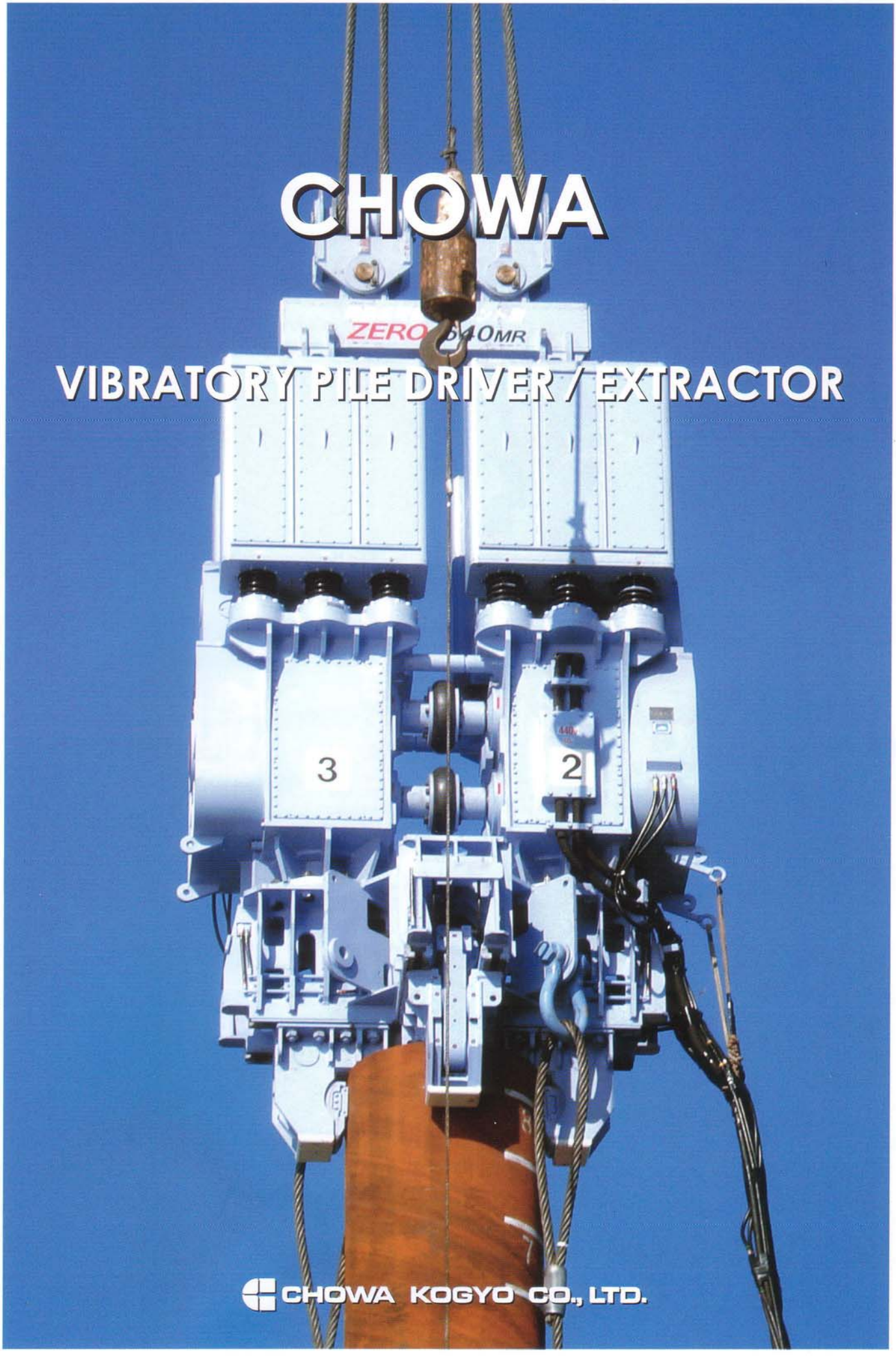

CHOWA
ZERO 640MR
VIBRATORY PILE DRIVER / EXTRACTOR
3
2
CHOWA KOGYO CO., LTD.

