Hydrohammer®

The hydraulic impact hammer for all coastal & civil projects

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LET'S BUILD

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IQIP is a reliable and experienced service partner for all pile driving operations, both onshore and nearshore. In the Coastal & Civil markets, IQIP provides pile driving equipment and advice for the construction of stable foundations for bridges and jetties, harbours and quay walls, as well as building foundations. More than 30 years' experience prioritising the development of innovative solutions for the most complex construction projects within these market segments, makes IQIP a reliable industry leader.

For the Coastal and Civil Markets, two types of hammers are available, the S series and the SW series.

S series Hydrohammer®
IQIP's reliable and world-renowned, first generation hydrohammer S series, was developed in the early 80's and has been deployed for use on Onshore construction, Oil & Gas and Offshore Wind projects the world over. The S series is known for its unique robust design and its reliability in the field. Over 30+ years, multiple ranges of hammers in the S series have been developed to cater for all types of piling and foundation work. The S series ranges from S-30 to S-2000 and is available for rent and purchase.

SW series Waterhammer
The Waterhammer runs on water as a hydraulic oil alternative, which makes it an environmental friendly hammer. By using only water as medium, there will be no chance of hydraulic oil spills. This makes it also possible to use the hammer in areas where oil spill risk reduction is a high environmental project requirement. Besides this advantage, the hammer can also be used in several markets. While it's designed for deep water and the Oil & Gas market, it has also been used in Coastal & Civil river and harbour projects. In addition, the Waterhammer is simple to control in the same way as our standard hydraulic hammers with no energy or performance loss.

Driveability and advisory services
The correct choice of hammer can only be made after careful interpretation and assessment of the properties of the soil. To support customers, IQIP employs a team of experienced engineers to assist with pre- and post-pile driving analysis. These driveability studies are carried out using the most sophisticated computer programs (geowave). Driveability studies are performed for a best estimate but also take into account an upper bound situation. In the upper bound situation, a 30% higher soil resistance is accounted for, which gives a good indication of the expected driveability.

Hammer control and monitoring
All hydraulic hammer functions are electronically controlled and monitored by our new generation control and monitoring system. This system focuses on automatic pile driving based on the desired pile velocity, blow rate and blow energy, making the system flexible and easy to use.

Highlights of the system include:
- Maximisation of equipment utilisation and efficiency.
- Wireless digital communication and control.
- Increasing equipment reliability and lifespan through comprehensive diagnostics.
- Data registration and reporting system for project data, settings, configuration and important measurements.
- Integration of documentation in the control system.

MIQIP customer portal
MIQIP is a globally connected platform that will provide you with operational intelligence on your foundation installation assets. Hammer operators, project managers and service crew have direct access to all information needed for efficient and reliable reporting. MIQIP makes jobsite preparation possible from the comfort of your office. The portal provides an up to date transparent overview of the documentation and certification and enables you to easily push piling plans and equipment spreads configurations to the selected C-36 control units.

S series Hydrohammer

SW series Hydrohammer

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Jetties

Whether they are unloading LNG, oil carriers or berthing vessels, in order to provide an invaluable service, jetties must be able to withstand the full force of nature. Therefore, choosing and installing the foundation in an optimum way is critical. Using the Hydrohammer can prove to be a perfect solution for installing either steel or concrete foundation piles.

Raked pile driving
The majority of jetties consist of a series of bents of raked steel piles, driven into the ground. Traditional methods for raked pile driving are inefficient due to their inability to compensate for the loss of gravitational force. This is not the case with the Hydrohammer. By adjusting the gas pressure above the ram's piston head, the ratio between the energy delivered by gravity and by gas energy can be adjusted. When driving raked piles, the gas pressure is increased to compensate for the loss of gravitational force. Battered piles up to a rake of 1:1(45 degrees) can therefore be driven at full energy. It is even possible to drive horizontally.

