

SOLUTIONS FOR THE GEO THERMAL INDUSTRY

Peak performance for renewable energy production



With GEO DYNAMICS we have established a new brand exclusively dedicated to the strongly growing renewable energy and water industries. Our specific focus lies on the development of state-of-the-art technologies for geothermal applications. Additional hydraulics for higher flow rates and optimized efficiencies, innovative protector systems and a completely new, leading edge family of ESP motors and drives are being developed. Our power of innovation combined with our industry leading factory and field service makes GEO DYNAMICS your preferred partner for geothermal and water projects. Come and experience the future today.



THE RIGHT SELECTION FOR GEOTHERMAL SOLUTIONS:

Pumping systems from GEO DYNAMICS

GEO DYNAMICS supports the megatrend towards drastic reductions of greenhouse gas emissions which are linked to climate change. Therefore, we are focusing our extensive knowledge and experience in artificial lift systems on the development of sustainable submersible pumps – for the lifting of geothermal energy from deep lying reservoirs.

Geothermal power and heat systems are considered the lowest cost option because they use the earth's own internal renewable heat to generate energy. Moreover, they are highly efficient and they provide this energy steadily and independent of wind and sun – 365/7/24.

Turning ideas into performance

Even though the principles are much alike, geothermal pumping systems are different from similar pumping systems in the oil industry: the fluid temperatures can be significantly higher, the flow rates and required motor ratings are excessively bigger and the fluids contain aggressive salts and abrasive scaling.

Most manufacturers are fighting with these specifications. Not GEO DYNAMICS: We are mastering them. Because our engineers use an open-mind approach and integrate successful developments from other industries, like power generation, into true workhorses for artificial lift systems in geothermal applications.

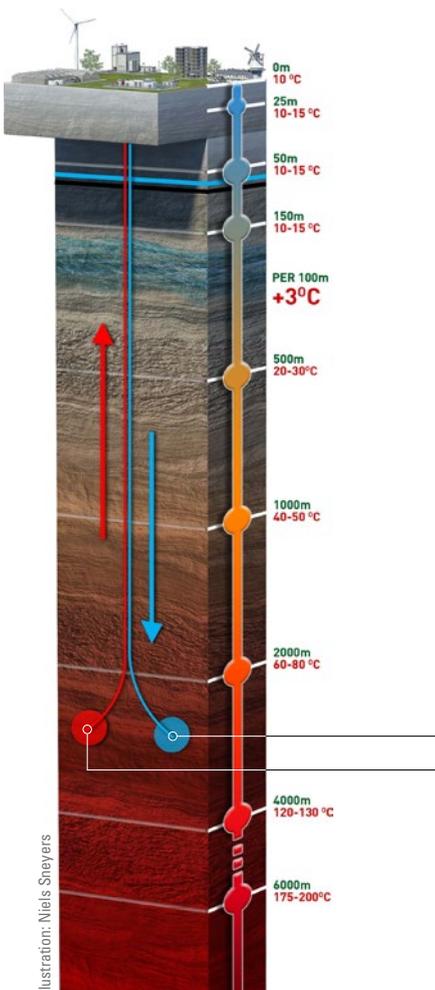
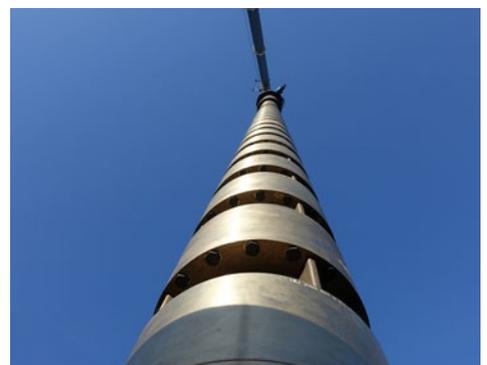
GEO DYNAMICS HPS Solution

GEO DYNAMICS ESP Solution

We see it this way: a great deal is possible with an innovative concept, integrating proven technologies and a strong inner drive.



Of course, our solutions are inspired by our experience and knowledge from the oil industry. But we continuously strive, in close cooperation with our clients, to develop systems which provide ever convincing performance in this tough and challenging environment. They deliver significantly higher system efficiency and a sustainable service life. Significant company resources are being invested in research and development projects to design and build new technological concepts for protector and motor systems.



