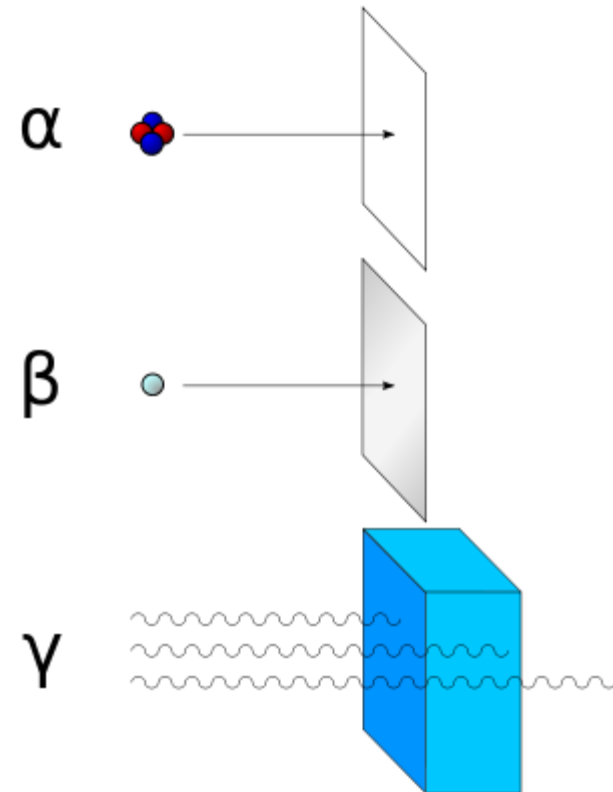


airpointer[®] PM module:
Metone BAM 1020



β - decay (electron emission)

- Alpha radiation consists of helium nuclei and is readily stopped by a sheet of paper. Beta radiation, consisting of electrons or positrons, is halted by an aluminum plate. Gamma radiation is dampened by lead.



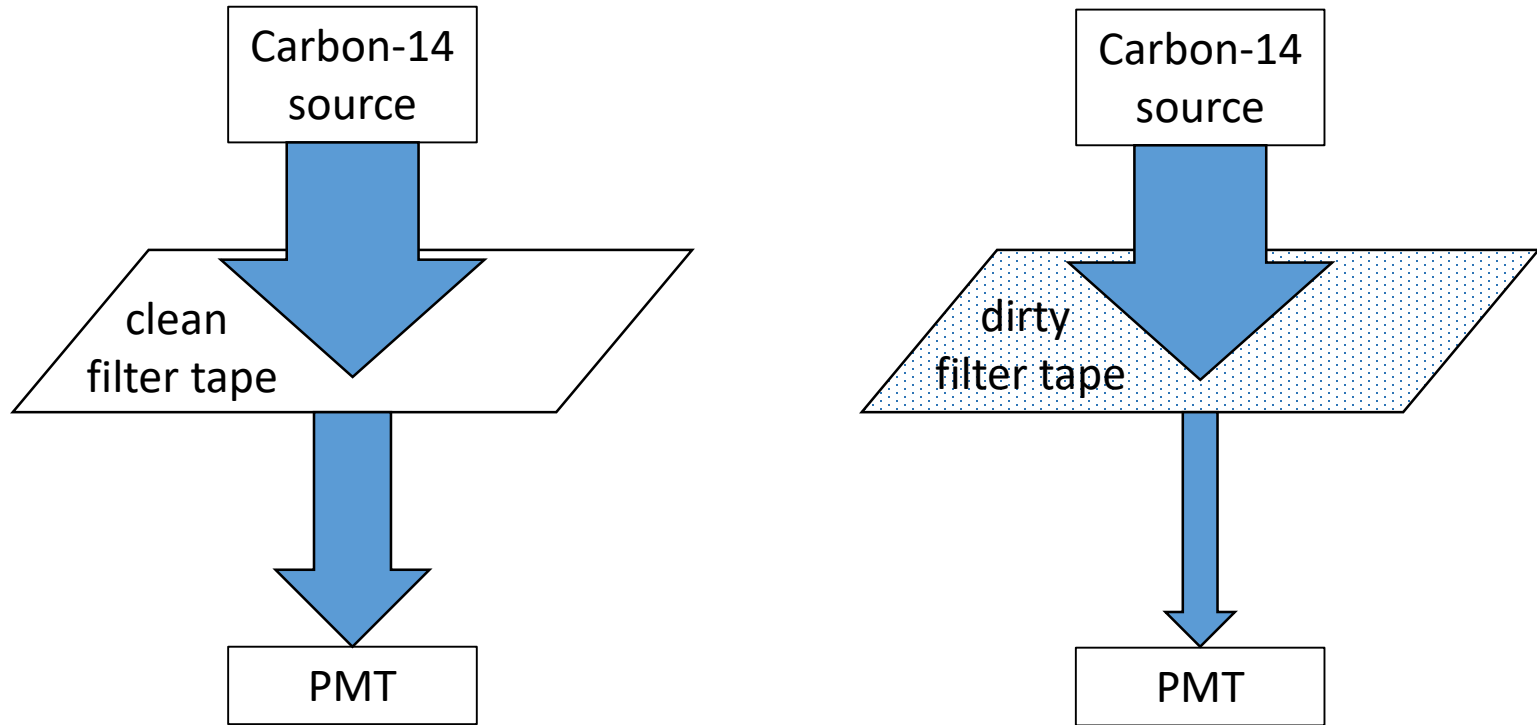
β -decay of Carbon-14

Carbon-14 is radioactive: it decays into Nitrogen-14, emitting a β - particle (an electron).



