the total amount of impulses detected is shown.

- Catch the liquid in a measuring cup or another appropriate container.
- Once the chosen amount (1L or 10L) is reached stop the calibration by

pressing [ENTER].

- The detected number of impulses per liter is displayed.

`167 speichern?`

- Safe the new value by pressing [ENTER] or discard it by pressing [ESC].

The calibration procedure should be carried out with utmost care. Calibration errors directly influence the measurement accuracy.

For example make sure that there are no air pockets in the system (use the emergency mode function to fill the system with liquid before calibration).

Help for choosing the correct flowmeter

To obtain optimal results for measurement and control it is important to choose a flowmeter appropriate for the intended flow rate. The following table serves as a first indicator.

Digmesa flowmeter-type	flowmeter value for water [Imp/L]	max. flow rate [L/h]	min. recommended flow rate [L/h]
1,0mm	2223	35	9
1,2mm	1787	46	11
1,5mm	1386	80	13
2,0mm	1013	139	18
2,5mm	754	164	24
3,0mm	572	293	32
4,0mm	382	435	48
5,6mm	256	498	75
7,0mm	165	1080	110

Please take note that the flowmeter values can differ for other liquids or if nozzles are used.

Emergency operation mode

If there is an external failure in the system (switches, flow-meter) or you want to fill the tubes or test the pump you can use the emergency operation mode.

ATTENTION: the dry-running-protection does not work in this mode.

ATTENTION: Since correct flowmeter operations are not considered granted in this mode, the measured amounts are NOT added to customer amount or total amount

Activating the emergency operation mode

- navigate to the following menu item and confirm

  `manual function` **+** `[ENTER]`

- The display now reads:

  `P 25% Start?`

- Adjust the motor power in percent with `[+]` `[-]`.
- Pressing `[ENTER]` again activates the pump with the previously set power.
- The display now shows the motor power and the current flow rate:

  `P: 25% 22L/h`

  ATTENTION: The flow rate is not controlled in this mode. This is a mere display value. The pump will work without flowmeter too.

- While the pump is running `[+]` `[-]` will adjust the motor power.
- To stop / pause the pump press `[ENTER]` again.
- To stop the pump and leave the emergency operation mode press `[ESC]`.

Adjusting control parameters

For optimal adjustment of the flow control to the system (Pump, tube length, nozzles, etc…) it is possible to directly influence multiple parameters.

ATTENTION: *only experienced personnel should tamper with these adjustments. Wrong control parameters could impact the systems performance negatively.*

If you want to adjust control parameters navigate to the menu
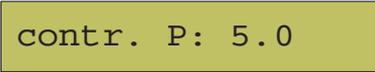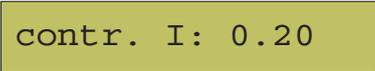
control params

ENTER switches to the next control parameter. Changes made are saved automatically.

ESC aborts the entire process and directly returns to the main menu

In order to change the selected parameter press **+** **-** .

The following control parameters can be adjusted:

- | contr. P: 5.0 | proportional component of the PI controller

- | contr. I: 0.20 | integral component of the PI controller

- | contr. max:16A | Maximum motor current in amperes. Set this value high enough to compensate for high startup currents of your pump.
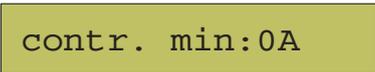
- | contr. min:0A | Minimum motor current in amperes. When the pump is active this current will always be supplied by the Dosistar.

Alarm level

The device possesses two different adjustable alarm levels. Both alarm levels can be set in the `alarm level`. They are set in % of the current flowrate. If the current flowrate falls below the given percentage of the setpoint for a set amount of time the alarm is triggered.
Factory settings are

`running dry:20%`

`running dry:10s`

`underdose:75%`

`underdose:6s`

All values can be changed with `+` `-`. Press `ENTER` to confirm changes. `ESC` aborts the menu and discards all changes made.

If the dry running alarm triggers the pump stops and the error message

`dry running` **+** ((●)) will be displayed. This error must be acknowledged by pressing `ESC` before you can continue dosing.

If the underdosing alarm is triggered, the alarm relais and the red LED ((●)) will switch periodically. The dosing won't be interrupted.

Both alarm functions are active during charge dosing and normal dosing. They are inactive in the emergency operation mode.

