STAHL UND APPARATEBAU
HANS LEFFER GMBH & CO. KG

LEFFER

OUR HISTORY

A FAMILY BUSINESS SINCE 1946

Since 1946, LEFFER has been standing for reliability and quality in the manufacture and assembly of machinery, pressure vessels and complex industrial equipment. Still 100 % family-owned today, the company employs 500 skilled workers. On 35000 m^2 of hall space, LEFFER manufactures to the highest quality standards – and enjoys international esteem for high-performance, reliable construction machinery and drilling tools for deep foundation engineering.

All over the world, our products are successfully used in major projects and meet even the highest demands. For example, in the production of pile foundations up to a diameter of 3.8 m, depths of up to 120 m or in the use of our equipment for off-shore applications. We are certified according to ISO 9001 and DIN EN ISO 3834-2. As a „one-stop shop", we cover the complete process chain, starting with product development, prefabrication, assembly, welding and testing, to industrial coating or transport management.

Our name stands for high robustness at highest manufacturing quality. Our machines keep their promise on the construction site. We take pride in that.

Hans Leffer Dr. Andreas Leffer

Your management

PRODUCT RANGE AND APPLICATION

Construction of pile foundation

Grab Drilling	Kelly, Double Rotary Drilling	Full Displacement Drilling
Oscillators	Oscillators type KL	Full displacement augers
Casing rotators	Casing rotators type KL	Partial displacement augers
Power packs	Casing extracting machines	
Spherical grabs	Adapters	
Hydraulic spherical grabs	Electric automatic adapter	
Single-/Double-rope pully grabs	Hydraulic retaining clamps	
Single-/Double-rope scissor grabs	Augers	
Chisels	Drilling buckets	
	Core barrels	
	Cross Cutters	

Accessories Grab, Kelly, Double Rotary Drilling		Continuous flight auger drilling
Casings	Casing lifting devices	SOB continuous flight augers
HD Casings	Tremie pipes and accessories	
Cutting shoes	Casing funnels	

Special Operations

Construction of diaphragm walls	Construction of wells	Offshore Equipment
Diaphragm wall grab	Oscillators	Oscillating clamps
Hydraulic diaphragm wall grab	Grabs	Lifting and oscillating clamps
Stop-end-elements and accessories	Casings	

Construction of customized special machines	Technical support	Maintenance and repair
Client-specific adjustment of standard products	Engineering services	Inspections
Prototype construction/ special machines	Workshops	Repair services

GRAB DRILLING

Special machines for well construction „light series”

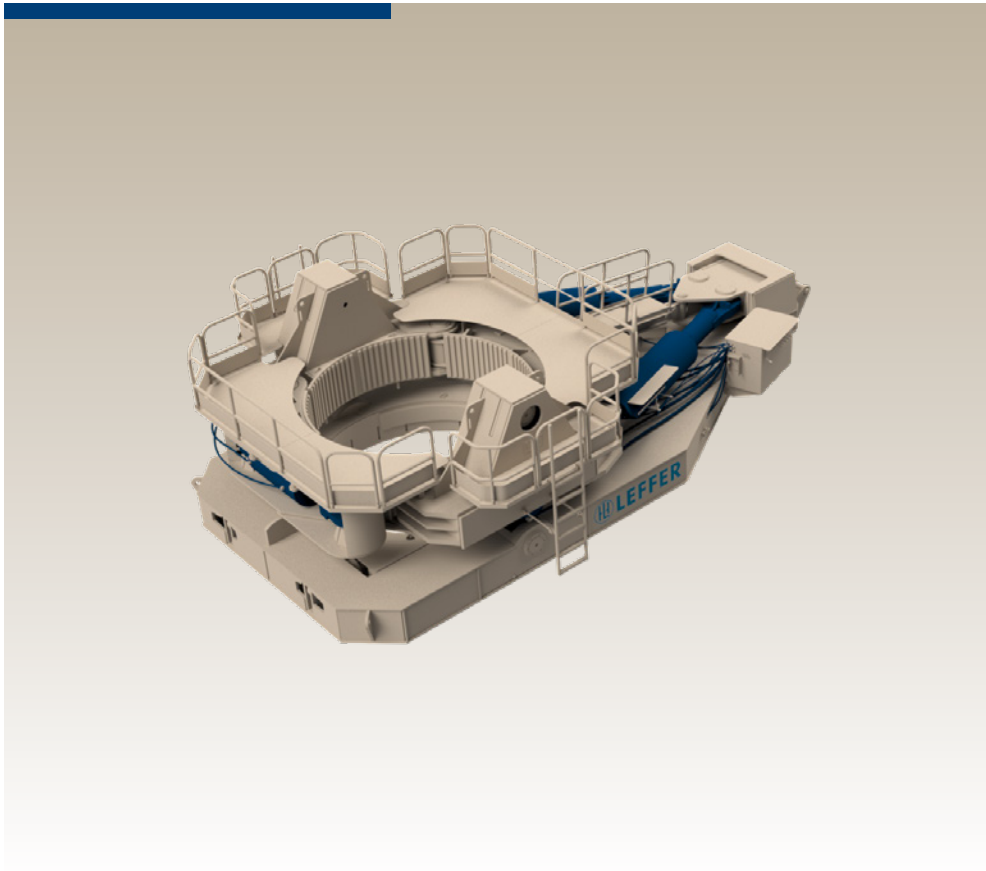
INFO

Grab Drilling	Casing Oscillators in mm	Lifting force in N	Torque in kNm
VRM 1300	620–1300	1530	1660
VRM 1500	750–1500	2050	2900
VRM 2000	1180–2000	2650	4110
VRM 2200	1500–2200	2650	4520
VRM 2500	1800–2500	5150	9500
VRM 3000	2000–3000	9000	13500
VRM 3300	2500–3300	10860/11780	19900/23000
VRM 3500	2500–3500	10860	22000
VRM 3800	2800–3800	8310/8310/11780	15800/22000/31000

Casing Oscillators for cable excavator attachment

Hydraulic oscillators are used when the torque of conventional drilling drives is insufficient or the use of rotary drilling rigs is uneconomical, for example in the case of large drilling depths or high casing friction due to the subsoil. Furthermore, it is used when the pull-back force of the carrier is not sufficient for pulling the casings. Our experience from decades of cooperation with contractors in the field of special civil engineering has always been incorporated into the improvement and further development of our machines. LEFFER stands for solid machines and profitable construction site operations.

