

24 TO 32 LITERS MARINE ENGINES

# TWO THOUSAND HORSEPOWER



Baudouin, Weichai engine block, French engineering and European components. Its profile is more commercial than leisure. Preview at the 2015 SMM. “Baudouin spotted in Hamburg in commercial dress. Weichai’s contribution is certainly financial, both for the investment in research and development (some years of R&D and a testing period is estimated at 6/700 hours) and for the competitiveness of the alloys (especially cast iron, which is used for the monoblock), which come from Chinese foundries. The assembly of the 12 M26.3 series is instead done in France, the birthplace of some components of this 12 cylinders V, such as the aftercooler and the heat exchanger. Both high pressure pumps and waste gates are doubled, i.e. one per bank, with Bosch 1,800 bar common rail, control unit and hydraulics which feature electronic redundancy (the name of the device is ‘take me home’). Speaking of French and their relationship with the parent company: what if the announced 50% efficiency threshold were to be translated on all the endothermic engines of the Weichai Group? Considering the

specific consumption of marine engines this would mean a few barrels of diesel saved. Finally, the time has come for the announced news. Let’s start with Caterpillar, which had just followed the German skirmishes. The Acert system, designed to mitigate emissions of American trucks and exported throughout the huge yellow motor line (industrial mobile applications, stationary, leisure, commercial boating), is the backbone of the revision that allows the American 32 liters to squeeze 2,000 HP up to 8% of the sailing time. The launch of the boosted C32 in Houston, Texas, dates back to August. Its power density, which benefits from a 5 percent improvement of the specific curve, comes from the Adem 6 ECM control unit and the optimized injection cycle (delivering more injections means improving pulverization and reducing the acoustic impact of detonations). «We are very excited to give our customers more power with the C32B, while helping to reduce engine noise and continuing to provide excellent engine performance and reliability.» said

Covid was fatal, so it was that ‘rien ne va plus’ of the Prefecture of the Maritime Alps on August 23rd. The 2020 Cannes Motor Show would record exploits of Caterpillar and MTU. Translated in HP, 2,000, for Cat, 1,974 for Mtu. In 2014 the Germans boosted the 2000 series thanks to the 1,432 kW of the 12 V2000M96L, which proves itself capable of 5,576 Nmo at 2,450 rpm at that power rate. In the box (p.36) you will find a summary of what we wrote on our return from the Cannes Yachting Festival in 2014. Just a year after MAN picks up the challenge, raising from 1,800 to 1,900 hp. This is what we wrote in late spring 2015: “The V12-1900 delivers 1,397 kW at the usual 2,300 rpm, thanks to improved fluid dynamics and setting of the control unit. MEP speaks volumes about thermody-

amic optimization: although being top level on the V12-1800 it was further improved from 29.5 to 30.7 bar. The real ace up the liters sleeve of MAN still remains the weight: the V12 is confirmed as the super-light of the segment. With 2,365 kg it leaves 415 kg behind the Friedrichshafen’s 12-cylinder, featuring higher power density and specific power (22.8 and 1.9 kW). Also with regard to dimensions, just 3.12 m<sup>3</sup>, the only one to be compared is MTU (3.37 m<sup>3</sup>), being

Caterpillar and MTU threw down the gauntlet for MAN. Now there are three of them at 2000 hp for leisure applications. The fourth protagonist is Baudouin

American and French at 4.51 and 4.71 m<sup>3</sup>. Speaking of convenience for small engine compartments, the filter remains in line with the shape of the engine, also favoring the replacement inside the same compartment. Torque curve shows an interesting profile, 6,220 Nm available at 1,200 rpm and steady up to 2,000 rpm, which allows to rely on 5,800 Nm at maximum power. These figures owe so much to the EDC control unit that drives the 1,650 bar Bosch common rail with double stage per bank, intercooler and waste gate valve, two pumps for low pressure and two for high pressure. The water exchanger is no longer tube bundle but plate. MAN did not stop there, and in 2018 made a round figure: the 12-cylinder V thus increased to 2,000 HP, aka 1,470 kW, leaving behind the cousins of Lake Constance. We mentioned

