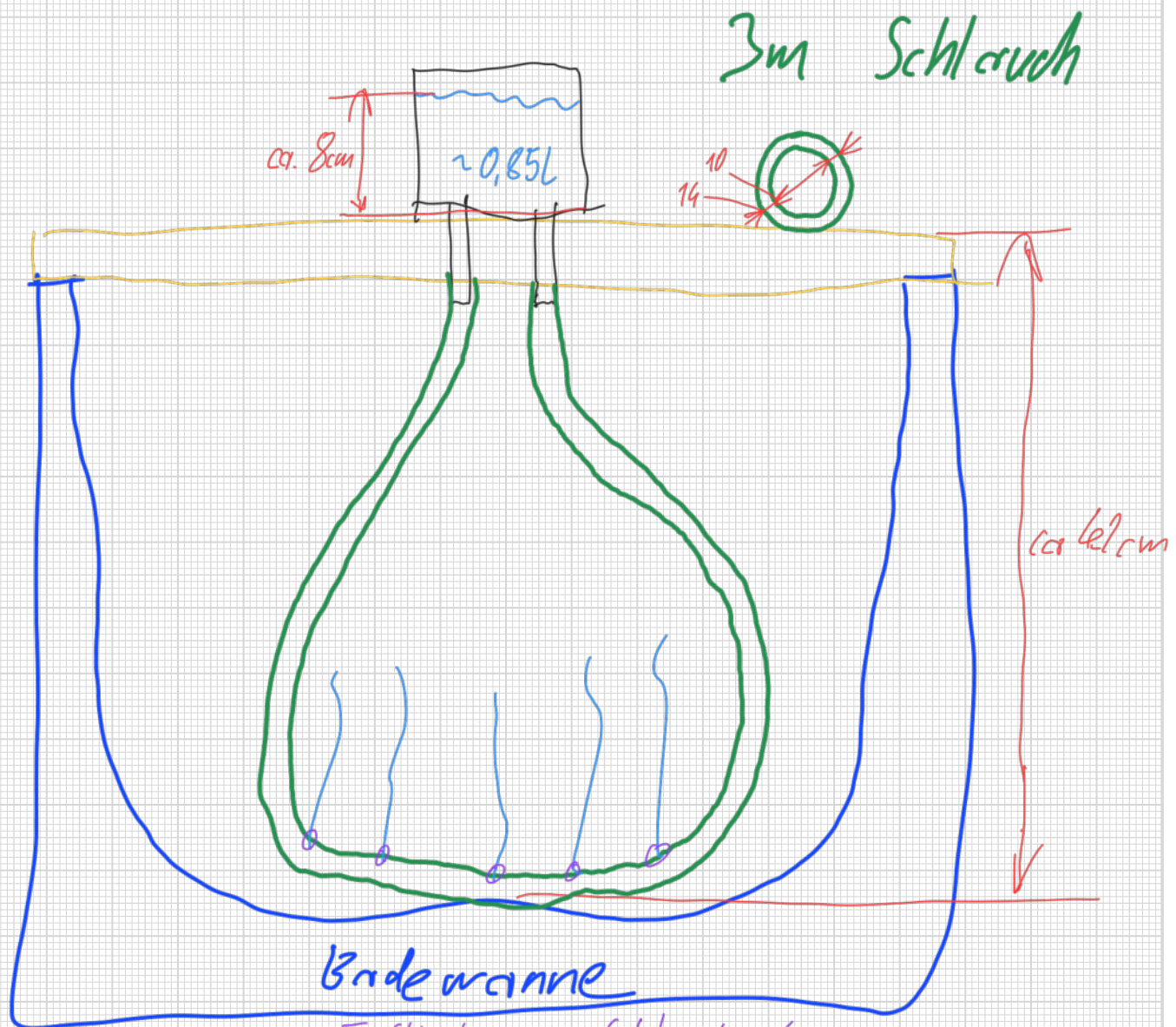


Experiment



5 Stk. Löcher im Schlauch $\varnothing 1,5mm$

$t = 60 \dots 80s \Rightarrow 0,85L$

$\sim 0,85 \frac{L}{min}$



5 x 0,8 mm ϕ

1 min 45 s

0,5 L \sim 3,6 l/h pro Loch

50.. 46 cm

Wassersäule

5 x 1,0 mm ϕ

1 min 20 s

\sim 4,5 l/h pro Loch

5 x 1,2 mm ϕ

49 s

\sim 7,3 l/h pro Loch

Hydrostatischer Druck

$$h \begin{cases} 50 \text{ cm} : 4895 \text{ Pa} \Rightarrow 3,13 \text{ m/s} \\ 46 \text{ cm} : 4503 \text{ Pa} \Rightarrow 3,00 \text{ m/s} \end{cases} \quad \bar{v} = 3,065 \text{ m/s}$$