CASING OSCILLATOR VRM3300T2300



Hydraulic Power Packs

To increase the performance and improve the flexibility of our casing oscillators and casing rotators, separate hydraulic power packs adapted to our machines can be used. We attach great importance to components from renowned manufacturers in order to be able to guarantee trouble-free operation and the best possible availability of spare parts via the international dealer network. To ensure continuous operation under extreme loads, the cooling capacity of the power units has been optimized. Exhaust emission standards for the drive engines are met, as are the lowest possible noise emissions for work in noise-sensitive areas. To ensure economically optimal service interventions, all components are arranged according to the best possible accessibility.

HYDRAULIC POWER PACK PP1000-570 TIER4F

Hydraulic Power Pack	PP 205/75	PP 400/270	PP 800/420	PP 1000/570	PP1200/630
Engine	Hatz 4H50TICD	Caterpillar C7 ACERT	Caterpillar C13 ACERT	Caterpillar C18 ACERT	Caterpillar C18 ACERT
Power in kW (PS)	55 (75)	201 (270)	313 (420)	420 (570)	463 (630)
Pump flow rate in l/min	2 x 125 (1 x 250)	2 x 200	2 x 400/ 2 x 106	2 x 520	2 x 600
Use	VRM 1000–VRM 1200/ VRM 100 KL–VRM 120 KL	VRM 1500–VRM 2200/ VRM 150 KL–VRM 250 KL	VRM 2500– VRM 3000	VRM 3000– VRM 3800	VRM 3500– VRM 3800

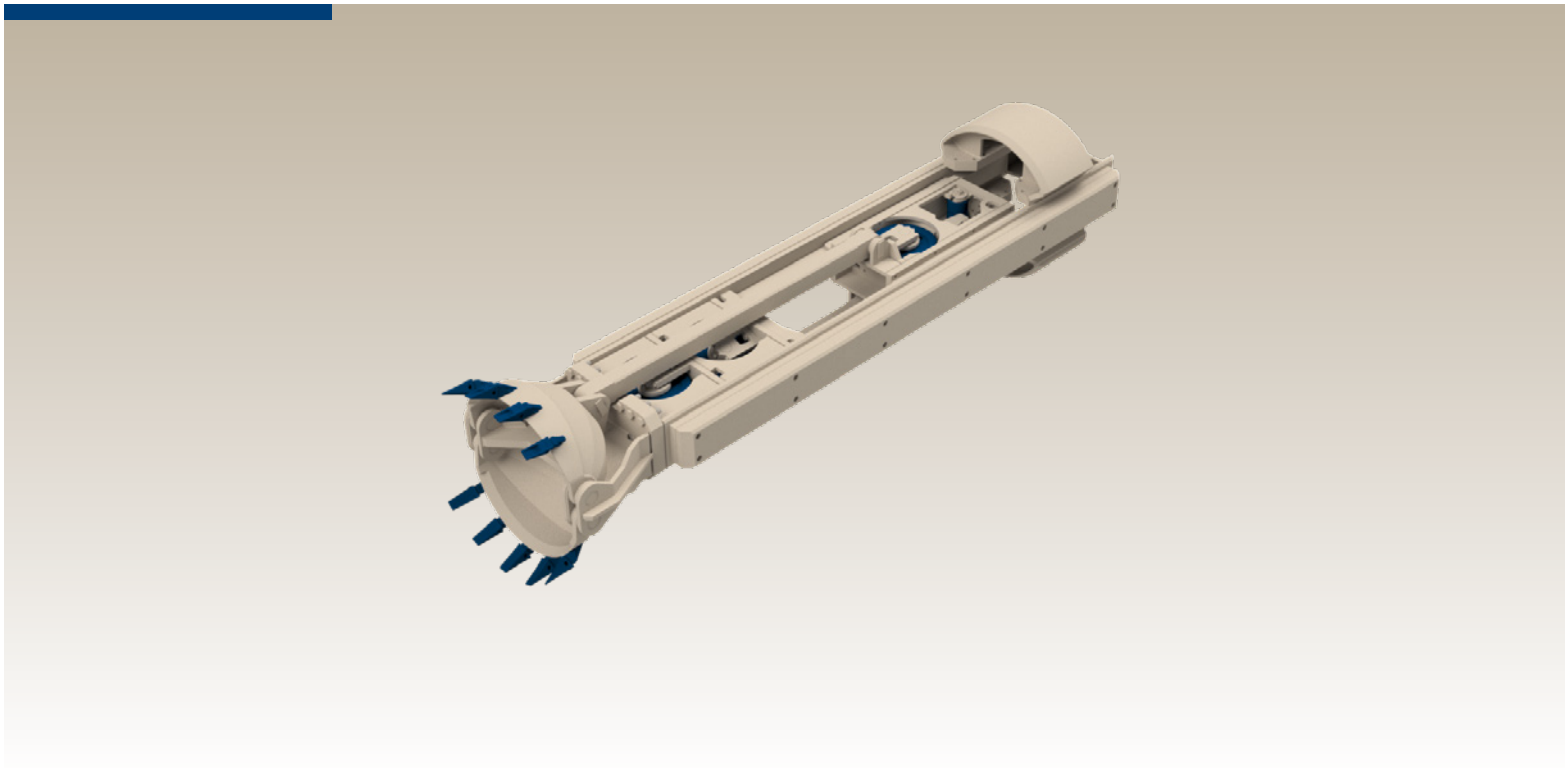
Single-rope and double-rope spherical grabs and pulley grabs

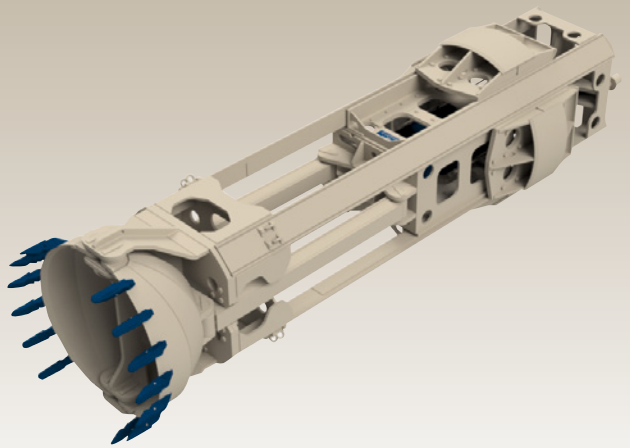
The drilling and construction progress in projects depend not only on the machines used, but also quite significantly on reliable tools. For cased pile foundations, a robust drilling grab is essential. LEFFER has developed three robust digging grabs with high impact force for sinking boreholes in rocky, rolling soils and for working under water superimposed loads. The single-rope pulley grab is particularly characterized by its oil-filled bearings, which remain maintenance-free over the entire service life.

