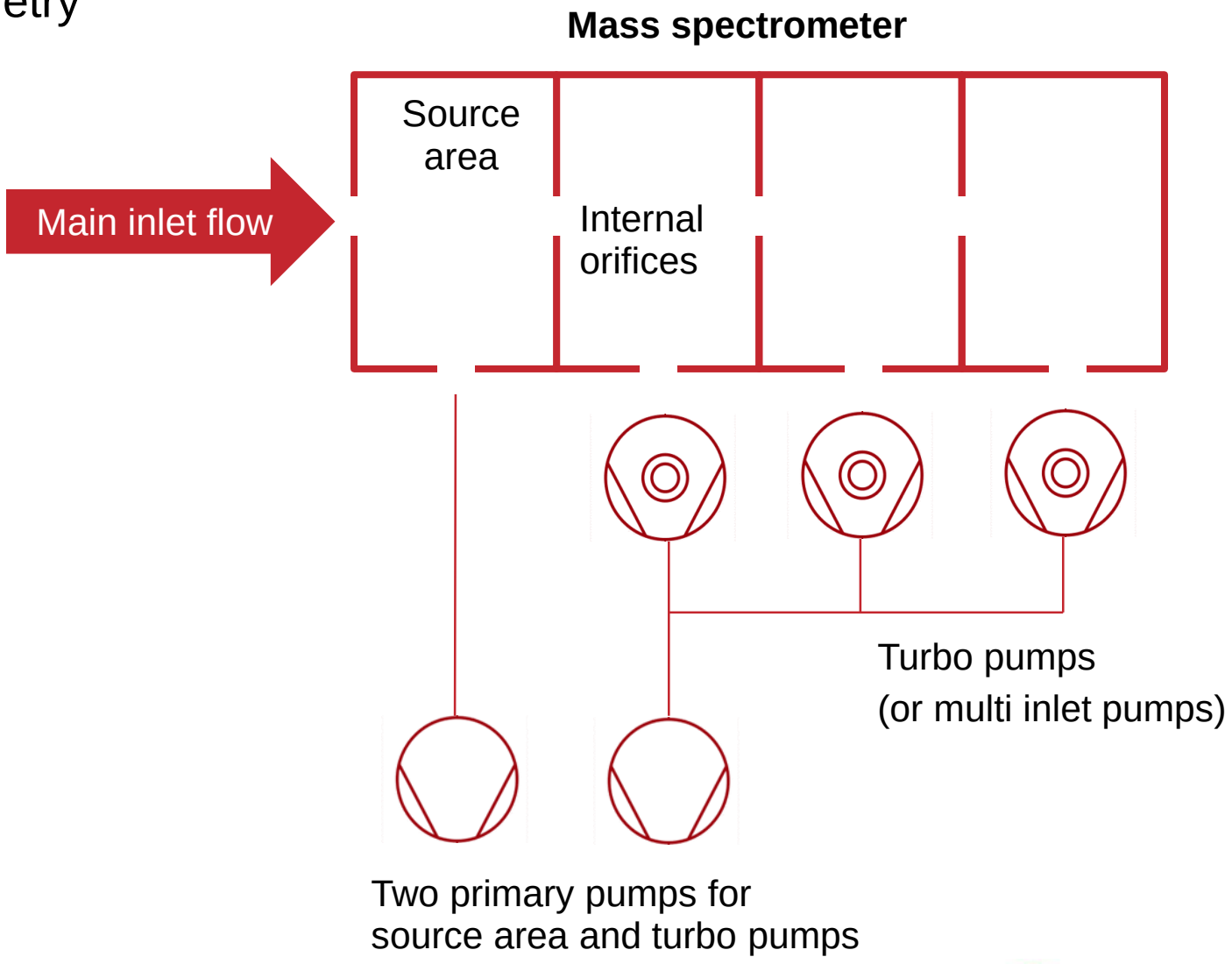
DUAL INLET nXLi FOR MASS SPECTROMETRY

Alexander Kaiser, November 2020

CHALLENGE

Vacuum requirements in mass spectrometry

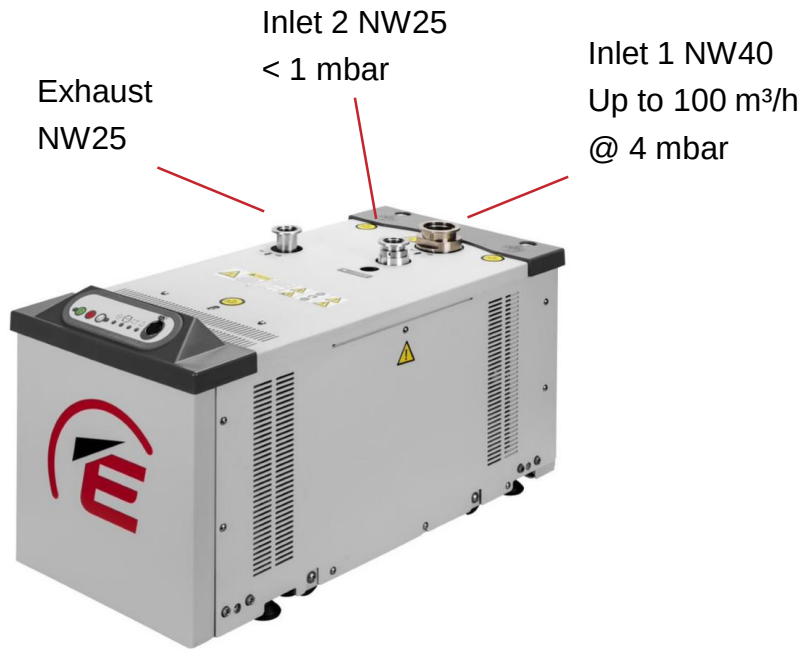
- Mass spectrometers have high vacuum requirements on primary pump:
  - Primary pumps needs to pump high gas flow from source area
  - Primary pumps need to create good ultimate pressure for turbo pumps
- Workaround: use two pumps:
  - High pumping speed for source
  - Low ultimate for turbo pumps