Lightweight hammer
The ram weight of the Hydrohammer S series is relatively light in comparison to its competitors, and the hammer receives a substantial part of its power from acceleration due to the gas pressure on top of the piston. This greatly increases its handling and makes it ideal for constructing jetties.

Harbours

When it comes to installing foundations and quay walls for complex maritime projects, steel structures are the best solution. As a result of its unique design, the Hydrohammer is perfectly suited to driving steel piles and essential for a successful installation.

Special solutions
Driving clutched piles is possible with a specially designed clutch sleeve. With this sleeve, the use of a follower or dolly to drive clutched piles is no longer required, making pile driving more cost-effective and efficient. The clutch sleeve also reduces the weight by up to 10t, depending on the follower length. To prevent additional costs incurred as a result of damage to the coating of piles during pile driving, IQIP can equip the inside of the sleeve with synthetic material.

DRIVING FREE HANGING RAKED PILES AT FULL ENERGY

WELL EQUIPPED FOR ALL HARBOUR-RELATED PILING WORKS

Bridges

The foundations of a bridge are of critical importance. Not only must they support the entire weight of the bridge, they are also required to withstand dynamic loads, and be resistant to earthquakes. Over the past few decades, upscaling the sizes of bridges and their foundations has become necessary due to heavier traffic and increasing traffic flow.

Large diameter piles
For IQIP, large diameter piles are common practice. Offshore, we have vast experience driving the biggest monopiles with a diameter of up to eight metres. We've taken this experience onto dry land, and are capable of driving any pile size required with our wide range of hammers and sleeves. Our S-600 Hydrohammer is used frequently for bridge foundation works all over the world. One of the biggest hammers ever supplied for a bridge foundation project is the S-2000 Hydrohammer.

IDEAL SOLUTION FOR PILE DRIVING ON ALL BRIDGE PROJECTS

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Sheet legs

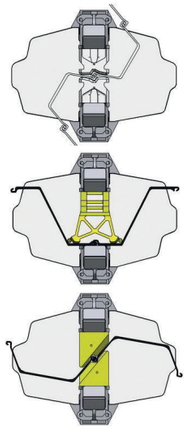
When equipped with sheet legs, the Hydrohammer is the perfect tool for driving sheet piles. The legs provide the required stability when driving sheet piles in a free-riding mode and eliminate the need for a leader. Many different types of profiles can be driven this way, from single and double sheet piles to single and double H-beams, combi walls, and more.

Polygonal anvil
Another new development is the polygonal anvil. Its special shape enables it to drive a wide range of sheet piles with maximum coverage. This ranges from the small profiles, with a width of 500mm (for example, Hoesch L25) to the big profiles, measuring 700mm in width or 750mm. We have developed sheet legs for our S-30, S-40, S-70, S-90, S-120 and S-150 Hydrohammer models. The solid one-piece upper section has a high rigidity. These sheet legs can be used with the polygonal anvil for double sheet piles, and with an anvil for single sheet piles.

Short sheetleg set
The latest development for driving sheets is the short sheetleg set.

With this set, a construction is made which pushes the guiding shoes to the sheet with just enough force to stabilize the hammer, with no extra acceleration to the hammer sheetleg construction. This, in combination with the anvil, suitable for double sheets of 1.6m, provides the opportunity to drive all of the new series of sheets.

With this type of sheetleg, the hammer is more stable on the sheets, reducing misalignment and resulting in efficient energy transfer from the hammer to the sheets with less wear and tear. Additionally, the sheet can be driven closer to the soil level which eliminates the need to remove the soil along the sheet pile wall.

