Kawasaki Supercharged H2 Engine Family

A TECHNICAL REFERENCE FOR CAR INSTALLATIONS

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Please Read First

This document is general guidance only. It is published to help owners, builders and prospective buyers understand the Kawasaki supercharged H2 engine family and what is involved in running one outside its original motorcycle.

It is not a specification, a build manual, or advice on any individual engine or installation. Specifications vary by model year, market and production revision, and engines that have previously been modified or rebuilt may differ from anything described here.

> **ON THE SOURCES BEHIND THIS DOCUMENT**
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> Everything here is assembled from Kawasaki published specifications, parts catalogues and owner's manuals, from our own measurements, and from working on these engines in cars. Public information on this family is inconsistent and in several places directly contradictory — including between one Kawasaki document and another.
>
> Where sources disagree we say so and show both positions rather than quietly choosing one. Where we do not know, we say that too. This is the best position we can reach from what is publicly available. It is not a guarantee, and nothing in it should be treated as a definitive factory figure. Confirm anything you are about to spend money on against the Kawasaki parts catalogue for the specific model and year of engine in front of you.

Installing a motorcycle engine in a car is a substantial engineering exercise with real consequences if it is done badly. Nothing here replaces proper inspection, measurement and calibration by a competent person.

How to read the confidence markings

Manufacturer figure	Kawasaki-published or press-released. Reliable, but check it applies to your model year.
Disputed	Sources conflict. Both positions are given, and the conflict is set out in *Where Published Sources Disagree*.
TFTR development work	Our own measurement or calibration decision on a specific engine. Not a general recommendation.
Reported	Consistent owner and tuner reports. Indicative ranges, not measurements.

Scope

The H2 family is frequently discussed as though it were one engine. It is not. The variants share a common architecture, but the differences between them are more substantial than is generally assumed, and several are mechanical rather than electronic. Those differences determine how an engine should be boosted, fuelled and calibrated once the original motorcycle electronics are removed — which in a car installation they always are.

This document is written for car installations generally: lightweight sports cars, kit and component cars, sports racing cars, single-seaters, hillclimb specials, buggies and one-off chassis. Packaging, cooling and transmission solutions differ enormously between them. What does not differ is the underlying behaviour of the engine, its lubrication requirements, and its need for a properly specified standalone electrical and management system. Motorcycle electronics, rider aids and trim are ignored throughout, except where a model designation is a clue to which engine you are looking at.

Platform Overview

Kawasaki introduced the supercharged H2 platform in 2015. Every engine in the family is a 998 cc inline-four with a centrifugal supercharger developed in-house by Kawasaki Heavy Industries. These engines were designed around forced induction from the outset — they are not naturally aspirated engines with a blower added — and the architecture, piston cooling and lubrication strategy all reflect that. It is one of the reasons the platform tolerates car use as well as it does, provided its actual limitations are respected.

COMMON TO ALL VARIANTS	SPECIFICATION
Configuration	998 cc inline four-cylinder, DOHC, 16-valve
Bore × stroke	76.0 mm × 55.0 mm
Induction	Centrifugal supercharger, in-house Kawasaki design
Supercharger drive	Planetary gear train from the crankshaft via an intermediary gear, stepping impeller speed up to approximately 9.2× crank speed
Charge cooling	None fitted as standard — no intercooler on any variant
Piston cooling	Oil jet beneath each piston
Transmission	6-speed dog-ring, chain final drive
Lubrication (standard)	Wet sump

Impeller diameter differs between the two engine groups and is given in the next section. The 9.2× step-up figure is Kawasaki's own for the Z H2; treat it as approximate across the family.

CHARGE COOLING — THE REASONING DOES NOT TRANSFER TO A CAR

Kawasaki's position is that the supercharger does not raise charge temperature sufficiently to require an intercooler on the motorcycle. That reasoning is sound in its original application. It does not automatically transfer to a car, where airflow through the engine bay, ambient recirculation, sustained load and heat soak in traffic or on a grid can all be considerably worse than anything a motorcycle sees.