Half-life > 5000 years

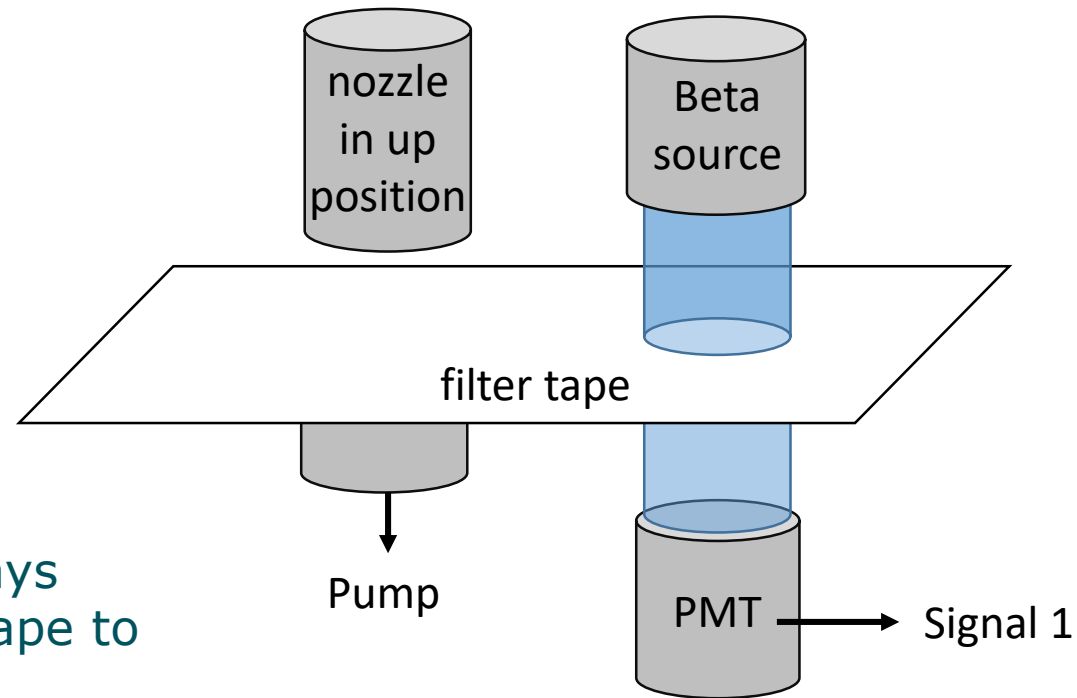
β -attenuation monitor



The particles adsorbed on the filter tape attenuate the signal detected by the PhotoMultiplier Tube (PMT)

β -attenuation monitor

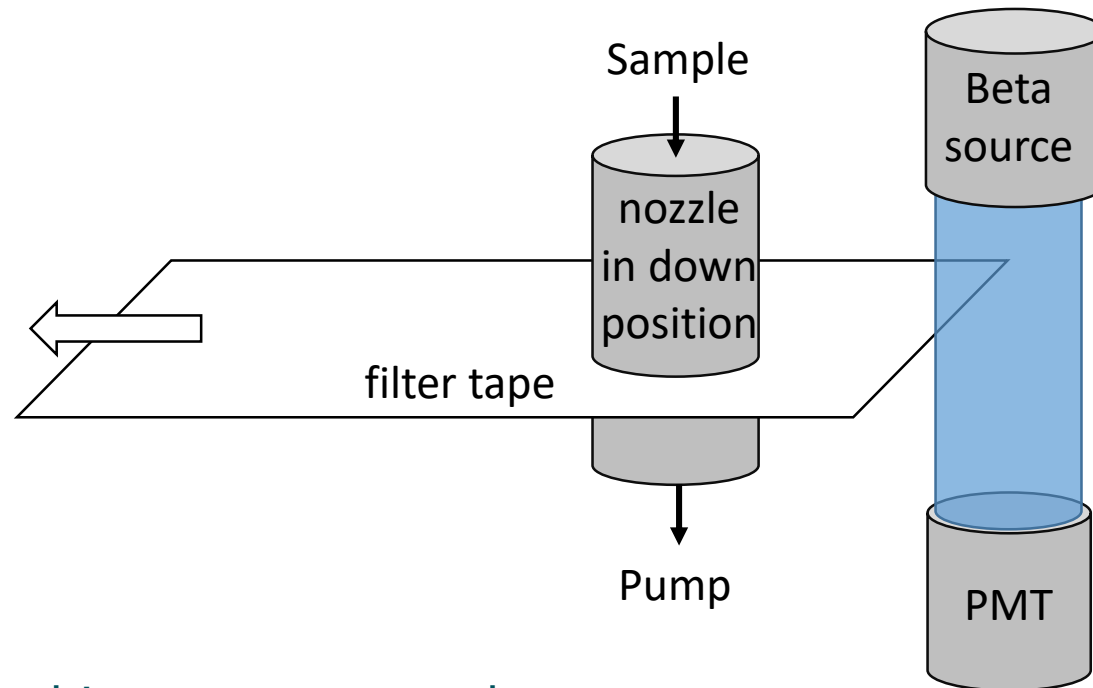
- From $t = 0$ minute to $t = 8$ minutes



A small ^{14}C element emits β rays through a clean spot of filter tape to determine a zero reading.

β -attenuation monitor

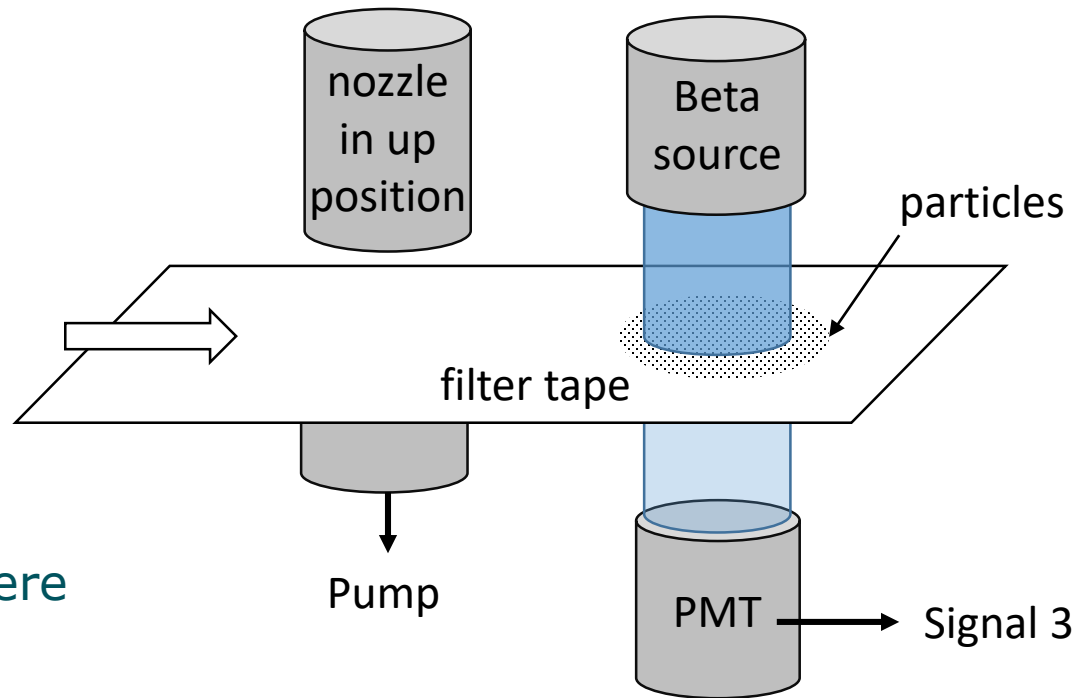
- From $t = 8$ minutes to $t = 50$ minutes



The BAM advances this exact spot to the sample nozzle where air containing particulate is sampled onto the filter tape.