  - **Larger investment necessary!**



NXLI DUAL INLET

Solution: Two pumps in one

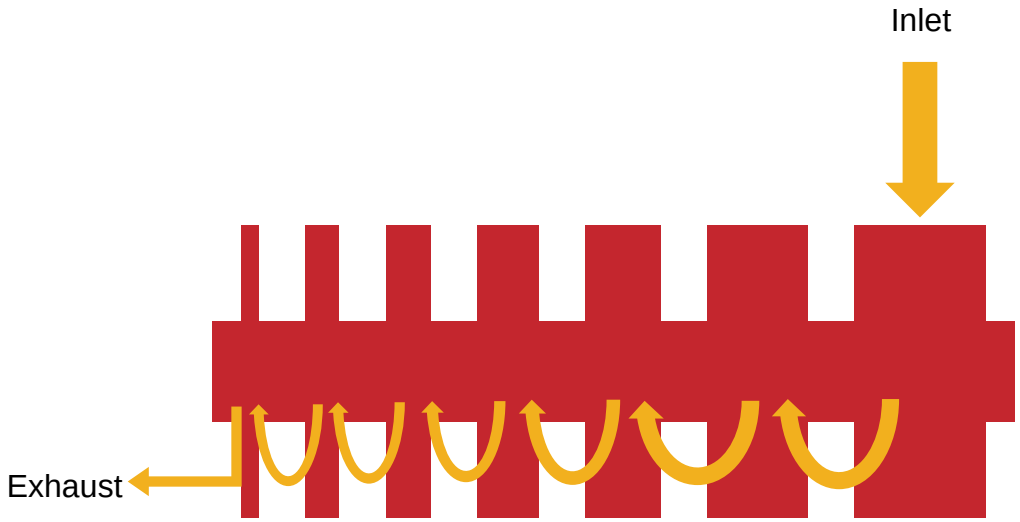
- Goal: Allow high flow in the mass spec while protecting the turbo pump without adding a second backing pump
- Unique dry pump with two inlets – acting like two pumps in one housing:
  - One at high speed, high pressure for LCMS inlet pumping
  - One at lower speed, lower pressure for turbo pump backing
- Benefit:
  - Temperature reduction for turbo pumps
  - Additional backing pump not required