ZERO-320MR

ZERO-160VR

ZERO-SR30

CE-100V

LHV-09

CHV-200

The vibrohammer construction method is recognized even in the Specifications for Highway Bridges, which serves as a reference for the technological standards to be met in bridges and substructures of high bridges in Japan, as one of the pile driving methods recognized for use in the laying of bridge foundations using prefabricated piles.

The Chowa Vibro Series of vibratory pile drivers has an excellent reputation and record of performance not only in Japan but also in many other countries throughout the world.

The Huge Vibro Series, which forms part of the Chowa Vibro Series, performs particularly well in the driving and removal of large-diameter and long-length steel pipe piles and steel pipe sheet piles. Fitted with special high-performance electric motors, the Huge Vibro Series provides a level of power far greater than any other similar products in pile driving and extracting.

Chowa technologies — a wide range of applied technologies which use vibrohammers capable of being used in almost all type of steel pile driving and which include our vibrohammer interlocking technology, applied technologies for battered piles, and water-jet co-use technologies — have played an important role in laying the foundations for numerous numbers of construction projects and are widely recognized in the industry.

The Huge Vibro Series not only provides level of performance which cannot be found anywhere else, but also provides level of durability which make it possible to perform otherwise difficult jobs easily and at a lower cost.

The Chowa Huge Vibro Series opens up a world of unlimited possibilities not only in ocean, harbor, river, and other marine construction projects, but also in all types of land-based or large-scale construction performed under complex conditions.

■Example of past work performance

■Project description	■Pile specifications diameter / length	■Use
Kanbara-Horikawa Offshore Levee	PPL φ 1,400 45,200	Dam body foundations
Ishikawa Coal-Fired Power Plant Construction	PPL φ 1,000 35,200	Pier foundations
Ikarajima Bridge Construction	PPL φ 2,400～3,300 25,000～56,000	Bridge foundations Earth retaining & Harbor
Construction of Sakishima access road to Osaka Bay / Yumeshima Minatojima Tunnel Construction	SPPL φ 1,000～1,500 28,000～56,000	protection facilities
Minatojima tunnel construction (No.3 Construction)	SPPL φ 1,200～1,500 28,000～57,000	Soil stablization
Kinu-ura Port Central Pier Preliminary Road & Tunnel Construction	SPPL φ 1,300 41,500	Soil stablization
Yumeshima J Harbor Protection	SPPL φ 1,500・1,700 61,000	Harbor protection
Shin-shin-yume-no-shima Tokyo Waste Disposal Plant Construction	SPPL φ 1,371.6 54,000	Land reclamation to protect harbor
Small-scale Soil Landfill Repair Work at Kanda Offshore	PPL φ 1,700 39,000	Land reclamation to protect harbor
Partition Work No.2 on east end of Tokyo Bay Highway Kisaradzu airtificial island	PPL φ 1,900 36,000	partition for harbor protection
Sentosa Courseway Bridge	SPPL φ 1,016 27,500	Temporary cofferdam
Marina Bay Bridge Project	SPPL φ 1,016 27,500	Temporary cofferdam
Mekong Bridge	PPL φ 2,000 30,000	Cast-in-place pile casing
Mekong Bridge	PPL φ 2,000	Cast-in-place casing
Kilifi Bridge	PPL φ 2,000 40,000	Cast-in-place pile casing
New Nyeri Bridge	PPL φ 2,100 50,000	Cast-in-place casing
Johorubaru Second Courseway	PPL φ 1,000 28,000	Cast-in-place pile casing
IL02 Coal Fired Power Plant	PPL φ 900 40,000	Pilot Pile
Red River Bridge Project	SPPL φ 1,000 28.5m	Temporary cofferdam
Lungmen No.4 NPP cooling water conduit	PPL φ 1,500 36,300	Soil stablization & foundations
Meghna Bridge	PPL φ 1,016 30,000	Temporary cofferdam
Four Katmandu Bridge	PPL φ 776 25,000	Bridge support casing
Samsung's automotive plant	PPL φ 600 50,000	Base pile

