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The Metabolic Company

Training

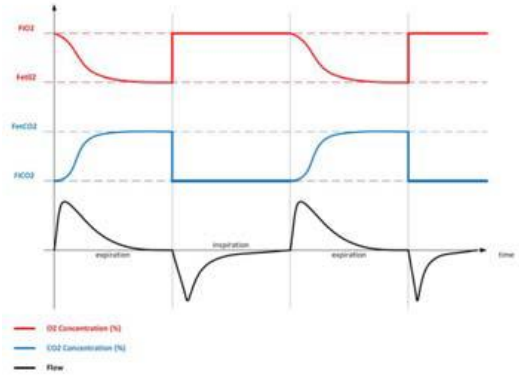
K5 – Wearable Metabolic System

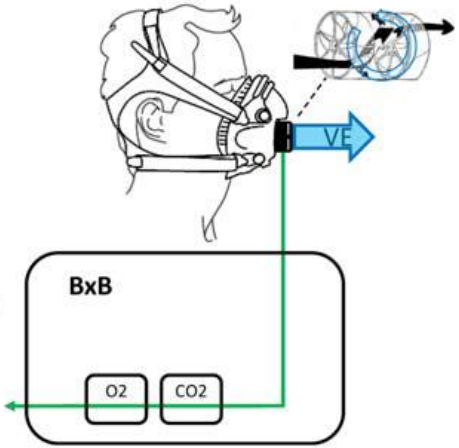
Applications

Module	Quark CPET	Tests Available
VO2 BxB	√ (standard)	Exercise testing – Breath-by-Breath
VO2 Mix mode	√ (option)	Exercise testing – Mirco Dynamic Mixing Chamber
ANT® + Engine	√ (option)	Additional ANT+ input module

VO2 Breath-by-Breath

- Oxygen Uptake (Vo_2)
- Carbon Dioxide Excretion (Vco_2)
- Respiatory Quotient (R),
- Ventilation, etc.





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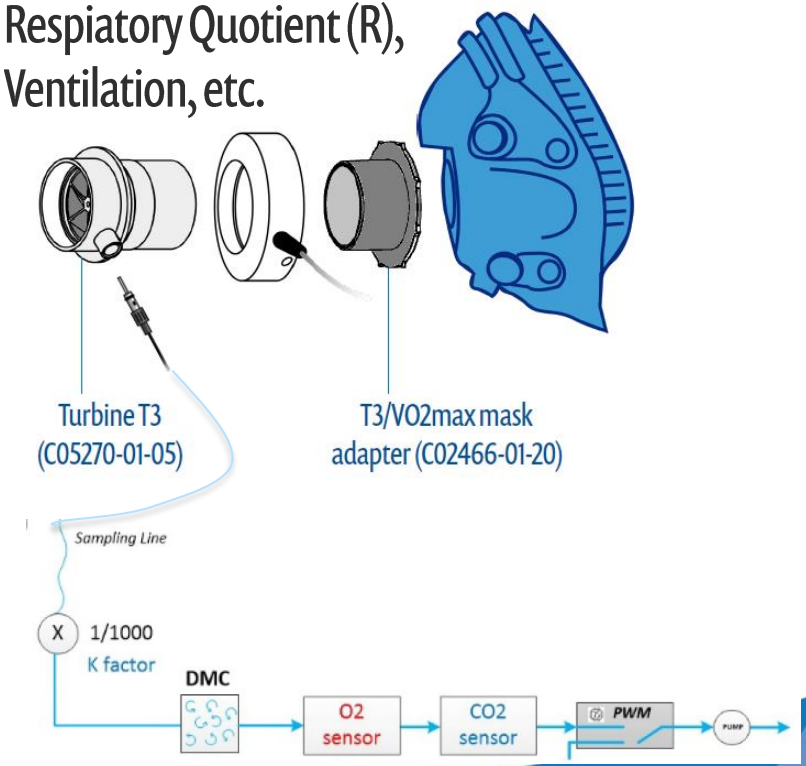
VO2 Micro Dynamic Mixing Chamber

- 2-3 minutes to stabilise Micro Dynamic Mixing Chamber

- Oxygen Uptake (Vo_2)
- Carbon Dioxide Excretion (Vco_2)
- Respiatory Quotient (R),
- Ventilation, etc.



Operating modes

Stand-alone

Start/stop on K5
Data stored in K5
Data can be imported in OMNIA afterwards

Wireless

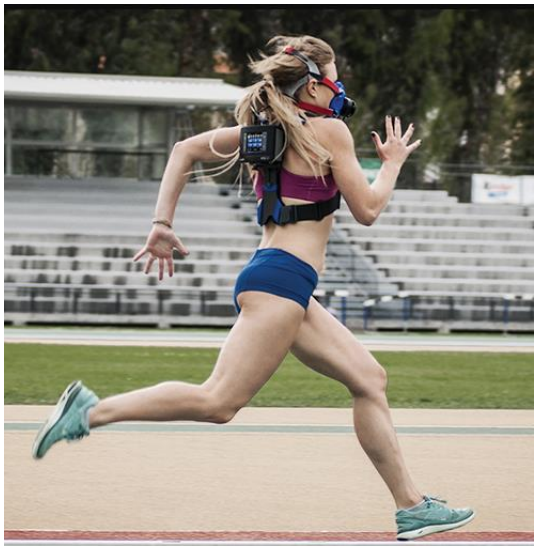
Start/stop on PC
Data stored in K5 & PC
If communication lost, data are always in K5
Bluetooth: 10 m
Extended: 1000 m

Stationary

Start/stop on PC
Data stored in K5 & PC
Control of exercise device

Headphone

One-way communication via Bluetooth*

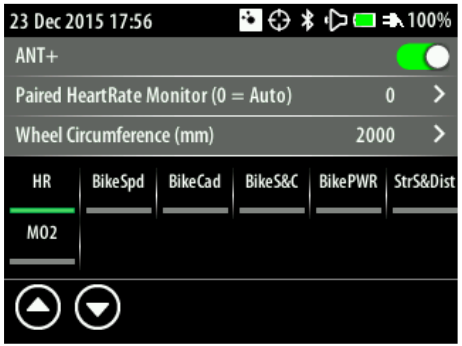


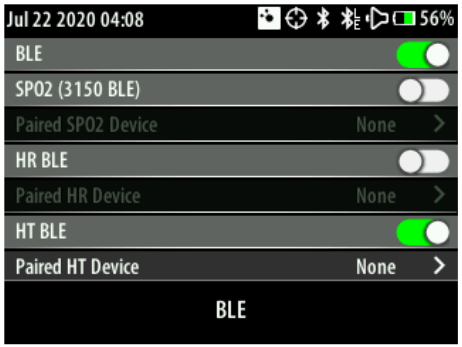
*Running independently of OMNIA via Windows Bluetooth