The design of the two-rope grab is similar, but does without a pawl carrier and release crown. Lifting and lowering of the grab is controlled by the first rope, the so-called drive rope. The second rope (closing rope) is used for opening and closing. With this design, the operator can also open and close the grab several times during the drilling process – for example, to loosen the ground or to empty the grab in very cohesive soil. If very large closing forces are required, the use of spherical grabs is recommended.

Due to its high intrinsic mass and additional teeth on the spherical shells, the spherical grab can dig into the ground during the closing process and exert very high splitting forces on the ground to be loosened.

SPHERICAL GRAB LKG1 145 CAT



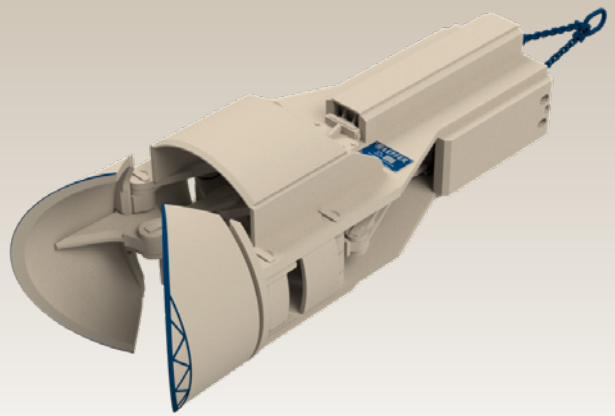


HYDRAULIC SPHERICAL GRAB

Hydraulic spherical grabs

For partially or uncased drills and/or when vibration-free drilling is required, the hydraulic spherical grab is used. Several hydraulic cylinders in the body of the grab provide high closing torques. In combination with its large dead weight, this ensures a constantly good filling level of the grab buckets. The hydraulic rotary drive allows controlled rotation of the drilling grab around the vertical axis by ± 100°. In order to detect and counteract deviations from the vertical axis, all LEFFER hydraulic grabs are equipped with a 2-axis inclinometer. A simultaneous display in the operator's cab of the carrier provides additional support during calibration – especially for uncased drills.

Grab	(Hydraulic) spherical grab	Single-/Double-rope spherical grab	Single-/Double-rope scissor grab
Drilling diameter in mm	**880–3660**	**600–3000**	**470–2000**



SCISSOR GRAB L1360 ZS

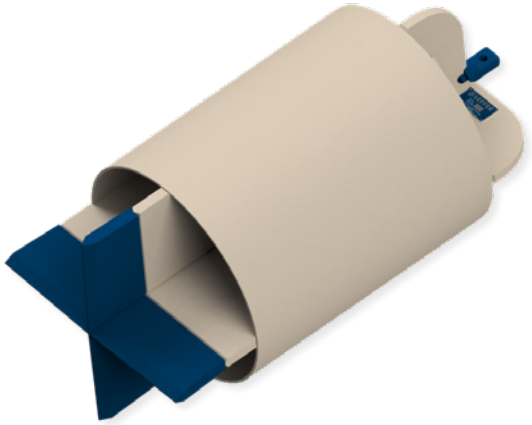
Single-/Double-rope scissor grabs

LEFFER's scissor grab is a top-of-the-line universal drilling grab that has proven itself under a wide variety of requirements. Instead of using rope pulleys, this grab closes with a scissor system that operates with very little wear. A pre-tensioned spring is used to open the buckets and also ensures that adhering drilling material is ejected.

The shape of the grab body has been designed so that high fall speeds can be achieved even when drilling in water. Additional side pockets on the lower part of the grab increase the filling volume of the shovels in soft soils.

Chisel

Chisels are used when drilling in very hard soils or rock and for piercing through drilling obstacles. They can also be used in cohesive soils for pre-cutting in order to be able to penetrate better with a piercing tool afterwards. The cutting edges of all LEFFER chisels are made of high-strength steel (Hardox 450). This guarantees high wear resistance in combination with high cold bending strength.



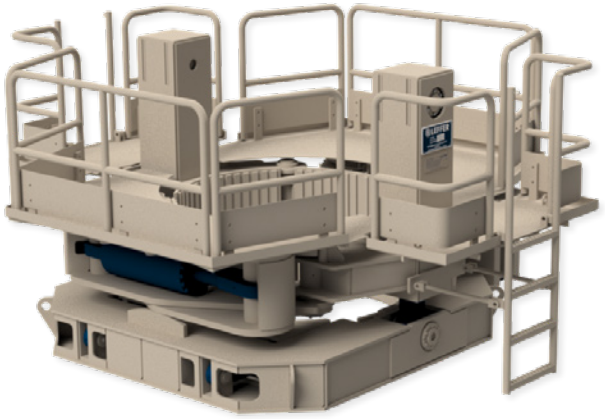
KELLY DRILLING

Casing machines type KL for combined use rotary drilling rigs

To support the rotary drilling rig, LEFFER offers casing oscillators in short design (type KL). In general, the LEFFER casing oscillators have been designed according to special empirical values:

- The five-link clamp, which encloses the casing, prevents plastic damage to the pipe circumference and ensures efficient and force-locked transmission of torques and vertical forces.
- Our casing machines can be converted to smaller diameters in a matter of minutes thanks to our reduction inserts.
- The torque-resistant attachment to the excavator guarantees the transmission of the full oscillating movement. This allows rotation of the pipe string up to 25° per oscillating movement.
- The low headroom on the excavator side allows a 360° movement of the excavator upper carriage even when coupled.
- LEFFER casing machines can be used to case and drill at the same time. It is controlled either via the on-board hydraulics of the carrier device or via a LEFFER-own unit.