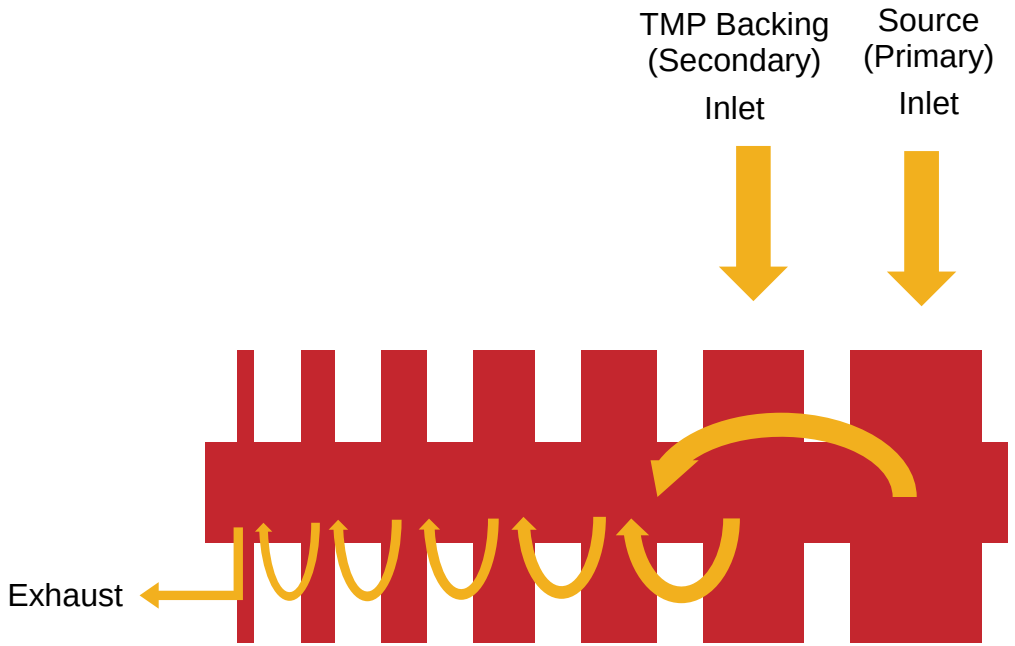
STAGE PORTING CONFIGURATION

Generating two inlets out of one pump

- The Dual-Inlet concept is shown below



Standard Pump Gas Flow



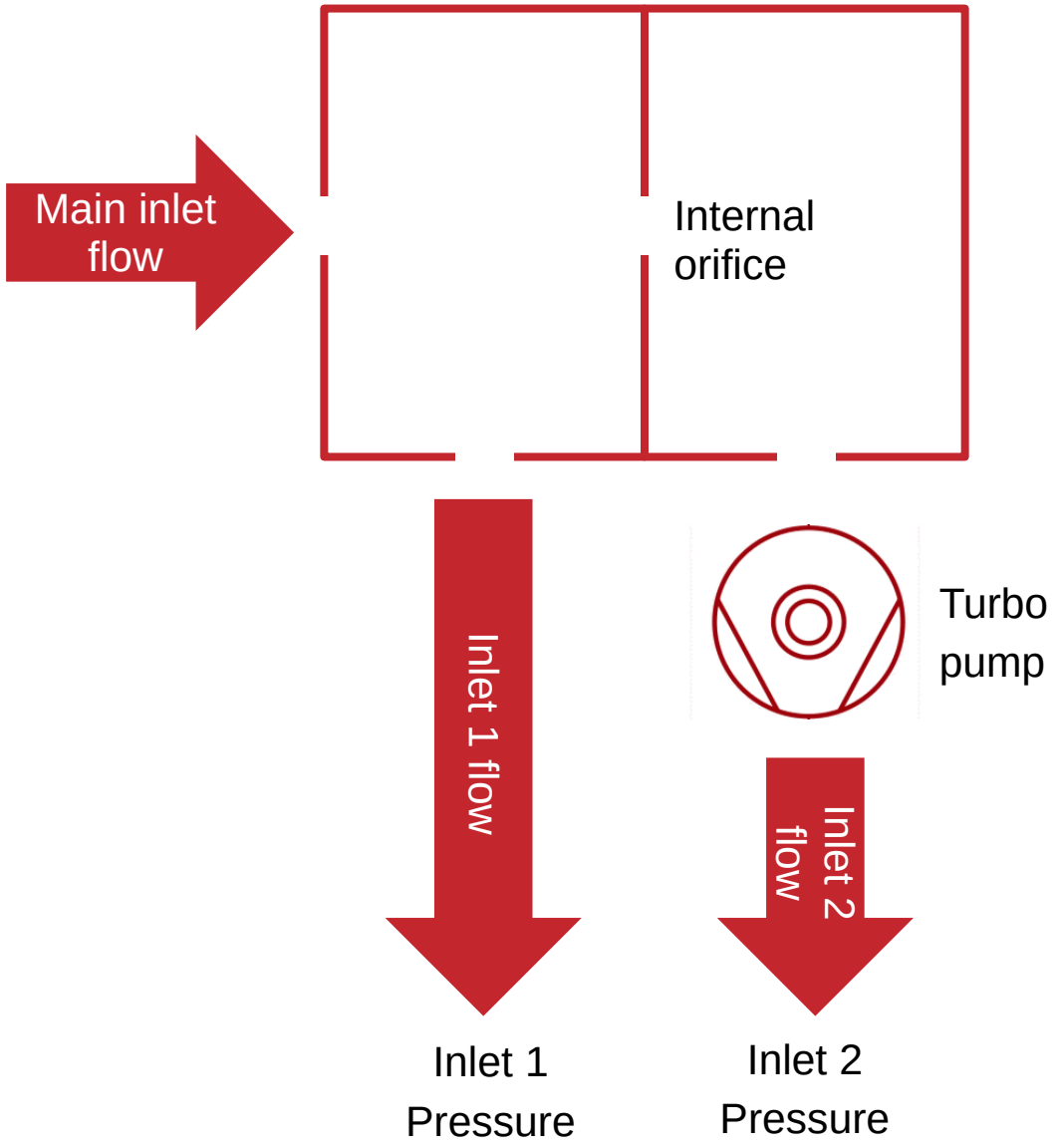
Dual-Inlet Pump Gas Flow

TYPICAL PARAMETERS

- Actual vacuum parameters depend on flow ratio between Inlet 1 and Inlet 2
- Typical parameters:

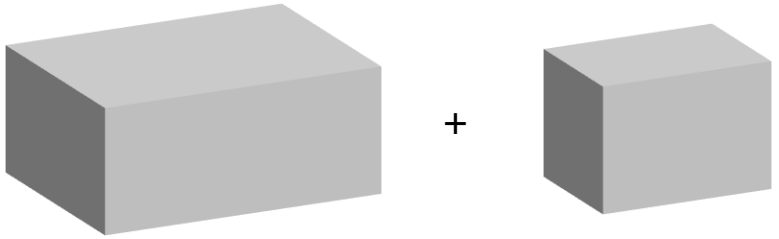
Main inlet flow	8 slm
Inlet 1 flow	7.5 slm
Inlet 1 pressure	< 5 mbar
Inlet 2 flow	0.5 slm
Inlet 2 pressure	< 1 mbar
Power consumption	800 W