PPL: Steel pile pipe SPPL: Steel pipe sheet piles

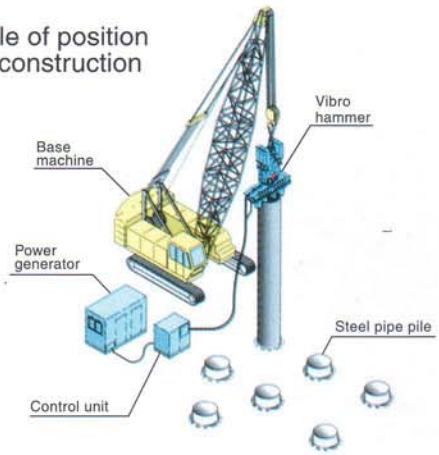
Overview of the vibrohammer method

Vibrohammers make it possible to perform construction using only base machines such as cranes, and engine power generators to provide power (or a special hydraulic power unit when using a hydraulic Vibro unit). The vibrohammer method also makes it possible to perform many different types of work even on sites which require a large working radius or different heights by using a crane as the base machine. Vibrohammers also place no restrictions on the type of base machine used, this making it possible to drive battered piles using a pile driving leader or when performing construction from a floating crawler crane mounted on barge.

ZERO-200MR

ZERO-SR30

■ Example of position during construction

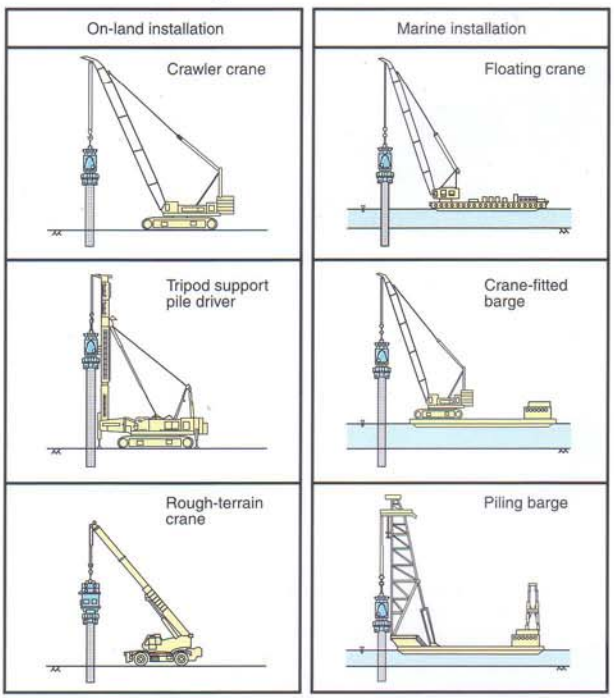


■ Main types of equipment and materials using Vibrohammer

Classification	Equipment and materials		Installation conditions: On-land installation	Marine installation: Rivers	Marine installation: Harbors
Basic equipment and materials	Vibro hammer		○	○	○
	Steel pipe chuck		○	○	○
	Power generator (for Vibrohammer)		○	○	○
Base machine	Land machinery	Crawler crane	○※	—	—
		Wheel crane (Rough-terrain crane)	○※	—	—
		Third point support pile driver	○※	—	—
	Marine machinery	Crawler crane	—	—	○※
		Pile-driving ship	—	—	○※
		Crane fitted barge	—	○	○※
Auxiliary crane	Crawler crane		△※	—	—
	Crane fitted barge		—	△	△
	Wheel crane (Rough-terrain crane)		△※		
Work Boat	Piling barge		—	○	○
	Tugboat		—	○	○
	Winch ship		—	—	△
	Diving Boat		—	—	△

■ ○:Regular use □:Used as necessary —:Not used
■ ※:Selected according to work conditions

■ Installation using different base machines



Piling design methods and dynamic bearing capacity by Vibrohammer methods

■ Design

Based on a large number of load test results on piles, the ultimate bearing capacity (Ru) of steel pipe piles, which are driven using a vibrohammer, is calculated by a maximum of 300 kN/m2 bearing capacity of the point,according to the pile diameter to the embedment length for the same bearing layer as the impact hammers, and pile friction resistance of all types of soil condition.

Design method of ultimate bearing capacity is authorized in the Specifications for Highway Bridges (Japan Road Association)

Bearing capacity formula

$$Ru=qdA+U\Sigma\ell i\,fi$$

■ Dynamic bearing capacity

The formula of dynamic bearing capacity for vibrohammer methods,which is a dynamic pile driving method, has been created and adopted in many actual applications to check the dynamic bearing capacity as a way of the pile driving control.

