

A basic unit for reduction of Cesium 137, Strontium 90

A short description of a compact unit for extensive reduction of Cesium 137 and Strontium 90 in contaminated water from a nuclear plant.

After cooperation with and research by a swedish company that handles large amounts of contaminated water an efficient and compact unit has been developed.

Depending on the amount of water that needs to be handled more units can easily be connected. Two units in a parallell connection doubles the flow and the total water being purified. Four units quadruples the flow etc.

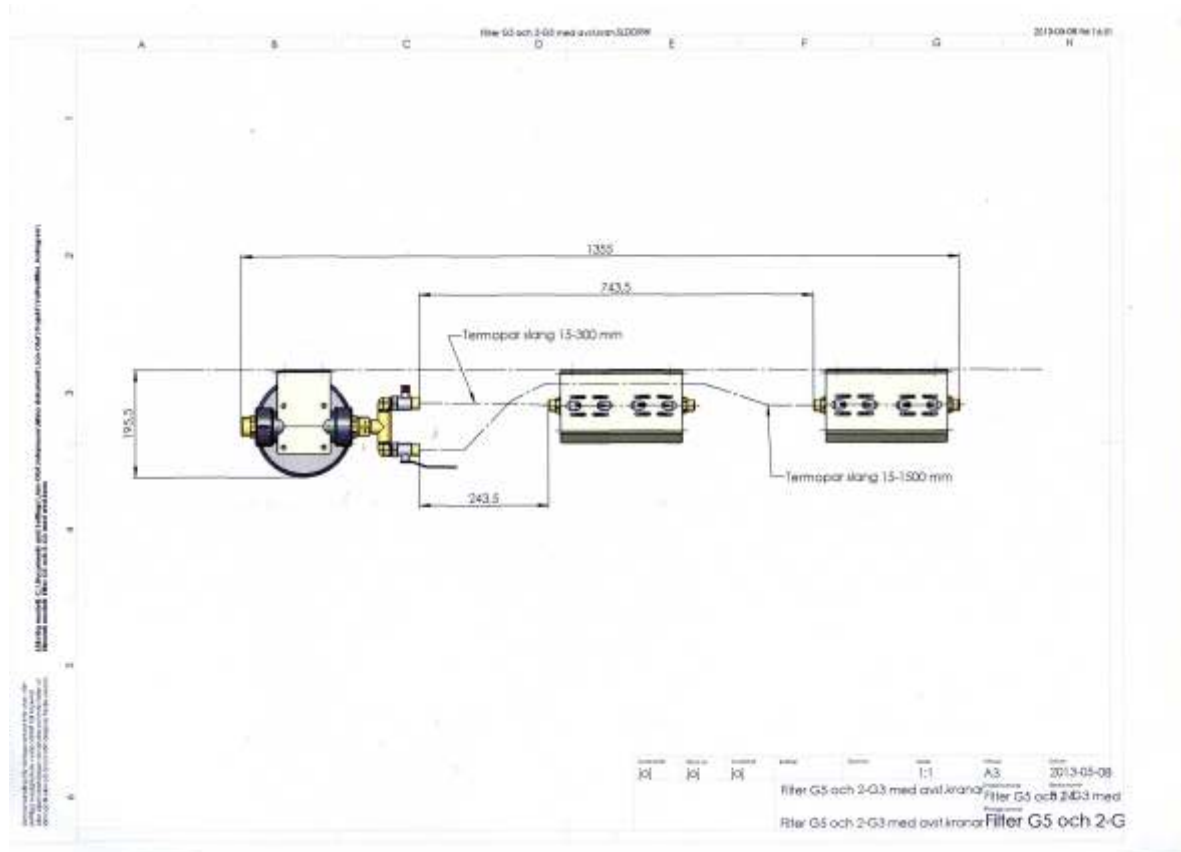
The construction described has proven to be the optimal configuration and produces the best possible flow/efficiency ratio.

A basic unit consists of one G5 filter that works as a prefilter for two serial connected G3-units. (Se the drawing below). The G3-units are equipped with standard micro-spiral filters with a porosity of 0,05 μm . This filter material has in extensive testing proven to be by far the most efficient filter against heavy metals as uranium, led etc and because of that, the idea emerged that it could be used in a context with alpha- and beta particles.

Capacity

The capacity of a unit is, of course, depending on the degree of the contamination level in the water being treated. Usually, however, the amount of purified water seems to reach at least 10.000 litres before the filter cartridges need to be changed.

The flow rate, also depending on the level of contamination of the water, usually reaches 5 l/min (at a pressure of at least 0,5 bar).



the basic unit

Test results Cesium/Strontium

(microspiral filter porosity 0,05-0,1 µm)

The result below is from a swedish test performed in may 2013 on microspiral filters (0,05µm).

The purpose of the test was to establish the amount of reduction of alpha- and beta particles from a water contaminated with Cesium 137 and Strontium 90.

The result, as displayed below, showed the reduction of Alpha with > 98% and Beta with >99%!

In the experiment two serial connected microspiral filters (0,05µm) were used as displayed on the next page.