Sensors

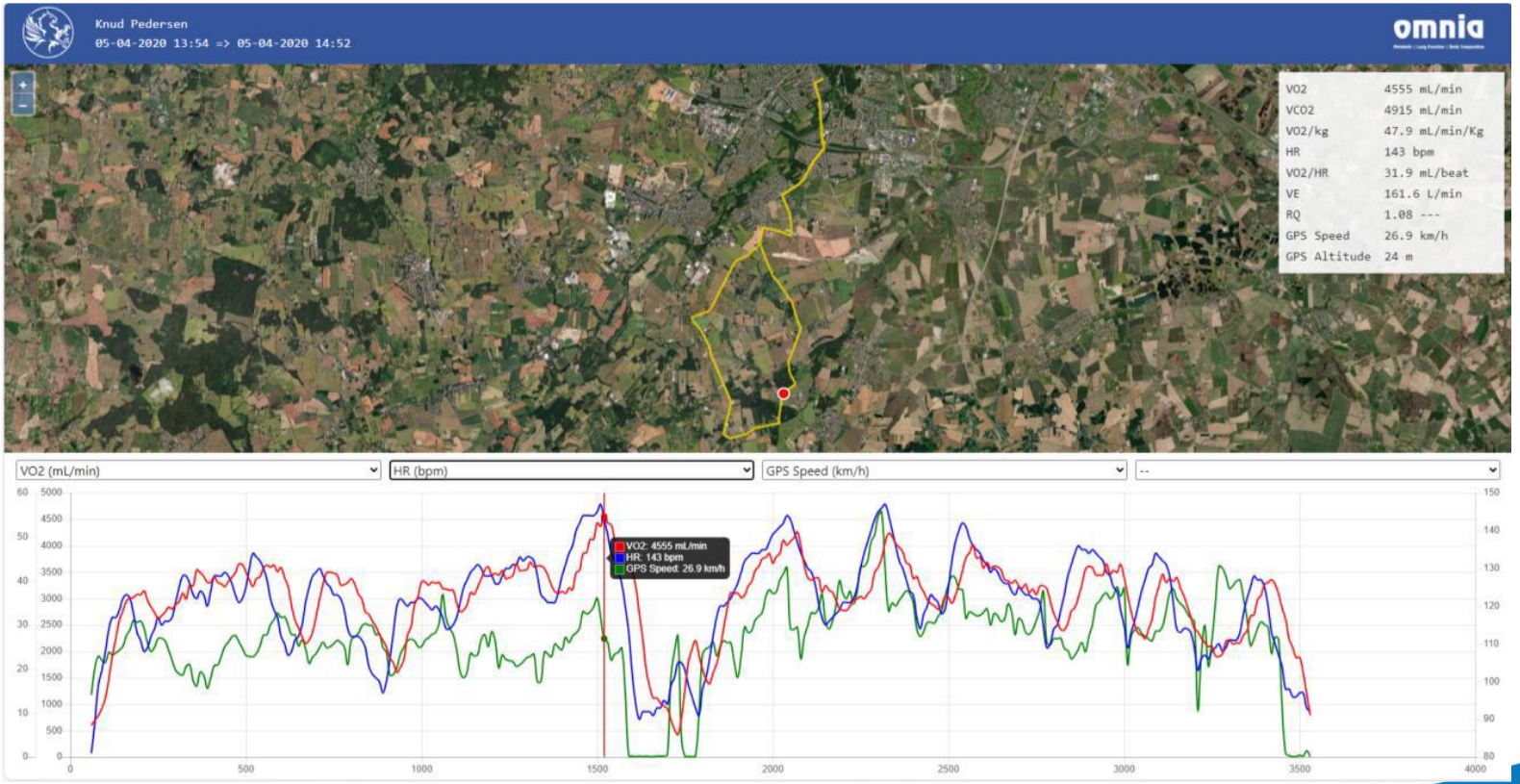
ANT+

BLE





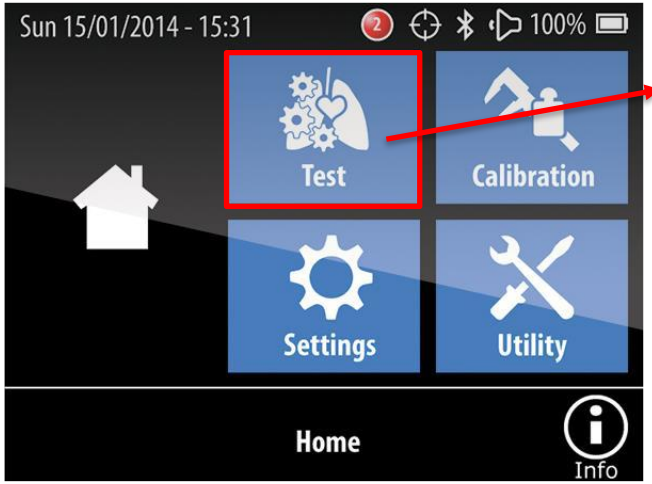
Geotag

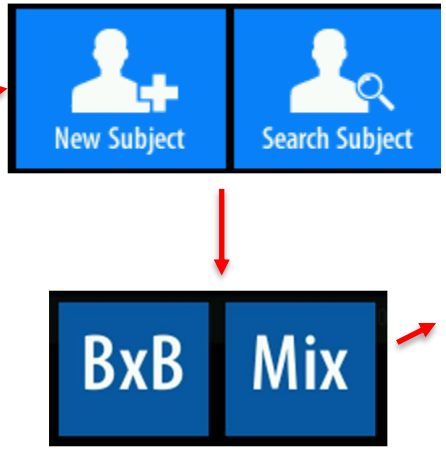

Knud Pedersen
05-04-2020 13:54 => 05-04-2020 14:52
omnia
VO2 4555 mL/min
VCO2 4915 mL/min
VO2/kg 47.9 mL/min/Kg
HR 143 bpm
VO2/HR 31.9 mL/beat
VE 161.6 L/min
RQ 1.08 ---
GPS Speed 26.9 km/h
GPS Altitude 24 m
VO2 (mL/min)
HR (bpm)
GPS Speed (km/h)
--
VO2: 4555 mL/min
HR: 143 bpm
GPS Speed: 26.9 km/h