Variant Guide

MODEL	ROLE	COMPRESSION	CLAIMED POWER	PEAK TORQUE
Ninja H2 **2015–2018**	Road-legal hypersport	8.5:1	200 PS (210 ram air) @ 11,000 rpm	133.5 Nm
Ninja H2 **2019 on**	Road-legal hypersport	8.5:1	231 PS (242 ram air) @ 11,500 rpm	141.7 Nm @ 11,000 rpm
Ninja H2 Carbon	Road-legal hypersport	8.5:1	As Ninja H2 of the same year	As Ninja H2
Ninja H2R	Track only	8.3:1	310 PS (326 ram air) @ 14,000 rpm	165 Nm @ 12,500 rpm
Ninja H2 SX **SX SE / SE+**	Sport touring	11.2:1	200 PS (210 ram air) @ 11,000 rpm	137 Nm @ 9,500 rpm
Z H2 / Z H2 SE	Naked roadster	11.2:1	200 PS @ 11,000 rpm	137 Nm @ 8,500 rpm

Claimed power is a crank figure measured to a manufacturer standard and will not appear on a dyno; the reasons are set out under *Measured Output and Tuning Headroom*. Ram-air figures are unavailable to a stationary engine and effectively unavailable to most cars.

SE and SE+ are equipment designations, not engine specifications. They denote suspension, brakes, rider aids and lighting, all of which is discarded in a conversion. There is no SE engine variant and no low-compression SE. A Z H2 SE and a base Z H2 are the same engine; an H2 SX SE and a base H2 SX are the same engine. The badge is useful only as a pointer to the model family, and therefore to which compression group to expect.

What Actually Differs Between the Variants

This is the section most worth reading carefully, because the common assumption — that these engines differ only in airbox and mapping — is wrong.

Two distinct engine specifications, not one

The family splits into two meaningfully different builds. Kawasaki's own terminology is the clearest way to hold them apart: the H2 and H2R are the **power-supercharged** engines, the H2 SX and Z H2 the **balanced-supercharged** engines.

LOW COMPRESSION, HIGH BOOST — NINJA H2 AND H2R (8.5:1 / 8.3:1)

Built for peak output. More aggressive camshafts, particularly on the H2R. Higher boost. Greater tolerance of raised boost, because the knock threshold sits further away.

HIGH COMPRESSION, MODERATE BOOST — NINJA H2 SX AND Z H2 (11.2:1)

Built for real-world torque and efficiency. These use a different cylinder head, different camshafts, different crankshaft and different pistons from the Ninja H2, along with a different supercharger and plenum chamber. Kawasaki's launch material describes the SX engine *including its exhaust system* as approximately 3 kg lighter than the H2 installation; that is not a statement about the bare long engine alone, and it is often quoted as though it were.

The superchargers are genuinely different units between the two groups, not the same part with a different map. The balanced unit fitted to the SX and Z H2 uses a 69 mm impeller carrying six full-length blades at the tip expanding to twelve at the base. **The SX and the Z H2 share that impeller.** The Z H2's stronger mid-range comes from intake routing and calibration — its torque peak is placed at 8,500 rpm against the SX's 9,500 — rather than from a different compressor.

Why this matters in a car

Compression ratio is the dominant variable once you are running your own calibration:

- **Boost ceiling.** An 11.2:1 engine reaches its knock limit at markedly less boost than an 8.5:1 engine. If the objective is a high-boost, high-output build, the low-compression Ninja H2 specification is the more tolerant starting point.
- **Fuel sensitivity.** The high-compression engines are more sensitive to fuel quality and to charge temperature — which, as noted above, is a harder problem in a car than on a bike.
- **Off-boost behaviour.** The high-compression engines are considerably better below and between boost. In a car — heavier than a motorcycle, and usually geared longer — this matters far more than it does on the original bike.
- **Calibration is not transferable.** Ignition and fuelling developed on one compression ratio should never be carried across to the other.

There is no single best variant. There is a variant that suits the intended use, and choosing it deliberately is worth considerably more than choosing on price or availability.