Casing machines	Drilling diameter in mm	Lifting force in N	Torque in kNm
VRM 100 KL	500–1000	920	800
VRM 118 KL	620–1180	1200	1250
VRM 120 KL	620–1200	1200	1250
VRM 130 KL	750–1300	1700	1600
VRM 150 KL	750–1500	1700	1850
VRM 180 KL	1000–1800	2250	2500
VRM 200 KL	1200–2000	2250	2700
VRM 220 KL	1500–2200	2250	2900
VRM 250 KL	1800–2500	2950	3250



Casing pulling machine

When completing piles in the diameter range 600 to 1500 mm, the use of a a rotary drilling rig is often inefficient. For the installation of the reinforcement, the concreting pipes and the subsequent concreting process crane work is required, for which the drilling rig is equipped with a auxiliary winch.

To ensure safe retraction of the casings, very large drilling rigs are used uneconomically, deliberately avoiding the use of a casing machine. For larger construction projects, it is therefore more economical to use a drilling rig exclusively for the production of the cased borehole and a crane with a compact LEFFER casing pulling machine for the completion of the pile.

Electric automatic rotary adapter

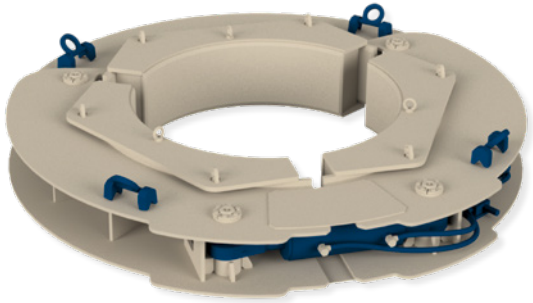
Drilling rigs of the latest generation deliver very high torques, which increasingly means that cased holes can be drilled even to greater depths. For this purpose, longer and longer casings are used, where the rotary adapter must be locked at great heights. It is also sometimes necessary to „untwist“ the casing by pulling it back, which makes it necessary to lock the adapter while the casing is still being brought down.

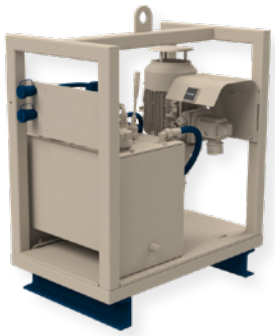
The manual locking and unlocking of the adapter with the casing is very time-consuming – it also involves risks for the personnel on the construction site. Our solution is the E-ADT: Electromechanically operated and controllable via a radio hand-held transmitter, it eliminates the need for manual locking and unlocking. Operating functions and operating states are signaled and monitored via the hand-held transmitter. The standard scope of delivery includes 2 rechargeable batteries with a long service life to completely avoid downtimes.

The LEFFER E-ADT enables safe working with considerable time savings while minimizing downtimes.

Hydraulic retaining clamps

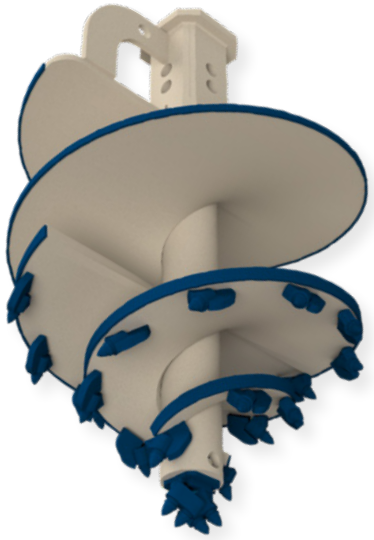
Retaining clamps are used in the rotary drilling process to prevent the drill string from slipping when the casing is pulled after uncoupling from the adapter. The hydraulic retaining clamp SPA can be supplied via a carrier unit or via a separate hydraulic power pack (E-PP5). The clamping cylinder with load holding valve ensures that the casing string is held securely.





RETAINING CLAMP AND AGGREGAT E-PP5

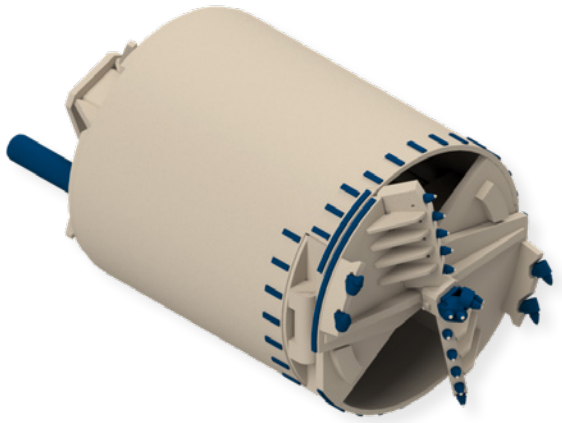
UP TO 30 M DRILLING DEPTH



Augers

Augers are used for loosening and conveying dry ground or rock. For drilling in dry ground, LEFFER offers a wide range for dry drilling variants for optimal processing of the subsoil.

The number of cutting edges, the pitch of the auger helix and the type and number of teeth or bits vary depending on the soil conditions. For better guidance of the auger, the augers are additionally equipped with calibration bits. Wear strips reduce the abrasion on tooth holders and auger flights. We recommend our types BS and BS-1 for soft soil layers and BSF, BSFoP, BSP and BSP-2 for hard soil layers.