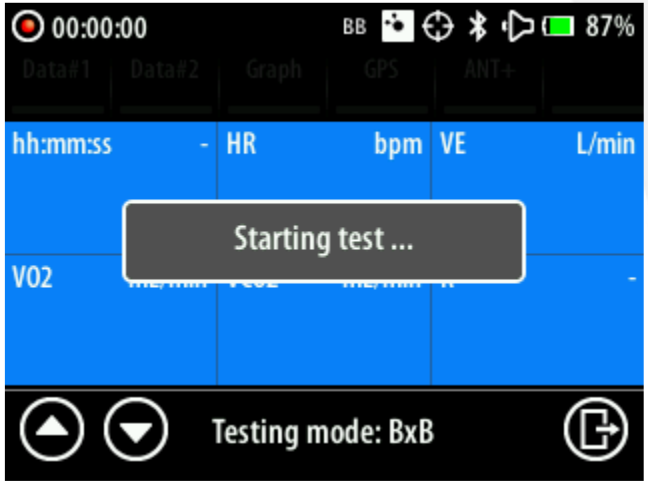
Test – stand-alone

- Reading sensors wireless via ANT+ or Bluetooth

Test – stand-alone



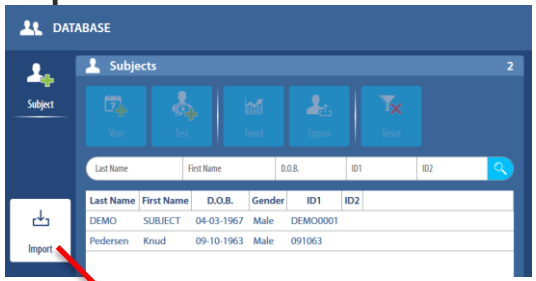


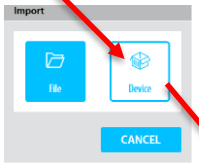


Press the REC button to start the recording but recommended to wait approx. 1 minute to flush internal chambers.
Note: when the REC LED is blinking data are not stored.
To stop a test: Press the REC button again or the stop icon.

Test – stand-alone

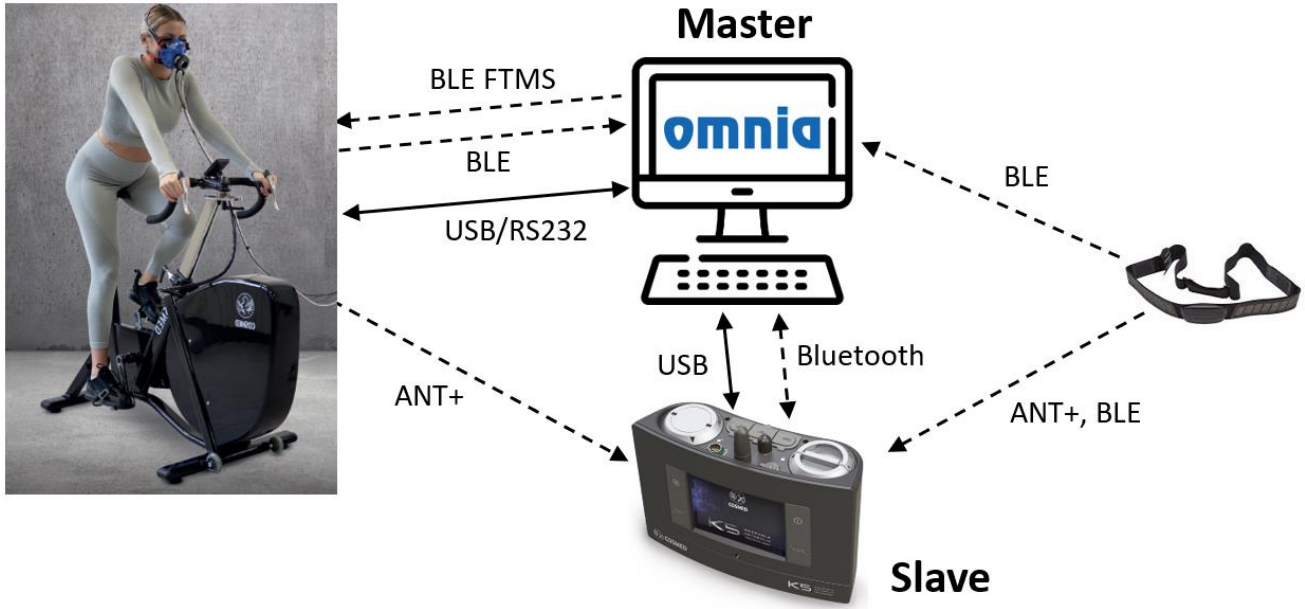
- Export data via SD card, or
- Import data into OMNIA:



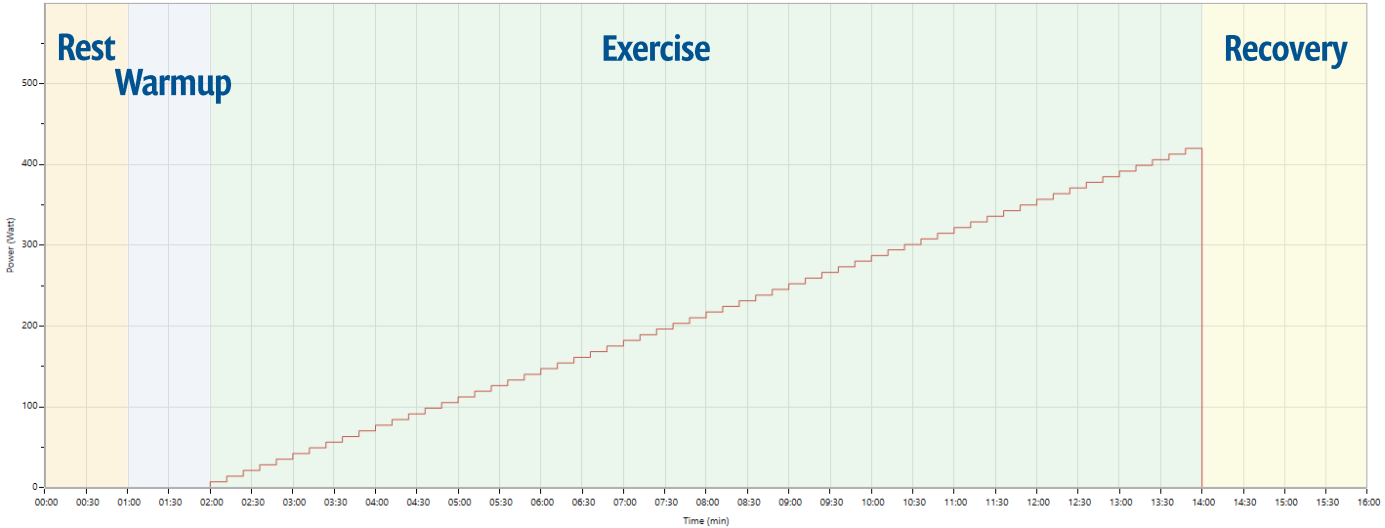


Test via OMNIA

- Drivers for most common bikes and treadmills
- Cable: RS232/USB
- Wireless: BLE FTMS (Fitness Machine Service)



Exercise protocol (only via OMNIA):



Typical protocol:

- Rest: 1-2 min
- Warmup: 1-2 min – unloaded pedaling
- Exercise: 8-12 min to max
- Recovery: 1-2 min

