

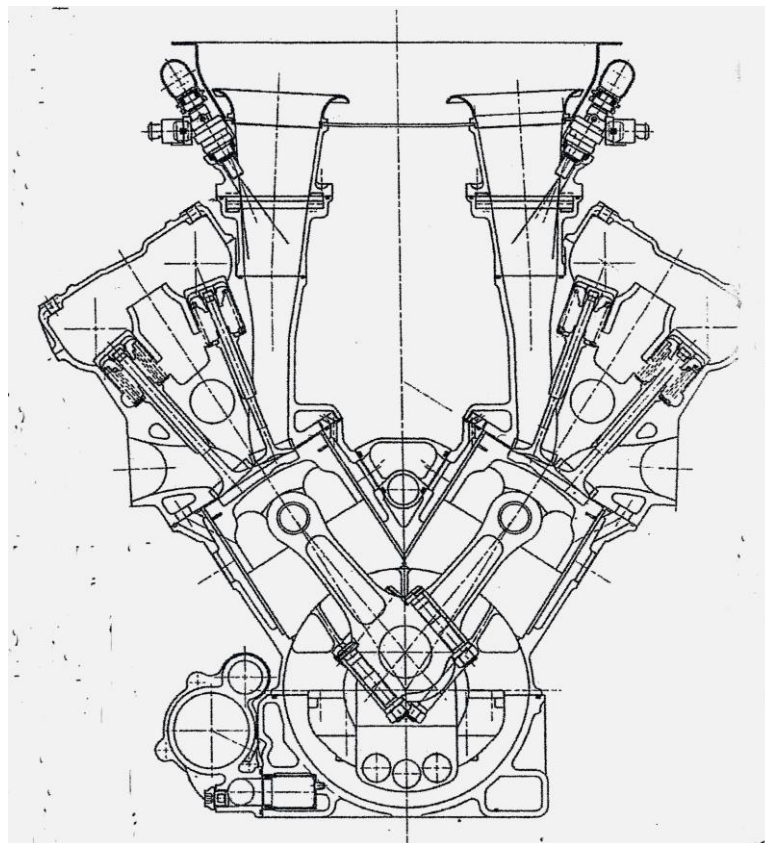


### **SO30: Ferrari 1990 type 037**

When the F1 formula became solely 3½L Naturally-Aspirated (NA) in 1989, Ferrari began to race a series of 65V12 engines with 5 valves per cylinder (5 v/c). This basic configuration, with increasing Bore/Stroke (B/S) ratio (see the 3NA Era Eg. 84) was retained by them for 4½ years until late 1993

The most successful engines of this series were the 1990 types 036 and 037, with which power in the type 641 car Alain Prost scored 5 wins and Nigel Mansell another, for 2<sup>nd</sup> place in the Constructors' Championship. Had it not been for the notorious collision between Prost and Senna (McLaren-Honda) at the 1<sup>st</sup> corner on the 1<sup>st</sup> lap of the 1990 Japanese GP it is *just* possible that the title could have been won. This result compares with 3 wins for the 65V12/5 v/c configuration in 1989 and *no further wins* after 1990. It was superseded by a Honda-influenced 65V12 4 v/c redesign. Clearly Ferrari had concluded that 3 inlet valves + 2 exhaust valves was not the "way-to-go".

A factory cross-section of a 1990 engine has recently been brought to the author's attention (see DASO 1124) and is shown on Fig. N122A below.



This drawing is dated 25/05/90 and is identified only as "F1-90". Ferrari introduced the type 037 for Qualification at the 7<sup>th</sup> race (French GP) in July 1990 (DASO 1123) so it seems reasonable to conclude that the section is of that type (sources often identify the 037 as a 1991 engine). This is therefore assumed in scaling for details ( a process which involves some margin for error).

As one of only a few F1 section drawings published over the last 4 decades, although not the power of a "GP Car-of-the-Year" (CoY), it was decided to include it in the "Significant Other" series as SO 30.

65V12 B = 86 mm; S = 50.2 mm (DASO 1077)\*  
 Swept Volume = 3,499 cc  
 B/S = 1.713  
 100/Smm = 1.992

\*Source shows this data as 1991

$$\left. \begin{array}{l} \text{Peak Power (PP)} = 725 \text{ HP} \\ \text{@ NP} = 14,500 \text{ RPM} \\ \text{Compression Ratio (R)} = 13 \end{array} \right\} \text{(DASO 1077)*}$$

so ASE = 0.642.

Inlet Valve Head Diameter (IVD) = 29.5 mm

3 inlet valves, so  $\left(\frac{\text{IVA}}{\text{PA}}\right) = 0.35$

Mean Gas Velocity at inlet @ NP (MGVP) = 69.3 m/s.  
Coil Valve Return System (CVRS) with BNP = 20.8 m/s.  
Valve Included Angle (VIA) = 20°.