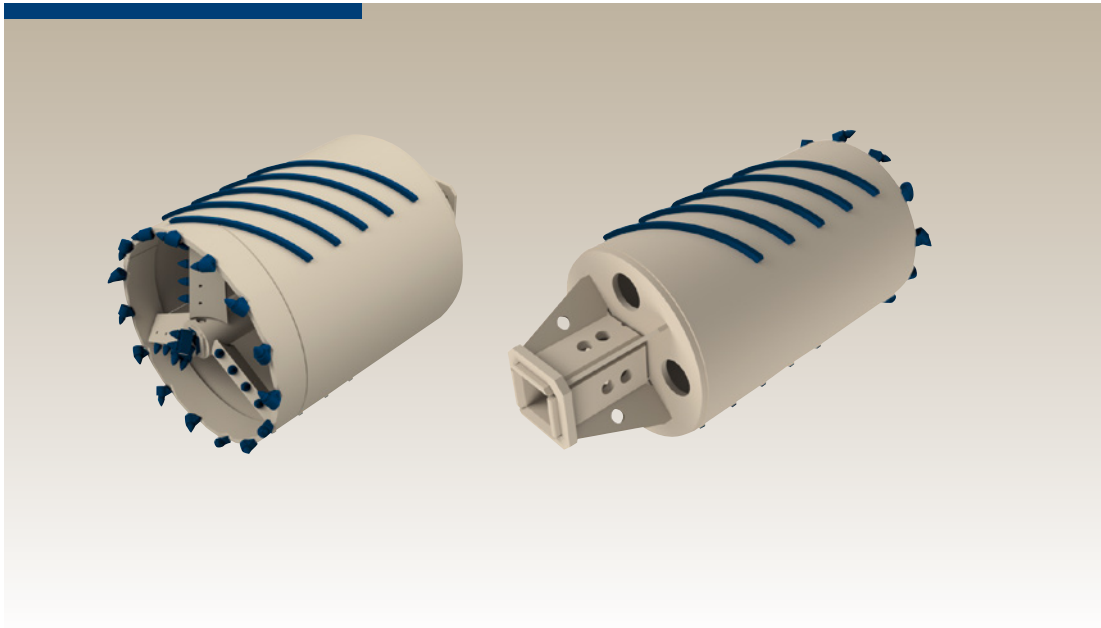
Drilling buckets

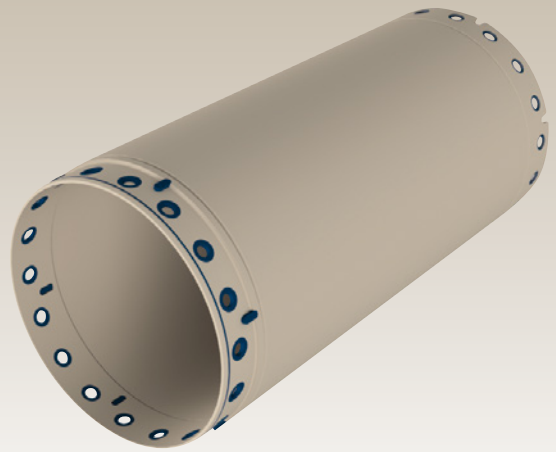
The drilling bucket is used when drilling in water, supporting liquid or very soft, cohesive soils. It also ensures a flat cleared borehole bottom. The revolving segment can be opened by turning it to the right (locking direction of the kelly bar) to feed material into the drilling bucket. The filled drilling bucket is closed by turning it to the left (unlocking direction of the kelly bar). For optimal processing of different drilling grounds, the drill bucket can be equipped with different cutting edges, pilot drills, toothed bits or chisels on the underside. For cleaning the bottom of the borehole, a bucket without pilot bit, but with reamer bar, is suitable. Drilling buckets with single-bladed revolving segment with flat teeth are used in soft to semi-solid cohesive soils as well as non-cohesive soils up to dense bedding. For larger diameters (from approx. 1.5 m) and for uncased boreholes, the drilling bucket should be equipped with two cutting edges. To avoid suction (piston effect) while pulling the drilling bucket, LEFFER drilling buckets are equipped with a flow channel. In the case of smaller versions, the bucket is closed by means of a rotary heart locking mechanism; in the case of large diameters, by means of a hook-locking mechanism. For soft soils we recommend our types BE and BE-2, for hard soils the types BEF, BEF-2 and for clearing the bore bottom the type BER.

Core barrels

Core barrels are used to cut an annular space in hard rock, boulders or concrete. In order to break the upcoming material with high tension, torque and feed force are concentrated on a relatively narrow ring. Depending on the strength of the rock and the drill diameter, the toothing of the core barrel can be adjusted: For concrete and rock with unconfined compressive strengths up to approx. 100 MPa, core barrels with welded-on carbide pins or studs are used. Alternatively, core barrels with round shank bits are suitable for this purpose. For drilling in compact rock with unconfined compressive strengths from 100 MPa to over 250 MPa, LEFFER core barrels with roller bits have proven to be the best choice.

CROSS-CUTTER AND CORE BARREL





CASING

ACCES-SORIES GRAB, KELLY, DOUBLE ROTARY DRILLING

Casings

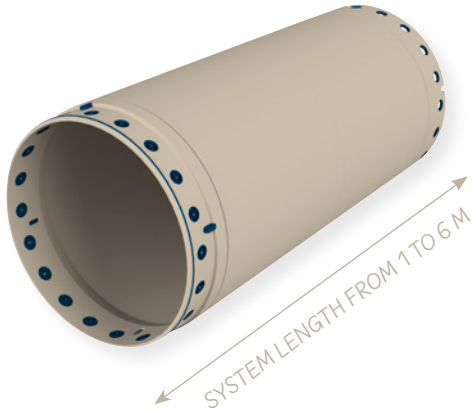
For cased boreholes, LEFFER offers double-walled casings in different useful lengths. Our low manufacturing tolerance for diameter, roundness and straightness pays off on the construction site: Precisely fitting casing joints ensure fast, straight placement, bolting and optimum force transmission. The casing joints, consisting of a female and male part, are secured with radially arranged conical bolts. The inside and outside of the casings are smooth throughout their entire length, which prevents the reinforcement cage or drilling tool from getting stuck when pulling the casing. LEFFER casings have also proven themselves many times over in cased kelly drilling through water-bearing soil layers or in drilling with water ballast. To prevent water and fines from entering the casing, both the cone bolts and the casing joints can be sealed with additional sealing rings.

Intermediate and oversizes available on request! **ALL** LEFFER drilling tools and machines are available in the individual dimensions of the drilling diameter!

INFO

HD Casings

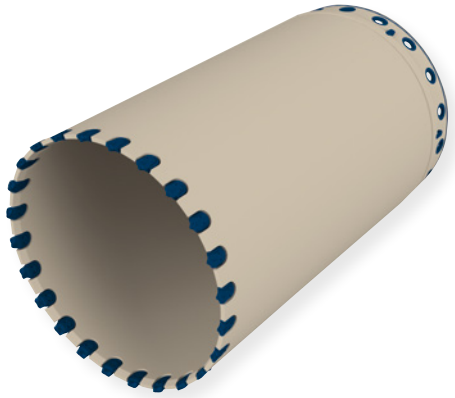
For cased boreholes in greater depths or with diameters greater than 1500 mm, LEFFER HD has casings in its portfolio that meet the high requirements for particularly large drilling depths. Reinforced casing joints with backlash-free, conical bolts and larger wall thicknesses reduce wear on the casing joints and also ensure reliable transmission of vertical forces and torques.