β -attenuation monitor

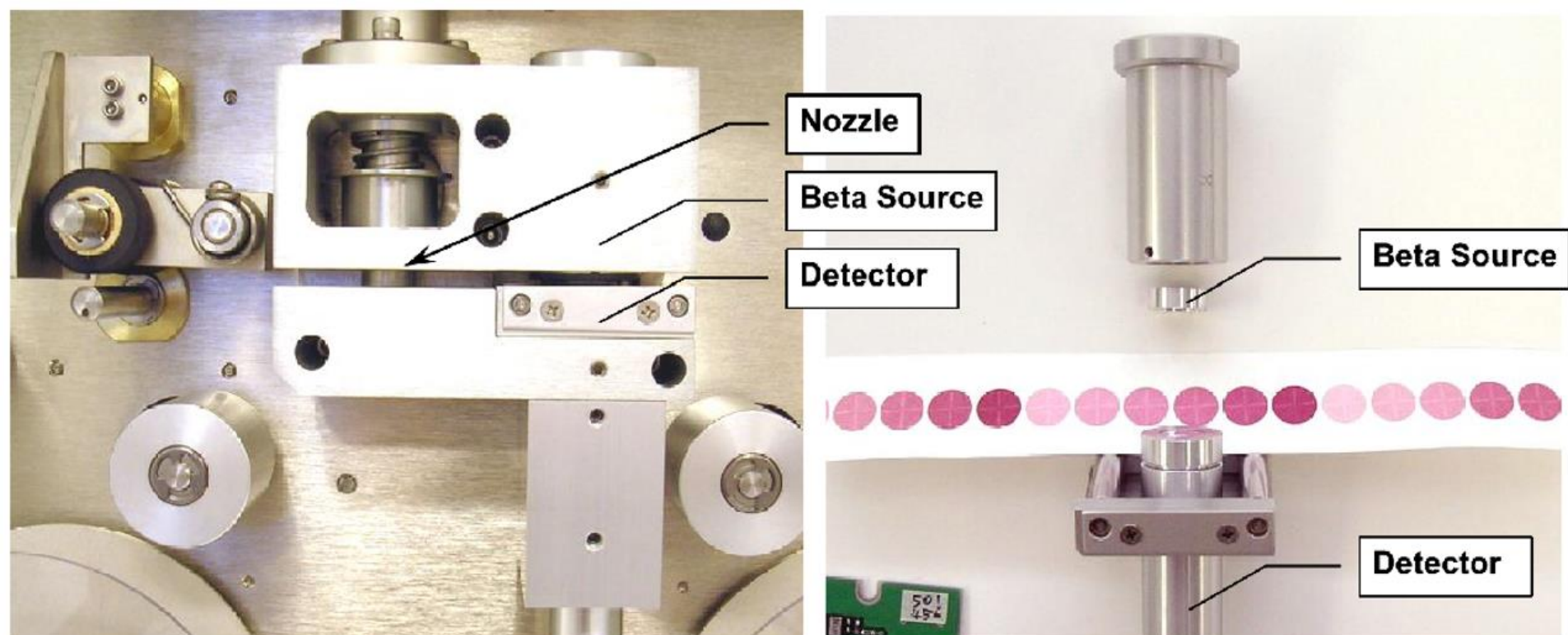
- From $t = 50$ minute to $t = 58$ minutes



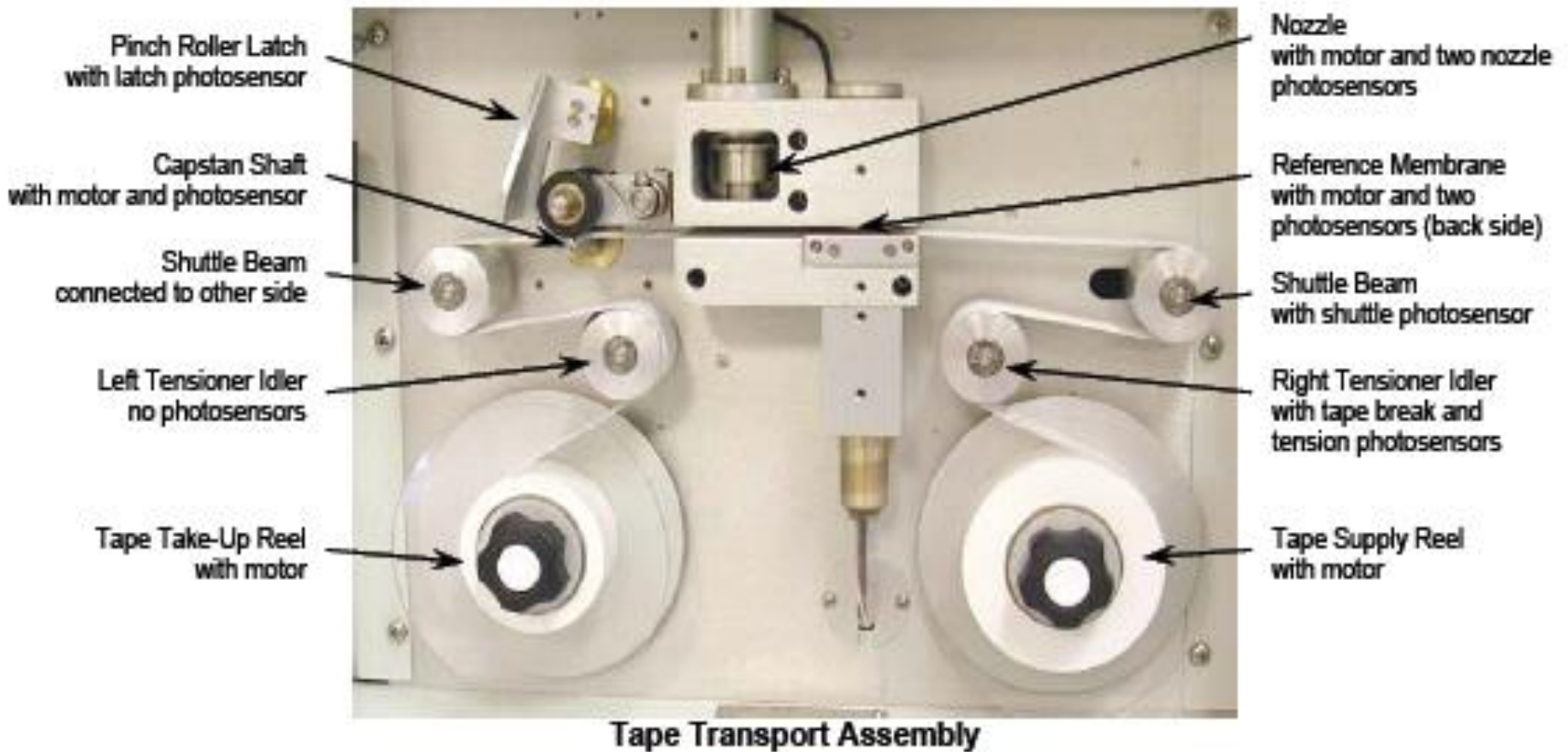
The same exact dirty spot is placed back at the source where it is re-measured with β rays.

The dirty tape absorbs more beta rays than the clean spot did. The difference between the two measurements is related to the mass concentration by a variation of Beer's Law.