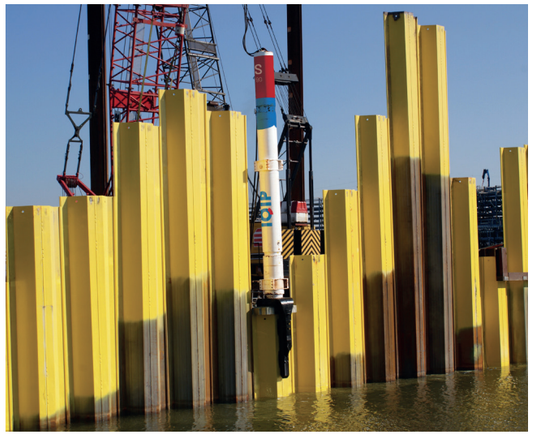


Coverage with the polygonal anvil at the profile L25

Coverage with the polygonal anvil at the profile AZ 40-700

Coverage with the polygonal anvil at the profile AU 26

DRIVE ALL TYPES OF SHEET PILES AND PROFILES



Rockbreaking

Equipped with a chisel set, the Hydrohammer becomes a highly effective and powerful rock breaker. It is able to produce the high impact force necessary for breaking rock, cemented layers, concrete floors and slabs.

Chisel with housing
The Hydrohammer can be used as a rock breaker both on land and underwater. It is fitted with a special sleeve that features an internal anvil and a chisel. After being driven into the rock, the hammer and chisel are lifted and moved to the next spot. Delivering upward blows and lifting the hammer at the same time strongly facilitates the retraction of jammed chisels.

The system
To withstand heavy resistance, the Hydrohammer must be properly guided in a leader-guide profile. This operating criterion secures the central alignment of the chisel and hammer for optimum energy transfer between ram/anvil and chisel. The position of this leader profile should be fixed during breaking and extracting.

Operating methods
The Hydrohammer has proven its reliability for rock breaking projects, and IQIP offers other equally reliable handling equipment which can be used to lift and position the rock breaker and leader profile, including a piling rig, excavator or backhoe, or a cutter dredger. The choice depends predominantly on the equipment available for the project, and on water depth.

Rock hardness
The average compressive strength that a normal cutter dredger can handle is 40MPa. To date, rocks with a hardness up to 230MPa have been successfully broken using an S-70 Hydrohammer to punch vertical holes in a relatively level surface.

HIGH IMPACT AND VERSATILE ROCK BREAKING WITHOUT EXPLOSIVES

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Cast-in-situ technique

1. The steel casing is placed on the steel cover plate
2. The steel casing is driven to final penetration level
3. A reinforcement cage is placed inside the (empty) steel casing
4. Concrete is poured inside the steel casing
5. The steel casing is extracted by force, in combination with small blows downwards – or even upwards
6. A concrete pile with a high bearing capacity is in place

Advantages cast-in-situ

One of the unique features of the Hydrohammer design – besides its sturdiness and high level of controllability – is its ability to facilitate the extraction of casings that have already been driven. This means that only one hammer is needed for both driving and extracting, making the Hydrohammer ideal for handling cast in-situ (vibro) piles.

High blow rate with minimal energy

During extraction, the Hydrohammer can achieve a blow rate of 280bpm with minimal energy. These small vibrations in the casing create the tractive force required to pull the casing out of the ground. In case of extremely high friction, the Hydrohammer, in combination with the pulling force of the crane can even give upward blows to overcome the soil friction.

Very economical and high bearing capacity

This technique is very economical compared to precast piles, since reinforcement is installed after tube installation instead of being designed with respect to transport and handling, as pile length is not limited by transport. On request, concrete can be delivered within a few hours by a concrete mixer truck, which prevents the storage of precast piles and makes it easier to reach the job site. The reinforcement of pile shaft can be increased at the top of the pile. Due to an increased end bearing and optimal friction along the shaft, a high bearing capacity is usually achieved. Allowable pile loads can be extremely high. Another advantage is that the adjustable pile length can be determined at the job site.

