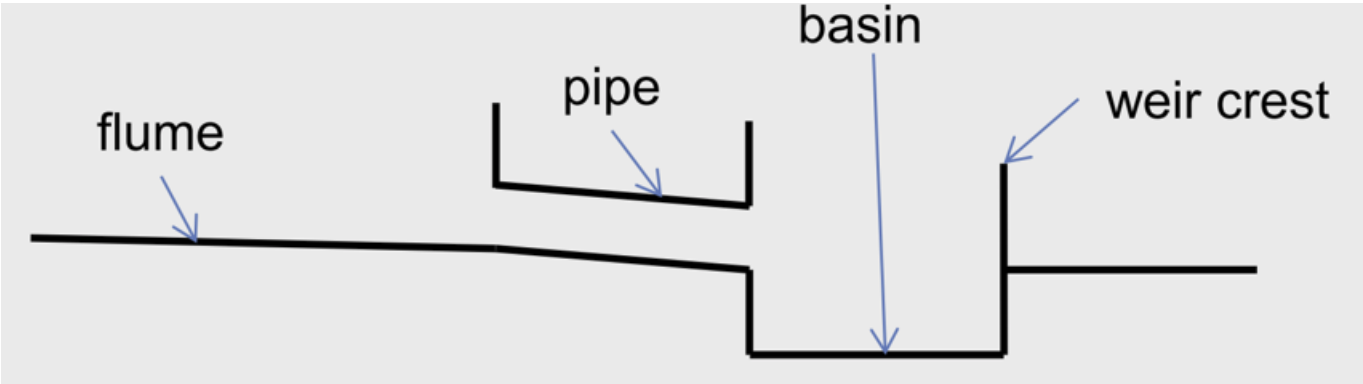
EXERCISE 5 – FLUME, PIPE, BASIN, WEIR

DESCRIPTION

Given:

- Q = 0.25 m³/s, k = 0,5 mm
- Flume: B = 0.8 m, H = 1m, zo / zu = 101.1 / 101.0 masl, L = 50 m
- Pipe: DN 500, zo / zu = 101.0 / 100.5 mask, L = 20 m
- Basin: B = 30 m, H = 3m, z = 99 masl, L = 10 m
- Weir: B = 30 m, H = 0.5 m, z = 101.25 masl
    - Trapezoid teeth: height 0.05 m, bottom width 0.05m, top width 0.15 m, distance between teeth 0.2 m, μ = 0.59

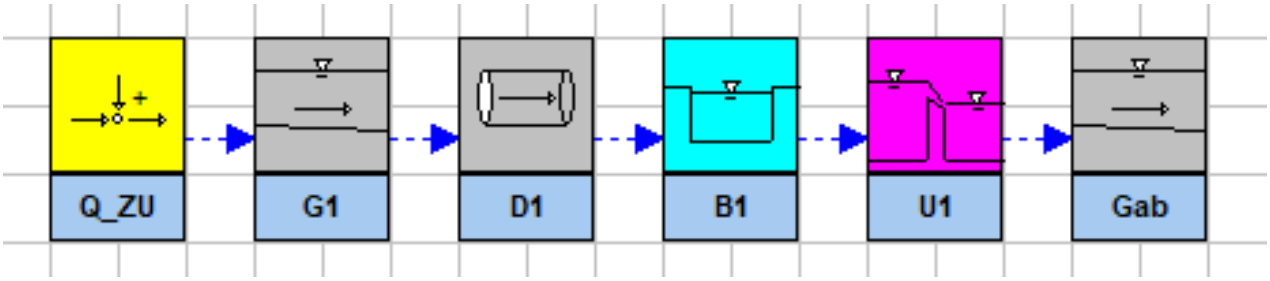


TASK

Determine the overfall height, water level in the basin, and depth of flow in the flume. Does pressurized flow occur in the pipe?

SYSTEM ABSTRACTION IN HYBEKA

To model this system in HYBEKA we need a flow changer, two open channel elements, a pipe, a basin and a weir element.