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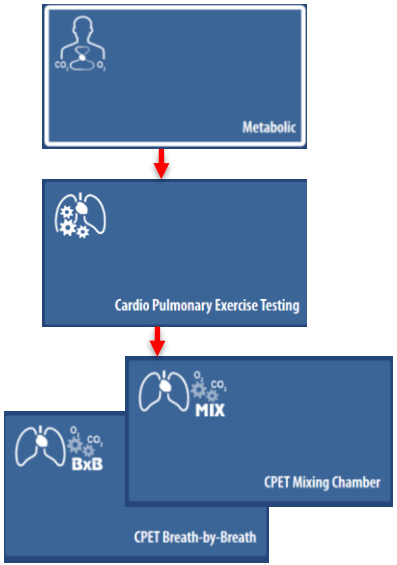
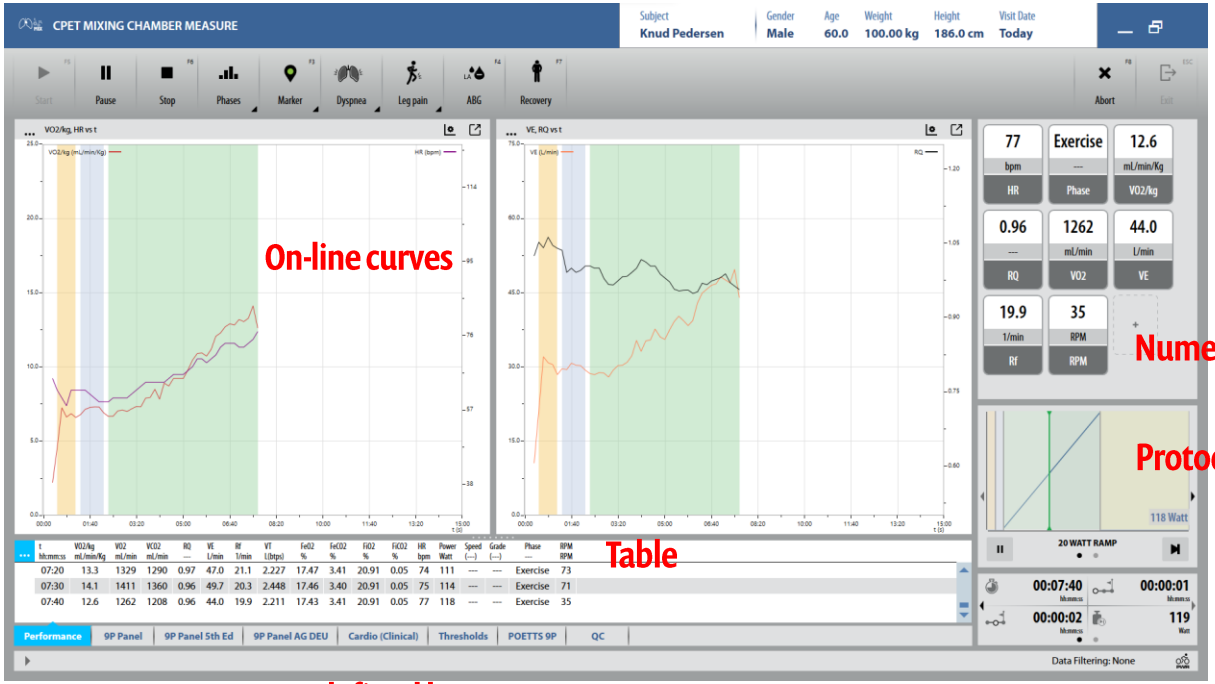
Exercise test (only via OMNIA):





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VO2 Max:

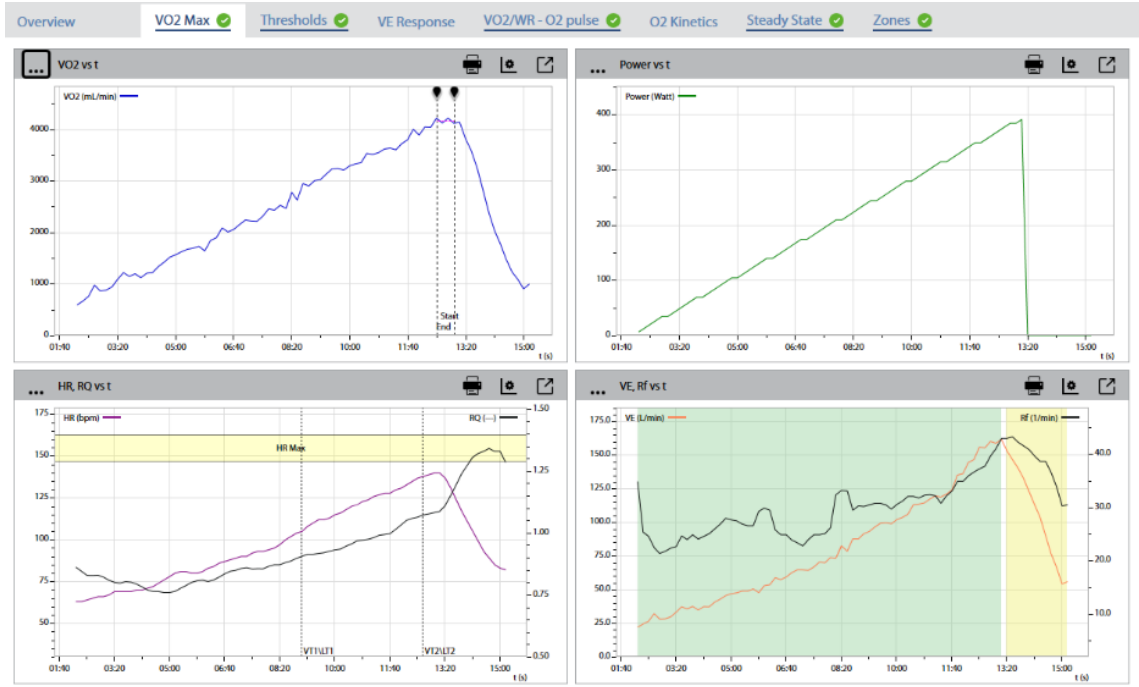
Maximal capacity of an individual's body to transport and use oxygen during incremental exercise, which reflects the physical fitness of the individual

Women VO2Max Norms

Rating/Age	Fair	Good	Excellent	Superior
13-19	>31	>35	>39	>41.9
20-29	>29	>33	>37	>41
30-39	>27	>31.5	>35.7	>40
40-49	>24.5	>29	>32.9	>36.9
50-59	>22.8	>27	>31.5	>35.7
60+	>20.2	>24.5	>30.3	>31.5

Men VO2Max Norms

Rating/Age	Fair	Good	Excellent	Superior
13-19	>38.4	>45.2	>51	>55.9
20-29	>36.5	>42.5	>46.5	>52.4
30-39	>35.5	>41	>45	>49.4
40-49	>33.6	>39	>43.8	>48
50-59	>31	>35.8	>41	>45.3
60+	>26.1	>32.2	>36.5	>44.2



- **Typical set at last 30 sec of exercise**
- **If VO2 flatten out at the end it is VO2 max otherwise VO2 peak**
- **RQ @ rest: 0.7 – 0.9**
- **RQ @ AT: ≈ 1.0**
- **RQ @ max: ≈ 1.1 – 1.2**