$$\rho = 998 \text{ kg/m}^3$$

$$g = 9,81 \text{ m/s}^2$$

$$v_{dpu} = \sqrt{\frac{2 \cdot p_h}{\rho}}$$

5 x 1,5 mm ϕ

34 s

\sim 10,6 l/h pro Loch

Versuchsaufbau

Zeitmessung: 1,0L → 0,5L

~ 1L box

Formeln

Höhendruck

$$p_H = \rho_w \cdot g \cdot h$$

$$\rho_w = 998 \text{ kg/m}^3$$

$$g = 9,81 \text{ m/s}^2$$

$$h = 0,46 \dots 0,5 \text{ m}$$

$$v \cdot \frac{\rho_w}{2} \cdot \zeta = p$$

v Austrittsgeschwindigkeit

ζ Zeta-Wert

$$p \hat{=} p_w$$

$$v = \sqrt{\frac{2 \cdot p_w}{\rho_w \cdot \zeta}} = \sqrt{\frac{2 \cdot \rho_w \cdot g \cdot h}{\rho_w \cdot \zeta}}$$

$$v = \sqrt{\frac{2 \cdot g \cdot h}{\zeta}} \quad \leftarrow h = \frac{h_1 + h_2}{2}$$

$$v^2 \cdot \frac{\rho_w}{2} \cdot \zeta = \rho_w \cdot g \cdot h$$

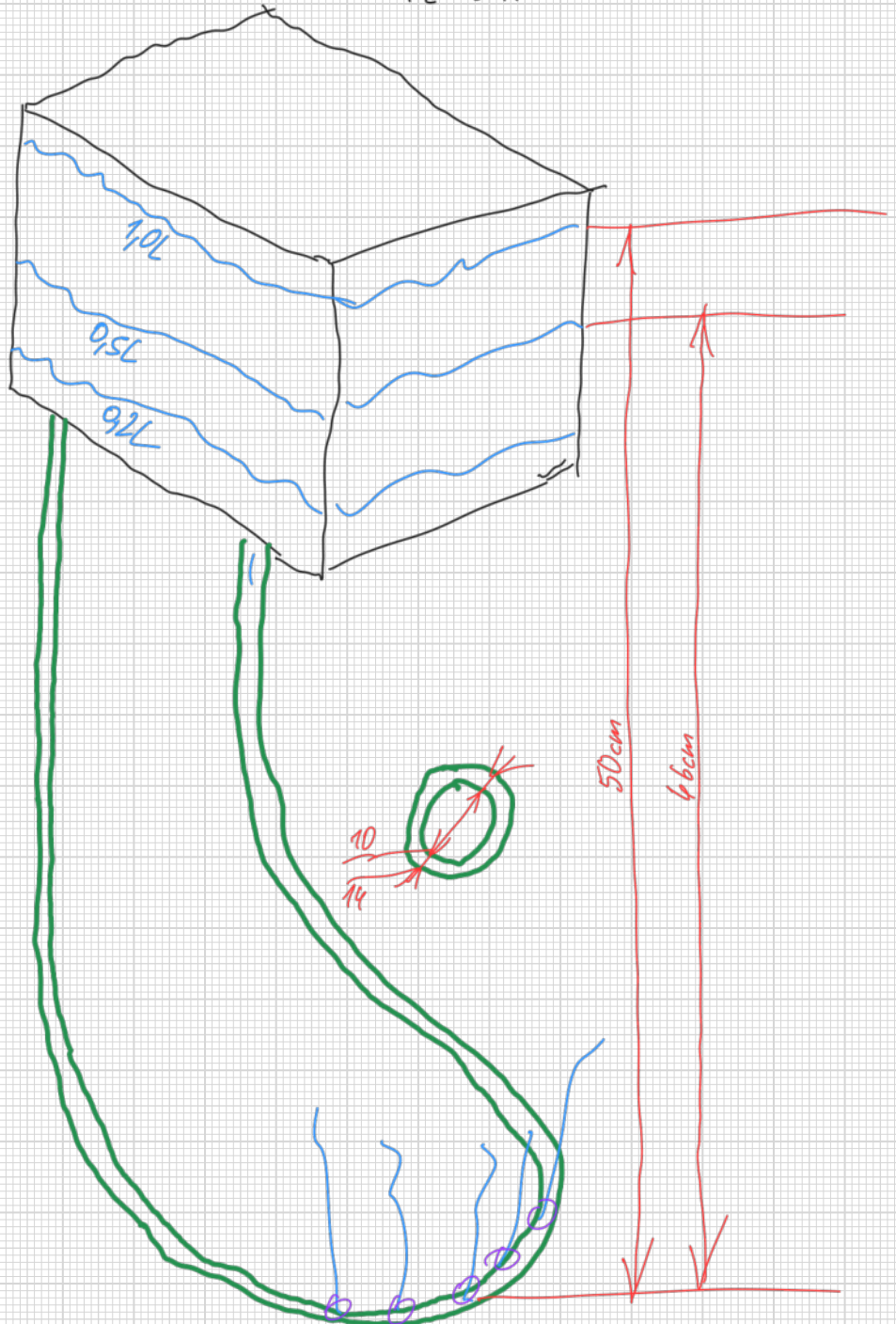
$$\zeta = \frac{2 \cdot g \cdot h}{v^2}$$

