# P A R S H A L L   F L U M E S

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## U S A G E

**Parshall flume** is a device for measurements of flow of water with wide range of usage. The flume can be installed on:

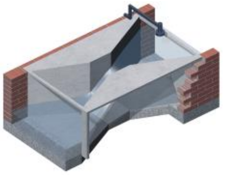
- waste water plants
- streams
- draining and watering channels
- sewerage outfalls

**Wide usage of flumes is given by the following advantages:**

- low energy loss (3-4 times lower in comparison to weirs)
- relatively high insensitiveness to the distribution of velocity on the inlet
- capability to measure even with high flooding of back water on the outlet
- high velocity prevents sedimentation of suspended solids
- long lifetime, minimal maintenance requirements
- wide range of measured water flow

## E X A M P L E S   O F   U S A G E

in open channel

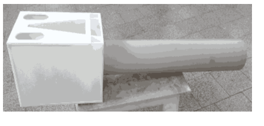


manhole DN 1000, 1500

manhole DN 1000, 1500

unpaved ground, in nature

socket Parshall flume



in box

## H Y D R A U L I C   C H A R A C T E R I S T I C S

**Parshall measurement flume** shall be fixed in axis of channel. On the inlet to the Parshall flume there must be river flow (Fr<0,5) throughout the whole range of measured flows. The level must not be swollen up by the resistance of throat of flume too much to affect the velocity and to enable the suspended solids to settle down on the bottom of the flume do the distance in front of the throat. Partially settled suspended solids do not affect the measurements as they tend to be washed away during the periods of high flow. The flow shall be balanced equally without whirls and waves – the velocity profile shall be balanced. On the outlet from the throat the water shall be freely flowing out so that the ratio of submersion Hd/Ha do not exceeds 0,5. Method of hydraulic calculation including design of inlet and outlet, calming sections, necking and expansion of the channel can be found on our website **www.pars-aqua.com**.
We can also provide examples or models of measurement objects (Parshall flumes) in manholes (.dwg projects in AutoCAD). If interested, we can provide check of hydraulic calculations or design of your measuring channels.

## P R I N C I P L E   O F   F U N C T I O N

**Water** flowing into the flume if forced by local bottleneck of the channel and by drop in the floor at the flume throat to transit from subcritical flow (Fr<0,5 !) through critical flow into supercritical flow (Fr>1). Thanks to this transition from one regime to the other it is possible to calculate actual flow according to the depth of water at certain point in front of the throat. The level of liquid in the flume is measured in axis of the inlet to the flume mostly using ultrasound sensor or directly in the flume using float gauge, pneumatic or pressure sensor or can be measured directly on the ruler placed on side of the flume. Our Parshall flume can be equipper with such ruler on demand.
**Parshall flume** is made out od UV stabilized polypropylene which can withstand environment temperatures ranging from -30 to + 60 °C. Exact measures of Parshall flumes, weights and flow ranges are stated in the table Characteristics of Parshall Flumes.
**Read outs of flow** rate of water can be done by ultrasound sensor and control unit capable of calculation of Consumption equation of the Parshall flume.

# C O N S U M P T I O N   E Q U A T I O N

**Consumption equation** can be programmed into any control unit of any producer which is capable of calculation of consumption curve formula. The sensor (ultrasound sensor, radar, etc.) is electronically connected to the control unit.

$$Q= a*h^b$$

Q – flow rate ($m^3/s$)
a, b – constants given by used Parshall flume
h – depth of water at the length B´ in front of the throat (measured by ultrasound sensor)

**CE certified sensor and control unit can be delivered together with our Parshall flume on request.**

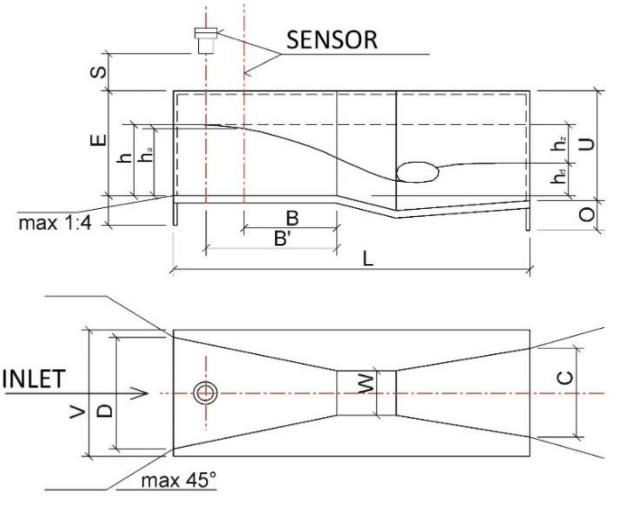
# P R O P E R T I E S   O F   P A R S H A L L   F L U M E S

