TechNSports

Metabolic Profile

Cyclist · Road Cyclist · Initial assessment ≈ estimated VO_2max Highest confidence: the published model was validated against direct threshold measurement in cycling; this report is cycling (A)

40 yrs · Male
78.0 kg (as you gave it to us) · 180 cm
Step test + sprint
21 Sep 2026

How this test was done · Test: Step test on the bike with blood lactate. Stages: 9 stages of 4:00. Sprint: 10 s. First sample: 1:00. Venue: Laboratorio TNS, Plaza 333, Mérida.

What this sheet supports best is the comparison against yourself: same protocol, same equipment, same way of measuring, so the change between two of your own tests is signal and not method noise.

YOUR THREE NUMBERS

SUSTAINABLE CEILING
MLSS

262

W

The fastest pace you can hold in equilibrium. Above it, lactate accumulates faster than you clear it and the clock runs against you.

Estimated between 249 and 275 W. Your zones use the midpoint. It is an estimate on your own data, not a direct measurement.

FIRST THRESHOLD
LT1

168

W · 49 % of your VO_2max

Your first threshold. Slower than this you can go for hours in conversation: the ceiling of your easy days.

Defined as the point where your lactate rises 0.5 mmol/L above your resting level.

AEROBIC CAPACITY
VO_2max

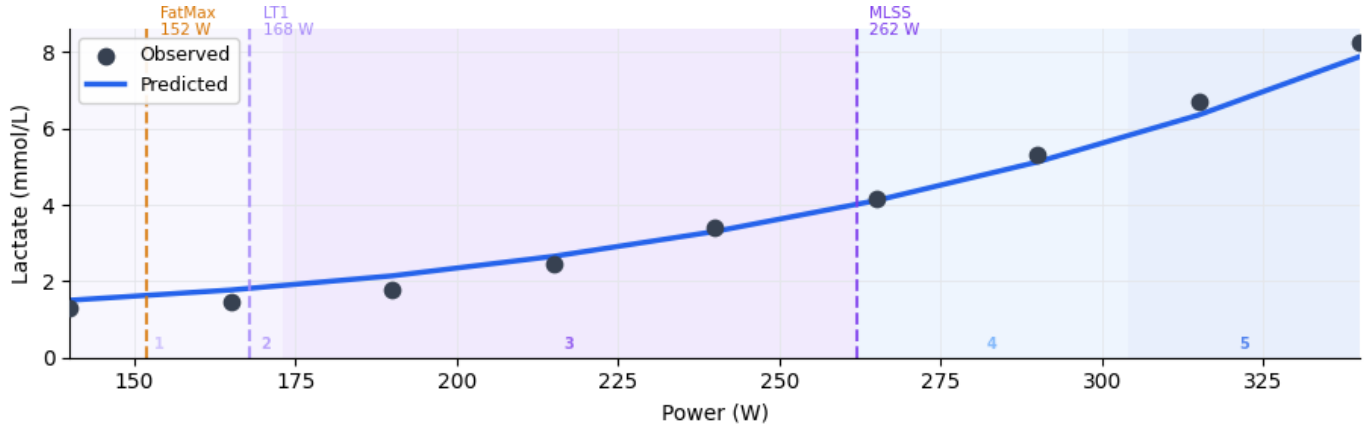
58.0

ml/kg/min

The size of your aerobic engine: the number your watch tries to estimate. It sets how far everything else on this sheet can grow.

Your watch or a field estimate supplied it; this test did not. Your zones are set by your threshold, which does come from your blood.

Your lactate curve, with your three paces marked



WHEN TO MEASURE AGAIN

SECOND ASSESSMENT

30 Nov 2026

10 weeks is what the plan-page priorities need to move measurably. The second assessment turns these numbers into a trajectory. Same protocol, same number of stages, conditions as similar as possible.

YOUR ACTION PRIORITIES

1 Use the engine you already have.

Your threshold sits at a moderate fraction of your aerobic ceiling: there is room between what your engine can give and what you are using of it. Strong evidence for the polarised structure with one quality dose (Neal 2013; Campos 2021).

What to do: Keep the easy base (between 168 and 173 W, 125–127 bpm) and one controlled quality session. Most of the week stays easy. With your coach, point your existing quality day at controlled powers near 262 W, without adding threshold volume: in your first year the dose grows after the base.

What triggered it: THRESHOLD INTENSITY · and it is the number to watch at your retest

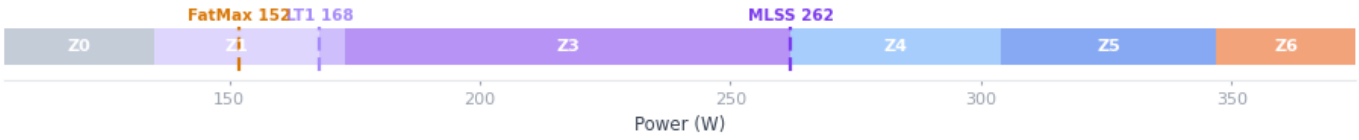
2 Your explosive engine is low, and here that works for you.

You produce little lactate for the speed you carry, so at race pace you spend less carbohydrate than someone with your ceiling and a higher explosive engine: your autonomy comes cheaper and your ceiling holds longer. Grade B: the direction is well established in the substrate literature; what is not settled is how far this number can be moved on purpose, so the recommendation is to use it rather than chase it.

What to do: Use it: your easy band (between 168 and 173 W, 125–127 bpm) is where your week pays most, and quality can sit beside the threshold rather than far above it. What is worth watching is the finish: if your race ends in a change of pace, train that separately, because it is exactly what this engine does not give.

