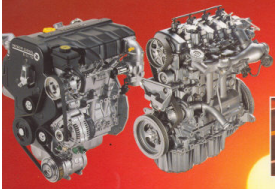
EACH ENGINE IS CUSTOMIZED



AUTO MOTIVE

INDU STRIAL

MARINE

VM®

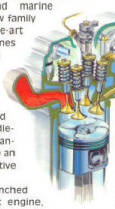
the pride of diesel

Diesel engines

The Company

Founded by two private entrepreneurs in 1947, VM Motori is specialized in the design and production of diesel engines. Initially developed for the industrial, agricultural and marine industries, a new family of state-of-the-art diesel engines readily found its place in the automotive industry in the mid-'70s. These high speed turbocharged diesel engines transformed VM into an integral automotive supplier.

In 1990 VM launched the Turbotronic engine, and with its the turbocharger and electronically controlled combustion system, was able to provide best-in-class performance both in terms of power and emissions. It was considered the cleanest light duty diesel engine in the world.

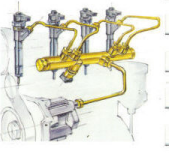


In 1997 VM presented a new family of multi-valve engines equipped with the revolutionary "common rail" injection system. With the introduction of these new engines to our existing line, VM will have a complete range of world class diesel engines to offer the passenger car, SUV and commercial vehicle markets. It is the unequaled combination of our engines performance, fuel economy, emissions, noise control, cost effectiveness and quality that attract such customers as Chrysler, Ford, General Motors, Rover and Alfa Romeo, have chosen VM engines. Many other important clients have adopted VM engines for various industrial, agricultural and marine applications. A prime example is Mercury Marine, which under the Mercruiser brand, sells the marine engines produced by the Italian company. VM has attained several important quality system standards such as QS 9000. In 1995, VM became part of the Detroit Diesel Corporation, one of the world's most important manufacturers of diesel engines, having a power range up to 10,000 HP and a sales force of over 2500 distributors worldwide.

VM is located in Cento, near Bologna, the province capital of Emilia, a leading region in the automotive field as it is the home of the famous Ferrari, Maserati and Lamborghini companies.

VM currently produces about 75,000 engines/year in a 80,000 square meters facility, with approximately 1,000 employees. 75% of the engines produced are exported worldwide.

A new facility was opened in Curitiba, the capital of the State of Parana (Brazil) towards the end of 1997.



VM MOTORI ISO 9001 QUALITY SYSTEM CERTIFIED BY RINA

VM MOTORI QS 9000 QUALITY SYSTEM CERTIFIED BY RINA

Company with the Quality System Certified for diesel engine manufacturing

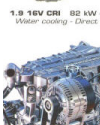
Automotive

SPECIFICATIONS

Engine Model	No. of Cyl. Config.	Bore x Stroke mm	Total Displ. ltr.	Max. Brake Power (1) kW	HP	rpm	Max. Torque Nm	Kgm	rpm	Main Dimension Length mt	Width mt	Height mt	Weight kg	lbs
Low unitary displacement - 4 valve/cyl.														
1.4L 12V CR	3 /	82 x 82	1.457	46	63	4200	135	13,7	1800	418	565	680	115	253
1.4L 12V CR	3 /	82 x 82	1.457	56	76	4200	170	17,3	1800	418	565	680	115	253
1.9L 16V CR	4 /	82 x 82	1.943	66	90	4200	180	18,3	1800	514	580	680	140	308
1.9L 16V CR	4 /	82 x 82	1.943	82	111	4200	250	24,5	1800	514	580	680	140	308
2.4L 20V CR	5 /	82 x 82	2.429	105	143	4200	300	30,6	1800	610	590	660	180	397
High unitary displacement - 2 valve/cyl.														
2.5L TCI	4 /	92 x 94	2.499	92	125	4200	300	30,6	2200	669	615	680	208	458
2.5L CRI	4 /	92 x 94	2.499	100	136	4200	320	32,6	1800	669	615	680	208	458
2.8L TDI	4 /	94 x 100	2.776	86	120	3800	310	32	2000	669	615	680	209	460
3.1L TCI	5 /	92 x 94	3.124	110	150	4200	405	41,3	2200	782	615	685	250	551
3.8L TCI	6 /	92 x 94	3.749	118	160	4200	415	42	2200	898	615	690	300	661
4.2L TDI	6 /	94 x 100	4.164	132	180	3800	465	47	2000	952	578	713	310	638
High unitary displacement - 4 valve/cyl.														
2.8L 16V CRI	4 /	92 x 94	2.499	110	150	4200	340	34,7	1800	540	645	682	171	377
2.8L 16V CRI	4 /	94 x 100	2.776	123	165	4000	385	39,3	1800	540	645	682	175	385