| FLUME | | P1 | P2 | P3 | P4 | P5 | P6 | P7 | P8 | P9 |
|---|---|---|---|---|---|---|---|---|---|---|
| $Q_{MIN}$ | l/s | 0,26 | 0,52 | 0,78 | 1,52 | 2,25 | 2,91 | 4,4 | 5,8 | 8,7 |
| $Q_{MAX}$ | l/s | 6,22 | 15,1 | 54,6 | 168 | 368 | 598 | 898 | 1211 | 1841 |
| A | - | 0,0609 | 0,1197 | 0,1784 | 0,354 | 0,521 | 0,675 | 1,015 | 1,368 | 2,081 |
| B | - | 1,552 | 1,553 | 1,555 | 1,558 | 1,558 | 1,556 | 1,56 | 1,564 | 1,569 |
| B' | cm | 30 | 34 | 39 | 53 | 75 | 120 | 130 | 135 | 150 |
| U $Q_{MIN}$ | % | 5,4 | 4,1 | 4,1 | 4,1 | 3,8 | 3,8 | 3,6 | 3,6 | 3,5 |
| U $Q_{MAX}$ | % | 4,8 | 3,6 | 3,6 | 3,6 | 3,2 | 3,2 | 3,1 | 3,1 | 3 |
| $H_D/H_A$ | - | 0,6 | 0,6 | 0,6 | 0,6 | 0,6 | 0,7 | 0,7 | 0,7 | 0,7 |
| M | kg | 5,7 | 7,7 | 17 | 47 | 81 | 146 | 183 | 231 | 252 |
| W | cm | 2,54 | 5,08 | 7,62 | 15,24 | 22,86 | 30,48 | 45,7 | 61 | 91,4 |
| C | cm | 9,29 | 13,49 | 17,8 | 39,4 | 38,1 | 61 | 76,2 | 91,44 | 121,9 |
| D | cm | 16,75 | 21,35 | 25,88 | 39,69 | 57,47 | 84,46 | 102,6 | 120,7 | 157,2 |
| E | cm | 23 | 26,4 | 46,7 | 62 | 80 | 92,5 | 92,5 | 92,5 | 92,5 |
| L | cm | 63,5 | 77,5 | 91,5 | 152,4 | 162,6 | 286,7 | 294,3 | 301,9 | 316,9 |
| O2 | cm | 2,8 | 4,2 | 5,7 | 11,5 | 11,5 | 10 | 10 | 10 | 10 |
| O1 | cm | 4,6 | 6,4 | 8,2 | 19,1 | 19,1 | 17,6 | 17,6 | 17,6 | 17,6 |
| S | cm | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| U | cm | 24,8 | 26,8 | 49,2 | 69,6 | 87,6 | 101,1 | 101,1 | 101,1 | 101,1 |
| V | cm | 30,7 | 35,35 | 39,9 | 54 | 80 | 100 | 120 | 140 | 180 |

## LEGEND

| | |
|---|---|
| $Q_{min}$ | minimal flow |
| $Q_{max}$ | maximal flow |
| A | equation parameter |
| B | equation parameter |
| B' | distance of sensor from the throat |
| U $Q_{min}$ | expanded uncertainty of measurement |
| U $Q_{max}$ | expanded uncertainty of measurement |
| $h_d/h_a$ | maximal submersion |
| M | weight of flume |
| W | dimension – width of throat |
| C | dimension – width of flume at outlet |
| D | dimension – width of flume at inlet |
| E | dimension – width of flume (working) |
| L | dimension – length of flume |
| O2 | dimension |
| O1 | dimension |
| S | dimension – position of sensor |
| U | dimension – height of flume |
| V | dimension – width of flume |

## DRAWING OF PARSHALL FLUME

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