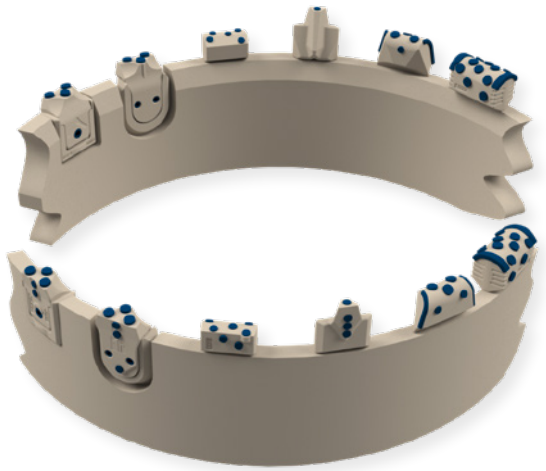


Casings	HD Casings
620/540	1500/1400
750/670	1800/1700
800/720	2000/1880
880/800	2200/2080
900/820	2500/2380
1000/920	2800/2640
1200/1120	3000/2840
1300/1220	3200/3040
1500/1420	3500/3340

Cutting shoes

Decades of practical experience are incorporated in the design and continuous further development of our cutting crowns. For continuous drilling, the tooth system, i.e. tooth shape and number, contact pressure and the corresponding free cut must be correctly selected. The geology of the ground determines the design of the cutting teeth. Taking these variables into account, LEFFER offers individual cutting crown types for a wide range of requirements.

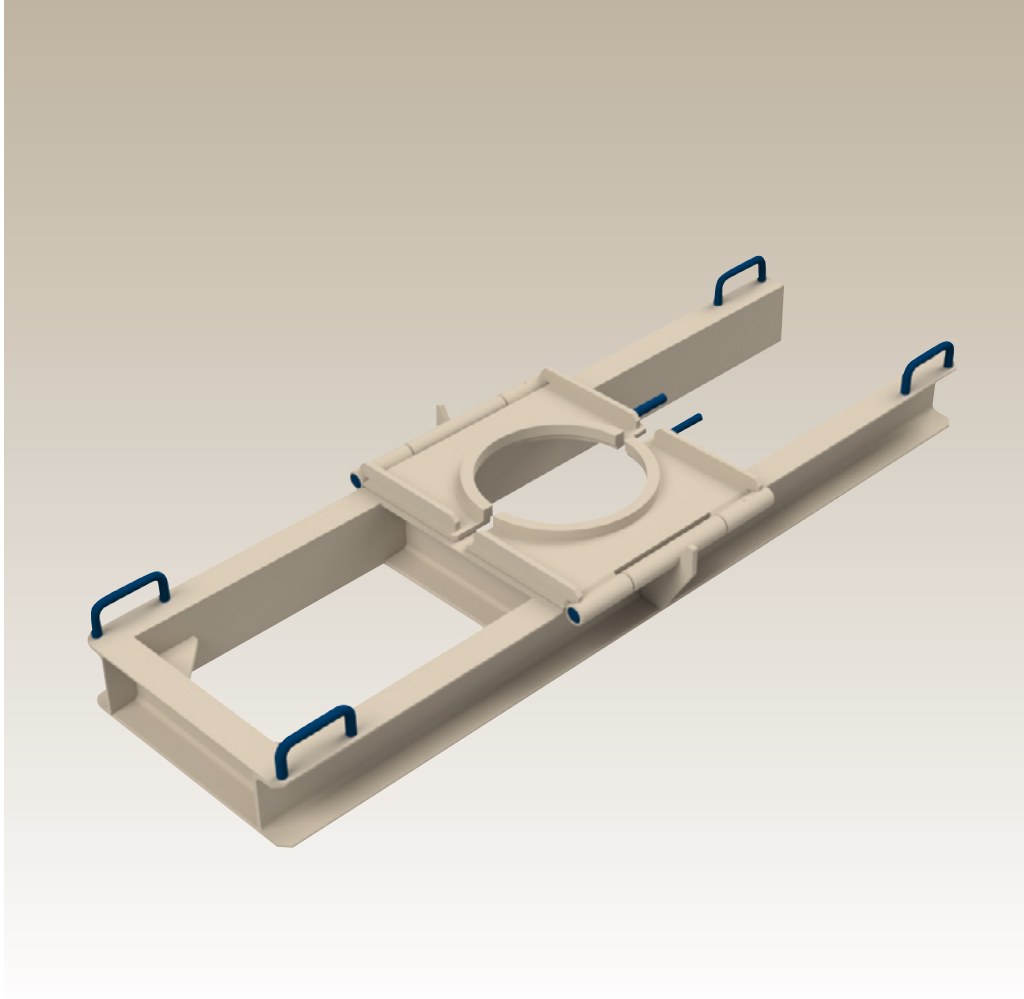




Tremie pipes and accessories

When concreting there is a risk of the concrete segregating in the downpipe. To ensure a safe concreting process, LEFFER has developed a special HD concreting tremie pipe system. The tremie pipe joints we have designed can resist very high tensile forces, which prevents the concreting pipe string from tearing off, even in case of very long pipe strings. The high-precision, machine-manufactured parts have a high degree of tightness and are therefore also ideally suited for applications in the field of air-lifting technology.

The reduction of individual parts (in contrast to flanged pipes) reduces wear at the joints. Easy to handle, maintain and (dis)assemble, LEFFER tremie pipes NW 150, 200, 250 and 300 save valuable time and thus costs at the construction site.