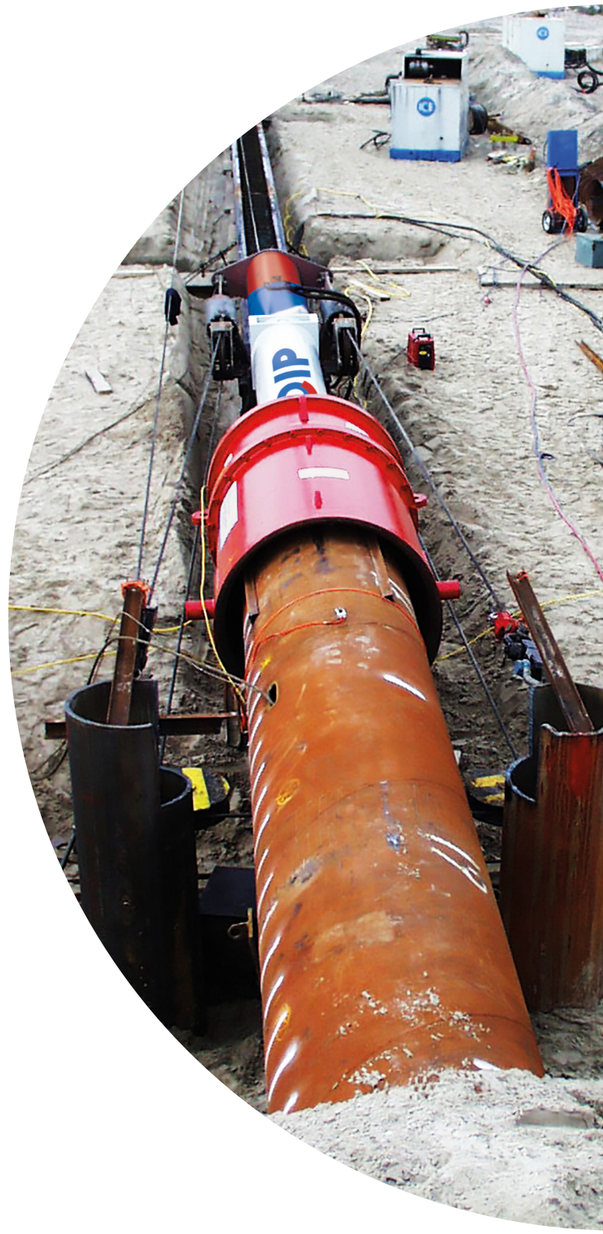
DRIVEN CAST-IN-SITU PILES

Horizontal pile driving

Pipes and piles are usually driven vertically, but in some instances horizontal piling is required. Horizontal piling requires powerful tools to deliver the amount of driving power or cutting capacity needed. As a result of two unique features in the design of the hydraulically driven and gas accelerated ramweight of the Hydrohammer, it is possible to operate under every inclination – even horizontally. The Hydrohammer is not only capable of installing piles and pipes horizontally, but it can also be used to remove disused piles and pipes from the ground.

Hydrohammer advantage

- Requires only a relatively small excavation.
- Used extensively for driving piles up to almost 5 metres in diameter.
- Faster tube installation progress.
- Ability to remove disused service lines and tubes.
- No modifications to the Hydrohammer are required.
- Safer operation – working tool is outside the tube, not inside.



Hydrohammer Noise Mitigation

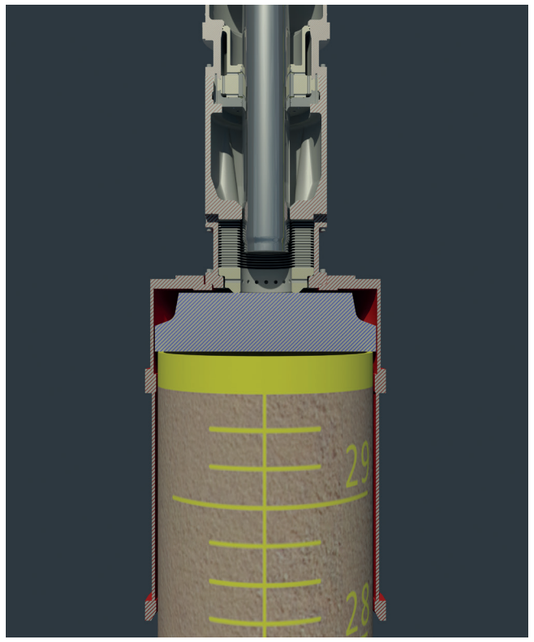
As noise management becomes increasingly challenging, IQIP has developed near-field and source mitigation solutions to reduce noise during impact piling. These solutions can be customized to meet your project's specific requirements.