What triggered it: EXPLOSIVE ENGINE · and it is the number to watch at your retest

Your zones, to scale



WHERE YOUR ENERGY COMES FROM

	Aerobic	Glycolytic	Phosphagen (PCr)
Sprint 10s	9 %	56 %	36 %
VO2max 3min	58 %	37 %	5 %
Threshold 20min	99 %	0 %	1 %
Tempo 60min	100 %	0 %	0 %
Endurance 2h	100 %	0 %	0 %

Where your energy comes from by effort duration: from your VO_2max and VLamax. Modelled shares, not measured: read the proportions, not the decimals. A 0 % glycolytic share below your threshold does not mean your glycolysis switches off: it means you clear all the lactate you produce at that intensity, so there is no NET contribution left to count.

Next retest: 30 Nov 2026, same protocol, conditions as similar as possible.

YOUR THRESHOLDS

SUSTAINABLE CEILING

262 W

MLSS (range midpoint)

Estimated between 249 and 275 W. The range is your own protocol's resolution (half a step either side) not the spread between two methods.

Its job: It is your reference power: everything sustainable is defined against it.

How it moves: It rises with controlled blocks near this pace (not faster) and with aerobic base underneath. It is the number you chase at your retest: if it improves, the block worked, and you know that from a number rather than from how it felt.

How far it goes: Your sustainable ceiling is estimated by two methods on your own curve and printed as a range, not a point. That range is your real working margin: train through the centre, and confirm it with one sustained session when you want it narrower.

FIRST THRESHOLD

168 W · 49 % of your VO_2max

LT1

Where you start producing more lactate than at rest. The ceiling of your easy days.

Its job: It sets the power of your easy rides: below this number.

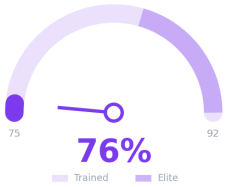
How far it goes: Your first threshold is read at the first breakpoint of your curve, and when your test started above it we can only bound it from above. Bounded or measured, it serves the same purpose: setting the ceiling of your easy days.

THRESHOLD INTENSITY

76 %

MLSS as a fraction of your aerobic ceiling

How much of your engine you can use sustainably: the difference between having a big engine and being able to use it.



Its job: It decides where your next gain is: fraction or engine.

Where you are: You use a healthy fraction of your engine and still have room on both sides: you can make the engine bigger, and you can learn to use a larger fraction of it.

How it moves: Threshold work raises it; the engine grows with Zone 2 volume. Both routes are still open.

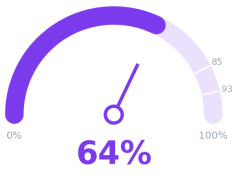
How far it goes: This percentage inherits the margin in your VO_2max, because it is one of your numbers divided by another. What is stable is the question it answers: whether to grow the engine or use the one you have better, and that reading does not change with a few points of margin.

YOUR AEROBIC BAND

94 W

First threshold to sustainable ceiling

The range of paces you hold without accumulating fatigue. The wider it is, the more training volume you absorb without paying for it the next day.



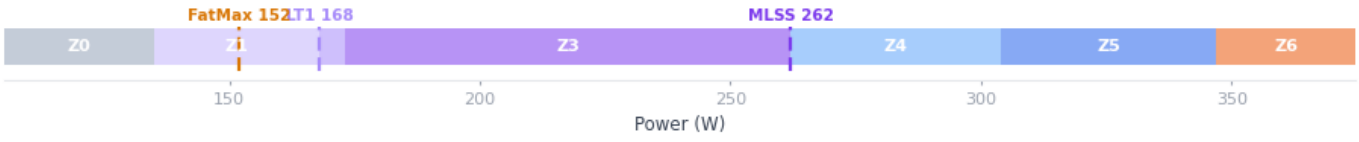
Its job: It sets how much volume you absorb per week without compromising quality.

Where you are: Your band is wide: your first threshold sits well below your ceiling, so you have a broad band for riding and tempo, and your aerobic ceiling still has room above it.

How it moves: Easy volume defends it; threshold work raises the ceiling without eating into the band.

How far it goes: Your aerobic band is the distance between two estimates, so it carries the margin of both. Read it as the width of your comfortable working zone, which is exactly the decision it governs: how much room you have between easy and demanding.

Your three paces, over the range you tested



YOUR ENGINES

AEROBIC CAPACITY

58.0 ml/kg/min · power at VO_2max: 347 W

VO_2max

The size of your aerobic engine: the upper limit training can build toward.



Field estimate, supplied with the test, so compare it against another estimate of the same kind and read your own change between tests.

Its job: It is the ceiling over everything else.

How far it goes: It is the slowest-moving number on the sheet, and its provenance is stated once, above on this same card. What moves your week is the threshold, and that comes from validated methods applied to your own data.

EXPLOSIVE ENGINE

0.45 mmol/L/s · your sprint released ≥ 4 kJ glycolytic

VLamax

How fast you produce lactate under pressure. Low means less carbohydrate at the same pace and a higher ceiling.



Measured with a short maximal test: read it as a good approximation, not an exact ceiling. Full detail in the appendix.

Its job: It sets the glycolytic cost of every surge and how much carbohydrate you spend at race power.

Where you are: Yours is low: you produce little lactate under pressure and spend relatively little carbohydrate at a sustained pace.

How it moves: Short, powerful work raises it; easy volume lowers it. Which way to move it depends on your event: talk it through with your coach.

How far it goes: Your VLamax comes from a sprint of a few seconds, so it depends on how you went that day. An even, maximal sprint makes it highly repeatable, which is why the protocol guards it so closely: executed well, it is the input that best explains your carbohydrate spend.

THE COST OF GOING OVER

1.15 mmol/L / 10 %

Accumulation Index

For every 10 % you go past your threshold, your lactate rises about this much. Two people with the same threshold can pay very differently for the same overshoot.

Measured across the stretch of your curve from threshold to 120 % of it: the range your own stages covered.