- Actual parameters will depend on both flows



ENERGY CONSUMPTION

nXLiD vs two wet pumps

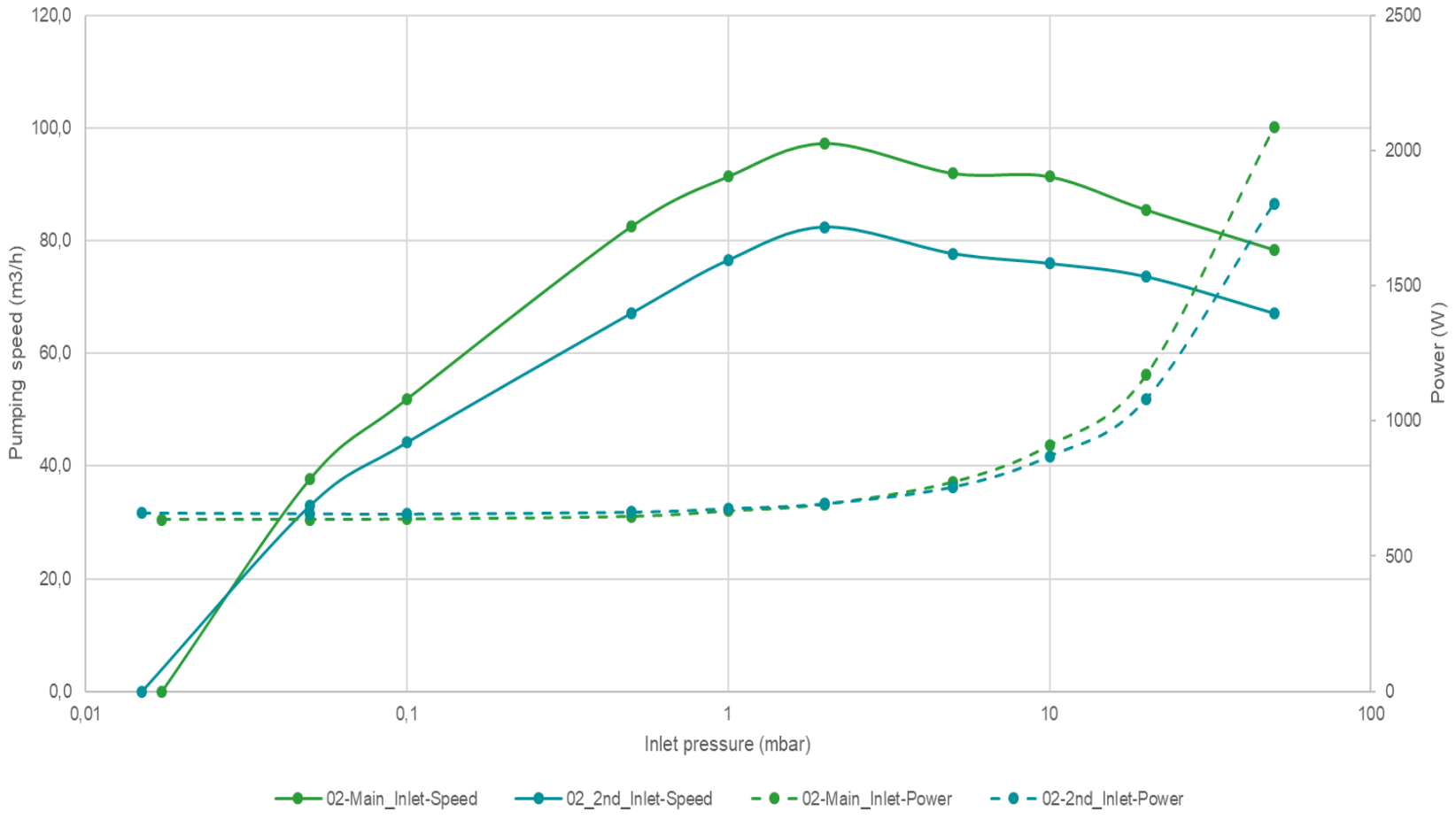


	nXLi D	Rotary vane pump 120 m³/h	Rotary vane pump 20 m³/h	Savings
Power consumption	800 W	1400 W	600 W	**1200 W**
		2000 W		