PP/V = 207.2 HP/Litre

BMPP = 12.79 Bar

@ MPSP = 24.26 m/s

$$\text{ECOM} = (\text{EV} \times \text{EC} \times \text{EM}) = \left(\frac{\text{BMPP}}{38 \times \text{ASE}}\right) = 52.4\%$$

Weight (W) has been reported as around 300 lb (136 kg) ([www.gomog.com](http://www.gomog.com)) but this is considered too light (the Honda 72V10 in the 1990 CoY is now known to have been 160 kg (it did have a balance shaft, weighing, say, 5 kg).

If W was actually, say, 150 kg, then PP/W = 4.8 HP/kg.

Con. Rod Length between centres (CRL) = 112 mm ([www.f1technical.net](http://www.f1technical.net) CRL for the 036 has been accepted); CRL/S = 2.23; Maximum Piston Deceleration @ NP (MPDP) = 7,221 g.

Piston Height (PH) = 52 mm; PH/B = 0.6; PH/S = 1.04.

Crank Pin diameter (CP) = 34 mm; CP/S = 0.68;

Gudgeon Pin diameter (GP) = 17 mm; GP/CP = 0.5.

### Design features

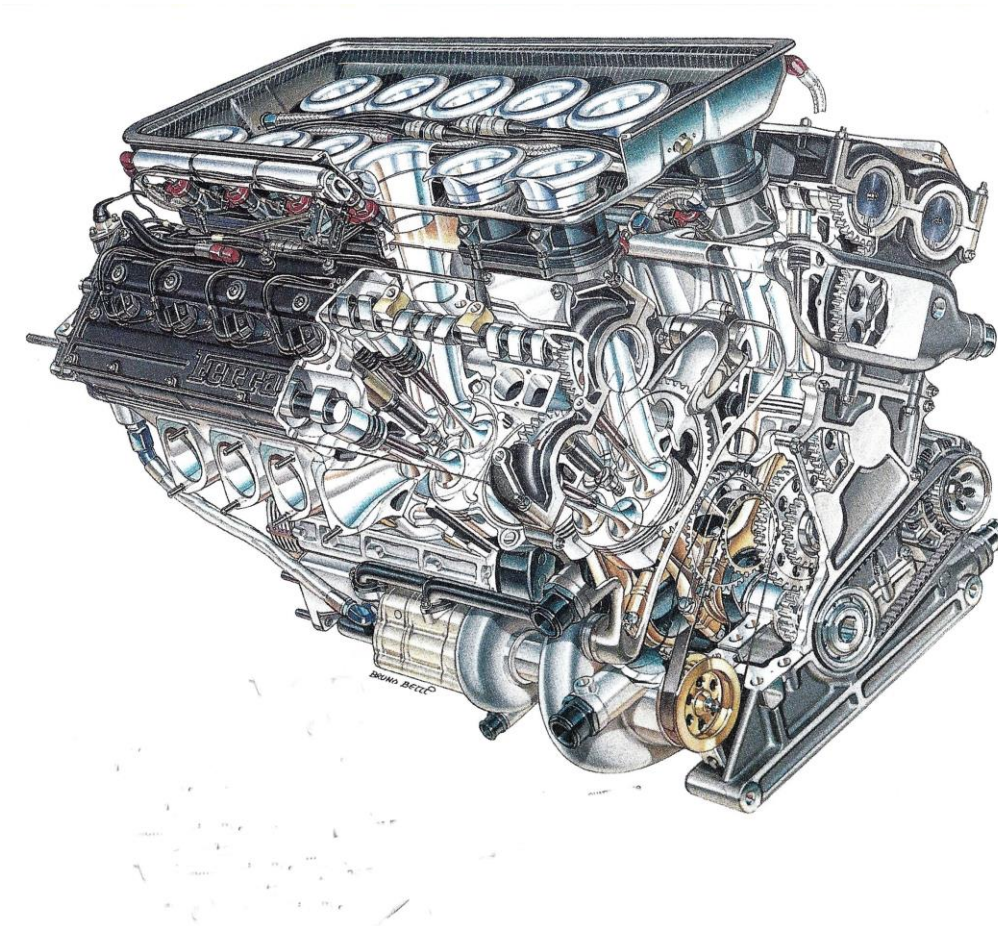
- Inlet tract length from entry to valve (LIN) was 222 mm; LIN/S = 4.42. Note 27 estimates the resonant MPS = about 20 m/s; this corresponds to 82% of MPSP, where PeakTorque would be expected. The area variation would affect this figure.
- The inlet tract was shaped to provide Tumble Swirl.
- The inlet tract had 60° of downdraft and the exhaust 30° of updraft, both relative to the plane of the piston crown.
- The combustion chamber was formed in the piston crown.
- Pistons had only 1 ring.
- Con-rods were I-section.
- Valve springs were half-shrouded by the tappets.
- Wet cylinder liners were fitted. Although this would usually imply that the block/crankcase was Al-alloy, it has been stated elsewhere that it was "ghisa molto speciale" ("special cast-iron", probably spheroidal graphite material).