RECOVERY

53 /100

Recovery index, 0 to 100 (higher is better)

Computed from your lactate clearance, VLamax, VO_2max and peak lactate. It does not use your heart rate.



A coaching heuristic, not a validated physiological measurement, so it is worth having as a reference against yourself: it repeats the same way every test, and the change is the signal.

Its job: It decides how much you recover between repeated efforts.

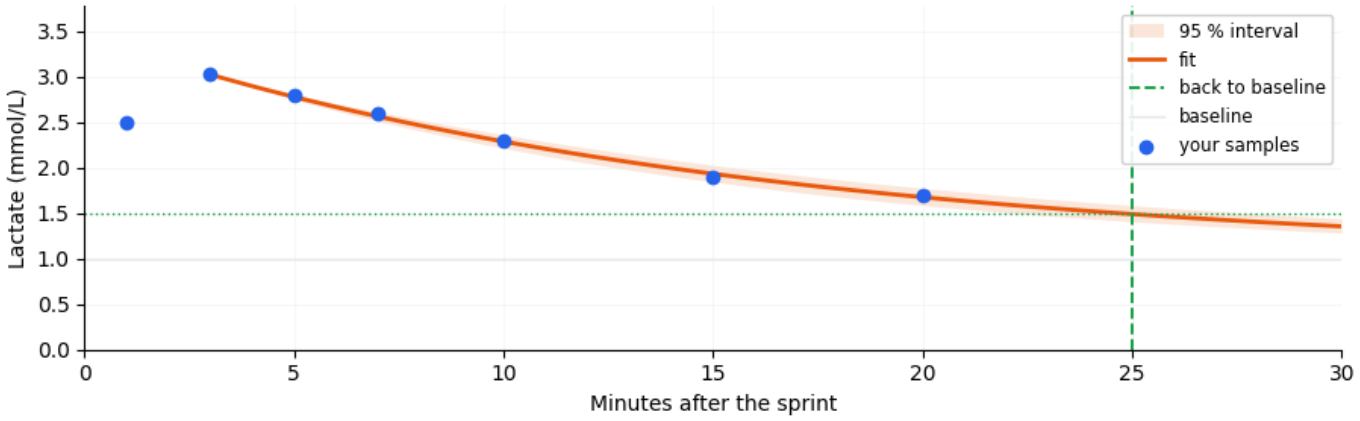
How far it goes: Your recovery index comes from a single test and moves with sleep, heat and the day's caffeine. That is why it is worth most against your own previous value under similar conditions, which is how you will read it at your retest.

YOUR SPRINT BLOCK

What this sheet measures: how long your lactate takes to return to baseline after an all-out sprint. From that comes the rest between sprints, and with it the dose of one block.

Measured: a peak of 3.0 mmol/L at 3 min after the sprint, a 1.0 mmol/L baseline, 5 falling readings.

Your lactate after the sprint, measured and fitted



Dots: your samples. Line: the exponential fit toward your 1.0 mmol/L baseline, with its 95 % interval shaded. The vertical mark is the minute you are back within 0.5 mmol/L of your baseline.

Rest between sprints
25 min
95 % interval: 23 to 28 min

Sprint duration
10 s
the same one you ran in the test

Repeats per session
3
all maximal, all recovered

Block length
6 to 8 weeks
at the end, the sprint is repeated and the prescription recalculated

Your lactate half-time
11 min
every 11 min it halves what remains above baseline

With 25 minutes between sprints your lactate returns to within 0.5 mmol/L of your 1.0 mmol/L baseline, so every repeat starts from the same point and trains power, not tolerance.

3 sprints of 10 s with 25 min of rest between them: about 50 minutes of block, not counting the warm-up. Fewer sprints fully recovered are worth more than many half recovered.

Your VLamax sits in the lower part of the range, so this block is the dose that moves it up, without cutting your aerobic base.

The prescription is a block of 6 to 8 weeks, not a permanent number. Short-term VLamax changes are functional and reverse in days or weeks; structural ones take months. At the end of the block we repeat the sprint and the prescription is recalculated from your new lactate.

YOUR FUEL, OVER YOUR ZONES

PEAK FAT BURNING

152 W · medium-low confidence

FatMax

The intensity where you get the most energy per minute from fat. It sits in your easy range, below your first threshold.

The most model-dependent number on this page: absolute fat rates are estimates, not measurements. What does hold is the SHAPE of your curve and where its peak falls, and that is what decides the intensity you train your base at.

Its job: It marks the power of your long base rides and checks that your base is growing between assessments.

How far it goes: Absolute grams of fat per minute need gas exchange to calibrate, here and in any laboratory. That is why the reading that serves you is where the peak sits in your range of paces and how it changes against yourself: the same bias applies to both tests, so even when the absolute grams are not exact, the change between them is real.

FAT / CARB CROSSOVER

152 W

Fat / carb crossover

You switch to carbohydrate well below threshold: room to improve fat oxidation.

Modelled from your thresholds and VLamax, not measured, so read it as the ORDER of your fuels rather than exact grams: the order is what governs your fuelling.