1200 Watt energy saving = $1000 cost saving per year

PERFORMANCE

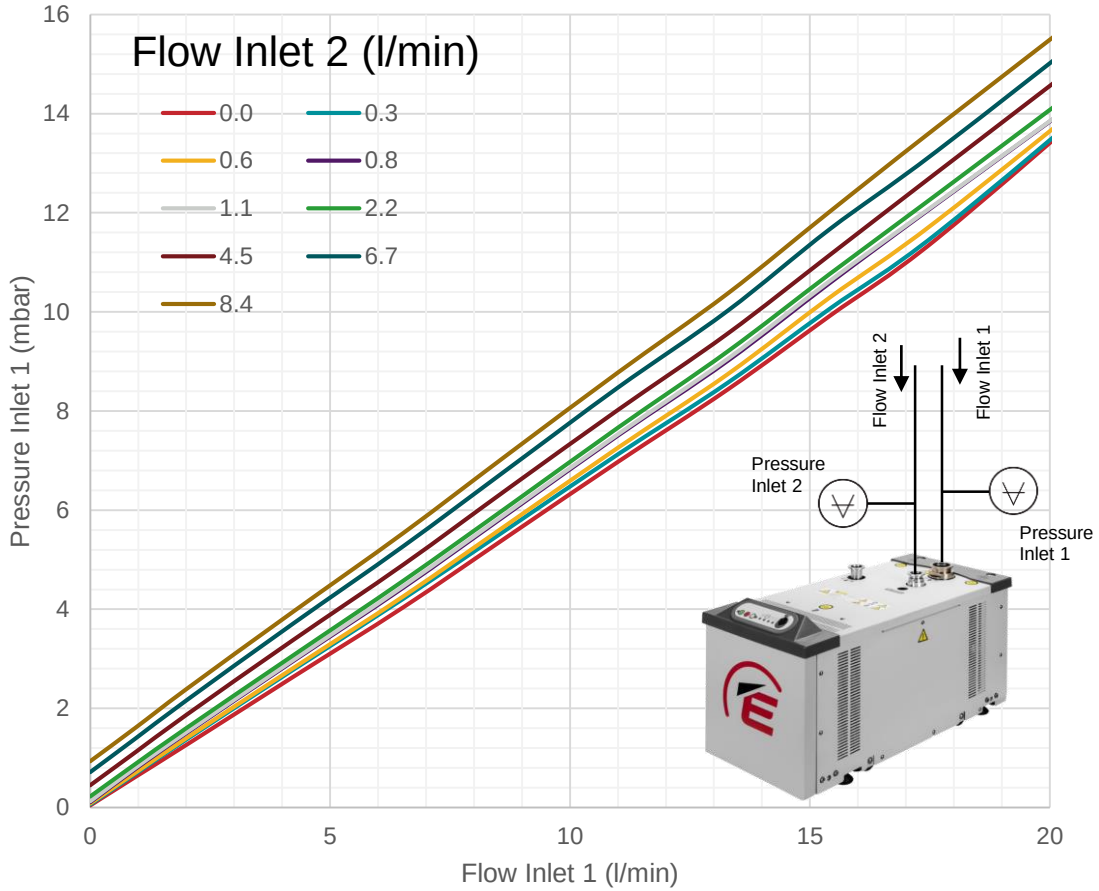
Maximum single inlet performance – only one inlet open