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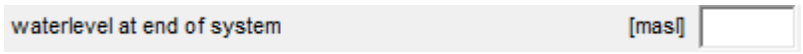
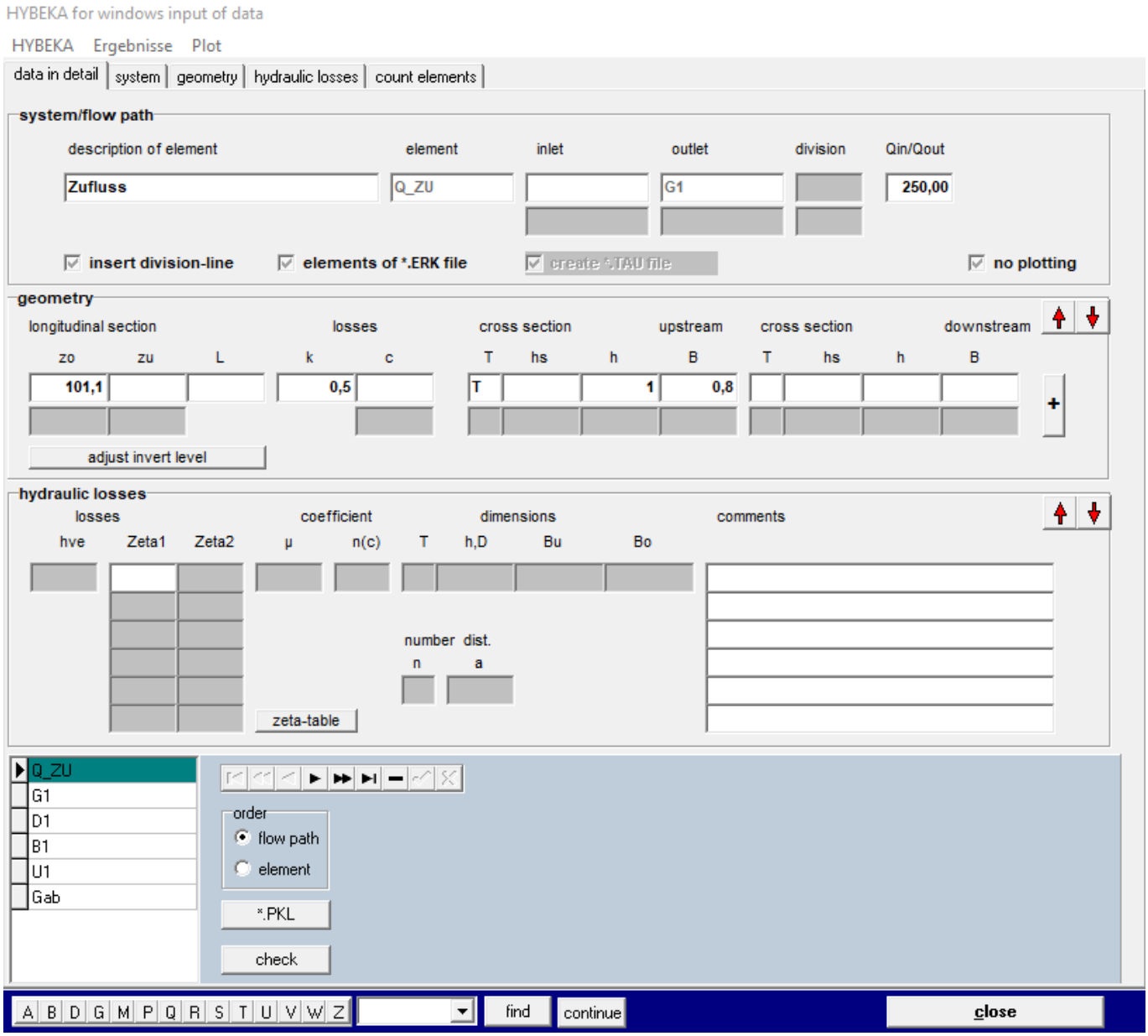
DATA INPUT

General settings:

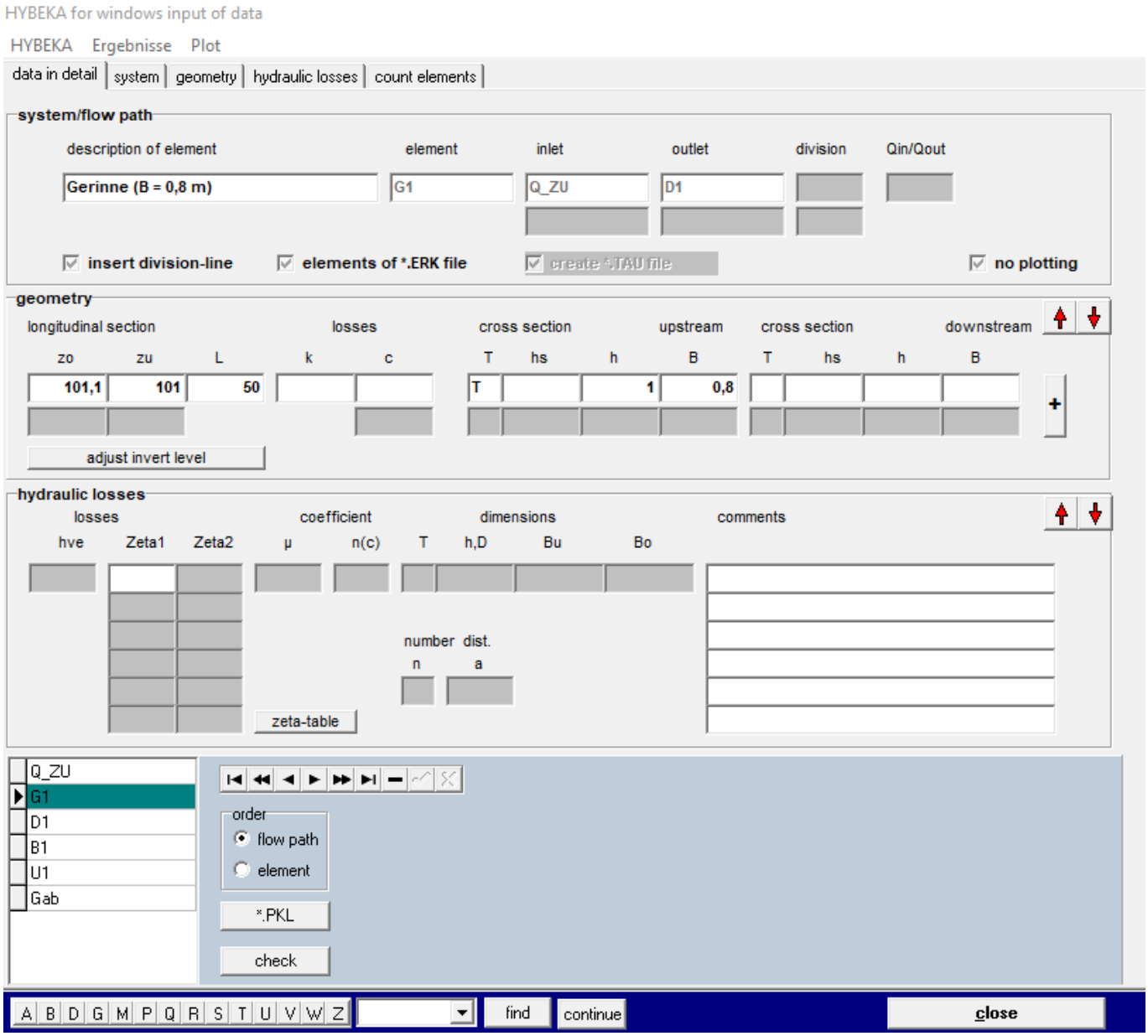


The water level at the system outlet is left empty and critical flow depth will be used as starting point.