Noise Reduction System
For a safer working environment and reduced noise pollution during piling, IQIP offers an optional noise reduction system. Developed in collaboration with leading Dutch research institute TNO, the system features an impact enclosure and bellow sections around the pile, effectively reducing noise levels by 10 to 18 dB(A). This significant improvement in noise emissions makes it ideal for modern construction sites. The system is compatible with free-hanging and leader-guided pile driving.

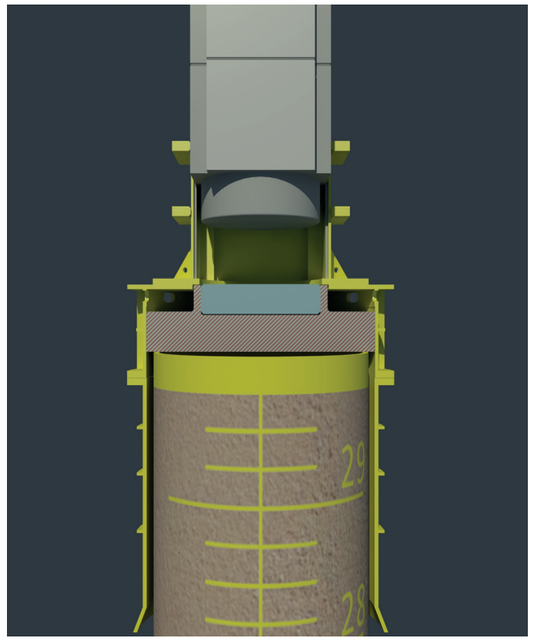
PULSE®
PULSE, a modular addition to the Hydrohammer, minimises noise both in air and underwater during pile driving, delivering an environmentally-friendly foundation installation. The PULSE system delivers a blow lasting twice as long as that of conventional hammers, boosting piling efficiency while minimizing pile fatigue and impact noise. Adaptable to varying conditions, PULSE operates at maximum peak force for optimal performance. When paired with the Hydrohammer, it ensures efficient, environmentally-friendly installations, reducing noise, pile fatigue, and operating costs.

Efficiency Hydrohammer®

Hammer comparison
Most piling hammers are rated by their potential energy. However, the Hydrohammer is rated by its kinetic energy. Furthermore, steel-to-steel energy transfer ensures an extremely high peak force in the pile. Therefore, it is incorrect to only compare hammers on (potential) energy. In order to make an accurate comparison between the different hammer types, the actual ability of a hammer to overcome soil resistance is far more important than its rated energy. The below table compares energy between the different hammer types based on the driveability.



Hydrohammer®: steel to steel energy transfer



Diesel and conventional hydraulic hammer: energy transfer with cushion

Comparison on energy needed

Hammer type	S-30	S-40	S-70	S-90	S-120	S-150	S-200	S-280	S-350	S-500
	kNm (kJ)									
Steel to steel (Hydrohammer®)	30	40	70	90	120	150	200	280	350	500
Diesel hammer	72	98	170	220	290	366	488	785	920	1220
Conventional hydraulic hammer	40	57	100	130	170	216	289	400	504	675