$$\zeta_{0,8} = 2,62$$

$$\zeta_{1,0} = 3,71$$

$$\zeta_{1,2} = 2,89$$

$$\zeta_{1,5} = 3,14$$



5 Löcher

0,8 mm
1,0 mm
1,2 mm
1,5 mm

} Messreihe



| Versuchsaufbau | | | | | | |
|--|-------------------|----------------------|-------------------|---------------------|--|------------------|
| | | | 0.5 l | | | |
| Loch [mm] | Zeit sek | Volumenstr [m3/s] | Strömung [m/s] | Querschnitt [m2] | | Zeta-Wert |
| 0.8 | 105 | 4.7619E-06 | 1.8947017 | 2.51327E-06 | | 2.62336397 |
| 1 | 80 | 0.00000625 | 1.59154943 | 3.92699E-06 | | 3.71791946 |
| 1.2 | 49 | 1.0204E-05 | 1.80447781 | 5.65487E-06 | | 2.89225878 |
| 1.5 | 34 | 1.4706E-05 | 1.66436542 | 8.83573E-06 | | 3.39971783 |
| Kalkulation | | | | | | |
| | Annahme Zeta-Wert | | 3 | Behälter | | 5 L |
| | Lochdurchmesser | | 0.8 mm | Löcher | | 10 Stk. |
| Bewässerungshöhe | | | | | | |
| (Mittlere Wasserspiegelhöhe - Schlauchaustrittshöhe) | | | | | | Bewässerungszeit |
| [m] | [Pa] | [m/s] | [L/h] | | | [s] |
| | | | pro Loch | | | |
| 0.1 | 979 | 0.81 | 1.5 | | | 00:20:30 |
| 0.2 | 1958 | 1.14 | 2.1 | | | 00:14:30 |
| 0.3 | 2937 | 1.40 | 2.5 | | | 00:11:50 |
| 0.4 | 3916 | 1.62 | 2.9 | | | 00:10:15 |
| 0.5 | 4895 | 1.81 | 3.3 | | | 00:09:10 |
| 0.6 | 5874 | 1.98 | 3.6 | | | 00:08:22 |
| 0.8 | 7832 | 2.29 | 4.1 | | | 00:07:15 |
| 1 | 9790 | 2.56 | 4.6 | | | 00:06:29 |
| 1.5 | 14686 | 3.13 | 5.7 | | | 00:05:18 |
| 2 | 19581 | 3.62 | 6.5 | | | 00:04:35 |
| 2.5 | 24476 | 4.04 | 7.3 | | | 00:04:06 |