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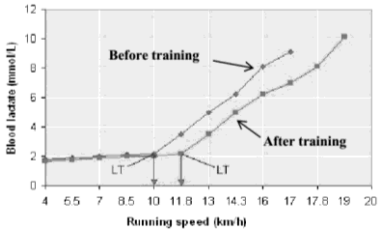
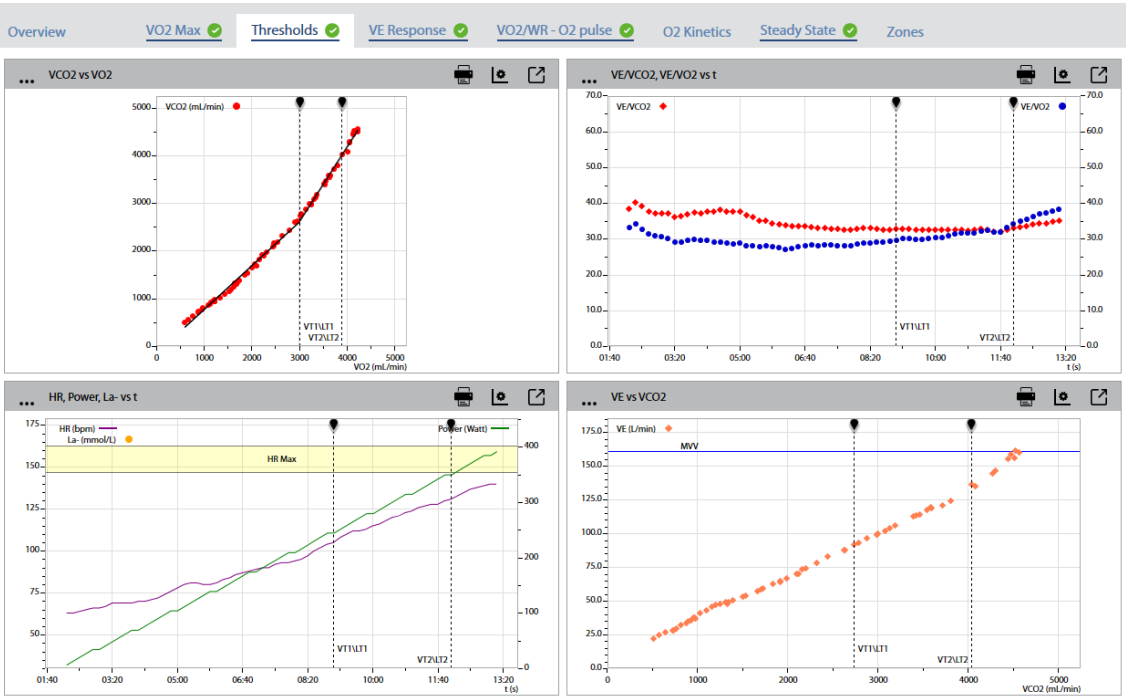
Thresholds:



Normal: 50% - 60%
Athletes : >75%

VT1 is a better predictor of performance than VO2 max in athletes



- **Two thresholds can be set:**
  - **Threshold 1 (LT1/VT1) (previous AT: Anarobic Threshold)**
  - **Threshold 2 (LT2/VT2) (previous RC: Respiratory Compensation).**
- **Threshold 1 is normally set using V-slope on the VCO2 vs VO2 plot, where there is a shift in slope. Alternatively where VE/VO2 starts to rise.**
- **Threshold 2 is set where VE/VCO2 starts to rise, or at the shift in slope on VE vs VCO2.**

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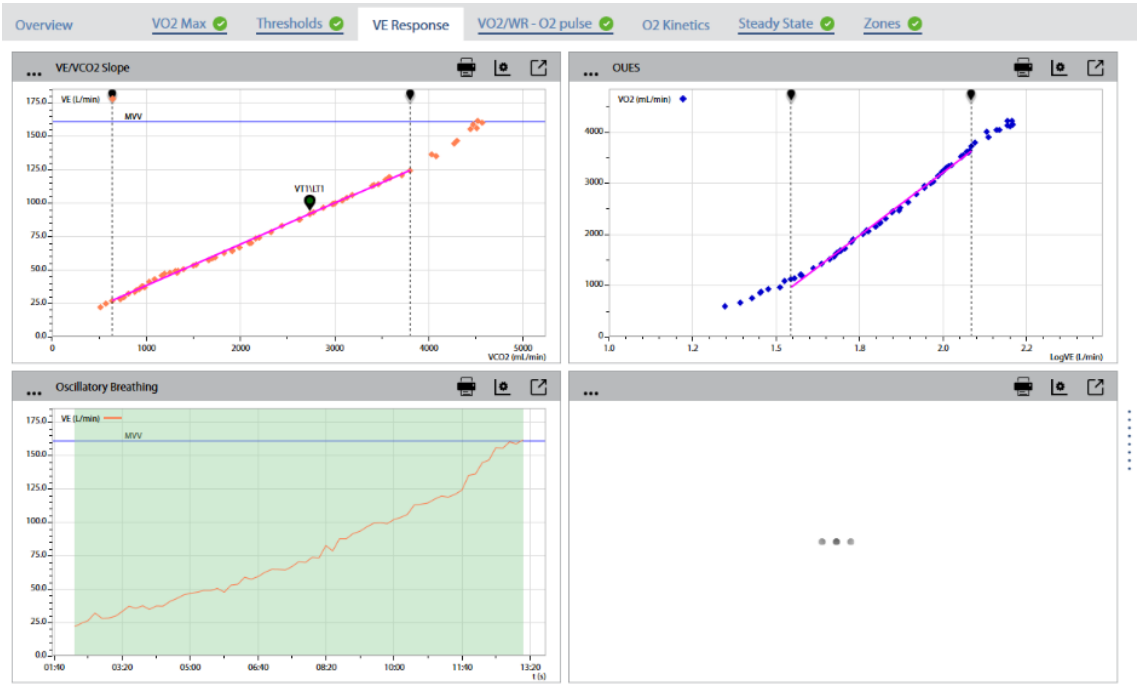
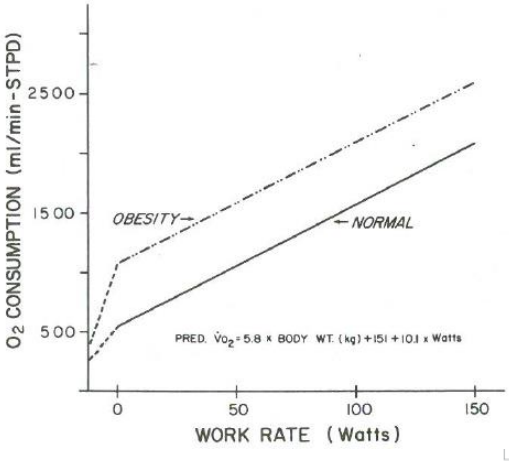
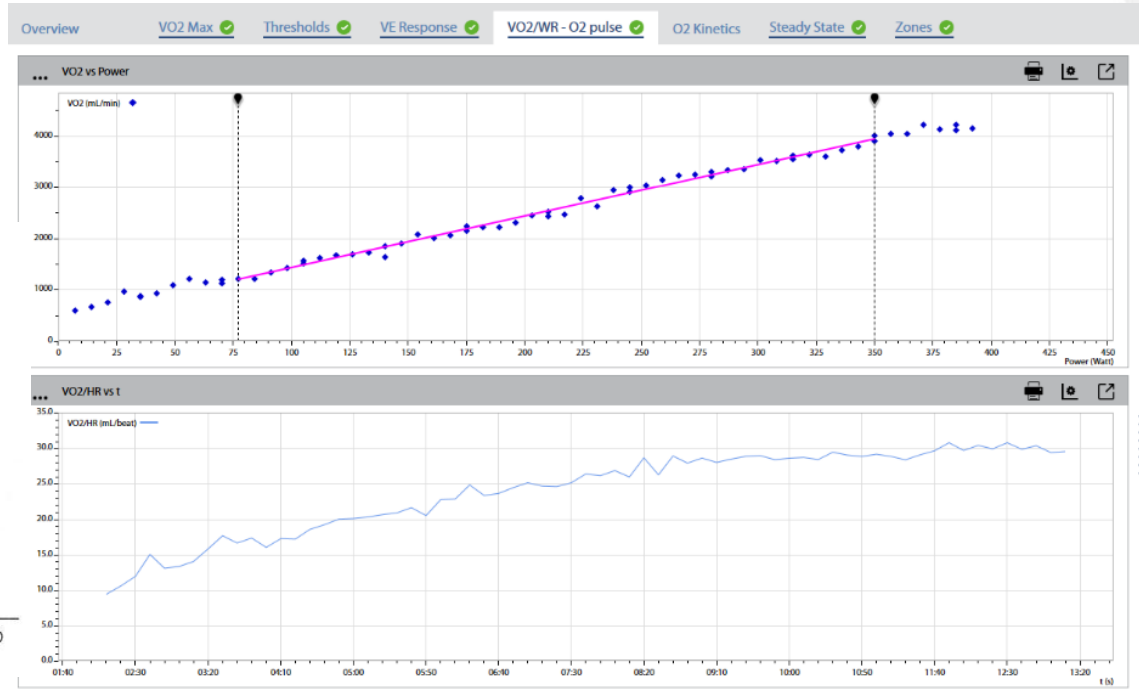
VE response:



- VE/VCO2 slope is the slope of VE vs VCO2 during the first part of the exercise.
- VE/VCO2 slope is an indirect measurement of the ventilatory efficiency – used clinical.
- Normal VE/VCO2 slope < 30.

VO2 vs Load:





- ΔVO2 /ΔLoad is the slope of VO2 vs Load during the first part of the exercise.
- ΔVO2 /ΔLoad: ≈ 10 ml/min/watt.

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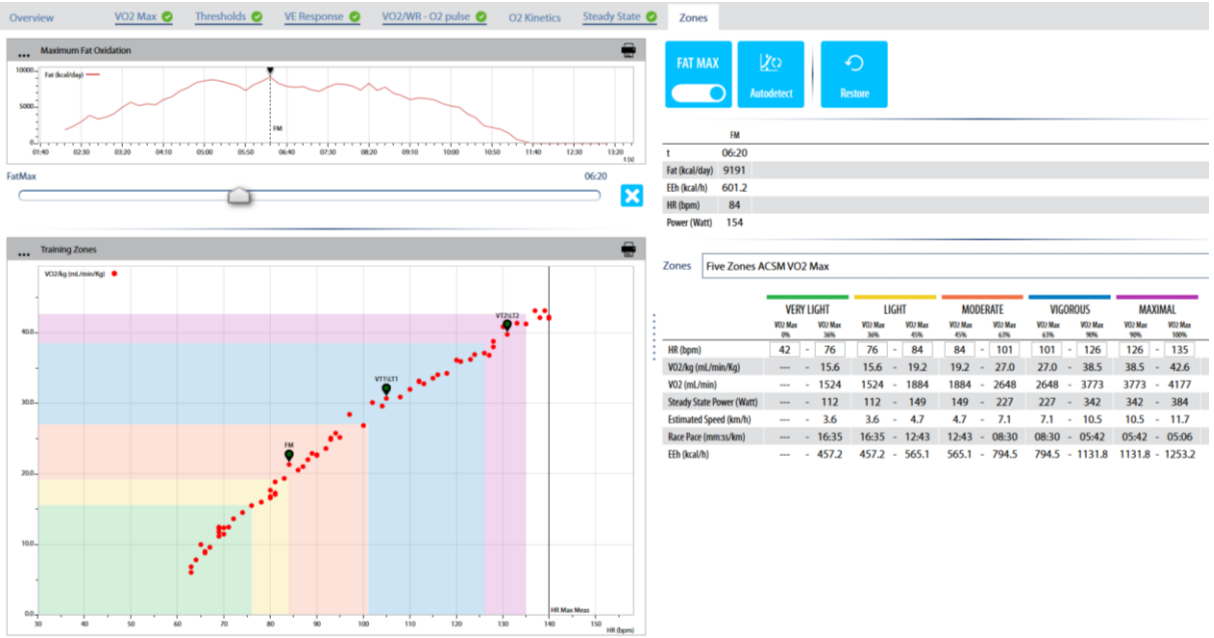
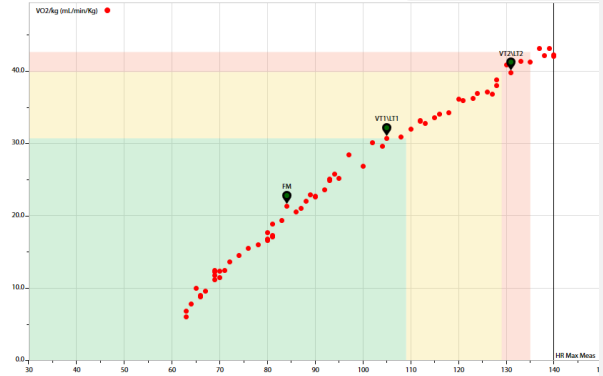
Training zones:

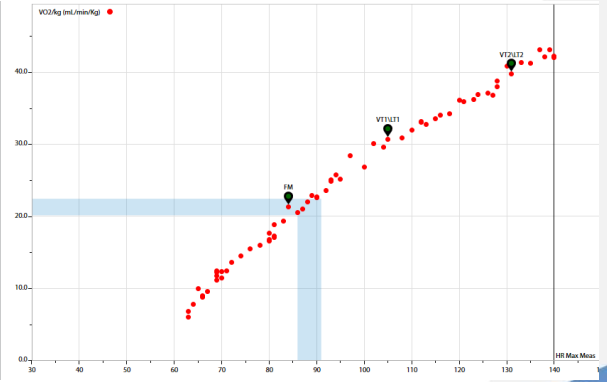


	FM
t	06:20
Fat (kcal/day)	9191
EEh (kcal/h)	601.2
HR (bpm)	84
Power (Watt)	154

Zones: Five Zones ACSM VO2 Max

	VERY LIGHT	LIGHT	MODERATE	VIGOROUS	MAXIMAL
	VO2 Max 0% – VO2 Max 36%	VO2 Max 36% – VO2 Max 45%	VO2 Max 45% – VO2 Max 63%	VO2 Max 63% – VO2 Max 90%	VO2 Max 90% – VO2 Max 100%
HR (bpm)	42 - 76	76 - 84	84 - 101	101 - 126	126 - 135
VO2/kg (mL/min/Kg)	--- - 15.6	15.6 - 19.2	19.2 - 27.0	27.0 - 38.5	38.5 - 42.6
VO2 (mL/min)	--- - 1524	1524 - 1884	1884 - 2648	2648 - 3773	3773 - 4177
Steady State Power (Watt)	--- - 112	112 - 149	149 - 227	227 - 342	342 - 384
Estimated Speed (km/h)	--- - 3.6	3.6 - 4.7	4.7 - 7.1	7.1 - 10.5	10.5 - 11.7
Race Pace (mm:ss/km)	--- - 16:35	16:35 - 12:43	12:43 - 08:30	08:30 - 05:42	05:42 - 05:06
EEh (kcal/h)	--- - 457.2	457.2 - 565.1	565.1 - 794.5	794.5 - 1131.8	1131.8 - 1253.2





Default zones:

- Five Zones ACMS based on VO2 max (requires VO2 max is set).
- Three Zones based on threshold 1 and 2 (requires VT1/LT1 and VT2/LT2 is set under Threshold).
- Fat Zone based on Fat Max (requires Fat Max is enabled and set).

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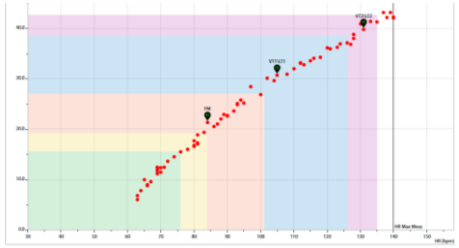
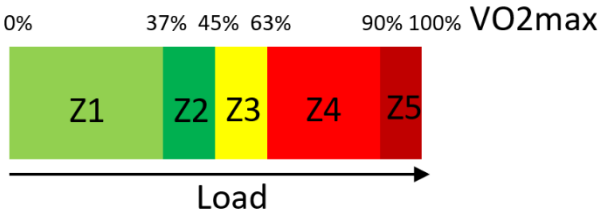
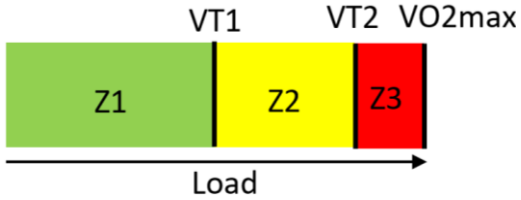
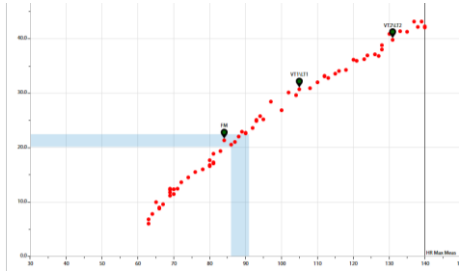
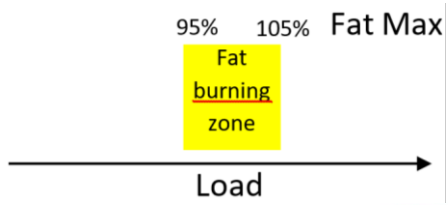
Training zones:



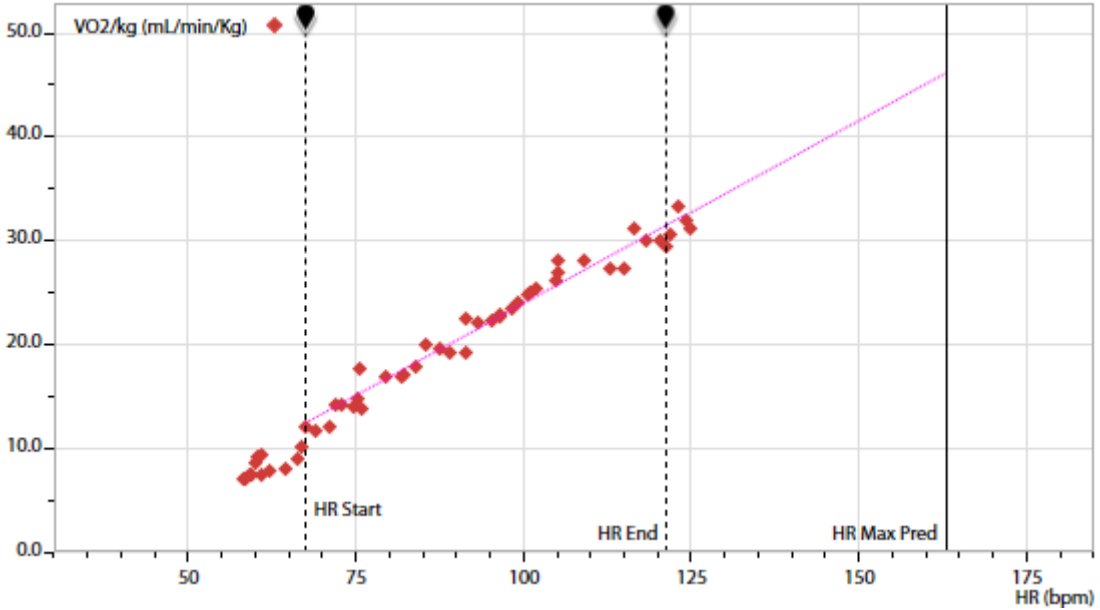








Sub-max:

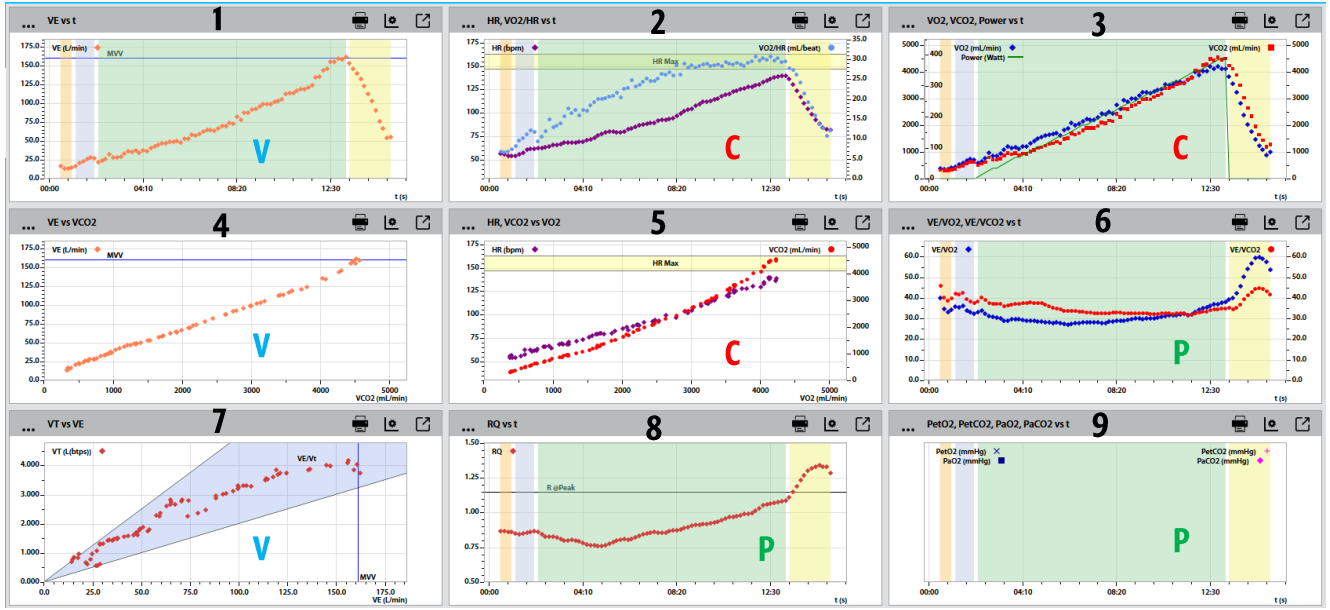


Sub-max exercise test:

- Performed as a graded exercise test, but stopped before maximum is reached.
- VO2 vs HR is used to extrapolate the VO2 to max predicted HR.
- HR max pred = 220 – age but can also be set manually.
- Not as accurate as a real max exercise test but can be used as a less exhausting test.

9-panel:

V = Ventilation
C = Cardiovascular
P = Ventilation perfusion



- A nine-panel graphic array is commonly used to describe the cardiovascular, ventilatory, V/Q matching, and metabolic response to exercise in the medical record (Wassermann).
- The nine panel plot displays the measurements made during cardiopulmonary exercise testing.
- Each plot focuses on different test-related physiologic aspect measured during exercise.
- The resulting patterns differ among healthy and clinical subjects and allow the identification of specific pathophysiology.

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Calibration (only via K5)

Calibration	Warm-up time from power on at 20°C (min)	Recommended Interval	Note
Flowmeter	0	Daily or whenever the turbine is replaced	Recommended after cleaning and disinfection
Scrubber	20	Before each test	ONLY if the test is performed indoor
Reference Gas (Mix)	30	Daily	ONLY if Mixing Chamber tests are performed
Reference Gas (BxB and Delay)	60	Daily	ONLY if BxB tests are performed

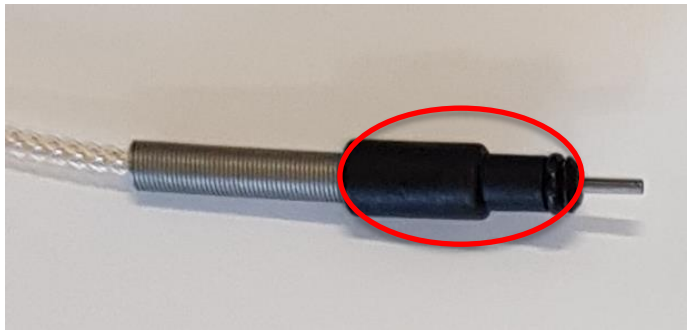
Gas sample lines:

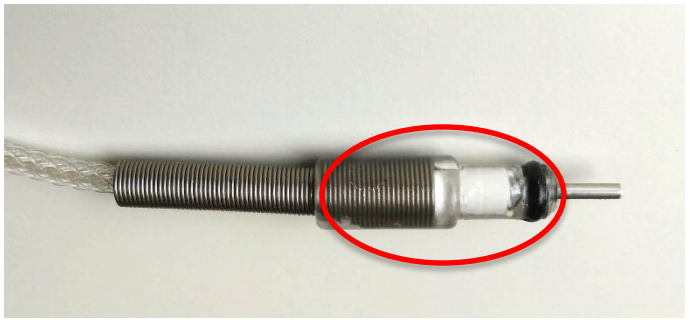
- Swap gas sample lines between tests when doing many in a row
- Replace gas sample line after 100 tests or after 6 month (use log)
- Only push – pull holding at the black/stiff part of the tip

Sample line number: _____

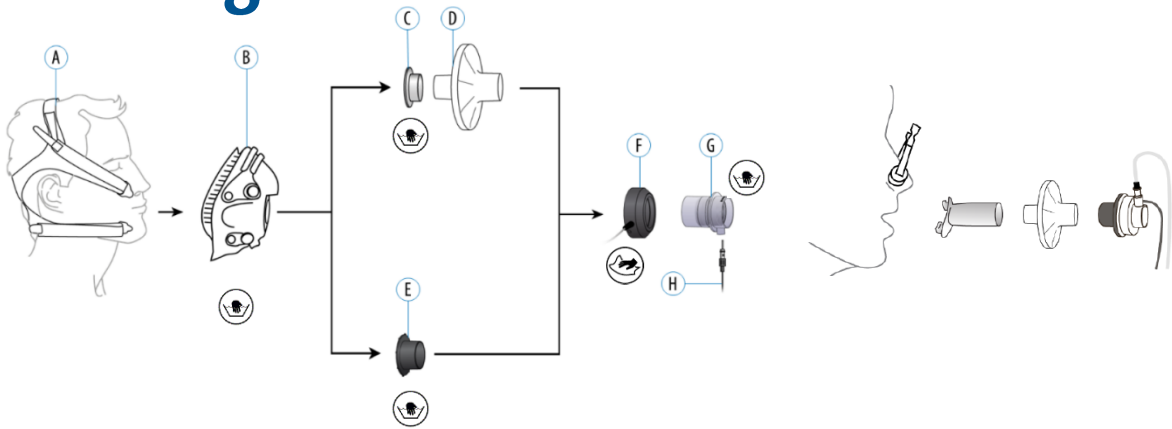
Please, mark with date and name after using the sample line (maximum use = 100 time)

01-01 2024 Name									





Cleaning:



Phase / Group	Pre-treatment	Cleaning	Drying
	• Wipe soil with a moist sponge or towel	• Wipe with a soft cloth sprayed with detergent solution for 30 seconds.	• Let air dry
	• Rinse in water at 22-40°C	• Soak for 3 minutes in a detergent solution at room temperature (>22°C). • Using a soft bristle brush, scrub the submerged part during the 3 minutes. • Wipe while rinsing for 5 minutes in water. • Inspect all surfaces and part features to ensure that it is visibly clean, repeat Cleaning if not.	• After cleaning, immediately dab with a lint free cloth and let air dry. • Inspect all surfaces and part features to ensure that they are visibly dry, repeat Drying if not.

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The Metabolic Company

Thank you for listening !