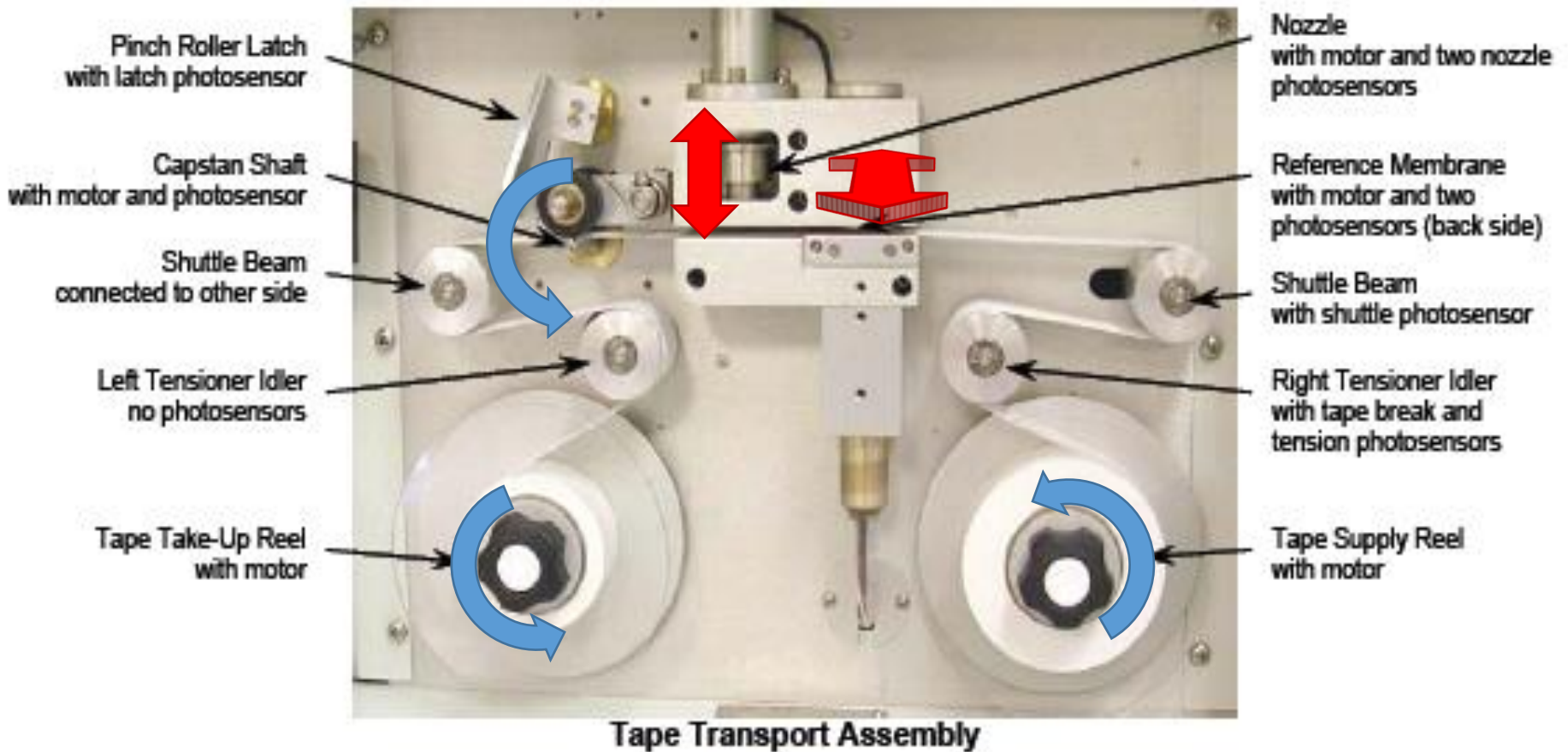
Source and detector



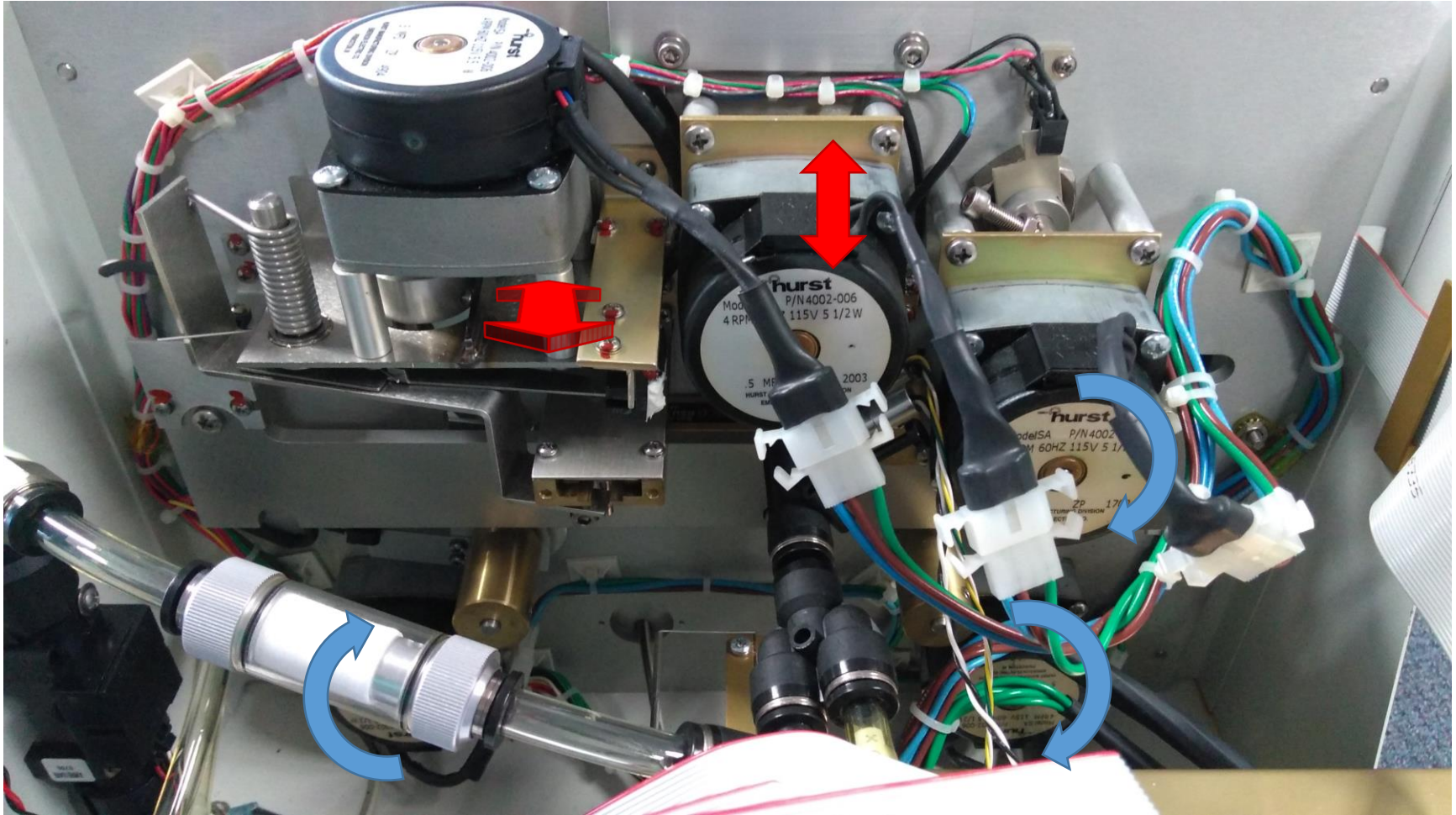
Motors and optical sensors



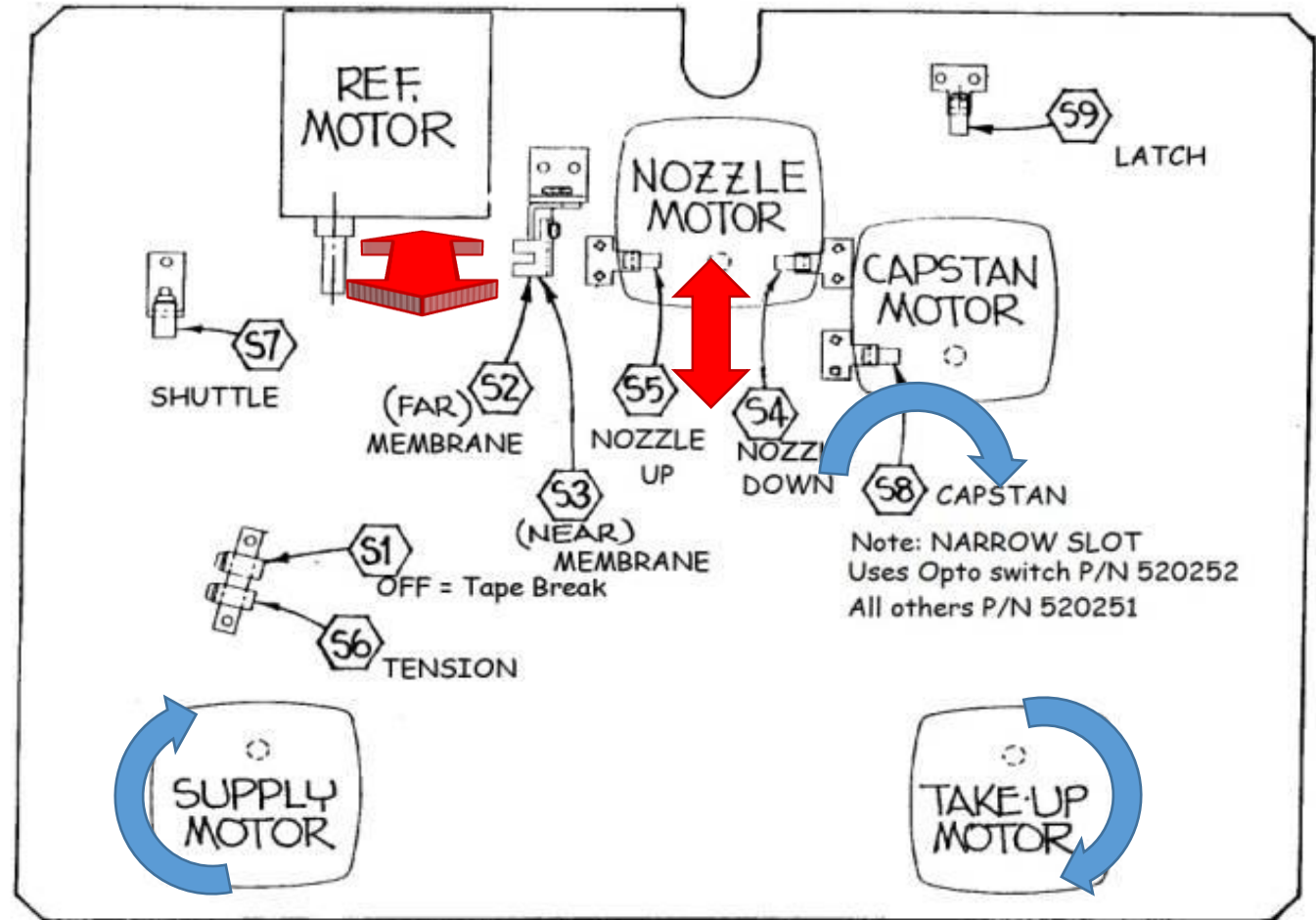
Motors and optical sensors



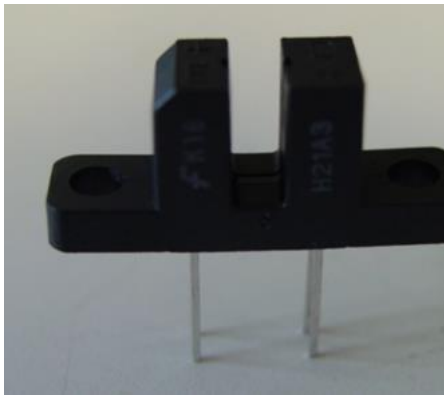
Motors and optical sensors



Motors and optical sensors



Optical sensor:



Pneumatics

Inlet Receiver

Filter Temp
RH sensors

P sensor

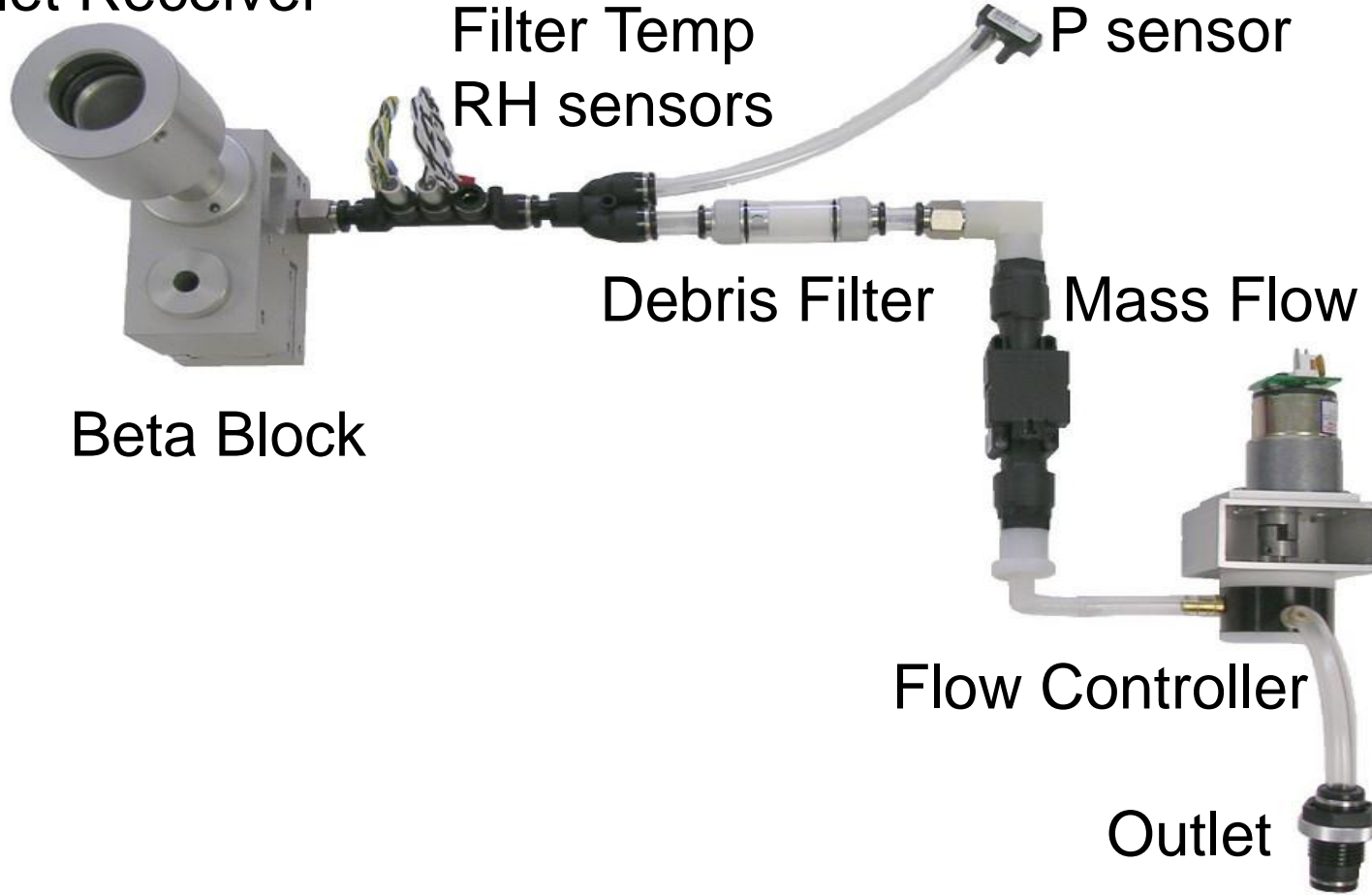
Debris Filter

Mass Flow Sensor

Beta Block

Flow Controller

Outlet



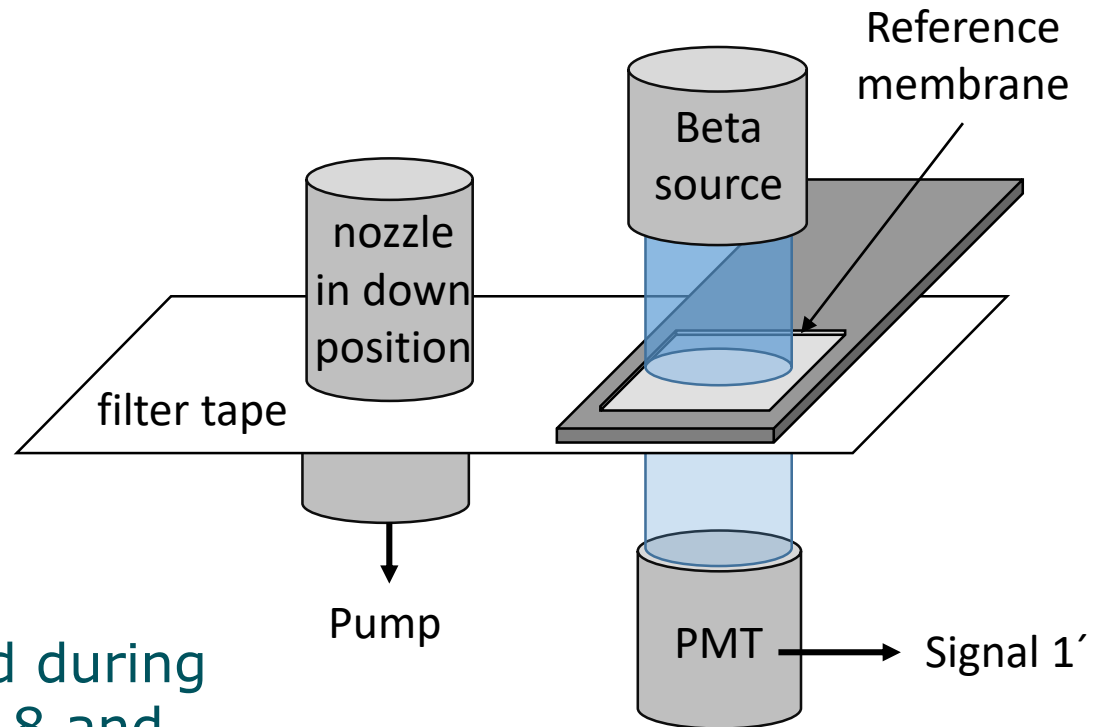
Parameters

Parameter	Value	Unit
Conc	66.000	microg/m3
Qtot	0.834	m3
RH	11.0	%
Delta	20.600	°C
AT	-3.2	°C

Calibration

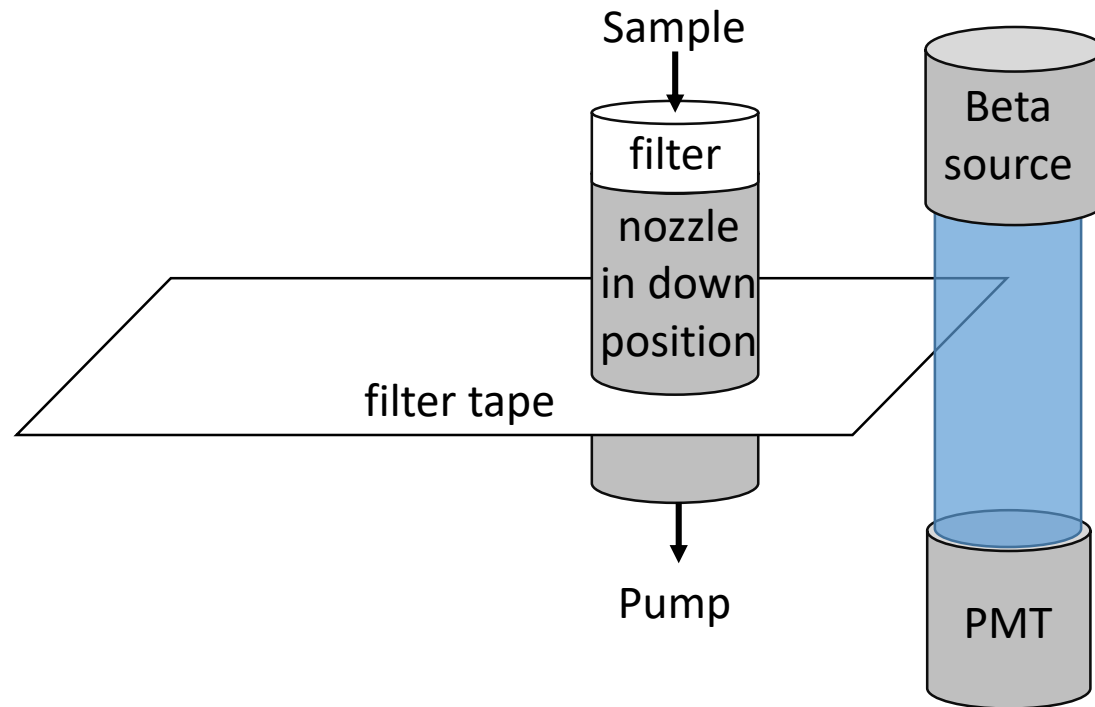
The β -attenuation monitors can be calibrated by comparison with a "primary standard", i-e: a calibrated β -attenuation monitor