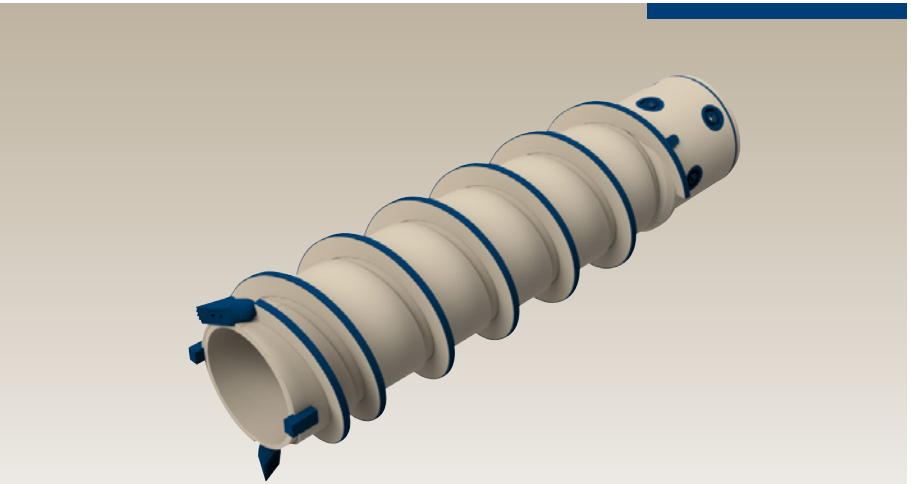
RETAINING CLAMP FOR TREMIE PIPES

FULL DISPLACE-MENT DRILLING

Partial displacer

The partial displacer or cylindrical displacer is considered a variant of the full displacer.

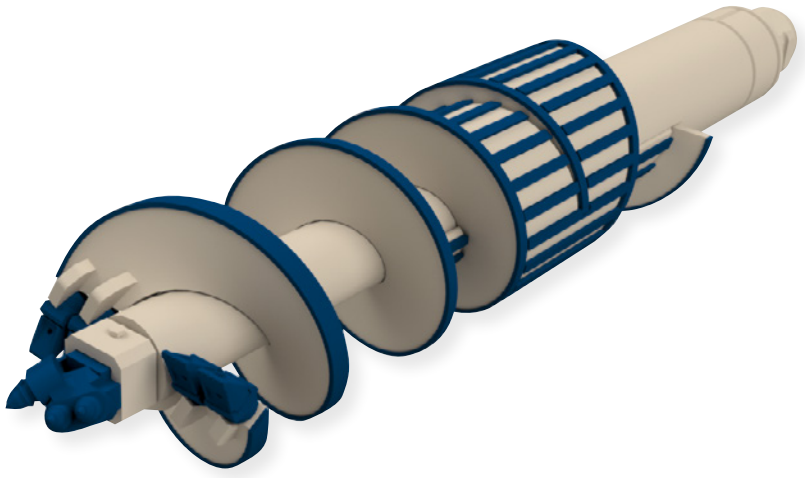
PARTIAL DISPLACER F-TV



Full displacement drilling

The LEFFER full displacement auger types VV 400, VV 510 and VV 600 enable a cost-effective, environmentally friendly and safe production of in-situ concrete piles in a vibration-free drilling process. A bottom plate at the drill tip of the full displacement auger ensures that the ground to be worked is fully displaced and compacted at the same time. The actual drilling of the borehole is completely eliminated – a dry bore-hole is produced without excavating the ground. This low-noise and vibration-free drilling method is particularly suitable when the existing water balance must not be disturbed, where soils are contaminated and soil replacement is out of the question, or for construction work where nearby buildings must not be affected by shocks or vibrations.

In this drilling method, the borehole is drilled to final depth in one operation using the single-pass method. Since the borehole wall is always supported, the risk of ground failure is minimized. During the concreting process, the displacer can be retracted in a clockwise direction. This creates a spiral embossment of the borehole wall, which significantly improves the load-bearing capacity of the pile. With the patented LEFFER pipe connection system, full displacement bored piles can be produced with an inclination of up to 4:1 and torques of up to 450 kNm can be transmitted.

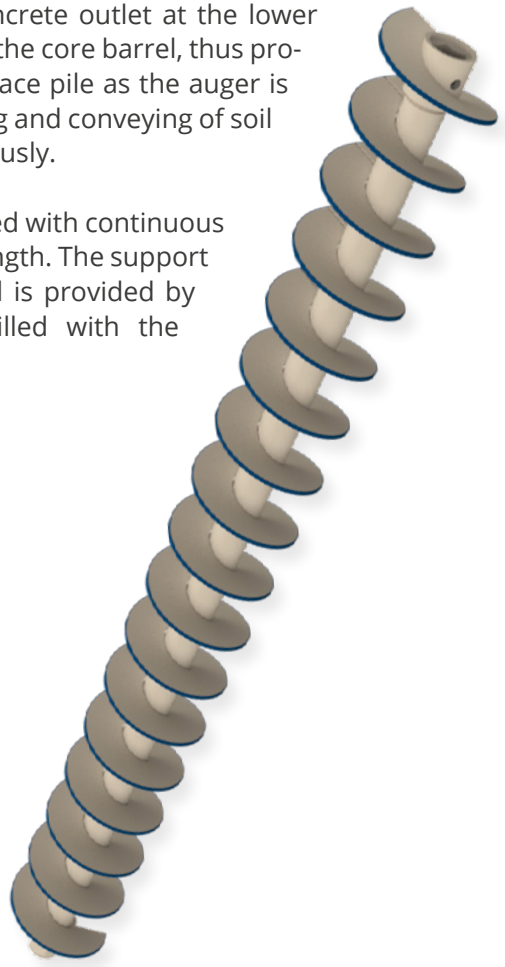


CONTINUOUS FLIGHT AUGER DRILLING

Continuous flight auger drilling

In the SOB continuous flight auger drilling method, the auger is rotated into the ground to its final depth in a single operation. The concrete is conveyed to the concrete outlet at the lower end of the auger via the core barrel, thus producing the cast-in-place pile as the auger is pulled. The loosening and conveying of soil takes place continuously.

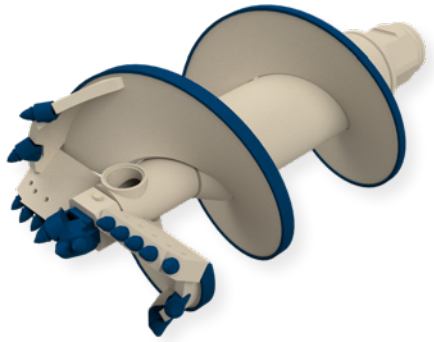
The auger is equipped with continuous flights over its full length. The support of the borehole wall is provided by the auger flights filled with the drilled material.