The formula is an extremely reliable tool in reaching the bearing capacity by the pile displacement velocity, total power consumption (in kilowatts) of the vibro-motor, the characteristics of the piles being used, and soil conditions of construction.

Dynamic bearing force

$$Ra=\frac{1}{3}\left[\frac{Pw}{V\nu}\cdot\alpha+\frac{\overline{N}U\ell}{ef}\right]$$

Loading test

Ru : Critical bearing force decided by the ground(k/N)
A : Tip of the pile blockade area(m^2)
qd : The point bearing force degree
U : Surrounding length of the pile(m)
ℓi : Thickness of the layer considering the groundside friction force(m)
fi : Maxim round side friction force of the layer considering the round side friction(KN/m^2)
Ra : Allowable bearing capacity
Pw : Total consumption electricity(kw)
of the motor $Pw=1.3 \times I_A \times E10^{-3}$
I_A: Electoric current(A)
E : Voltage(V)
Vν : Displacement velocity(cm/sec)
N : Average N value against the surface area
ℓ : Length of the pile driven into the ground
ef : Revised coefficient

Applied methods

Steel sheet structure callular (embedded) method

The steel sheet Structure cellular (embedded) method is a method whereby vibrohammers are used to drive prefabricated cylindrically shaped large-size steel piles.

In this method, anywhere from a few to 10 or more 150-KW Huge Vibros (VM2-25000A), with the actual number used determined in accordance with conditions, are operated in conjunction with each other to lay a large-diameter steel cell deeply into the seabed.

Prefabricated sheet pile cell method

The prefabricated sheet pile cell method is a rapid construction method in which over a hundred straight sheet piles are preassembled to a circular cell, and the sheet pile cell is then driven into the ground at one stretch using several dozen large-scale 60-to 120KW Vibros equipped with special pile heads able to grasp 4-6 sheet piles.

Sand compaction method

The sand compaction method is a ground improvement method which uses the vibration of the Vibro to drive and pull out a casing into and from the sand and fill the casing with sand to a column which is then compacted, thus making it possible to provide increased bearing force, help prevent liquefaction, and ensure greater compaction and replaceability.

Tomec's Vibros designed especially for use in sand compaction make it possible to from sand compaction pile with a high degree of efficiency.

JV method

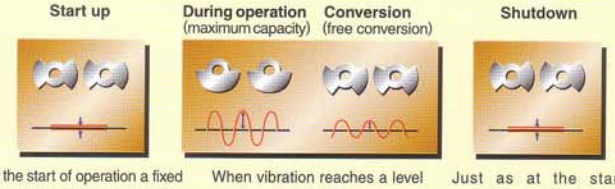
The JV method is a method where a water jet cutter is used in conjunction with a vibrohammer for pile driving into rock and other hard stratum.

And if combined with Huge Vibro, JV method displays its driving ability much more efficiently and strongly.

Startup and shutdown resonant vibration damping mechanism

Products in the Zero-MR and VR series employ a resonant vibration damping mechanism that eliminates resonant vibration during startup and shutdown through the use of a moment conversion mechanism. It is also possible to adjust the level of vibration freely during operation, thus making it possible to lessen noise, vibration, and other hermful environmental effects during operation.

ZERO-320MR



At the start of operation a fixed eccentric body and variable eccentric body operate against each other at an angle of 180 degrees to begin operation (from zero). The machine as a whole does not move at all unit a specified level of vibration is reached.

When vibration reaches a level in excess of the range of resonance with the foundation, the variable eccentric body is automatically adjusted to generate a given amplitude of vibration.

Even during operation, the moment may be varied through dial adjustment to vary the level of vibration energy.

Just as at the start of operation, variable eccentric bodies are made to operate against each other at an angle of 180 degrees to bring the level of vibration to zero before stopping (zero shutdown), thus making it possible to shut down operation quietly without creating resonations with foundations or crane booms.

Products

Electrically powered variable moment Vibro:

The Zero **MR**-series

ZERO-200MR

The Zero-MR series is a line of environmentally friendly Huge Vibros which provide all of the power of other Vibro products together with resonant vibration damping mechanisms.