Hammer type	S-30	S-40	S-70	S-90	S-120	S-150	S-200	S-280	S-350	S-500
	kip.ft									
Steel to steel (Hydrohammer®)	22	30	52	66	89	111	148	207	258	369
Diesel hammer	53	72	125	162	214	270	260	579	679	900
Conventional hydraulic hammer	30	42	74	96	125	159	213	295	372	498

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Operating principle

The operating cycle begins with the lifting phase of the ram (ram weight, ram pin and piston rod are forged in one piece). Here, valve P in the pressure line is opened and valve R in the return line is closed. When the preset stroke position is reached, the valves are automatically reversed allowing the ram to start its downward stroke. The ram is accelerated by gravity and by the pressure of the gas above the piston and reaches a maximum acceleration of 2g. This reduces the maximum stroke that is required and at the same time increases the blow rate of the hammer.

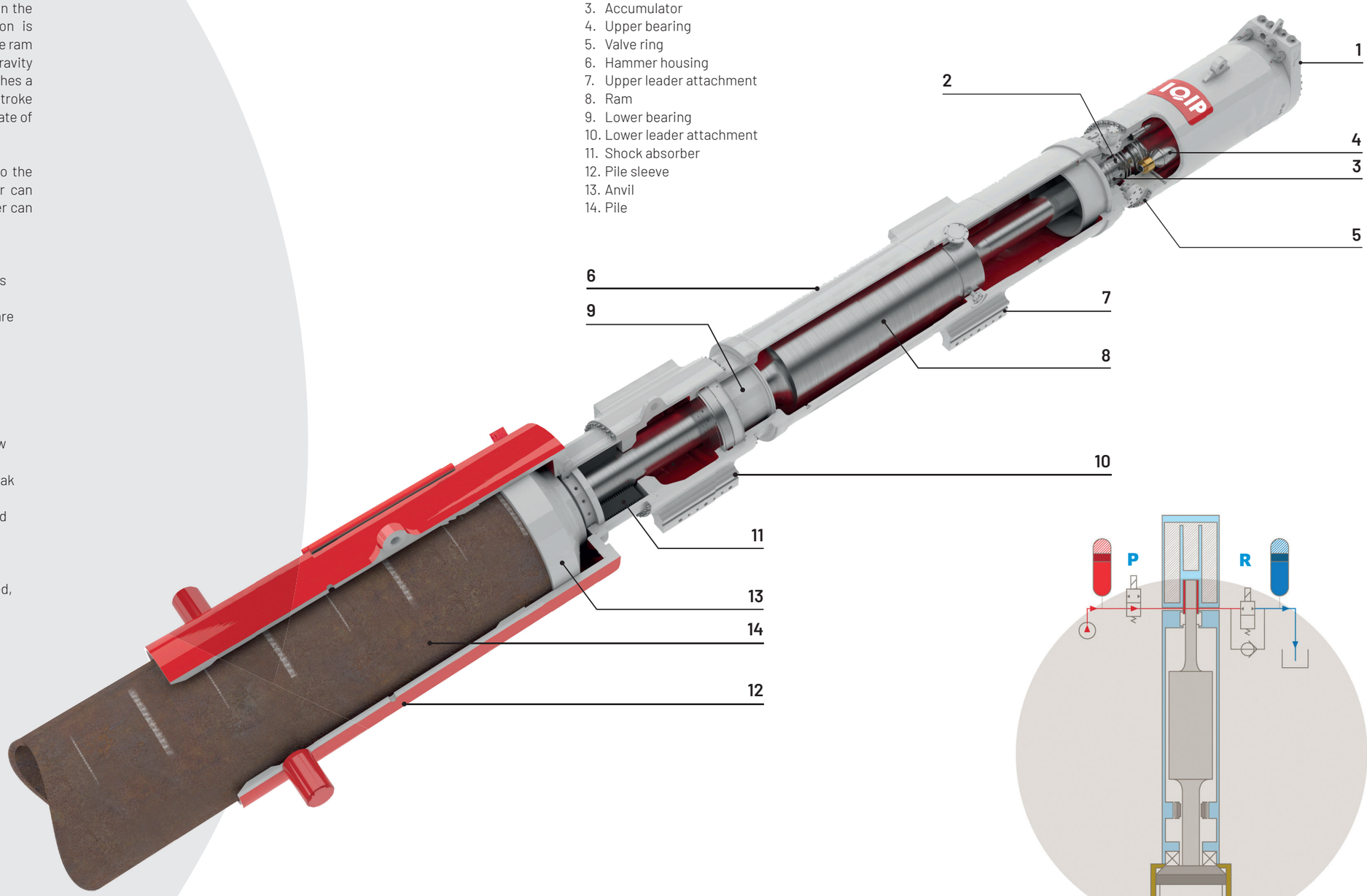
After impact, the cycle is repeated automatically. Due to the independently set acceleration force, the Hydrohammer can operate at any inclination - even horizontally. The hammer can operate leader-guided or free-hanging.