• For commercial vehicle applications horse-powers and cont. need to be downgraded.
£ : in litre - kW x 1.3362 HP

1.9 16V CRI 82 kW - 111 HP
Water cooling - Direct Injection



2.5L TCI 92 kW - 125 HP
Water cooling - Indirect Injection

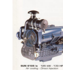
2.8L 16V CRI 123 kW - 165 HP
Water cooling - Direct Injection

It is the unequalled combination of our expertise, perspective, facilities, equipment, people and partnerships that give us the ability to offer such a world class line of high performance engines at competitive prices.
Today, we offer three automotive engines in the range of 92 to 118 kW (125-160 horsepower). All are turbocharged with air-to-air intercooling and electronically controlled rotary fuel injection systems. This turbocharged diesel family (TD) is available in three configurations: 2.5L TCI, 3.1L TCI and 3.8L TCI.
These engines all feature replaceable liners, hydraulic roller tappets, valve seat inserts, valve rotators and a number of other premium features which are found on high performance automotive engines. The air induction and fuel injection system of the current engine family is based on a 2 valve cylinder head with a pre-combustion chamber. The TD series is a modular design and more than 70% of the parts are interchangeable between the three configurations. The modular design reduces cost, simplifies training, keeps parts inventories to a minimum and allows new technology to be quickly applied across the entire family.

Three additions to the current TD line will be available in 1999. The first is the addition of a common rail fuel injection system to the current 2.5L 2 valve engine. Common rail fuel injection will provide significantly improved control of the fuel injection process over the entire operating range of the engine. The result is increased power, better fuel economy, reduced emissions, improved driveability and better starting. A 4 valve version of the 2.5 TD will also be available in 1999. In addition to common rail injection it will also feature dual overhead camshafts. The third addition to the TD line will be the introduction of a 4.2L 6 cylinder with direct injection. These additions to the TD line result in the further improvements in power and economy shown above.

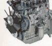
The new generation of high speed direct injection engines will debut beginning in 2000. This new line will consist of three in-line engines - a 5 cylinder 1.4L, a 4 cylinder 1.9L, and a 5 cylinder 2.4L.
These new engines are designed to be the world leaders in performance, economy, emissions, cost effectiveness, noise control and quality.
They will combine the economy of a diesel with the "feel" of a gasoline engine. This is achieved through the use of a stiff structural design, overhead camshaft, common rail electronic fuel system, central vertical injectors, and when necessary, balance shafts.
The modular concept is used throughout the design allowing the parts to be interchangeable, significantly reducing development time and cost.
With the introduction of these new engines to our existing line, VM Motori will have a **complete range of world class automotive engines and can be the single source for any automotive manufacturer's diesel needs.**