Daily span check



The span check is performed during the sampling time, between 8 and 50 minutes, so no data is lost

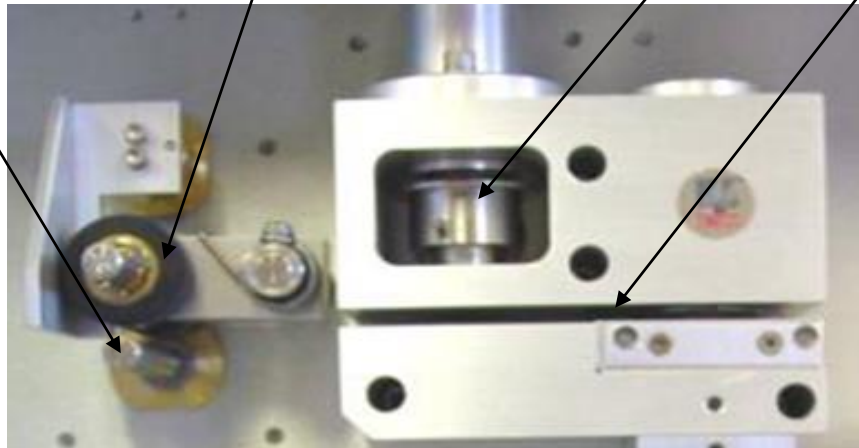
Zero check



Maintenance

Monthly: check the real-time clock, leak check, flow system check

Monthly cleaning: PM inlet trap, nozzle, vanes, capstan, and pinch roller tires



Maintenance schedule: manual rev.N page 53

Maintenance

Every 2 months: replace filter tape roll, run self-test function

Every 3 months: check settings, calibrate flows, clean PM inlets

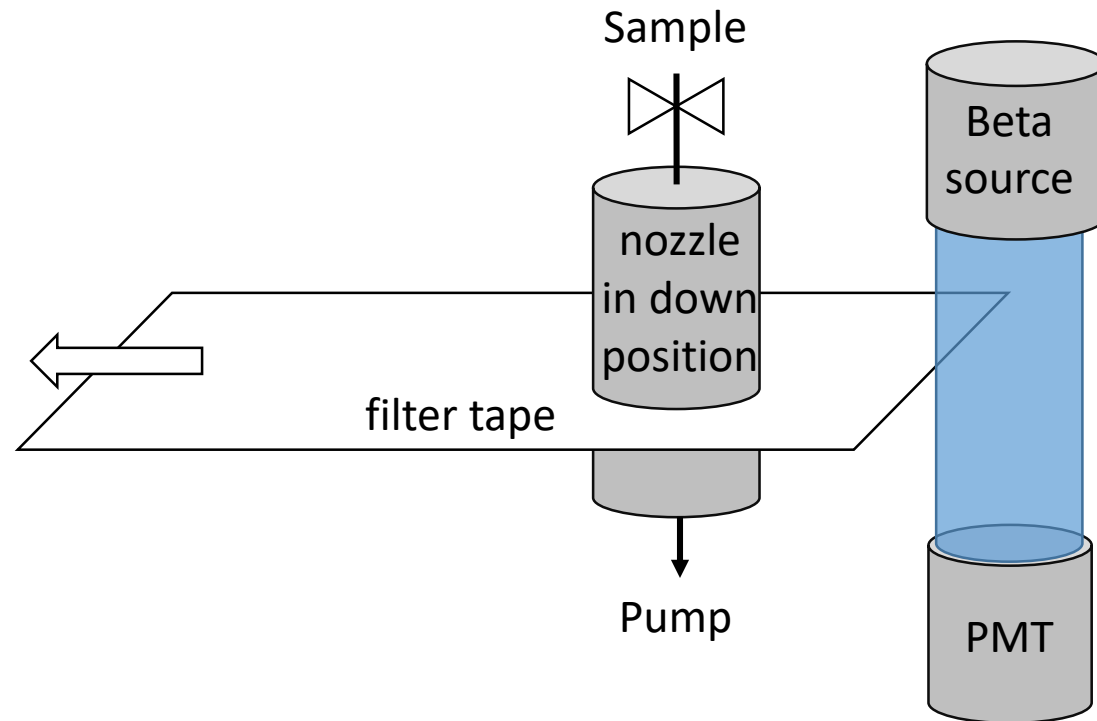
Every 6 months: Replace pump muffler, test smart heater and RH and T sensors

Every year: replace debris filter and battery, check reference membrane, β -count and dark count, clean the inlet tube