Z H2, H2 SX and SX SE as donors

As a donor engine, the Ninja H2 SX and SX SE carry the same 11.2:1 specification as the Z H2 — the same high-compression head, camshafts, crankshaft and piston family, and the same balanced supercharger. Intake, exhaust, electronics and trim differ, and all of it is discarded in a conversion. Once installed in a car, any of the three is essentially the same engine, and the SX is the more numerous bike.

Two qualifications. Second gear may not be common across the group — see the next section. And SX models from around mid-2022 moved to a Bosch ECU, which is irrelevant with a standalone system but does affect bike-side tuning support and therefore donor pricing. That same mid-2022 revision is the most likely point at which the gearbox change occurred, so it is worth noting the year for both reasons.

Gearbox, Ratios and Final Drive

Every variant in the supercharged family uses a **dog-ring** gearbox — the H2, H2R, H2 SX and Z H2 alike. This is unusual on a production engine and has three consequences for a car build: shift feel and shift actuation design differ from a conventional constant-mesh box; gear inspection means stripping the shaft assemblies rather than lifting out a single gear; and, as set out below, replacement parts are sold as complete shafts.

The gearbox follows the same two-group split as the engine. Third through sixth gear are identical across every variant — only the primary reduction and the two lowest gears differ.

RATIO	NINJA H2 / H2R	NINJA H2 SX / Z H2
Primary reduction	1.551 (76/49)	1.480 (74/50)
1st	3.188 (51/16)	3.077 (40/13)
2nd	2.526 (48/19)	2.471 (42/17) †
3rd	2.045 (45/22)	2.045 (45/22)
4th	1.727 (38/22)	1.727 (38/22)
5th	1.524 (32/21)	1.524 (32/21)
6th	1.348 (31/23)	1.348 (31/23)

† DISPUTED — SECOND GEAR ON THE HIGH-COMPRESSION GEARBOX

Kawasaki's 2018 Ninja H2 SX specification and the Z H2 specifications give **2.471 (42/17)**. A later Ninja H2 SX owner's manual gives **2.429 (34/14)**. Both are Kawasaki figures, so this is unlikely to be a simple error in one of them. The probable explanation is that second gear changed during H2 SX production while the Z H2 retained the original.

We have a 2022 SX SE manual showing 34/14, so the change had happened by then, but we have not established the exact model year and will not guess at one. Until it is confirmed against the parts catalogue for the specific engine, treat second gear on any Ninja H2 SX as unresolved between those two figures. Nothing else depends on it: the primary reduction, top gear and differential selection all rest on ratios common to every variant.

The factory chain final drive figures are 2.333 (42/18) on the H2R, 2.444 (44/18) on the Ninja H2 and H2 SX, and 2.556 (46/18) on the Z H2. In a direct-coupled car installation none of these apply — the differential replaces them entirely.

THE PRIMARY REDUCTION IS NOT OPTIONAL

The most common error in H2 gearing calculations, and it produces answers wrong by roughly half. Builders who have deleted the output sprocket sometimes conclude there is no reduction between engine and gearbox output. The primary reduction is not the sprocket — it is the gear pair between the crankshaft and the clutch basket, inside the crankcases, and it multiplies every gear. Overall ratio in a direct-coupled installation is **primary reduction × gear ratio × differential ratio**.

Gearbox parts availability

Kawasaki does not list individual gears for the Z H2. The transmission section of the parts catalogue contains two gear part numbers, both complete shaft assemblies — input 13341-0640 and output 13342-0678 — listing at roughly £950 and £2,450 at the time of writing. A gearbox wanting attention at both ends therefore approaches £3,400 in parts before labour, with no route through the factory system to replace a single damaged gear.

This follows from the dog-ring design rather than being an arbitrary catalogue decision. We have confirmed it on the Z H2 catalogue; since every variant uses a dog-ring gearbox, expect the same across the range, but check the catalogue for your own model before assuming it. Either way it changes what a used engine is worth. One offered cheaply with an unknown or noisy gearbox is not a bargain, and where the original gearbox is retained in a car — as it usually is — its condition deserves the same scrutiny as compression and supercharger condition.