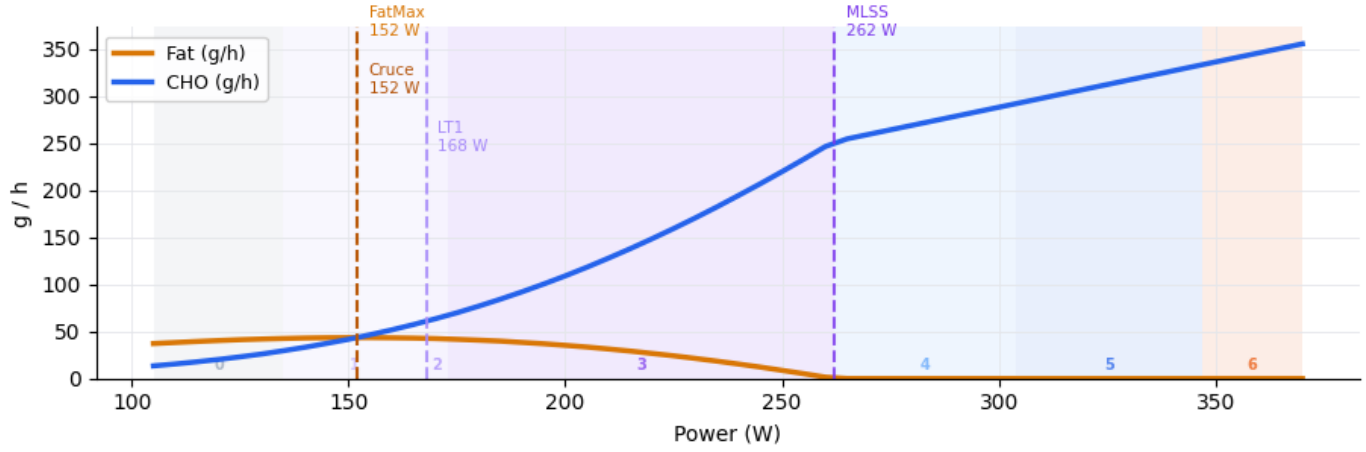
REFUELLING CEILING

189 W

CarbMax

Below this intensity you can, in principle, replace carbohydrate as fast as you burn it (practical ceiling ~90 g/h, Jeukendrup 2014). Above it, the difference comes from stored glycogen.

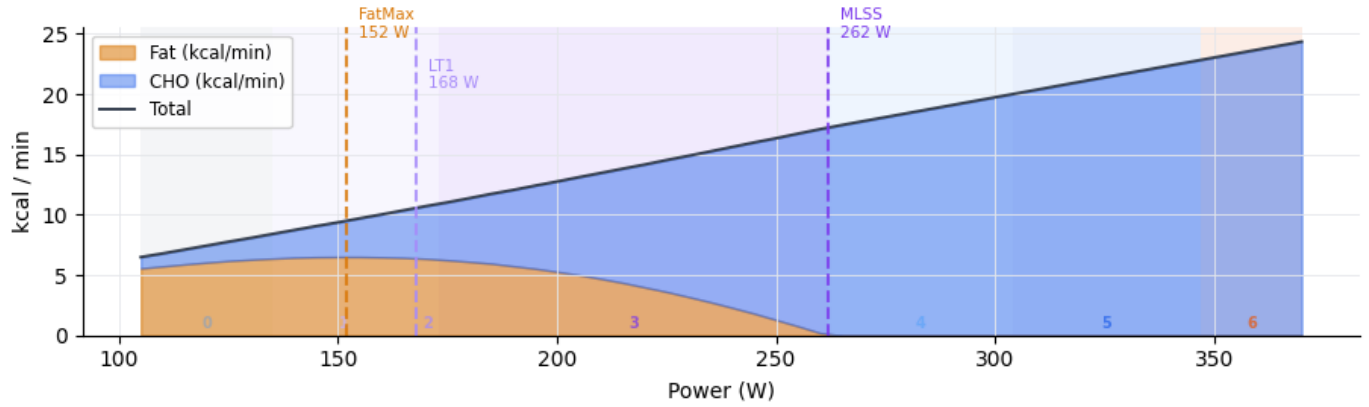
Fuel use by intensity (model estimate)



You always burn fat and carbohydrate together; what changes with pace is the proportion. Easy sessions build the reserve; hard ones spend it.

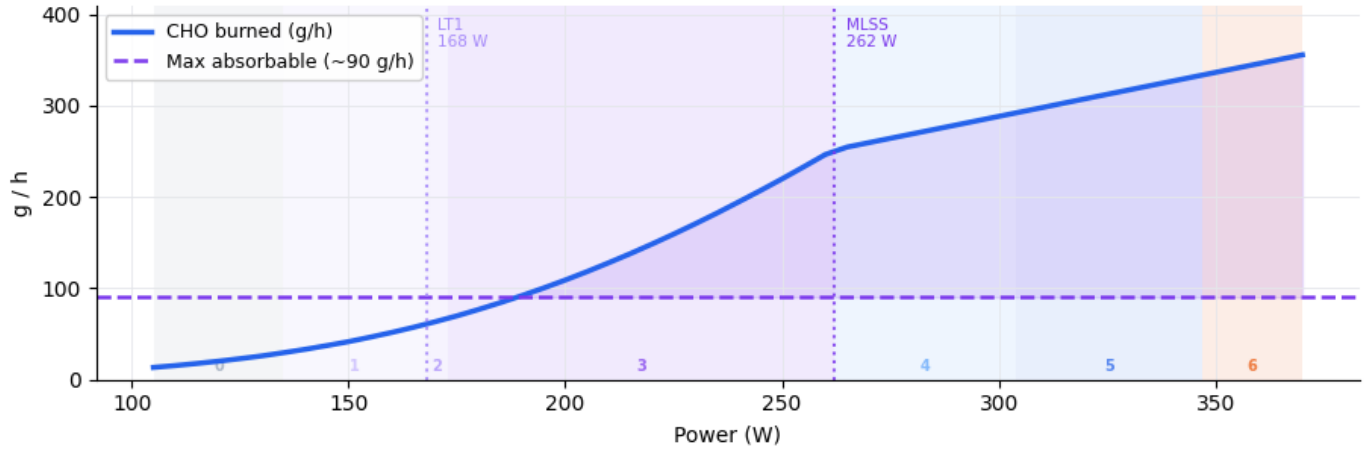
Figures modelled from your profile, not measured: absolute fat and carbohydrate values need gas-exchange analysis to calibrate. Comparisons within your own profile are the reliable reading.