Every 2 years: Rebuild vacuum pump, replace nozzle o-ring

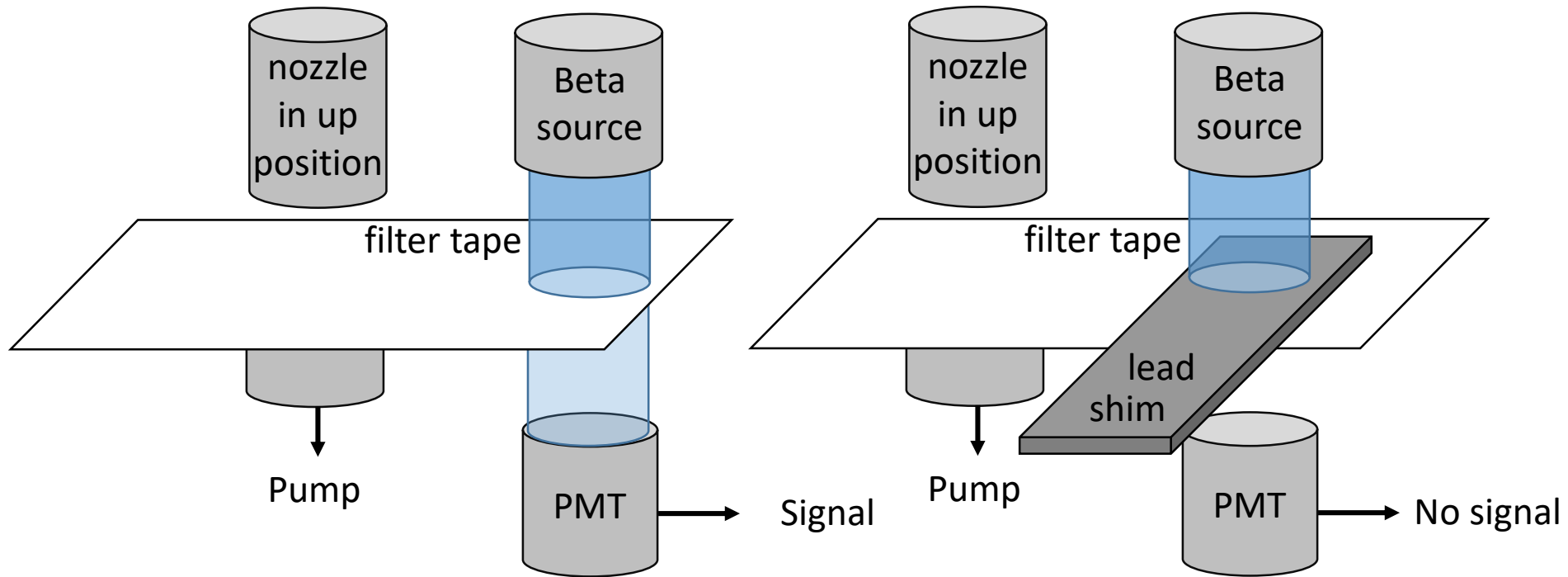
Maintenance schedule: manual rev.N page 53

Leak check



→ Flow should be ~ 0 L/min

β -count and Dark count

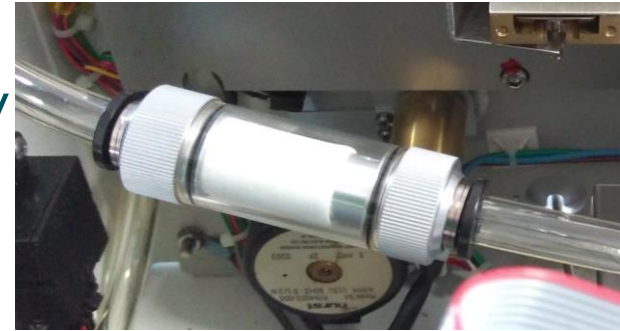


Troubleshooting

- The analyzer doesn't start → It starts at the full hour (e-g: 14:00). Check that the clock is accurate and wait!
- No data from the BAM → The BAM should be in the "main" menu, otherwise RS232 is inactive
- No flow → Pump check, Leak check, Flow audit
- Flow < 16L/min → Check that the pump muffler isn't clogged

Pneumatics

- Debris filter turns yellow → too high humidity
- Debris filter turns black → punctured tape

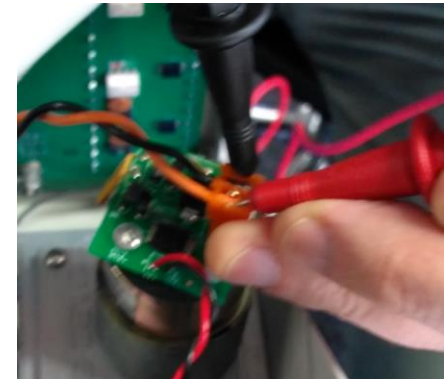


Voltages

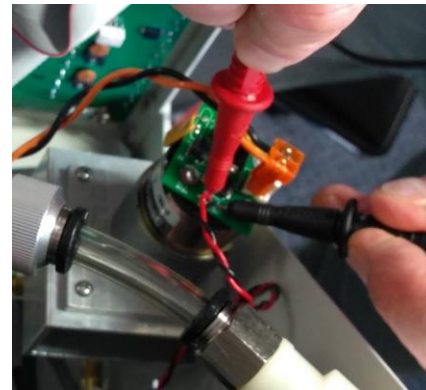
- On the board, from the flow sensor:

Flow (L/min)	Corresponding voltage (V)
0	1
15	3,6
16	4
18	4,2
Max (~20)	5,25

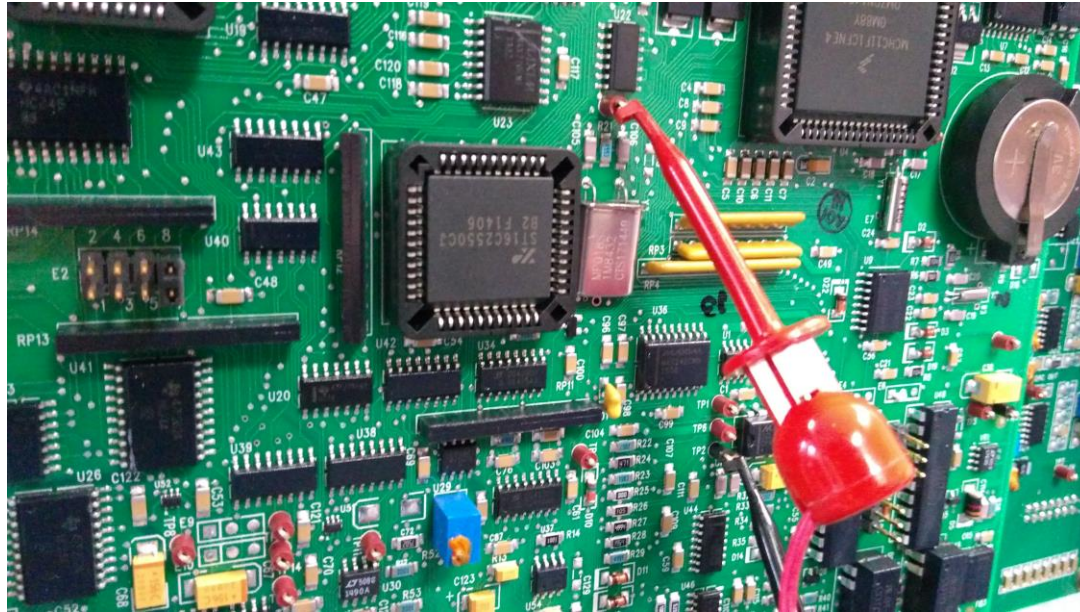
- On the flow controller power supply: -15V DC



- On the Flow controller control:
≠0V when the flow is stabilizing,
=0V when the flow is stable



Stack board assembly



- Check that TP13- TP2 (GND) = $5,25 \pm 0,05$ V
If necessary, adjust with the blue potentiometer on the power board
- No display → Use a full spare board to test the BAM
- Clock freezes, no flow control → Check the battery

Thank you for your attention!