INTERCHANGEABILITY — UNVERIFIED

Whether a complete Group A shaft assembly will fit a Group B crankcase, and whether the primary drive gear can be changed independently, are questions we have not resolved. Differing ratios do not demonstrate that shaft dimensions, bearing locations, dog-ring and sleeve dimensions, shift-fork geometry and case machining are common. Treat both as *no* until proven by Kawasaki part-number and dimensional comparison.

Identifying an Engine Correctly

Do not identify an H2 engine by its engine number prefix.

The **ZXT00NE** prefix appears across the supercharged family — on Z H2, Ninja H2 SX and Ninja H2 units alike. It identifies the 998 cc supercharged engine family, not the compression ratio or state of tune, and serial numbers run sequentially across the family, so a number falling within a known range proves nothing either. Given that the two groups differ in head, cams, crank, pistons and supercharger, buying on prefix alone is a real risk. Cosmetic finish is no better — supercharger housing colour varies by model and year and is not a Kawasaki specification code.

The frame number is what settles it

Any online Kawasaki parts catalogue with a VIN search will return the model, year and full model code from a chassis number. We have used this route to confirm engines in our own cars and for customers assessing engines before purchase, and it takes a couple of minutes.

PREFIX SEEN	MODEL FAMILY
...ZRT00...	Z H2 (ZR1000 series)
...ZXT02...	Ninja H2 SX family
ZX1002... (model code)	Ninja H2, 2019 on

VIN construction varies by market, so run the catalogue lookup rather than reading a prefix and assuming. The table above records prefixes we have seen returned, not a universal decoding rule.

Where no frame number survives

Establish the specification physically or by part number before any calibration work begins. The gearbox is the fallback: first gear is **51/16** on a Ninja H2 or H2R against **40/13** on a Ninja H2 SX or Z H2. Because every variant uses a dog-ring gearbox this means stripping the shaft assemblies on any of them — a definitive answer rather than a quick one. The primary gears differ too, at 76/49 against 74/50, but two teeth in seventy-six is a demanding count and we would not rely on it alone.

Where Published Sources Disagree

Three points on which the available evidence does not resolve cleanly. They are collected here so they are not mistaken for settled data elsewhere in the document.

1. Second gear on the high-compression gearbox

2.471 (42/17) against 2.429 (34/14), both Kawasaki figures. Set out in full under *Gearbox, Ratios and Final Drive*. Most likely a production change on the H2 SX; the model year is unestablished.

2. Factory rev limits

Poorly documented in public sources, and the figures in wide circulation do not survive scrutiny. Set out under *Engine Speed and Calibration*. We do not publish a factory limiter figure for any variant.

3. What changed on the 2019 Ninja H2

Kawasaki's own announcement attributes the increase from 200 PS to 231 PS to the H2 SX air filter, intake chamber, spark plugs and ECU, with compression unchanged at 8.5:1 and the gearbox ratios unchanged. That is the position we take. It has been argued elsewhere that Kawasaki also fitted revised pistons, camshaft timing and cylinder head hardware, but we have seen no part numbers supporting it, and a change of head hardware would be expected to move the compression ratio, which Kawasaki still lists at 8.5:1. We treat the intake-and-calibration explanation as correct pending a part-number comparison. Note also that the H2 SX did not receive the 2019 increase — the technology travelled from the SX to the H2, not the other way — and the SX engine has remained substantially unchanged since its 2018 introduction.

CORRECTIONS SINCE REVISION 4

Three statements in the previous revision have been withdrawn or amended, and are recorded here rather than silently removed.

- We previously stated that the Z H2 impeller differs from the H2 SX impeller. The evidence indicates they share the 69 mm balanced unit; the difference in torque character comes from intake routing and calibration.
- We previously implied that the dog-ring gearbox was particular to the Z H2. It is used across the whole supercharged family.
- We previously quoted approximately 3 kg as the weight saving of the high-compression engine. Kawasaki's claim is for the engine *including its exhaust system*.