		ZERO-200MR	ZERO-320 II MR	ZERO-640MR
Motor output	kW	180	240	480
Eccentic moment	N·m (kg.cm)	0~1569.1 (0~16000)	0~3531.6 (0~37000)	0~7256.8 (0~74000)
Frequency	Hz	13.3	11.7	11.7
Centrifugal force	kN	0~1116.2	0~1943.5	0~3977.6
Vibrating weight (with double clamp)	kg	16300	27000	56930
Total weight (with double clamp)	kg	19800	37000	70900
Amplitude (with double clamp)	mm	0~9.8	0~13.5	0~12.7
Double clamp weight	kg	4500	10200	17000
Max.line pull capacity	kN (ton)	490.3 (50)	1176.7 (120)	2353.4 (240)
Power source capacity	KVA	600	800	800×2

Electrically powered Vibro:

The **VM**-series

VM2-25000A

VM4-30000A

VM4-36000A

Huge VM series is a line of the most standard Vibros which make it possible to drive larger numbers of steel pipe piles and steel pipe sheet piles through the use of superior mechanical design and superior durability.

		VM2-25000A			VM4-30000A			VM4-36000A		
Motor output	kW	150			180			240		
Eccentic moment	N·m (kg.cm)	2452.5 (25000)	1962.0 (20000)	1471.5 (15000)	2452.5 (25000)	2746.8 (28000)	1471.5 (15000)	3531.6 (36000)	3139.2 (32000)	2452.5 (25000)
Frequency	Hz	10.3			11.0			11.3		
Centrifugal force	kN	1046.0	836.8	627.6	1431.6	1336.2	1145.3	1812.9	1611.5	1259.0
Vibrating weight (with double clamp)	kg	12900			18300			23700		
Total weight (with double clamp)	kg	15600			21500			27100		
Amplitude (with double clamp)	mm	19.4	15.5	11.6	16.4	15.3	13.1	15.2	13.5	10.5
Double clamp weight	kg	4500			7500			10200		
Max.line pull capacity	kN (ton)	490.3 (50)			588.4 (60)			686.5 (70)		
Power source capacity	KVA	500			600			800		

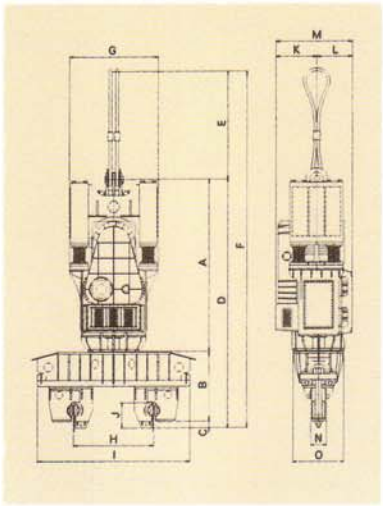
Combined Vibros:

The **VM-TWIN**

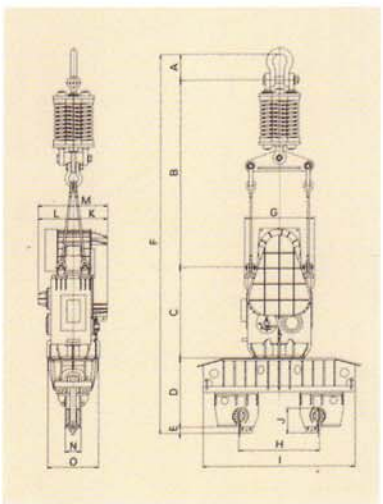
VM8-72000A

Huge Vibros may be linked together in operation to provide the highest level of pile driving capability available anywhere in the world.
Combined Vibro technologies used in cell construction make it possible to drive and extract even large-diameter and long-length piles.