Industrial



SUN 6105 Ie 125 kW - 170 HP
Air cooling - Direct injection

HR 494 HT2 68 kW - 93 HP
Water cooling - Indirect injection



D 704 LT 62 kW - 84 HP
Water cooling - Direct injection

SPECIFICATIONS

Engine Model	No. of Cyl. Config.	Bore x Stroke mm	Total Displ. lt	Max. Gross Power kW	HP	rpm	Max. Torque Nm	Kgm	rpm	Main Dimension Length mm	Width mm	Height mm	Weight (approx.) kg	lbs
SUN	**Power from 31 to 125 kW (42 - 170HP)**													
SUN 2105	2 L	105 x 115	1.992	31	42	2800	132	13,4	1600	671	540	770	245	540
SUN 3105	3 L	105 x 115	2.987	48	63	2600	196	20	1600	806	551	770	312	688
SUN 3105 T	3 L	105 x 115	2.987	55	75	2600	233	23,7	1600	744	556	780	322	710
SUN 4105 e	4 L	105 x 115	3.983	58	79	2400	256	26	1600	861	584	798	385	849
SUN 4105 Te	4 L	105 x 115	3.983	77	105	2400	345	35	1600	920	670	787	389	877
SUN 4105 Ie	4 L	105 x 115	3.983	75	102	1500	-	-	1600	1052	755	806	431	950
SUN 6105 e	6 L	105 x 115	5.975	88	120	2400	382	39	1600	1272	693	856	567	1250
SUN 6105 Te	6 L	105 x 115	5.975	116	158	2400	544	55,4	1600	1272	743	856	580	1279
SUN 6105 Ie	6 L	105 x 115	5.975	125	170	2300	589	60	1600	1380	743	881	613	1351
HR 94 / HR 2	**Power from 35 to 110 kW (48 - 150HP)**													
HR 394 HP	3 L	94 x 100	2.082	35	48	3200	129	13	1700	617	529	675	184	406
HR 394 HPT	3 L	94 x 100	2.082	49	66	3200	177	18	1900	617	558	675	190	419
HR 394 H	3 L	94 x 100	2.082	35	48	3200	125	13	1700	623	545	675	190	419
HR 394 HT	3 L	94 x 100	2.082	49	66	3200	176	18	1700	623	558	675	196	432
HR 494 H	4 L	94 x 100	2.776	48	65	3200	170	17,3	1800	735	518	688	230	507
HR 494 HT	4 L	94 x 100	2.776	65	88	3200	235	24	1900	754	526	688	224	494
HR 694 HT	6 L	94 x 100	4.164	100	136	3200	356	36,5	1900	991	617	697	330	727
HR 494 HT2	4 L	94 x 100	2.776	68	93	3200	230	33,4	1900	710	590	710	250	551
HR 694 HT2	6 L	94 x 100	4.164	110	150	3200	370	37,7	1900	865	620	710	350	771
D 700	**Power from 37 to 97 kW (50 - 132HP)**													
D 703 L	3 L	94 x 100	2.082	37	50	3000	147	15	1500	622	558	682	180	418
D 703 LT	3 L	94 x 100	2.082	53	72	3000	206	21	1600	622	558	729	196	432
D 703 LTS	3 L	94 x 100	2.082	46	62	3000	215	21,9	1400	622	558	729	196	432
D 704 L	4 L	94 x 100	2.776	51	69	3000	195	19,8	1800	735	518	674	254	560
D 704 LT	4 L	94 x 100	2.776	62	84	3000	302	30,8	1500	735	556	674	262	578
D 706 LT	6 L	94 x 100	4.164	97	132	3000	432	44	1400	976	536	685	373	822

• Data refer to standard version • Power rating according to ISO 3046, DIN 6271, ...
T = turbocharged • I = turbocharged with intercooler • L = in line

SUN

SUN series - 2, 3, 4 and 6 cylinder engines, air cooled, direct injection, available both in naturally aspirated and turbocharged versions and also as turbocharged and air to air after cooled. Designed according to modular concept which affords a 70% of common components, the SUN engines are compact and have a wide range of P.T.O. positions and accessories. Easy to install, they are suitable for heavy duty applications and can adapt to difficult ambient conditions. Maintenance is simple. SUN engines are used in generating sets, motor-pumps, construction and agricultural equipment.

HR 94 / HR 2

HR 94 series - 3, 4 and 6 cylinder engines, water cooled, indirect injection, available both in naturally aspirated and turbocharged versions. Designed according to the modular concept, they have several basical parts which are the same as the HR automotive series and are reliable whilst being produced on a large scale, thereby reducing cost.
They are very compact and perform excellently with reduced noise and vibrations.
The exhaust emissions observe very rigorous international legislation concerning both on-road vehicles, and industrial equipment. HR engines are used in agricultural tractors and forklifts as well as in on-road vehicles for heavy and special duty.
HR 2 version engines have been homologated according to EEC 88/77 and its amendements 91/542, 96/1 (**EURO 2** limits).