BRAND MODEL	BAUDOUIIN 12 M26.3	CATERPILLAR C32B	MAN V12-2000	MTU 12 V2000 M96X
I. D.				
B x S mm - S/B	150 x 150 - 1	145 x 162 - 1,12	128 x 157 - 1,23	135 x 156 - 1,16
N. cil. - dm <sup>3</sup>	12 - 31,80	12 - 32,10	12 - 24,24	12 - 26,79
Maximum power kW - rpm	1214 - 2.400	1491 - 2.300	1470 - 2.300	1472 - 2.450
Mep at max power bar	19,5	24,7	32,3	27,4
Piston speed m/s	12	12,4	12	12,7
Maximum torque Nm - rpm	4.851 - 1.400	5488 - 1.400	6.497 - 1.200	5566 - 1.300
Mep at max torque bar	19,6	21,9	34,4	26,6
% power at max torque (kW)	30	26,8	34,2	27,8
Torque at max power Nm	4.831	6.194	6.096,0	5.733,0
% power at max torque (kW)	58,6 (712)	54,00 (805)	55,60 (817)	51,50 (758)
Work range rpm	1.000	900	1.100	1.150
DETAILS				
Specific power kW/dm <sup>3</sup>	38,1	46,4	60,6	54,9
Specific torque Nm/dm <sup>3</sup>	152,5	170,9	267,9	207,7
Areal spec. power kW/dm <sup>2</sup>	57,24	75,23	95,21	85,68
RULES AND BALANCE				
Dry weight kg	3.215	3.075	2.380	2.850
L x W x H mm	2.333x1.350x1.494	2.106x1.482x1.422	2.139x1.153x1.265	1.847x1.293x1.414
Volume m <sup>3</sup>	4,71	4,44	3,12	3,38
Weight/power kg/kW	2,6	2,1	1,6	1,9
Weight/displacement kg/dm <sup>3</sup>	101,1	95,8	98,2	106,4
Power density kW/m <sup>3</sup>	257,8	335,8	471,2	435,5
Total density t/m <sup>3</sup>	0,68	0,69	0,76	0,84
Displacement/volume dm <sup>3</sup> /m <sup>3</sup>	6,75	7,23	7,77	7,93

**MTU, Cannes 2014**

It was 2014. These are our words on the return from the Cannes Yachting Festival after the launch of 2000 M96 series. “MTU came from Friedrichshafen to show the 2000 M96 series in Epa Tier 3. The three turbos in sequence trigger the central one for air compression and feed the pistons, which are re-designed to improve the spraying in the chamber. One of the most serious issues in these motorsport times is that of temperatures (*ed: six years have passed and not much has changed*), and on Lake Constance they thought to introduce a second pre-combustion air cooling device in order to reduce nitrogen oxides. Slight updates to the injectors, still Bosch but with a different nozzle profile, and a high pressure pump specifically conceived by L’Orange (once a specialist of Tognum, then MTU, who went on April 9, 2018 under Woodward Inc.). Also the alternator has changed, featuring a higher rate (the UC9 was installed instead of the UC7) and diesel filtration, which gains a second filter to clean up leakage and dust due to the enhanced intake capacity. All this is done leaving the weight unchanged and retouching height and width. The 2.23-liter cylinder delivers the same power rate of the previous version, the 12 cylinders delivers 1,268 kW at 2,450 rpm, the 16 liters reaches 1,630 kW which is equivalent to more than 2 Mega, once again with maximum ease: common rail and electronic control but no anti-emission devices, as is the practice in the marine industry, at least up to Imo Tier 3”.

**Allen Bowman**, Marine product strategy engineer for Caterpillar Marine. «*The C32B will provide our customers more opportunities for both first equipment and repowering options, which is raising enthusiasm for the future of the C32B and its contribution to the market.*» Let’s now move on to MTU and the 12 V2000 M96, which replaces the final ‘L’ with an ‘X’ and reaches 1,472 kW, 2,001 HP to be precise. «*Thanks to our highly-regarded Series 2000 M96 high-performance yacht engine, we’ve long been an established player in the market. Now we’ve been able to boost the engine’s output and thus its performance, without compromising its durability,*» said **Denise Kurtulus**, Head of Marine Business at Rolls-Royce’s PS Division. «*We’ve already sold the first of the new M96X engines to shipbuilders Viking and OTAM,*» added **Andrew Boyer**, Senior Sales Manager at MTU America. «*Viking is due to unveil the first yacht fitted with the higher horsepower engines by the end of the year.*»

In conclusion, outstanding MEP for the two German engines, huge nominal torque for Caterpillar, dimensions still on MAN and MTU side, specific curves all the way for Nuremberg and Friedrichshafen which deploy a slightly increased two liters cylinder (from 2 to 2.23 cc) compared to the roughly 2.60 liters cylinder of Baudouin and Cat. ■

BRAND MODEL	BAUDOUIIN 12 M26.3	CATERPILLAR C32B	MAN V12-2000	MTU 12 V2000 M96X
<b>INDEX</b>				
<b>Torque</b>	13	12,4	15,3	15,2
<b>Performance</b>	6,5	7,3	9,9	8,3
<b>Stress</b>	10,5	11,4	15,5	13,1
<b>Lightness</b>	16,9	16,4	14,5	16,5
<b>Density</b>	2,7	3,3	6,3	4,9
<b>DIESEL INDEX</b>	7,6	8,1	9,3	8,6

**1 | MAN**



**2 | CAT**



**3 | MTU**