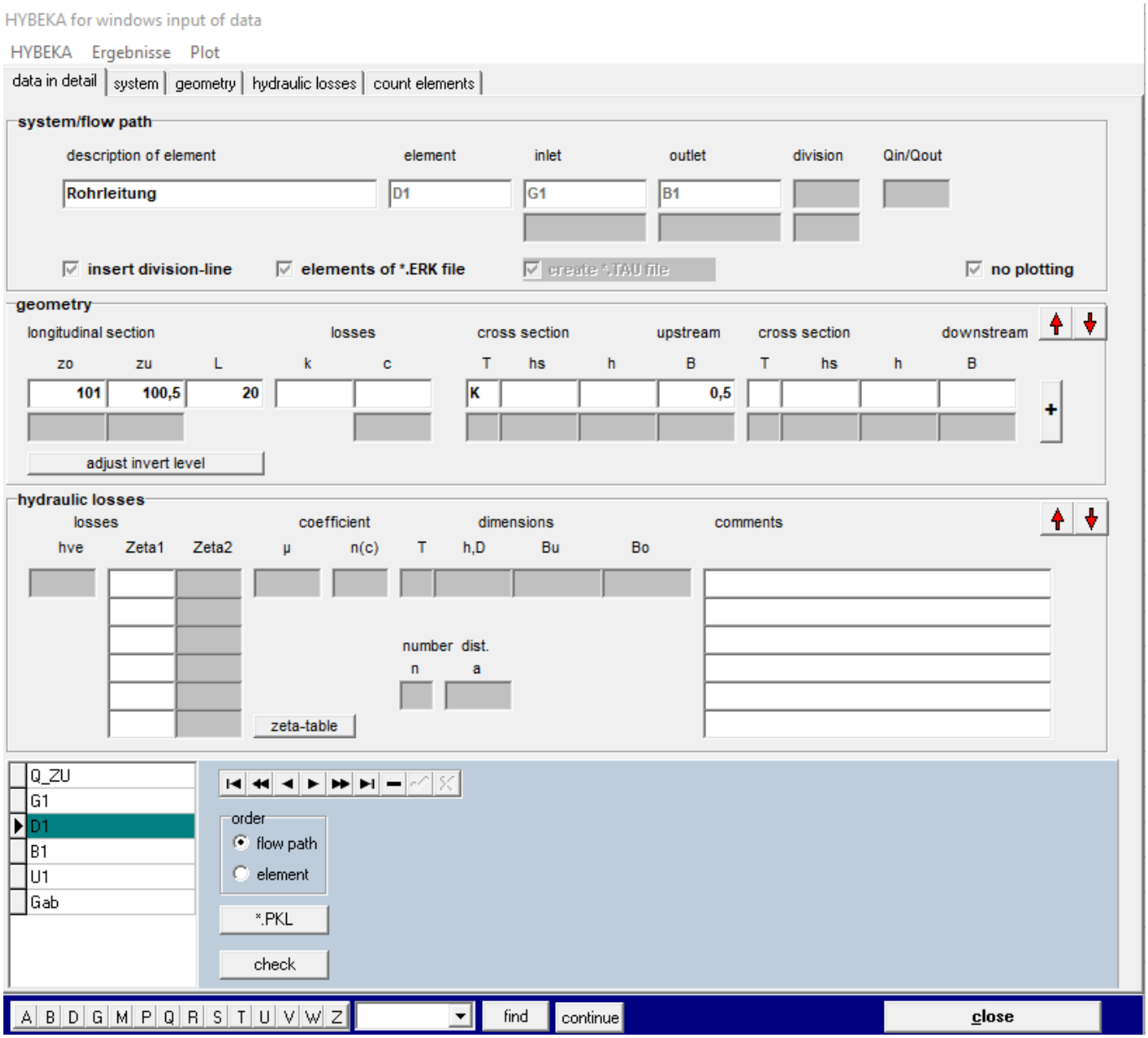
Flow changer Qzu:



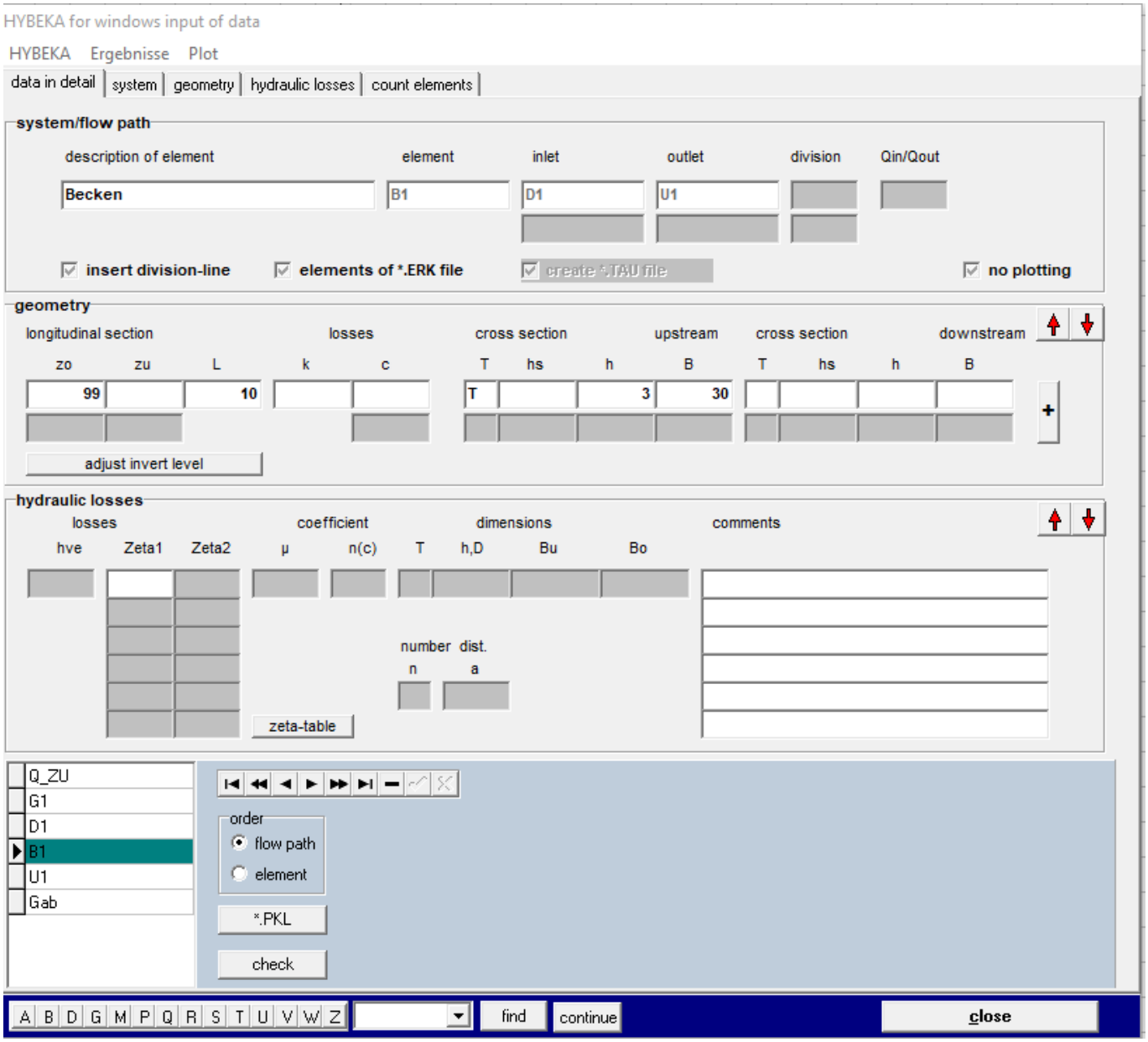
Flume element G1:



Pipe element D1:



Basin B1:


HYBEKA for windows input of data
HYBEKA Ergebnisse Plot
data in detail
system
geometry
hydraulic losses
count elements
system/flow path
description of element
element
inlet
outlet
division
Qin/Qout
Becken
B1
D1
U1
insert division-line
elements of *.ERK file
create *.TAU file
no plotting
geometry
longitudinal section
losses
cross section upstream
cross section downstream
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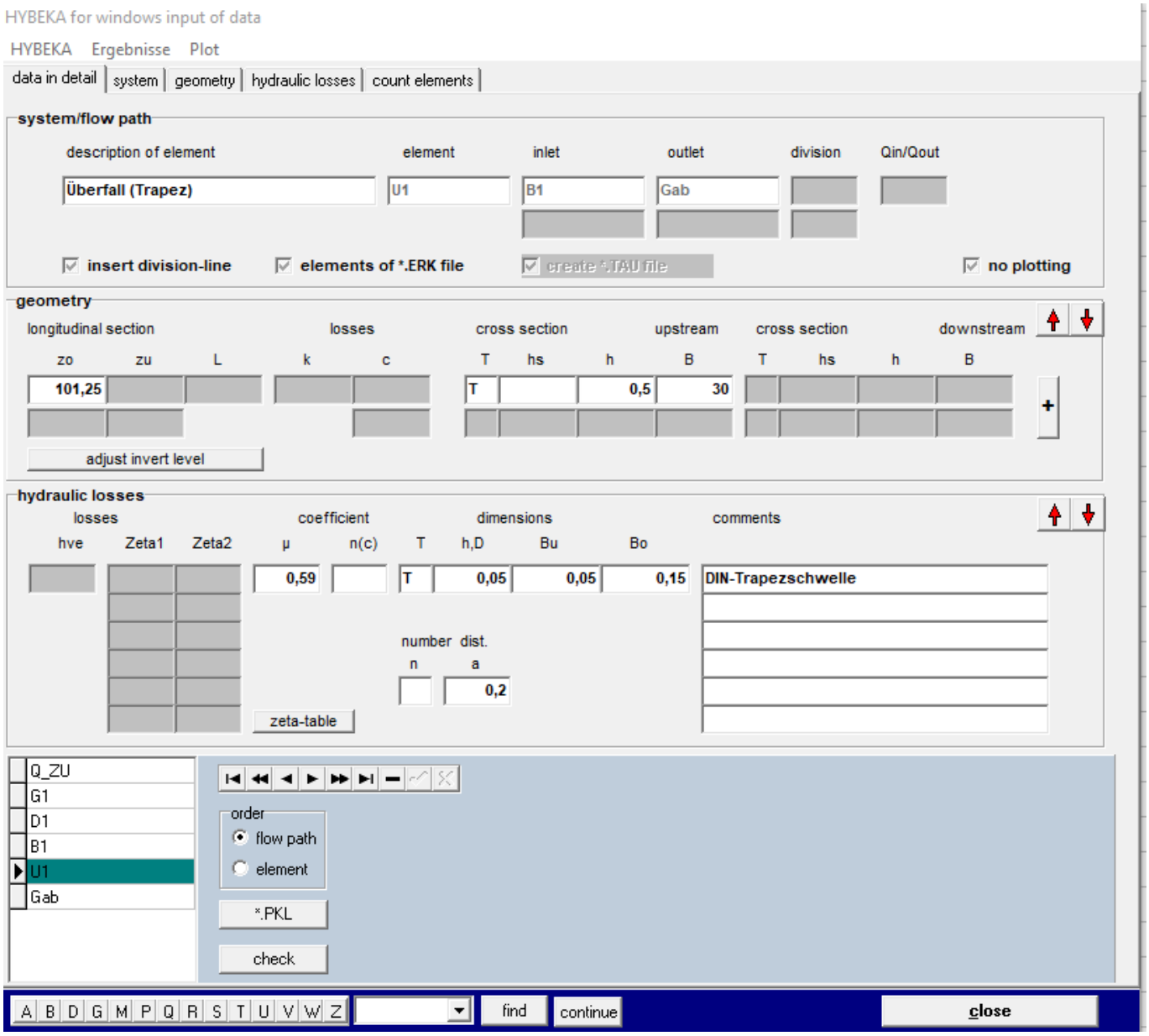
zeta-table
Q_ZU
G1
D1
B1
U1
Gab
order
flow path
element
*.PKL
check
A B D G M P Q R S T U V W Z
find
continue
close

Weir U1:


HYBEKA for windows input of data
HYBEKA Ergebnisse Plot
data in detail system geometry hydraulic losses count elements
system/flow path
description of element
element
inlet
outlet
division
Qin/Qout
Überfall (Trapez)
U1
B1
Gab
insert division-line
elements of *.ERK file
create *.TAU file
no plotting
geometry
longitudinal section
losses
cross section upstream
cross section downstream
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adjust invert level
hydraulic losses
losses
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comments
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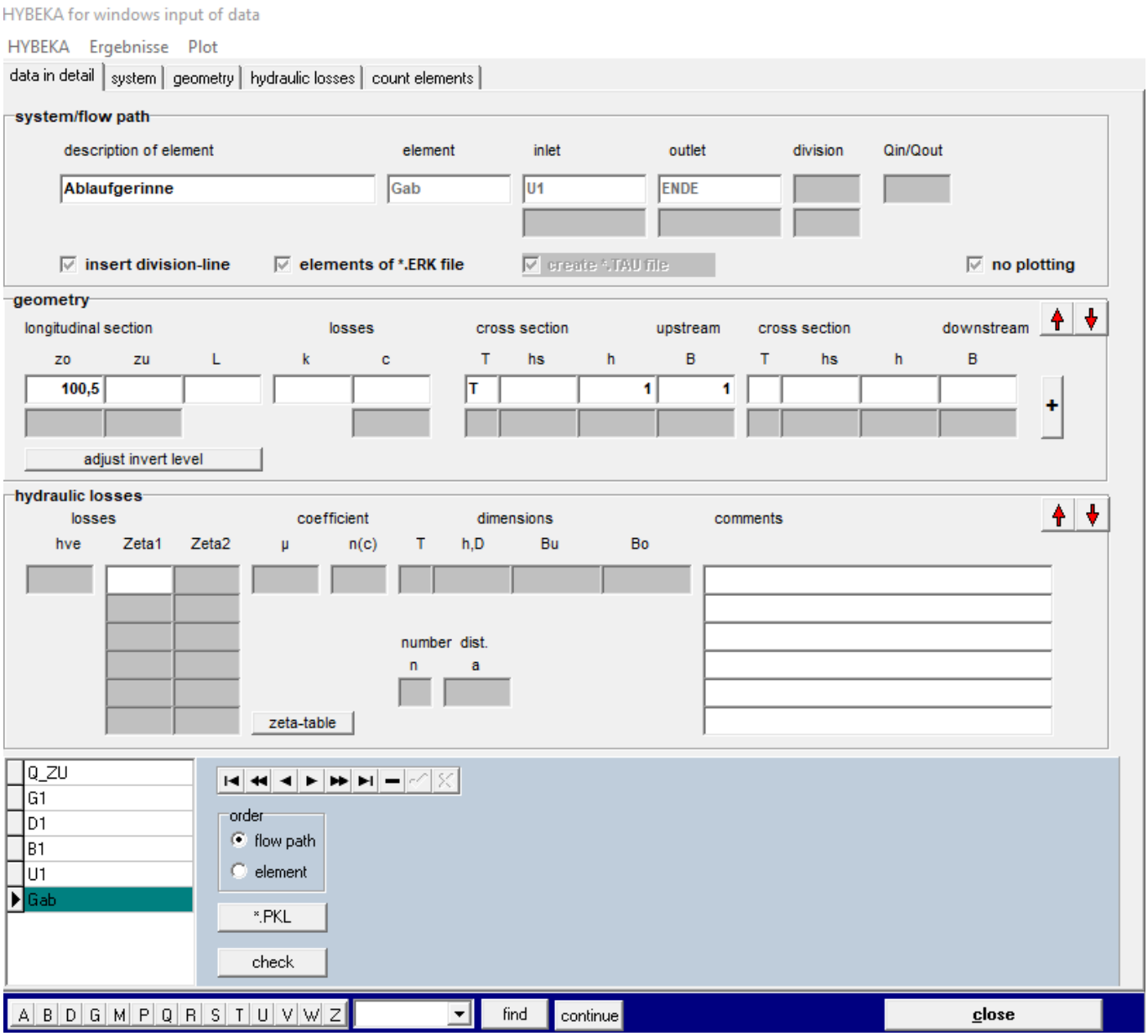
Q_ZU
G1
D1
B1
U1
Gab
order
flow path
element
*.PKL
check
A B D G M P Q R S T U V W Z
find
continue
close

Open channel Gab:



RESULTS:

	i	element	O	discharge	length	invert	board level	water level		wetted cross-sectic	velocity	energy level	shear stress	Pr	losses [m]				comment
				[m³/s]	[m]	[masl]	[m]	[m]	[masl]	[m²]	[m²/s]	[masl]	[N/m²]	o/g	frict.	single (1)	single (2)	transit.	
▶	1	Q_ZU	1	0,250	0,000	101,100	1,000	0,427	101,527	0,34	0,73	101,554	1,23	o				0,000	
	1	G1	1	0,250		101,100	1,000	0,427	101,527	0,34	0,73	101,554	1,23	o	0,024	0,000			
	2	G1	1		50,000	101,000	1,000	0,511	101,511	0,41	0,61	101,530	0,85	o				0,033	
	1	D1	1	0,250		101,000	0,500	0,343	101,343	0,14	1,74	101,498	7,32	g	0,116	0,000			gr V FS
	2	D1	1		20,000	100,500	0,500	0,799	101,299	0,20	1,27	101,381	4,10	g				0,083	d
	1	B1	1	0,250		99,000	3,000	2,299	101,299	68,96	0,00	101,299	0,00	o	0,000	0,000			
	2	B1	1		10,000	99,000	3,000	2,299	101,299	68,96	0,00	101,299	0,00	o				0,000	
	1	U1	1	0,250		101,250	0,500	0,049	101,299	68,96	0,00	101,299		o				0,521	
	1	Gab	1	0,250		100,500	1,000	0,185	100,685	0,19	1,35	100,778	4,51	o	0,000	0,000			gr
	2	Gab	1		0,000	100,500	1,000	0,185	100,685	0,19	1,35	100,778	4,51	o				0,000	gr

The overfall height is 0.185 m. The water level in the basin is 2.299 m and the depth in the flume G1 is 0.427 m at the inlet and 0.511 m at the outlet. In the pipe element D1 pressurized flow does indeed occur as indicated by the "d" in the comments.

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