Lubrication in Car Installations

Why the standard wet sump is the limiting factor

The H2 wet sump is well designed for its intended purpose. A motorcycle leans into a corner, so the oil surface stays broadly perpendicular to the sump and the pickup remains submerged. Sustained lateral loading is simply not a design case.

A car does not lean. The same corner produces sustained lateral acceleration acting across the sump, and oil migrates away from the pickup and stays there for the duration of the corner. Braking and acceleration add longitudinal displacement on top. The result is intermittent pickup uncovering under precisely the conditions that also produce peak bearing load.

The severity scales with the car. A road-biased build on modest tyres will see far less of it than a light car on slicks sustaining high lateral g through long corners — which is exactly the sort of car this engine tends to end up in. Long-radius corners and banked or high-speed circuits are the worst case, because the loading is sustained rather than transient.

This is a geometry problem, not a capacity problem. It is not reliably solved by baffling, by a deeper pan, or by simply running more oil within the original sump architecture. Oil starvation failures in car-installed H2 engines are a recurring pattern wherever the original wet sump arrangement has been retained or only lightly modified.

TFTR DEVELOPMENT WORK — DRY SUMP CONVERSION

FEATURE	SPECIFICATION
System type	Custom dry sump
Total system oil volume	Approximately 6 litres
Feed and scavenge lines	-12 AN
Scavenge pump	Derived from a proven Suzuki Hayabusa arrangement
Oil pump gears	Uprated gears (Extreme Creations)
Pressure regulation	External regulation, OEM relief valve retained
Piston oil jets	Cleaned and flow-checked, not modified

The combination of a dry sump, substantially increased system capacity and uprated pump gearing delivers materially better lubrication security than the standard motorcycle configuration, under conditions the original system was never designed to meet. It also removes the sump depth from the packaging problem, which in a low car is frequently useful in its own right.

Oil pressure characteristics

The H2 runs lower oil pressure than several comparable engines — the Suzuki Hayabusa being the usual point of comparison. This is by design and is not a fault. The H2 lubrication strategy prioritises flow and piston cooling over headline pressure.

CONDITION (HOT)	TYPICAL OIL PRESSURE
Idle	~2.0 bar
Normal running	~3.0–3.5 bar
Peak rpm	~4.0–4.5 bar

> **A NOTE ON INSTRUMENTATION**
>
> Motorsport pressure sensors frequently indicate apparently low or delayed readings on these engines, because the available sensor location sits downstream in the oil galleries rather than at the pump outlet. Readings should be interpreted against that, not against expectations formed on a different engine family. More than one perfectly healthy H2 has been diagnosed with a problem it did not have.

It has been reported that the high-compression engines run a reduced oil pump capacity, on the reasoning that the lower heat rejection of the balanced engine permits it. If correct, that would make a high-compression donor a stronger candidate for an uprated pump than a Ninja H2 donor. **We have not verified this by part number and do not rely on it.** It is recorded because it would matter if true, and it is on our list to confirm.

Engine Speed and Calibration

Factory rev limits for this family are far less well documented than the confidence with which they are quoted would suggest, and this revision withdraws the figures given previously.

The number most often attributed to the Ninja H2 is 14,000 rpm. That is the H2R's peak-power speed, not a limiter, and it appears to have been copied widely as though it were one. Independent evidence points elsewhere: tuner-published limiter values put a stock Ninja H2 nearer 12,700 rpm, and owner-read ECU data on the H2 SX and Z H2 shows a tachometer red zone marked at 12,000 with an actual cut nearer 12,500.

Published red zones, actual ECU cut points and aftermarket ECU definitions are three different things and are routinely conflated. We are not able to give a factory limiter figure for any variant that we would stand behind, so this document does not give one. If the number matters to your project, read it from the ECU of the engine in front of you.

In a car installation this is largely academic in any case. The OEM loom and ECU are removed entirely, so factory limits are not inherited, and engine speed becomes a deliberate calibration decision rather than an inherited constraint.