Fig. N122B (DASO 1125) on P.3 provides a cut-away of a later type of the Ferrari 65V12 5 v/c series.

Fig. N122B

Two observable differences from Fig. N122A are:-

- “Woods-type” tappets, mounted *above* the valve springs, giving them full exposure to cooling oil;
- 3 rings per piston.



#### References

DASO 1077 FERRARI; ALL THE CARS L Acerbi Haynes 2005.

DASO 1123 *AUTOCAR* GRAND PRIX REVIEW '90.

DASO 1124 Ferrari 1990 drawing published by Quattroruote in July 1990, copied to the author by courtesy of Ron Rex July 2015.

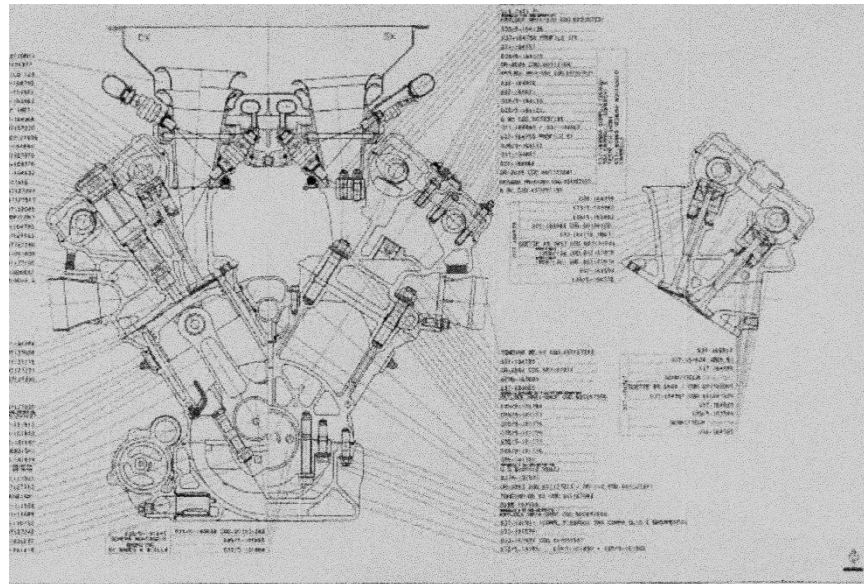
DASO 1125 Ferrari 65V12 cutaway published by Quattroruote, copied to the author by courtesy of Ron Rex July 2015.

Some correction & additions are now (August 2018) given as an extra page below.

## Addition

DASO 1203 recently advised by correspondent Ron Rex (see refs. below) gives a cross-section of the 1990 Type 036 65V12 3.5L Ferrari engine, shown below. This was the engine used for the first half of the season.

Fig. N122C



[The source incorrectly refers to this as Type 037, although giving in its text the correct dimensions of the 036:-  
 $84/52.6 \text{ mm} = 1.597$   
 The drawing has been confirmed as 036 by checking the B/S ratio.]

This section shows that the 3<sup>rd</sup> central inlet valve was at 3<sup>0</sup> to the cylinder axis, where the other pair were at 16<sup>0</sup>. The pair of exhausts was at 6<sup>0</sup>. It also shows the Variable Inlet System and twin fuel injection nozzles. Neither feature is shown on Fig. N122A, although it was a later engine. The drawing was presumably specially done for the magazine article in May 1990. It may be that Ferrari did not wish to disclose them at that time (Fig. N122C was published in 1993).

## Correction

A further detailed reference (DASO 1198) showed that the move from 036 to 037 was different from that given above, with different powers, as follows:-

<u>Races</u>	<u>Type</u>	<u>RACE TUNE</u> B x S mm Vcc BHP @ RPM	<u>QUALIFICATION</u> B x S mm V cc BHP @ RPM
• First 9 USA to Germany	036	84 x 52.6 3,498 656 @ 13,200	
• Introduced for Q at 3 <sup>rd</sup> race (S. Marino)	037		86 x 50.2 3,499 671 @ 13,600
• Last 7 Hungary to Australia	037	681 @ 13,600	
• Introduced for Q at 10 <sup>th</sup> race (Hungary)	037		700 @ 13,800

[Appendix 1](#) has been updated with the latest 037 data. ECOM = 53.7% instead of 52.4%.

## References

DASO 1203 Designed for Speed Museum of Modern Art, New York 1993  
 Advised by courtesy of Ron Rex July 2018.

DASO 1198 Ferrari Monoposto, Catalogue Raisonné, 1948 – 1997 B. Alfieri Automobilia.  
 Advised by courtesy of Ron Rex.