D 700

D 700 series - 3, 4 and 6 cylinder engines, water cooled, direct injection, available both in naturally aspirated and turbocharged versions.
Designed with a modular concept, the displacement of 700 cc/cyl. enables the engines to be compact and feature reduces noise and vibrations.
The D 700 series engines take advantage of VM experience in emissions control and with their high termodynamic efficiency is able to meet international legislation for exhaust emissions for industrial engines. Low specific fuel consumption and high torque at low speed make these engines ideal for agricultural or construction equipment and for special and heavy duty applications.
D 700 units are available for generating sets as well as motor pumps and fire fighting sets.

Marine Marine

SPECIFICATIONS

Engine Model	No. of Cyl. Config.	Bore x Stroke mm	Total Displ. ltr	Max. Brake Power 97 DIN 6271 kW	HP	rpm	Max. Torque Nm	Kgm	rpm	Main Dimension Length mm	Width mm	Height mm	Weight approx. kg	lbs
M 11,5				**Power from 26.5 to 79.4 kW (36 - 108HP)**										
2105 M11.5	2 *L*	105 x 115	1.992	26.5	36	2200	142	14,5	1400	638	540	770	375	827
3105 M11.5	3 *L*	105 x 115	2.987	39.7	54	2200	211	21,5	1600	793	540	770	436	961
4105 M11.5	4 *L*	105 x 115	3.983	52.9	72	2200	284	29,8	1500	948	594	800	488	1098
6105 M11.5	6 *L*	105 x 115	5.975	79.4	108	2200	417	42,5	1500	1271	694	856	730	1609
H 9 - H 10				**Power from 125 to 132.5 kW (170 - 180HP)**										
692 HI 9	6 *L*	92 x 90	3.588	125	170	3800	353	40	2800	1029	632	753	400	882
694 H 10	4 *L*	94 x 100	2.776	51.5	70	3600	150	15,2	1950	832	622	746	320	705
694 HT 10	4 *L*	94 x 100	2.776	73.5	100	3600	235	24	2000	805	632	746	370	815
694 HID 10	4 *L*	94 x 100	2.776	103	140	3600	291	29,8	2600	832	632	746	350	772
694 H 10	6 *L*	94 x 100	4.164	73.5	100	3200	240	25	2000	1056	622	753	420	926
694 HT 10	6 *L*	94 x 100	4.164	103	140	3200	324	33	2200	1056	632	753	450	992
694 HID 10	6 *L*	94 x 100	4.164	162	220	3600	520	53	2400	1140	696	766	400	882
694 HIL 10	6 *L*	94 x 100	4.164	132.5	180	3000	510	52	2200	1139	698	770	420	926
MD 700				**Power from 121 to 184 kW (165 - 250HP)**										
704 LI	4 *L*	94 x 100	2.776	121	165	3800	345	35	2200	948	739	778	325	716
706 LI	6 *L*	94 x 100	4.164	184	250	3800	550	56	2400	1172	739	778	450	991

L : in line
• Data refer to the standard version.
• Power rating according to: ISO 3046, IDC 80-1269 - DIN 6271, BS 5514

410S M 11,5 52.9 kW - 72 HP
Air cooling - Direct Injection

694 HID 10 162 kW - 220 HP
Water cooling - Indirect Injection

704 LI 121 kW - 165 HP
Water cooling - Direct Injection

M 11,5

The **M 11,5** air cooled engines are designed for heavy duty applications. They are normally supplied with an air/oil heat exchanger to cool the oil for engine and can be delivered complete with reverse / reduction gear.

H 9 - H 10

The **H9 - H10** series water cooled diesel engines can match any requirement both in the pleasure boat and fishing boat sector.
The 692 HI 9, 694 HID 10 and 694 HID 10 have been specifically designed for pleasure craft sector and their excellent power to weight ratio, and high RPM are ideal for high speed boats.
The remaining production, with 94 mm bore and 700 cc. unitary displacement, represents an absolutely reliable prime mover not only For pleasure crafts but also for professional fishing boats.
The cooling is granted by a double water circuit with fresh water/sea water heat exchanger.