TFTR DEVELOPMENT WORK — ENGINE SPEED ON OUR OWN INSTALLATION

Our Z H2-based installation is calibrated to 14,000 rpm. The reasoning is that the rotating assembly architecture is common across the family, and the H2R makes its peak power at 14,000 rpm on the same 55 mm stroke — a mean piston speed of approximately 25.7 m/s that Kawasaki already sanctions on this bottom end. The meaningful constraint on the high-compression variants is therefore combustion and thermal loading rather than the mechanical capability of the crank and rods, and that is managed through boost, fuelling and ignition strategy.

This is a documented position on one development engine, arrived at with supporting lubrication and cooling changes already in place, on standalone management with closed-loop lambda, knock control and logging. **It is not a general recommendation.** Where an engine is close to standard, on OEM rods, and without the supporting systems to match, the sensible default is to build margin rather than chase the number. Do not raise a limiter on a high-compression engine without the instrumentation to see what it is doing.

Measured Output and Tuning Headroom

This section answers the question most often asked about the engine: how much power it will make in a car, and which specification to buy for which target. It draws on our own measured output from a car installation and on figures reported consistently by owners and tuners of the motorcycles.

TFTR DEVELOPMENT WORK — MEASURED OUTPUT FROM A CAR INSTALLATION

Z H2 ENGINE, 11.2:1, UNOPENED	MEASURED
At the wheel	245.4 hp @ 13,930 rpm, 105.1 lb-ft @ 10,190 rpm
At the crank	284.4 hp @ 13,830 rpm, 121.9 lb-ft @ 10,190 rpm
Driveline loss	Approximately 13%
Test	Dynojet 224xLC, DIN corrected (1.03), smoothing 5. Daytuner Performance, Harrogate, 21 June 2024

Torque arrives early and stays flat from roughly 8,000 rpm through to beyond 11,000, and power climbs almost linearly to nearly 14,000 rpm without the flattening that normally signals a breathing or fuelling limit. The engine was run with our dry sump system, a standalone MBE ECU with closed-loop lambda and knock control, a car-specification cooling system, its own intake and exhaust, and 99 RON fuel. Note that the run extends well above any factory engine speed limit for this variant; the limiter is set by our own calibration, and these are not stock figures. Both dyno plots are published on the website.

Why manufacturer claims never appear on a dyno

The H2R's 326 PS headline is a ram-air figure — crank output with the intake pressure available at very high road speed. On a dyno the machine is stationary, so that contribution is absent, and 326 PS is 321 bhp before anything else is considered. The factory calibration is also deliberately conservative at the top of the rev range, with rich fuelling and cautious ignition timing, which is entirely correct for an engine sold with a warranty.

The practical result, reported consistently on motorcycle dynos, is that a standard H2R measures 230–240 hp at the rear wheel, and a corrected calibration adds around 30 hp — roughly 300–310 bhp at the crank on a static test. The gap to the brochure is ram air and correction method, not lost performance.

What the H2R actually adds over the H2

The Ninja H2 and H2R share bore, stroke, pistons, valves, valve springs and the supercharger itself. What differs is the intake, the exhaust, the camshafts, the ECU calibration, the head gasket and the clutch. The H2R's higher boost is not a different compressor; it is what the same impeller delivers once the intake and exhaust stop restricting it, combined with a considerably more aggressive ignition map. The H2 airbox and snorkel are the dominant restriction — removing the filter housing alone is reported to be worth around 25 hp on a bike dyno.

This matters in a car because a conversion supplies its own intake, its own exhaust and its own ECU. Most of the H2R's advantage over the H2 is therefore already present in a properly built car installation before the camshafts are considered. The H2R camshafts are the one remaining item. They fit the 8.5:1 engine without further parts — a cam-cover job, not a rebuild — and are reported to be worth in the region of 20–25 hp at the wheel on an otherwise free-breathing engine, at the cost of some output below 8,000 rpm.