SOB augers

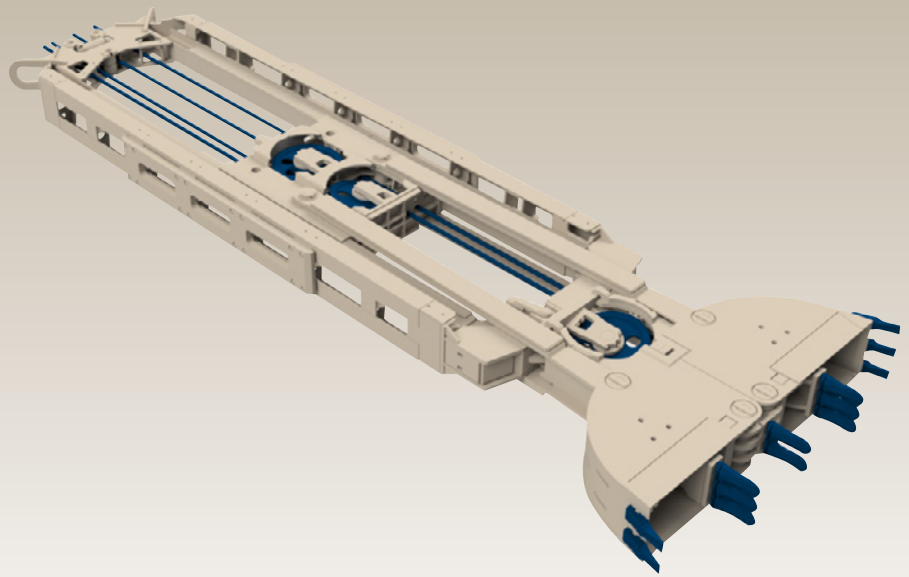
The SOB method has been an integral part of special civil engineering for years; nevertheless, many of the augers available on the market cannot withstand the required torques and tensile forces. LEFFER SOB augers are designed for torques of up to 470 kNm and are available in 600 mm, 900 mm and 1200 mm diameters.

Pulling forces of up to 900 kN can be accommodated. This ensures safe pull-back during concreting and SOB pile foundations of large diameters and at depths of up to 30 m.



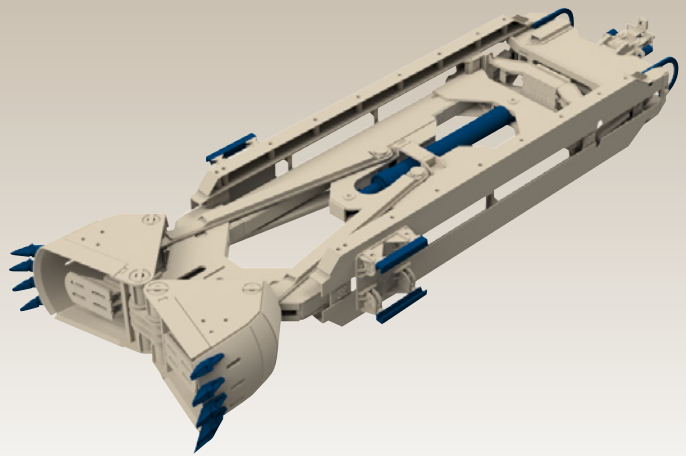
CONSTRUCTION
OF DIAPHRAGM WALLS

DIAPHRAGM WALL GRAB 3,4-6-600-2,2



Diaphragm wall grab

LEFFER diaphragm wall grabs are available with buckets in square or semi-circular profile. All rope and guide pulleys have adequately dimensioned, maintenance-free, oil-filled bearings. The replacements of shovels and teeth can be done on site to save time. LEFFER supplies diaphragm wall grabs and related stop-end-elements for diaphragm wall widths in the sizes 600 mm, 800 mm, 1000 mm, 1200 mm and 1500 mm.



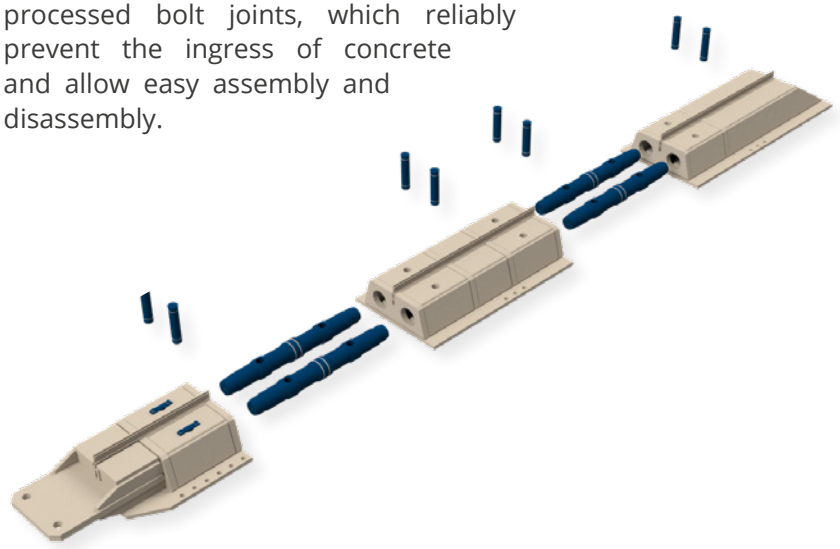
HYDRAULIC DIAPHRAGM WALL GRAB HSWG 600-1200

Hydraulic diaphragm wall grab

Equipped with a permanent measuring and control system, any deviation from a vertical excavation direction can be immediately detected and corrected with the hydraulic diaphragm wall grab HSWG. This ensures high accuracy even at greater depths (> 50 m) and perfects the production of diaphragm walls with grabs. The hydraulic diaphragm wall grab operates without noise and vibration and is much easier to operate. The HSWG type is equipped with verticality measurement and control system including measurement data recording (patents in many countries). The HSWG XY 360° is additionally equipped with a torsion control system.

Stop-end-elements and accessories

In the production of cast-in-situ concrete diaphragm walls, the use of the correct stop-end-elements plays an enormously important role, especially with regard to watertightness. Especially for wide diaphragms (B 800 mm and larger), the use of stop-end-elements is mandatory, as otherwise the reinforced diaphragm length is greatly reduced (e.g. when using stop-end-pipes). Water tightness between the individual elements is ensured by installing a special rubber seal. LEFFER stop-end-elements are connected with mechanically processed bolt joints, which reliably prevent the ingress of concrete and allow easy assembly and disassembly.



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