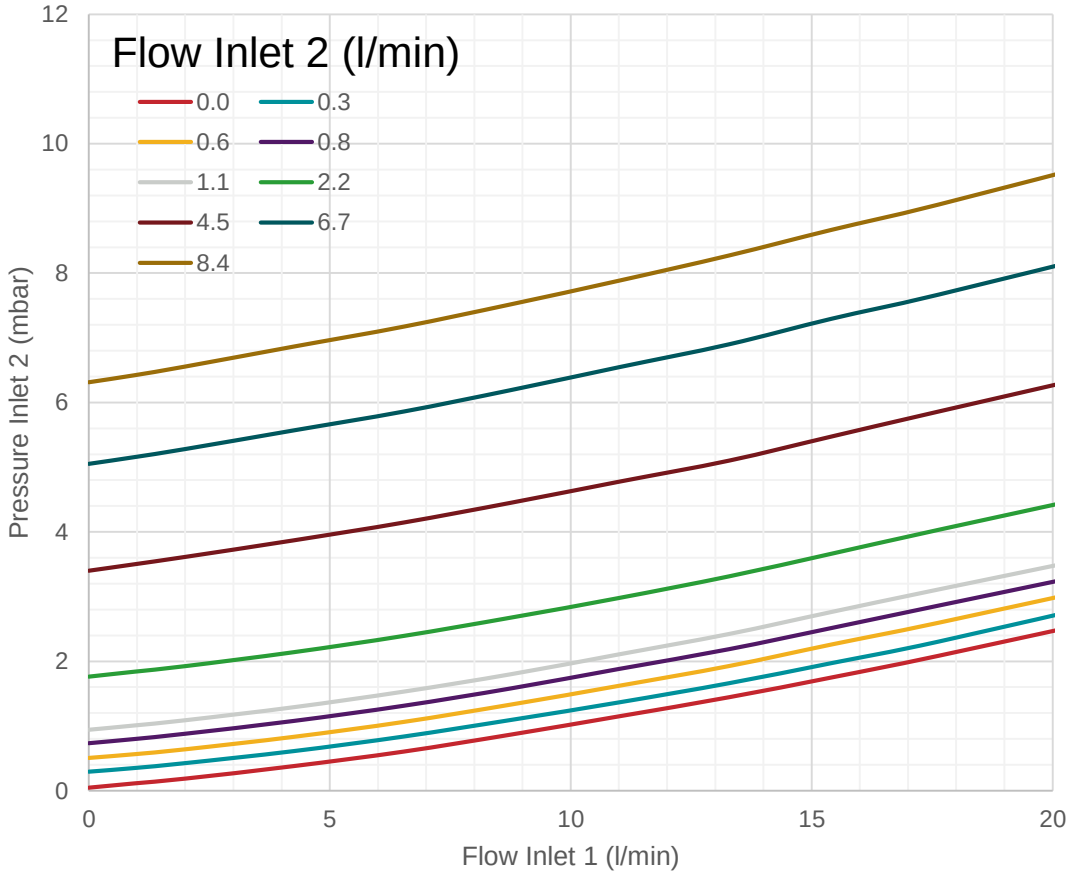


- Graph shows ideal situation: only one inlet open
- Reality: Flows on both inlets affect performance
- With gas flow on both inlets: peak performance drops