Highlights

- Energy transfer: Steel-to-steel energy transfer ensures extremely high peak force in the pile.
- Solid piece Ram: Ram weight, ram pin and piston rod are forged into one piece, eliminating the risk of the parts separating.
- Material: Forged alloy steel guarantees durability and allows unlimited piling on steel at full power.
- Shock absorber: The robust and tested construction sustainably resists the reaction forces from the pile.
- Multifunctional: Suitable for operation above and below the water.
- Acceleration energy: Relatively low weight and high peak force ideal to overcome soil resistance.
- Hammer control: Adjustable blow count per minute and impact energy.
- Real time monitoring: Piling data is directly printed on site and/or stored to allow detailed analysis.
- Environmentally friendly: Biodegradable oil can be used, and noise reduction is optimised with noise reduction packages.

Hydrohammer

1. Connection plate
2. Piston
3. Accumulator
4. Upper bearing
5. Valve ring
6. Hammer housing
7. Upper leader attachment
8. Ram
9. Lower bearing
10. Lower leader attachment
11. Shock absorber
12. Pile sleeve
13. Anvil
14. Pile



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Technical data

Metric

Hammer S		S-30	S-40	S-70	S-90	S-120	S-150	S-200	S-280	S-350
Max. blow energy	kNm (kJ)	30	40	70	90	120	150	200	280	350
Min. blow energy*	kNm (kJ)	3	4	7	9	12	15	20	31	39
Blowrate	bl/min	65	65	50	46	44	44	45	45	20
Weight, Ram	ton	1.5	2.2	3.5	4.5	6	7.5	10	14	18
Weight, Hammer	ton	4	4.7	8.5	10	14.5	16.5	27	31	36
Length, Hammer	mm	6100	6762	7418	8168	8296	8986	9130	10390	11384
Oil flow	l/min	175	175	250	250	460	460	700	700	700
Power pack type, preferred		P 250	P 250	P 250	P 250	P 460	P 460	P 700	P 700	P 700

Hammer S		S-500	S-600	S-800	S-1200	S-1400	S-1800	S-2000	S-2500
Max. blow energy	kNm (kJ)	500	600	800	1300	1400	1800	2000	2500
Min. blow energy*	kNm (kJ)	50	66	88	132	154	198	220	270
Blowrate	bl/min	45	44	45	38	35	35	35	32
Weight, Ram	ton	25	30	40	60	70	90	100	125
Weight, Hammer	ton	60	65	85	145	150	215	230	260
Length, Hammer	mm	11943	12745	14535	14300	14945	16630	17370	19025
Oil flow	l/min	1600	1800	2200	3300	3300	3300	4400	4400
Power pack type, preferred		O.R.	O.R.	O.R.	O.R.	O.R.	O.R.	O.R.	O.R.