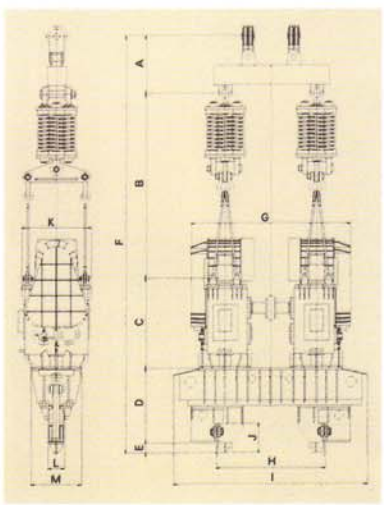
		VM4-50000A			VM8-60000A			VM8-72000A		
Motor output	kW	300			360			480		
Eccentic moment	N·m (kg.cm)	4905.0 (50000)	3924.0 (40000)	2943.0 (30000)	5886.0 (60000)	5493.6 (56000)	4708.8 (48000)	7063.2 (72000)	6278.4 (64000)	4905.0 (50000)
Frequency	Hz	10.3			11.0			11.3		
Centrifugal force	kN	2092.0	1673.6	1255.2	2863.2	2672.3	2290.6	3625.8	3223.0	2517.9
Vibrating weight (with double clamp)	kg	28000			35600			41600		
Total weight (with double clamp)	kg	38700			47300			53700		
Amplitude (with double clamp)	mm	17.9	14.3	10.7	16.9	15.7	13.5	17.3	15.4	12.0
Double clamp weight	kg	10200			13000			13600		
Max.line pull capacity	kN (ton)	980.7 (100)			1176.8 (120)			1372.9 (140)		
Power source capacity	KVA	500×2			600×2			800×2		



	ZERO-200MR	ZERO-320MR
A	3195	3964
B	1240	1596
C	175	145
D	4610	5705
E	2200	2500
F	6810	8205
G	1850	2040
H	ϕ600~ϕ1500	ϕ900~ϕ1600
I	2650	3500
J	465	570
K	947	929
L	746	829
M	1693	1758
N	300	358
O	1000	1170



	VM2-25000A	VM4-30000A	VM4-36000A
A	473	520	590
B	3648	3826	4254
C	1507	1964	2062
D	1240	1381	1596
E	175	224	145
F	7043	7915	8647
G	1590	1480	1594
H	ϕ600~ϕ1500	ϕ800~ϕ1600	ϕ900~ϕ1600
I	2650	2950	3500
J	465	574	570
K	871	786	783
L	715	798	807
M	1586	1584	1590
N	300	350	358
O	1000	1000	1170



	VM4-50000A	VM8-60000A	VM8-72000A
A	1340	1464	1314
B	4190	3811	4254
C	1507	1964	2062
D	1236	1750	1750
E	220	250	250
F	8493	9239	9530
G	3562	3388	3568
H	ϕ1200~ϕ2100	ϕ1300~ϕ2500	ϕ1500~ϕ2500
I	3760	4380	4480
J	660	690	690
K	1590	1480	1594
L	356	464	464
M	1160	1160	1160

Other series

These products may be used in applications covering everything from the driving and extraction of sheet pipe piles and H-beam piles to applications in which special pile head devices are used to lay concrete sheet piles, steel pipe piles, and steel pipe sheet piles.

The **VR**-series

The Zero-VR series is a redesigned version of the widely recognized and well-proven FM/CM series which has been designed for even greater ease of use and more efficient construction. The Zero-VR series reduces levels of resonant vibration and can be used to drive and extract a wide variety of different types of piles.

ZERO-80VR

ZERO-160VR

		80VR	120VR	160VR
Motor output	kW	60	90	120
Eccentic moment	N·m	18.3	18.3	18.3
Frequency	Hz	0~352.2	0~421.8	0~637.7
Centrifugal force	Kn	0~475.5	0~567.9	0~681.1
Total weight (with single clamp)	kg	5670	7140	9800

Hydraulic VIBRO

The Zero-SR series, which provides a maximum of up to 60 Hz in ultra-high-speed minute vibrations, attains levels of low vibration and low noise not seen anywhere else in the Vibro line, thus making it a popular choice for use in urban construction projects.

The Zero **SR**-series

		SR30	SR45	SR65
Power peak engine power	kW	190	235	350
Frequency	Hz	0~60	0~60	0~38
Centrifugal force	Kn	0~347.3	0~473.4	0~697.0
Total weight (with single clamp)	kg	4000	6500	8000

ZERO-SR45

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