Alpha particles

0,29 Bq/ml Before filter 130505 Ref 53
0,0058 Bq/ml After filter 130505 Ref 54

Beta particles

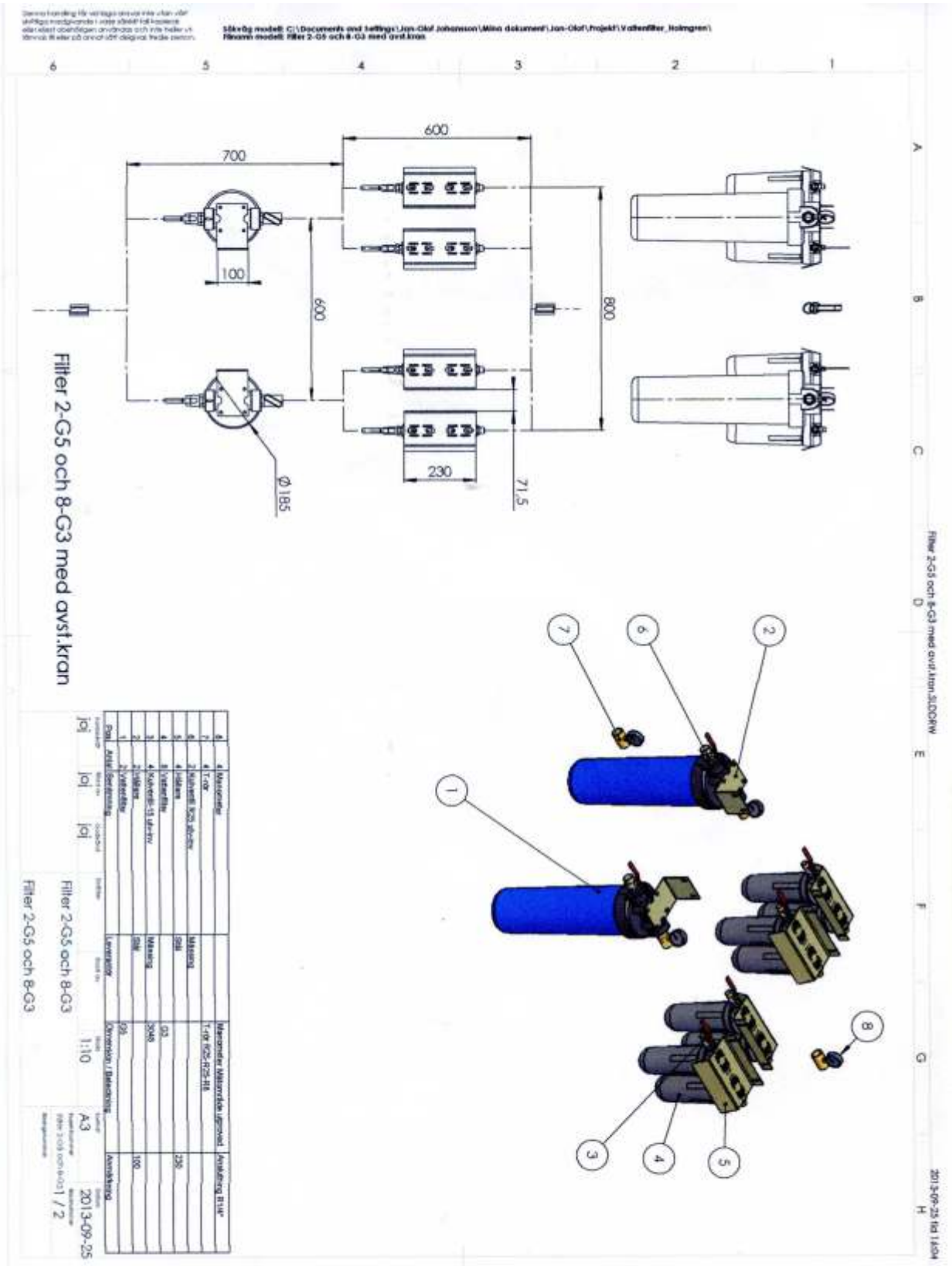
43 Bq/ml Before filter 130505 Ref 55
0,2 Bq/ml After filter 130505 Ref 56

Below the result of an international test performed in 1996

(Microspiral filter)- Cesium Test Results					
02 May 1996					
Initial Cs Feed Concentration = 417 mg/L pH = 3.4					
Measured Cs Feed Concentration (mg/L)	Feed Volume (L)	Mass of Cs in Feed Volume (mg)	Measured Cs Effluent Concentration (mg/L)	Mass of Cs Loaded on the Filter (mg)	Percent of Cs Removed (%)
417.00	0.25	104.25	<5.0*	99.25	95.20
417.00	0.50	208.50	<5.0*	203.50	95.20
417.00	1.00	417.00	<5.0*	412.00	97.60
417.00	2.00	834.00	<5.0*	829.00	98.80
417.00	4.00	1668.00	<5.0*	1663.00	99.40
417.00	8.00	3336.00	<5.0*	3331.00	99.70
	Total	6672.00		6637.00	99.85
* Cs concentration below the ICP detection level of 5 mg/L Filter mass for this test is approximately 170 g					

(Microspiral filter)- Strontium Test Results					
02 May 1996					
Initial Sr Feed Concentration = 142 mg/L pH = 3.4					
Measured Sr Feed Concentration (mg/L)	Feed Volume (L)	Mass of Sr in Feed Volume (mg)	Measured Sr Effluent Concentration (mg/L)	Mass of Sr Loaded on the Filter (mg)	Percent of Sr Removed (%)
142.00	0.25	35.50	0.002*	35.50	99.99
142.00	0.25	35.50	0.0040	35.50	99.99
142.00	0.50	71.00	0.0540	70.95	99.92
142.00	1.00	142.00	0.1440	141.86	99.90
142.00	2.00	284.00	0.2550	283.75	99.91
142.00	4.00	568.00	0.2900	567.71	99.95
142.00	8.00	1136.00	1.3900	1134.61	99.88
	Total	2272.00		2269.86	99.91
* Sr concentration below the ICP detection level of 0.002 mg/L Filter mass for this test is approximately 170 g					

Below the drawing of the complete basic unit with measuring instruments for the pressure which simplifies the monitoring process (indicating when the filters need to be changed)



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