MD 700

The new **MD 700** family represents the most recent innovation in the range of VM marine engines.
Direct injection and electronic control are the main changes which characterize it, as they are able to offer many advantages in term of performances, without altering the traditional strength of the water cooled engine.
The injection system chosen for the **MD 700** family allow high pressure fuel to be injected directly into the cylinder, offering important advantages in terms of starting, fuel consumption, power and torque.
This contributes to further reduce emissions and the heat deriving from the combustion process.
These engines have been homologated according to the most stringent emission legislation: **BODENSEE STAGE 2**

Generating Sets
Marine auxiliary generator sets

VM diesel engines are chosen worldwide by many generating sets specialists. VM assembles generating sets from 10 to 400 kW, 1500 and 3000 rpm for 50 Hz units, and 1800 rpm for 60 Hz. All the diesel engine families marketed by VM are used, so that both aircooled or water cooled generating sets can be offered. Generating sets are supplied with VM control panels, to ensure that a complete, reliable and up-to-date product is used. The range covers manual, automatic, in parallel units, as well as sound-proof sets to be used in urban areas.

GE
output **500 kVA**
on base frame

GE
output **319 kVA**
on slow - towing trailer

GAE 694 HT 10
output **94 kVA**
on base frame

Worldwide parts and service
In 1995, VM became part of Detroit Diesel Corporation, one of the leading diesel engine manufacturers in the world. Detroit Diesel offers a complete range of diesel engine up to 10,000 horsepower. The Detroit Diesel sales and service network consists of over 2500 outlets worldwide. Owners of VM engines can now make full use of the Detroit Diesel worldwide network.

SPECIFICATIONS *generating sets*

Group model	Electric Power 50 Hz - 1500 rpm STAND-BY kVA	kW	CONTINUOUS kVA	kW	60 Hz - 1800 rpm STAND-BY kVA	kW	CONTINUOUS kVA	kW
AIRCOOLED								
GE 2105	22	17.6	20	16	26	20.8	24	19.2
GE 3105	33	26.4	30	24	40	32	36	28.8
GE 4105 s	44	35.2	40	32	55	44	50	40
GE 6105 Ts	66	53	60	48	80	64	73	58
GE 6105 Is	83	66	75	60				
GE 6105 Ts	99	79	90	72	116	92	105	84
GE 6105 Is	110	88	100	80	129	103	117	94
WATERCOOLED								
GM 704 LT	55	44	50	40				
GE 706 LT	88	70	80	64				
GE 130	160	128	130	104	155	124	140	112
GE 160	160	128	160	128	180	144	155	124
GE 170	200	160	170	136	220	176	180	144
GE 200	220	176	200	160	250	200	220	176
GE 225	250	200	225	180	280	224	250	200
GE 250	300	240	250	200	315	252	280	224
GE 300	330	264	300	240	340	272	310	248
GE 325	350	280	325	260	380	304	340	272
GE 375	400	320	375	300	440	352	390	312
GE 400	450	360	400	320	500	400	430	344
GE 450	500	400	450	360	550	440	500	400
GE 500	550	440	500	400	630	504	560	448

SPECIFICATIONS *marine auxiliary gen. sets - Watercooled*

Group model	Net electric output to gen. terminals 50 Hz - 3000 rpm kVA	kW	kVA [1]	kW	60 Hz - 1800 rpm kVA	kW	kVA [1]	kW
GAE 494 H 10	47	37,5	43	34,5				
GAE 694 HT 10	68	53	60	48				
GAE 694 H 10	72	57,5	65	52				
GAE 694 HT 10	94	75	84	75				
	50 Hz - 1500 rpm							
GAE 9	175	140	188	134	200	160	192	153
GAE 11	230	185	220	176	265	211	254	203
GAE 11	300	240	286	230	337	270	323	258
GAE 16	372	297	357	285	410	327	393	314

[1] *Output at 45° C standard of engine room.*

Types and characteristics may be subject to modification without notice.

DETROIT DIESEL CORPORATION

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Advertising Department - Cod. 4 250 6000 N - 03/96