In order to deactivate an alarm function, set the corresponding alarm level to 0%.

Wiring the Dosistar Grainy LV

The wiring should be carried out very carefully by a specialist. The designation of the terminals is marked on the PCB. It is important to ensure proper wire cross sections and proper insulation. During installation the system has to be disconnected from power. It is important to ensure that the cable entries do not affect the tightness of the device.

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Connecting supply voltage / battery
Batterie   12/24V   positive terminal of the supply voltage
Batterie   Minus   negative terminal of the supply voltage

Connection of the pump:
Motor   +Plus   positive terminal of the motor
Motor   -Minus   negative terminal of the motor

Communication interface:
RS232/RS485:   contacts for an optional communication interface allowing
                    communication with other devices (e.g. a PLC).
                    Do not use in the standard device.

Alarm: potential free contact
During alarm or fault conditions this relay is closed, after removing the problem the relay opens automatically. One can choose between
  -   Closing contact: left and middle terminal
  -   Opening contact: middle and right terminal
Use this relay to switch an acoustic or visual alarm system.

Transport: potential free contact for conveyor systems
This contact switches simultaneously with the pump. A screw conveyor can be connected here via a power contactor.

Batterie Out: Direct connection to the unregulated supply voltage. A small electrical consumer can be connected here (max. 1A). These terminals are switched together with the main power supply of the device

Analog In: connect a sensor with an analog output (e.g. a temperature sensor) here. *Do not use in the standard device.*

D1: Sensor input for vacancy detectors (all sensor inputs are isolated from the rest of the device)
GND: signal ground
Sign**.**: sensor signal input
+ : +12V supply voltage for the sensor

This input can be used to supervise the level of a conveyer. You can use a potential free contact between GND and Sign. or you can use a sensor with open collector npn output. If the switch opens the pump stops and a warning is issued:

D1 open   ✚ (((●)))

If this function is not needed, connect GND and Sign. with a jumper.

D2: Input for remote control / standby (all sensor inputs are isolated from the rest of the device)

GND: signal ground
Sign.: sensor signal input
+ : +12V supply voltage for the sensor

This input allows an external device to control the dosing process. You can use a potential free contact between GND and Sign. or you can use a sensor with open collector npn output. The Dosing has to be started on the device itself. Once the dosing is running this input can stop and resume the process.
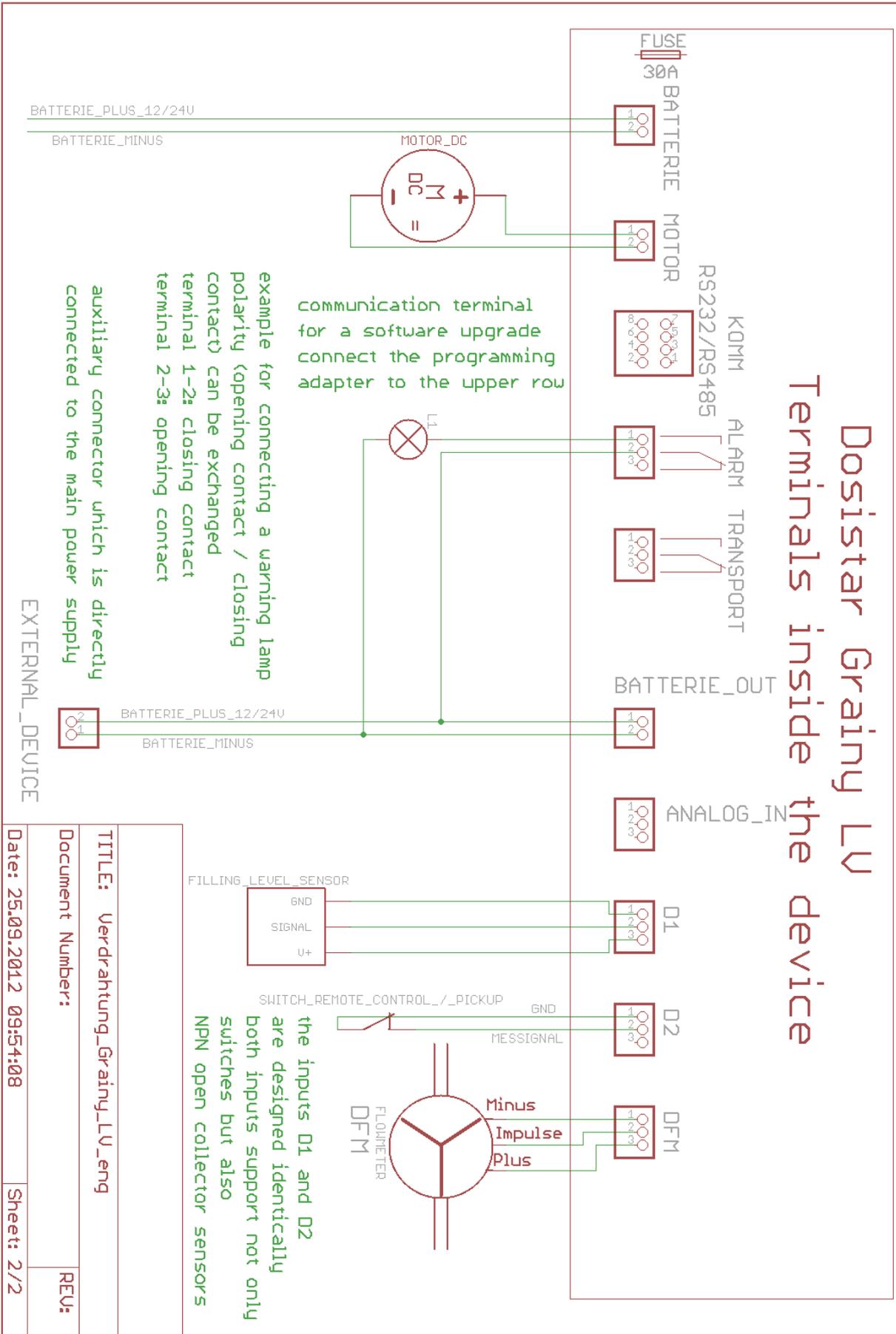
DFM: connector for a flowmeter **Open Collector NPN** (all sensor inputs are isolated from the rest of the device)
GND: flowmeter supply voltage ground connection
Sign.: impulse signal from the flowmeter
+ : +12V supply voltage