Hammer SW		S-90 W	S-500 W
Max. net energy	kNm (kJ)	90	500
Min. net energy*	kNm (kJ)	9	50
Blowrate	bl/min	46	26
Weight, Ram	ton	4,5	25
Weight, Hammer	ton	10.5	75
Length, Hammer	mm	8238	12060
Recommended water flow	l/min	250	1000
Power pack type, preferred		P 460	P 460

Power pack type		P 250	P 460	P 700
Max. pressure	bar	350	330	340
Max. oil flow	l/min	250	460	700
Power	kW	168	328	515
Dimensions (LxWxH)	mm	3500 x 1540 x 2044	4015 x 1689 x 2225	4850 x 1900 x 2346
Net. weight	ton	3.4	5.4	6.6
Weight, incl. fuel and oil	ton	4.5	6.8	9.5

** The standard minimal energy setting is about 10% of the hammer's maximum energy. When using the high frequency/low energy mode, the energy can be reduced to a minimum of 2% to 5%.*

Imperial

Hammer S		S-30	S-40	S-70	S-90	S-120	S-150	S-200	S-280	S-350
Max. blow energy	lb.ft	22,127	29,503	51,630	66,381	88,508	110,638	147,513	206,518	258,147
Min. blow energy*	lb.ft	2,213	2,950	5,163	6,638	8,885	11,063	14,751	20,652	28,765
Blowrate	bl/min	65	65	50	46	44	44	45	45	40
Weight, Ram	lbs	3,527	4,850	7,716	9,921	13,668	16,534	22,046	29,982	36,000
Weight, Hammer	lbs	8,599	10,362	18,298	21,348	31,526	35,714	56,878	67,240	72,000
Length, Hammer	ft	20.00	22.47	24.28	26.43	26.79	29.20	29.84	34.09	37.35
Oil flow	g/min	46	46	66	66	122	122	185	185	211
Preferred power pack type		P 250	P 250	P 250	P 250	P 460	P 460	P 700	P 700	P 700

Hammer S		S-500	S-600	S-800	S-1200	S-1400	S-1800	S-2000	S-2500
Max. blow energy	lb.ft	368,781	442,539	590,056	885,079	1032,952	1327,618	1475,131	1843,905
Min. blow energy*	lb.ft	36,878	44,254	59,005	88,508	103,259	132,762	147,513	199,141
Blowrate	bl/min	45	44	45	40	35	35	35	32
Weight, Ram	lbs	55,116	66,138	88,183	132,275	152,116	198,413	220,459	275,577
Weight, Hammer	lbs	126,794	141,093	182,981	308,642	326,279	454,145	487,213	573,201
Length, Hammer	ft	39.18	41.72	47.93	46.91	52.79	54.17	56.87	62.42
Oil flow	g/min	423	476	581	871	871	871	1162	1162
Preferred power pack type		O.R.	O.R.	O.R.	O.R.	O.R.	O.R.	O.R.	O.R.

Hammer SW		S-90 W	S-500 W
Max. net energy	lb.ft	66,381	368,781
Min. net energy*	lb.ft	6,638	36,878
Blowrate	bl/min	46	26
Weight, Ram	lbs	9.921	55,116
Weight, Hammer	lbs	23,149	41,226
Length, Hammer	ft	27.01	39.57
Recommended water flow	g/min	66	264
Preferred power pack type		P 460	P 460

Power pack type		P 250	P 460	P 700
Max. pressure	psi	5,076	4,786	4,931
Max. oil flow	g/min	66	122	185
Power	hp	228	526	700
Dimensions (LxWxH)	ft	11.46 x 5.05 x 6.71	13.22 x 5.07 x 7.30	15.91 x 6.23 x 7.69
Net. weight	lbs	7,495	11,905	14,550
Weight, incl. fuel and oil	lbs	9,921	14,991	20,943

** The standard minimal energy setting is about 10% of the hammer's maximum energy. When using the high frequency/low energy mode, the energy can be reduced to a minimum of 2% to 5%.*

Let’s build tomorrow’s world together!

IQIP.com