Energy per minute: fat + carbohydrate stacked



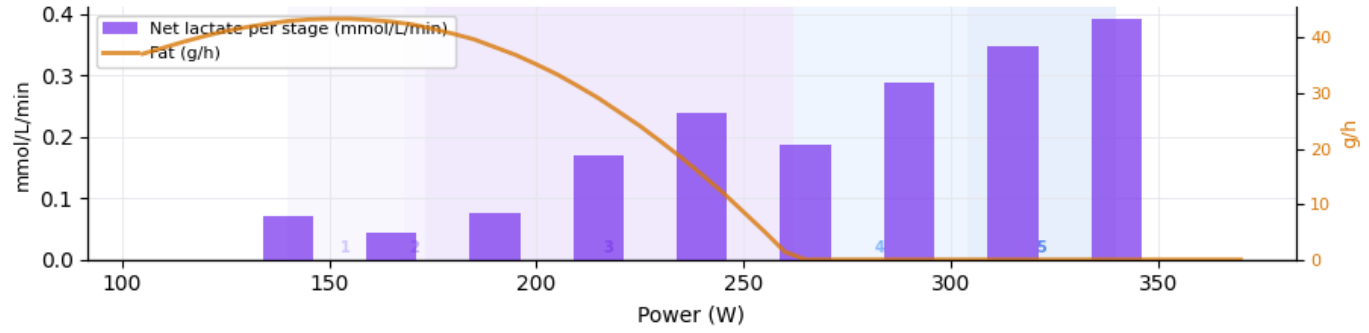
Your energy expenditure, in the unit food is measured in. The amber band is energy from fat; the blue one, from carbohydrate; together they add up to your total burn at each pace. The same curves as above, converted to kcal per minute.

Carbohydrate demand vs. what you can absorb



Above the dashed line you burn more carbohydrate than the gut can absorb (~90 g/h): the difference comes from stored glycogen, that is what puts a clock on the effort.

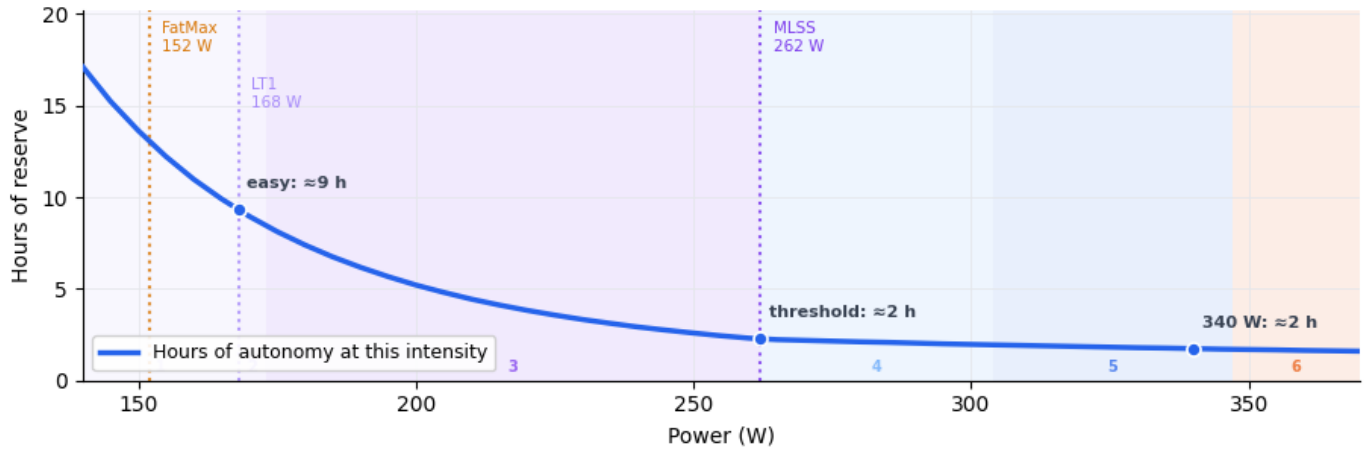
Net lactate accumulation, stage by stage



Where your lactate starts to pile up. Each bar is calculated from your own samples: the lactate change between consecutive test stages, divided by the stage duration. Green: holding. Red: accumulating. The amber curve shows your fat burning falling as it happens.

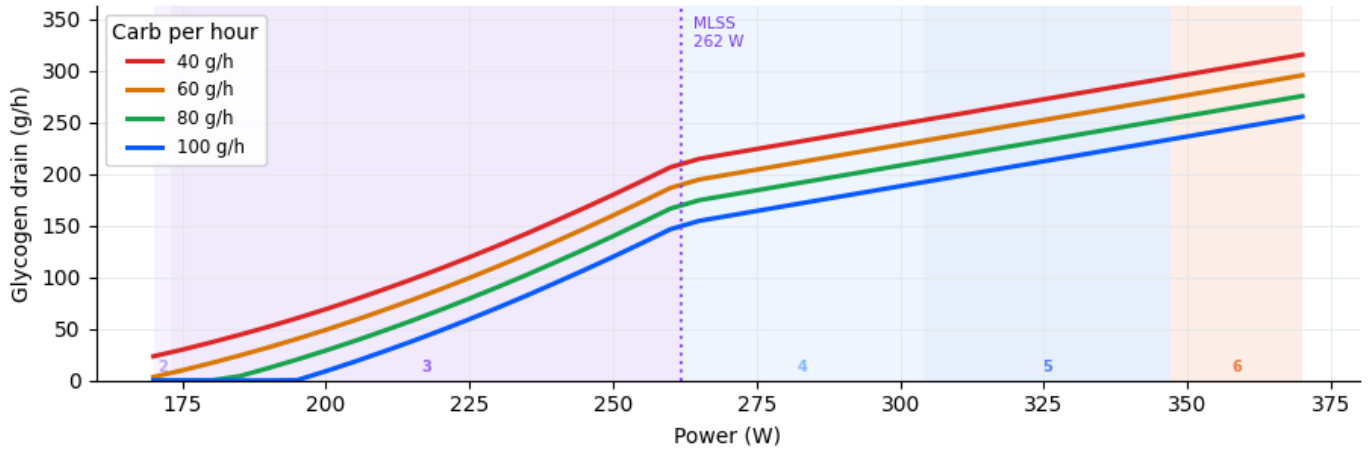
YOUR AUTONOMY

How long your stored carbohydrate lasts



At your fastest tested pace your reserve lasts about 1.7 h (~568 g stored). At that pace glycogen does count, so on long sessions fuelling starts from the first hour. The curve is a floor, not a prediction: as glycogen falls you shift toward fat, which stretches the time.