Dosistar Grainy LV
Terminals inside the device

FUSE
30A

BATTERIE

BATTERIE_PLUS_12/24V
BATTERIE_MINUS

MOTOR_DC

MOTOR

KOMM RS232/RS485

communication terminal
for a software upgrade
connect the programming
adapter to the upper row

ALARM

TRANSPORT

BATTERIE_OUT

BATTERIE_PLUS_12/24V
BATTERIE_MINUS

example for connecting a warning lamp
polarity (opening contact / closing
contact) can be exchanged
terminal 1-2: closing contact
terminal 2-3: opening contact

auxiliary connector which is directly
connected to the main power supply

EXTERNAL_DEVICE

ANALOG_IN

FILLING_LEVEL_SENSOR
GND
SIGNAL
U+

D1

SWITCH_REMOTE_CONTROL_/_PICKUP
GND
MESSIGNAL

D2

the inputs D1 and D2
are designed identically
both inputs support not only
switches but also
NPN open collector sensors

FLOWMETER
DFM
Minus
Impulse
Plus

DFM

TITLE: Verdrahtung_Grainy_LV_eng

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REV:

Individual system configuration

Use the following table to write down all relevant information for your specific system configuration:

flowmeter values	
liquid / flowmeter type:	calibration value:
liquid / flowmeter type:	calibration value:
liquid / flowmeter type:	calibration value:
liquid / flowmeter type:	calibration value:
liquid / flowmeter type:	calibration value:
liquid / flowmeter type:	calibration value:
control parameters	
proportional component:	
integral component:	
maximum current:	
minimum current:	
other parameters	
dry running threshold:	
time before dry running alert:	
underdosage threshold:	
time before underdosage warning:	

Technical data:

Power supply: 12/24V DC
Internal power consumption: 50mA
Output current alarm relay: max. 3A 250V AC or 2A /24V DC
Switching cycles alarm relay: minimum 1Mio. cycles
Dimension (BxHxT):   230mm x 230mm x 120mm
Protection: IP65

The case reaches its protection only with closed and locked cover. Moisture can lead to destruction of the device and malfunction.

Manufacturer:

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