Compression ratio under boost

11.2:1 is an ordinary ratio for a naturally aspirated engine. It is described as high in this family only because, under boost, the static ratio is not the pressure the piston sees. Effective compression scales with absolute intake pressure, and at the same boost the 11.2:1 engine carries more peak cylinder pressure than an H2R.

ENGINE	STATIC	BOOST	ABSOLUTE INTAKE	EFFECTIVE (APPROX.)
Ninja H2R	8.3:1	~24 psi	~38.7 psi	~22:1
Ninja H2	8.5:1	~18 psi	~32.7 psi	~19:1
Z H2 / H2 SX	11.2:1	~18 psi	~32.7 psi	~25:1

Kawasaki balances this on the 11.2:1 engines with moderate boost, torque-biased camshafts and a conservative calibration, and there is no intercooler on any variant. Knock is decided by cylinder pressure and charge temperature, not by the static ratio alone. That is why the same engine is comfortable on 99 RON with charge cooling and a proper ignition strategy, and marginal on lower-octane fuel with a fixed map and no cooling. The reported piston ring-land failures on tuned

11.2:1 engines sit almost entirely in the second category: bike ECUs with no ignition-against-boost table, 91–93 AKI fuel, and sustained high output with no charge cooling.

> **ON PISTONS**
>
> It is often stated that the Ninja H2 has forged pistons and the SX and Z H2 have cast. Kawasaki's own engineering description of the H2 records cast pistons throughout, chosen because the alloys with the highest hot strength cannot be forged. The pistons do differ between the two specifications, but the meaningful difference is compression ratio and the thermal margin that follows from it, not the forming process.

The cost argument — stay outside the engine

The reason this engine makes sense in a car is that a used donor is inexpensive. The moment the crankcases are opened — pistons, rods, crank — the cost converges on any other race engine and the advantage is gone. The useful ceiling is therefore the engine as Kawasaki built it, plus the items that stay outside it:

- **Intake, exhaust and ECU** — supplied by the conversion in any case.
- **Camshafts** — a cam-cover job on the 8.5:1 engine.
- **Charge cooling** — the single largest contributor to sustained output and knock margin, and far easier to package in a car than on the motorcycle.
- **Supercharger drive gearing** — a cover-off change, not a case split, giving roughly 5% or 9% more boost depending on stage. This is the step that raises effective compression, and it should only follow charge cooling.

On that basis the measured 284 bhp above, from an unopened 11.2:1 engine, is not a starting point. For a lightweight car it is close to the sensible end point, and it was reached for the price of a crash-damaged motorcycle.

Which engine for which target

BUILD (CAR INSTALLATION, STANDALONE ECU)	AT THE WHEEL	AT THE CRANK (13% LOSS)
Z H2 / H2 SX, 11.2:1, unopened — measured	245 hp	284 bhp
Ninja H2, 8.5:1, free intake and exhaust	~255–260 hp	~295–300 bhp
Ninja H2 + H2R camshafts	~265–275 hp	~305–315 bhp
Ninja H2 + camshafts + charge cooling + drive gears	~290–305 hp	~335–350 bhp

Ninja H2 figures are projected from owner and tuner reports on motorcycle dynos, converted at the same 13% driveline factor as our measured run. They are indicative ranges, not measurements, and they assume an engine speed ceiling set by the builder's own calibration rather than by Kawasaki.

For the 8.5:1 engine the order matters: camshafts and breathing first, then charge cooling, then boost. Raising boost is the last step, not the first.

The 11.2:1 engine reaches 284 bhp without any of that, and its strength is mid-range on pump fuel rather than peak output. Camshafts with charge cooling are a reasonable further step. Raising boost is the one thing it should not be asked to do, because that is the variable it is already carrying the most of. Whether the H2R camshafts physically fit the 11.2:1 cylinder head has not been verified — the head casting differs from the 8.5:1 engine, and journals, sprockets and chain timing should be checked on the bench before anything is ordered.