At what intensity does fuelling stop keeping up?



Each line is a fuelling rate. Where a line lifts off zero, that rate no longer covers your burn: the difference drains glycogen. At your first threshold you burn about 61 g/h, so on a long session the rate you choose decides how much glycogen you finish with.

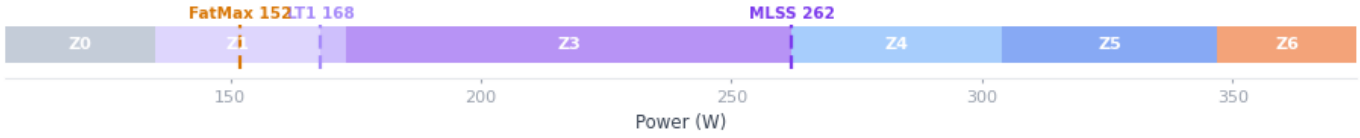
Practise it, do not improvise it. Taking carbohydrate while running trains the stomach like the legs: start on long runs, with the same product and schedule you will race with.

YOUR TRAINING ZONES

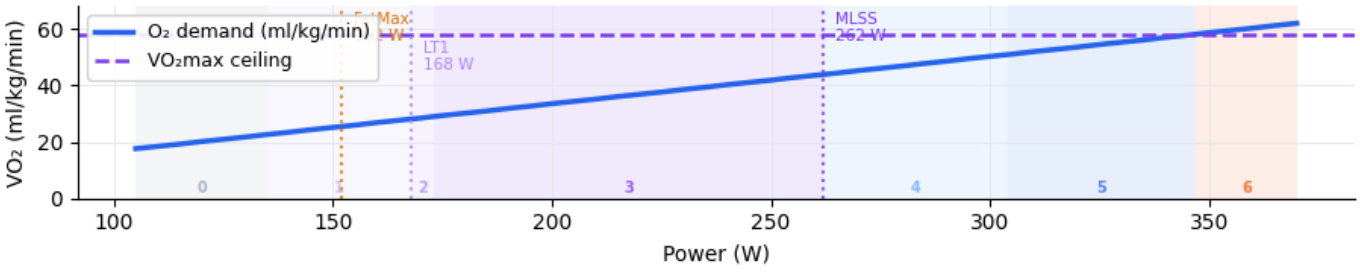
#	ZONE	POWER	TARGET	PULSE	RPE	HOW IT FEELS
0	Regenerative Below your flush day: field convention, 80 % of your first threshold measured in internal power, which in your own unit does not land exactly on 80 %	**< 135 W**	sin dato	sin dato	1–2	No effort; flush jog
1	Recovery Below LT1: fat dominant, minimal glycolysis	**135 – 168 W**	sin dato	< 125	2–3	Full conversation
2	Aerobic Base LT1 → FatMax: aerobic base, rising fat oxidation	**168 – 173 W**	sin dato	125 – 127	3–4	Long sentences
3	Tempo FatMax → MLSS: mixed fuel, lactate stable	**173 – 262 W**	sin dato	127 – 160	5–6	Short sentences
4	Threshold MLSS → VO2max onset: lactate accumulating, aerobic near ceiling	**262 – 304 W**	sin dato	160 – 175	7	Single words, controlled
5	VO2max From your VO2max onset to the power at which your oxygen uptake reaches it: maximal aerobic	**304 – 347 W**	sin dato	175 – 186	8–9	No talking; intervals
6	Anaerobic Above the power at which your oxygen uptake reaches your VO2max: glycolytic, sprint	**> 347 W**	sin dato	> 186	10	Maximal; not sustainable

These zones come from your own estimated thresholds, not a percentage of maximum heart rate. Pace leads. Pulse is the secondary reference: it rises with heat, dehydration and across a long session even at constant pace.

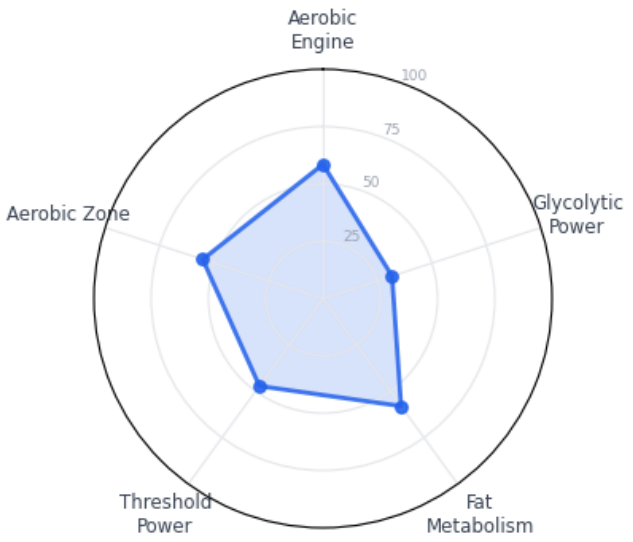
Your zones, to scale



What each intensity costs in oxygen



YOUR PROFILE AT A GLANCE



No axis of your profile stands out above the others: the differences between them are small, so what orders your work is your action priorities and not the shape of the figure.