REAL PERFORMANCE – FLOW IN BOTH INLETS

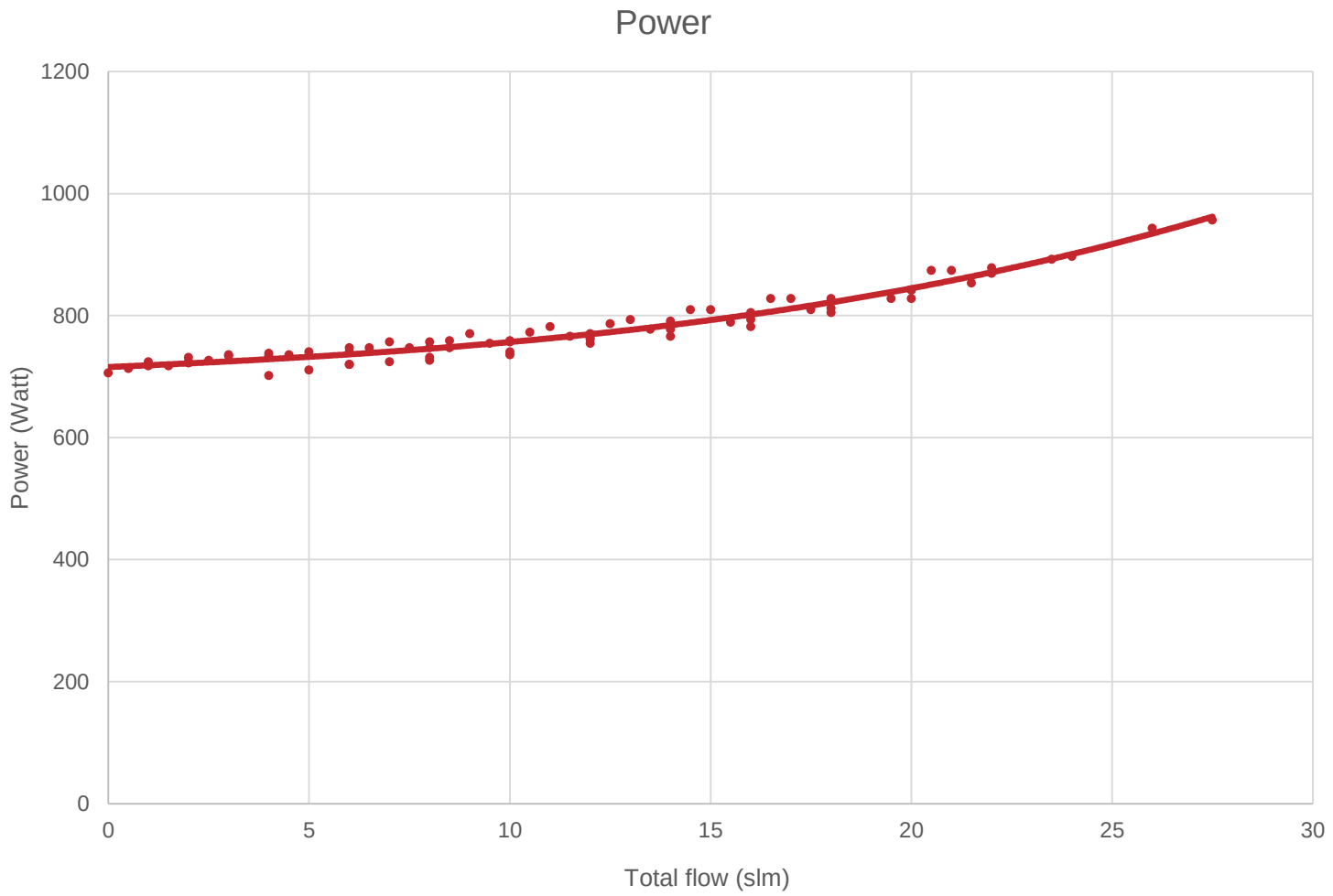
Working pressures vs. gas flows





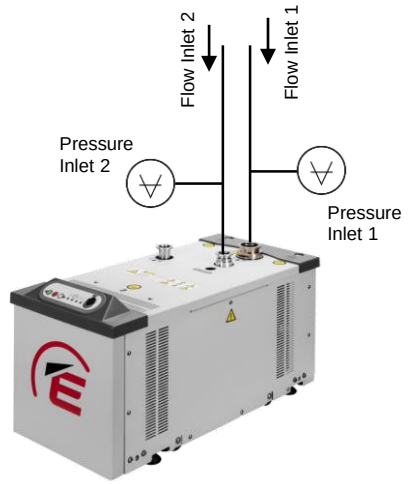
Maximum total flow 25 slm at 30°C ambient temperature.

POWER CONSUMPTION



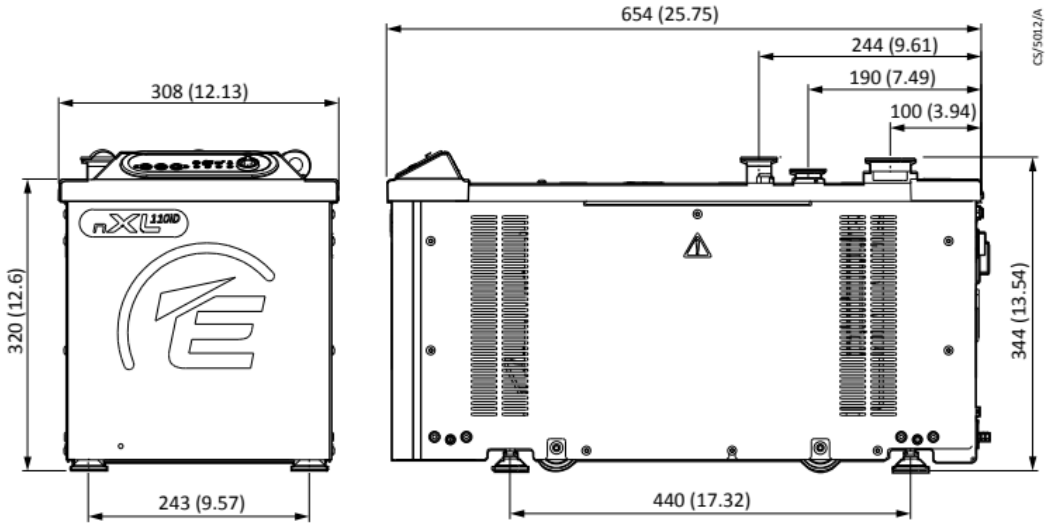
- Power consumption depending on total flow: q1 + q2

Total flow =
Flow 1 + Flow 2



TECHNICAL DATA

Maximum pumping speed (Inlet 1)	98 $m^3 h^{-1}$
Maximum pumping speed (Inlet 2)	75 $m^3 h^{-1}$
Maximum continuous inlet pressure at 40°C (30°C) ambient temperature	8 (15) mbar
Maximum continuous exhaust pressure	0.4 bar(g)
Noise level	56.7 dB(A)
Mains voltage	200-240 V
Power consumption at ultimate pressure	<800 W
Weight	78 kg



SUMMARY

- New product operates like two pumps in one housing – eliminating need for 2nd pump for turbo pump backing – while keeping turbo pump temperature at safe level
- Reduced cost for power and service - significant cost of ownership reduction compared to the use of two wet pumps

- Order data:

A77032320 nXL110iD 200-240V NW40/NW25/NW25

Other variants with different flange geometries may be added for large projects.


EDWARDS