Charge cooling and engine management

On these engines the limit on sustained output is thermal, not mechanical. Bike-market intercoolers are compromised by packaging; in a car they need not be. The blower is a centrifugal unit driven at a fixed ratio from the crank, so any pressure lost across the intercooler core is not recovered as it would be on a turbocharged engine with a wastegate — core restriction and pipework matter. Intake air temperature should be measured after the core, because that is the value the ECU's ignition correction should be working from, and it is the one that shows heat soak on a grid or in traffic.

A standalone ECU with closed-loop lambda, an ignition table referenced to manifold pressure and knock control takes most of the calibration risk out of the above. The factory motorcycle ECU has none of these in a form suited to raised output, and that — rather than the engine — accounts for most of the reputation the platform has acquired for fragility when tuned.

Loom and Engine Management

Car installation requires complete removal of the motorcycle wiring loom and ECU. This is not optional, and the reasons are worth understanding before a budget is set:

- **Immobiliser and security integration.** The factory system expects to see motorcycle-specific components before it will permit the engine to run.
- **Ride-by-wire throttle.** Throttle actuation must be correctly reproduced and calibrated by the replacement system, with the safety logic that implies.
- **Crank and cam trigger interpretation.** The replacement ECU must be configurable for the engine's trigger arrangement.
- **Sensor set and connector standards.** Motorcycle sensors and connectors are not always appropriate to a car's vibration, heat and moisture exposure.
- **Supporting systems.** Cooling fan control, fuel pump control, dash, warning strategy and data logging all require deliberate provision that the bike loom will not give you.

This is where a large proportion of H2 conversion projects stall. A purpose-designed loom and a correctly configured standalone ECU remove most of that difficulty — and they remove it at the start of the project, rather than after the engine is already in the car.

Considerations When Buying an Engine

1. **Establish which variant it is** — by VIN or model code, not engine prefix, badge or appearance. Confirm the compression ratio.
2. **Match the variant to the intended use.** High boost and high output favour the low-compression Ninja H2 specification. Strong mid-range and driveability on pump fuel favour the 11.2:1 Z H2 or H2 SX — and for most lightweight cars the 11.2:1 engine, unopened, is already more than the chassis can use.
3. **Gearbox condition.** Dog-ring parts are sold as complete shaft assemblies. A cheap engine with a noisy or unknown gearbox is not a cheap engine.
4. **Mileage and service history**, particularly oil change discipline.
5. **Evidence of previous car installation.** An engine previously run in a car on a wet sump, or a lightly modified sump, warrants close inspection of bearings and piston oil jets before anything else is spent on it.
6. **Evidence of previous tuning.** An 11.2:1 engine that has been flashed and run hard on the motorcycle warrants a leak-down and bore inspection with the head off, given the ring-land failure pattern described above.
7. **Supercharger condition.** The unit is not user-serviceable and is expensive to replace.
8. **Completeness.** Missing ancillaries are frequently harder to source than the engine itself.
9. **Plan the lubrication and electrical systems before purchase, not after.** Between them they account for most of the cost, most of the difficulty, and nearly all of the failures.

Document Notes

Manufacturer specifications have been checked against Kawasaki-published and press-released figures, parts catalogues and owner's manuals. Where a statement derives from our own development work rather than manufacturer data, it is identified in the text. Motorcycle dyno figures in the tuning section are drawn from consistent owner and tuner reports and are given as ranges for that reason. Where sources conflict, both positions are given and the conflict is recorded under *Where Published Sources Disagree*.

Revision 5, September 2026 — corrected the supercharger impeller position for the Z H2; corrected dog-ring transmission to the whole family; withdrew the factory rev-limit figures and explained why; added the gearbox ratio table with the disputed second gear; added gearbox parts availability and interchangeability; added source-confidence markings and a consolidated disagreements section; amended the weight-saving wording; trimmed motorcycle trim and electronics content not relevant to a car build.

Revision 4, September 2026 — added measured output, tuning headroom, compression under boost, donor equivalence of Z H2, H2 SX and SX SE, and charge cooling notes. **Revision 3, August 2026** — first public issue.

This document will be revised as the platform and our own development work progress. For advice on engine selection, dry sump conversion, loom and ECU specification, or complete installation support, contact Too Fast To Race.