> **How to read your profile figure.** Each axis runs from the lowest to the highest value reported in the literature for that parameter. **It is not a percentile or a comparison against other people**: it shows the shape of your own profile.

> **What the shape says.** Your axes, out of 100: Aerobic Engine (58), Fat Metabolism (58), Aerobic Zone (55), Threshold Power (47), Glycolytic Power (32). The figure shows the shape of your own profile: which of your systems are more developed than others.

What each axis measures

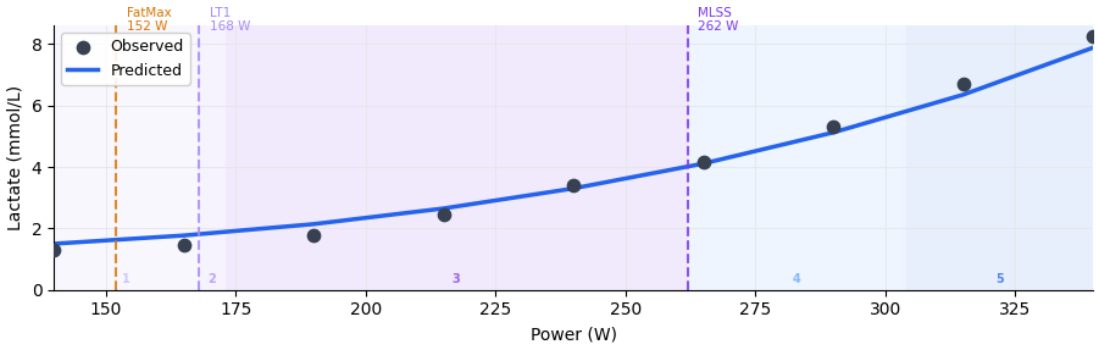
- **Aerobic Engine**: your VO_2max: the size of the aerobic engine.
- **Glycolytic Power**: your VLamax: how fast you produce lactate. Neither high nor low is “better”: it depends on the sport.
- **Fat Metabolism**: how close your fat-burning peak sits to your sustainable threshold.
- **Threshold Power**: the height of your ceiling, scored against the per-kilo cycling convention: a common scale for placing you, not watts you produce.
- **Aerobic Zone**: the width of your easy range: first threshold as a fraction of the sustainable one.

YOUR TEST DATA

#	POWER	LACTATE (mmol/L)
1	**140 W**	1.3
2	**165 W**	1.5
3	**190 W**	1.8
4	**215 W**	2.4
5	**240 W**	3.4
6	**265 W**	4.2
7	**290 W**	5.3
8	**315 W**	6.7
9	**340 W**	8.3

> Every number in this report comes from these measurements) your stages and your lactate samples, not a population table.

CASE



Who this is

A 40-year-old man, a cyclist with a power meter. He trains by watts and wanted to know where his real ceiling is.

What the numbers say

His sustainable ceiling is 262.0 W and his first threshold 168.0 W, a band of 94.0 W. His VLamax is 0.45 mmol/L/s.

What changes on Monday

Controlled blocks near the sustainable ceiling, and easy volume below the first threshold. The zones on this sheet come from those two numbers, not from a percentage of his maximum.

What the retest looks for

In 10 weeks, the same step protocol. What gets compared is the ceiling and the width of the band.

Sample report · fictional athlete · synthetic data

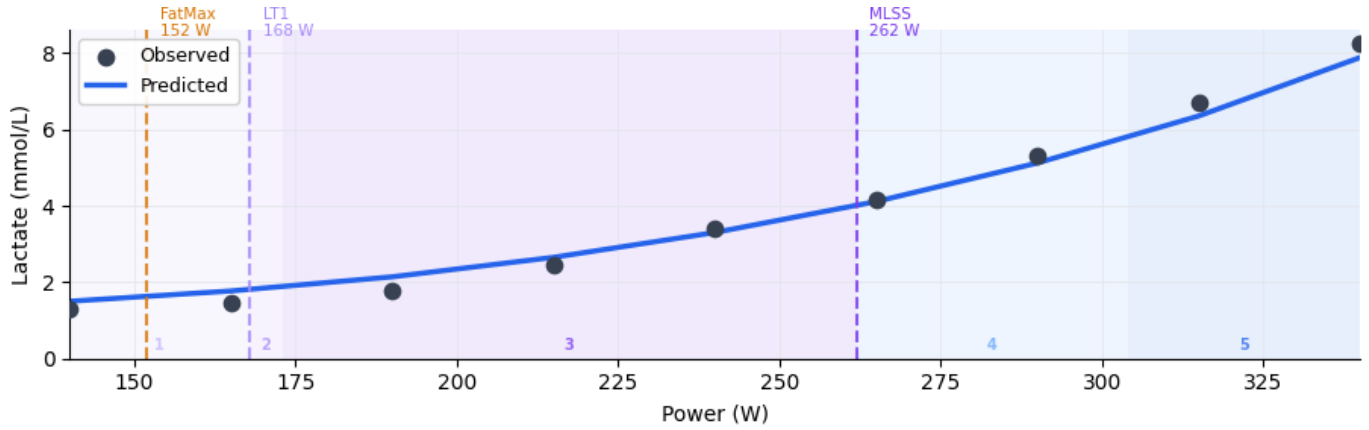
GLOSSARY

VO_2max	The size of your aerobic engine: the most oxygen your body can use.
VLamax	Your sprint engine: how fast you produce lactate via glycolysis.
MLSS	Maximal Lactate Steady State: the highest intensity you can hold without lactate running away. Your key threshold.
LT1	First lactate threshold: where lactate first rises above rest. Top of the easy, fat-burning zone.
FatMax	The intensity where your fat burning peaks: typically in your easy range, near your first threshold.
HRR / FC	Heart-rate recovery after effort: an index of fitness and recovery.
g/h	Grams per hour: the rate at which you burn fat or carbohydrate.

TECHNICAL APPENDIX

> Reference bands are field convention by sport, not a published cohort: use them as orientation, not a population position.

How well the model describes you: observed vs. predicted lactate



Mean model fit error: 0.23 mmol/L (R^2 = 0.97), measured on the 7 stages whose lactate stayed under 5.5 mmol/L, of the 9 drawn here. That is why your thresholds were anchored directly to your measured curve (methods below), not to the model's.

Where each number comes from

Sustainable threshold	from the model fitted to your measured lactate curve
LT1	read off your measured lactate curve: the point where it rises 0.5 mmol/L above your resting level
VLamax	calculated from your sprint blood-lactate series
VO_2max	field estimate, supplied with the test
FatMax	modelled (no gas analysis; medium-low confidence)

About your VLamax

Blood-referenced and alactic-time corrected, per Wackerhage et al. 2025 (a Mader 1994 variant). Measured with a short maximal test: the literature warns such a test likely undershoots the true maximum, so read it as a good approximation, not an exact ceiling. Published values typically span 0.2–1.0 mmol/L/s (Wackerhage et al., Sports Med 2025). Not a population distribution or percentile.

Methodology

- What the model used of your body (population estimates: no body scan on this test): mass 78.0 kg · active muscle 27.3 kg · muscle water 20.5 L · lactate distribution space 35.1 L.
- Your first threshold (LT1) is defined here as the point where your lactate rises 0.5 mmol/L above your resting level, read off your own curve between the measured stages. It is a fixed-offset-above-baseline definition of the kind the literature uses for the lactate threshold (Jamnick et al. 2018 list it). If your slowest stage was already above that level, your LT1 is reported as a ceiling below that stage.
- This engine's curve is calibrated on two athletes measured in April 2026. That sets what a margin here can promise: your numbers compare against yourself with confidence, and against a population with less. November's retests are the next two entries.
- VO_2max was not computed in this report: it arrived as a field estimate alongside the test. No equation is named here and no other method's margin is attached to it. Always compare estimate against estimate; the change between your own tests is what holds.
- The ceiling of your zones (the power at which your oxygen uptake reaches your VO_2max) is computed from that VO_2max, so the top of Zone 4 and all of Zones 5 and 6 inherit the estimate. The start of Zone 4 does not: that is your threshold, and it comes from your lactate curve. We do not know which way it is off, because the value was not computed here, so read the ceiling with the same margin as the VO_2max behind it. A measured value replaces it at your next assessment.
- Your sustainable threshold is solved by the model's lactate balance: the highest intensity where production does not exceed clearance: and not by a geometric method on your curve. DMAX and modified DMAX run here only as a cross-check, and the result is printed below.
- Cross-check. Your LT1 is read off your curve: 168 W; the model gives 185 W. Your sustainable threshold comes from the model, which governs on the bike because it is the modality with its own validation cohort: 262 W; read straight off your points it is 246 W. That difference exceeds 6 % on your LT1 and your sustainable threshold: when that happens the model's number and your curve's are not saying the same thing, and what holds is the change between your own tests measured the same way every time. Bring it to your next assessment.
- The threshold prints as a range, not a point, and its half width (13 W) is your protocol's resolution: half a step either side. Train through the middle of the range and confirm at the retest.
- The lactate-clearance constant was fitted to your own data (k = 9.21; RMSE 0.23 mmol/L).
- Internal model constants (Km, efficiency, active muscle mass) are estimated: absolute values are indicative; changes between your own assessments are the reliable reading.
- Calibrating those figures would take indirect calorimetry (Frayn 1983), which measures gas exchange breath by breath. Without it the split between the two fuels comes from the model rather than your breath, and glycogen is assumed well fed.
- A single assessment cannot separate real change from normal day-to-day variation. Repeated on different days, the reference test for the sustainable threshold varies by about 3 % (Hauser et al. 2012, Int J Sports Med 34:196-9), and the best method estimating it from a single step test typically misses by about 3 % (Garcia-Tabar and Gorostiaga 2018, Front Physiol 9:1034). That is why your retest repeats the protocol and the comparison reads how far your curve moved: that is how a change is told apart from a different day.
- OBLA 4.0 mmol/L was also computed for reference; it overestimates MLSS (~43 W in Płoszczyca 2020) and is never used as primary.

- Sprint block: the rest is the time at which the exponential fit to your post-sprint samples returns to within 0.5 mmol/L of your baseline; the constant is accepted only if its 95 % interval meets the house thresholds, and if not, the sheet says so. The prescription is a block of 6 to 8 weeks: Weber separates functional VLamax changes (enzyme activation and recruitment; days to weeks; reversible) from structural ones (fibre type and enzyme expression; months), so a short-term change is read with caution and the sprint is repeated at the end of the block (Weber, Scientific Triathlon EP#238; Mader and Heck 1986).

NOTICES

This is not a health service and does not replace professional advice. TechNSports is an assessment and training centre. This document describes performance measurements and does not assess any health condition. If anything you read raises a question about your health, talk to your doctor.

Your data. Your results and samples are handled per the consent you signed. You may request access, rectification, cancellation or objection by writing to info@technsports.mx.

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WHAT HAPPENS NEXT

What the session involves

About 90 minutes on your own bike, at the studio. Test: Step test on the bike with blood lactate. Stages: 9 stages of 4:00. Sprint: 10 s. First sample: 1:00. Venue: Laboratorio TNS, Plaza 333, Mérida. We ask for two to three hours without food and no hard session the day before.

What you leave with

This report, your seven zones ready to load into your watch, a session where we walk you through every page, and the guide so you can read it again without us. Your coach gets the same file.

When to retest

In 10 weeks, with the date already on the first page. Between one and the next, a short field test keeps the anchor current.

How to book

One message and we tell you which Saturday is open. Prices are on the test's own page on the site.