WE ARE SOLUTION-DRIVEN PEOPLE

Our promise

From individual components to best-in-class turnkey systems: OIL DYNAMICS offers a full range of products and services. As technology leaders in artificial lift systems and other up-stream pumping solutions, we provide complete system solutions that are tailor-made to your requirements. Based on our many years of combined experience, we know the industry's heartbeat: We know what you need. We know what will meet your requirements. You will get what you expect: German quality culture and a perfect partner that will ease your path to success.



Who we are

OIL DYNAMICS is a highly flexible company founded by a group of experienced professionals. We are focused on engineering, manufacturing, testing, installing and servicing of premium products for the geothermal industry.



Where we are

We are located in Heidelberg, Metropolitan Region Rhine-Neckar, one of Germany's most attractive regions and close to the Frankfurt International Airport. Our factory is located in Hockenheim, just a few kilometers away from Heidelberg. It was designed with specific focus on the requirements of artificial lift applications and hence offers a unique range of testing facilities for all our products. All our testing facilities meet or exceed the relevant industry standards.

Your success is our success

A true partner: Our team works in close and trustful relationships with our customers and suppliers – in order to successfully develop long-term relations and solutions that fit your individual needs.

ISO certifications

OIL DYNAMICS has been certified according to the latest standards: ISO 9001:2015 (Quality Management System) and ISO 14001:2015 (Environmental Management System).



Going the extra mile: 100% in-house testing

We are proud to provide a unique range of testing services to our customers: from a single equipment test device within the manufacturing process as quality control function up to a full string test of the whole pumping system. We have one of the finest testing facilities in the world – and therefore the capability to run your system as designed. Pumping unit, drives and controls are tested as complete system to insure full system integrity in the field. This guarantees a reliable and trouble-free start from day one!

Knowledge is the most valuable asset: The OIL DYNAMICS Academy

We are regularly qualifying and training our staff on products, applications and operation and pass on our knowledge – with technical classes and hands-on training in our OIL DYNAMICS Academy.



Solution-driven people

→ **Your company's name is OIL DYNAMICS. But in recent times, you are concentrating also on water and the geothermal sector. How does that fit?**

“Excellent. Of course, the oil and gas sector is where we come from, and it will stay our core business for the years to come. But the lifting of water and geothermal energy from deep reservoirs becomes more and more important in our today's world. Renewable energies and water supply will be key challenges for growing populations and safeguarding the world climate.

With our expertise and know-how in the pumping sector, we are predestined to find new solutions for these fields. Thanks to our experts and the close collaboration with our customers and renowned universities – which is a key asset of our company – we are continuously expanding our knowledge in these important sectors.

So, our business partners will get perfectly fitting and ever improving turnkey-solution that meet their requirements. The past brings forth the future!”

Jürgen Schulz
Managing Director



→ **But you are a new player in this market. What do you do different?**

“Well, the market itself is new. So, everybody is kind of a new player here. This means the market is open to anybody who is willing to put in the effort – and, of course, has the necessary expertise. We do. And that includes focused R&D projects to develop this technology further. We don't believe in a 'one size fits all' approach. Instead, we focus on providing customized solutions to ensure the long-term profitability of our customers.

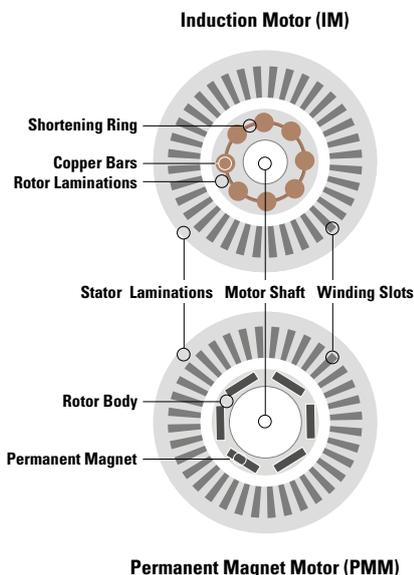
BOOST YOUR PRODUCTIVITY

Our built-to-perform pumping systems for geothermal applications

We make our ESP systems outstanding because we know they have to perform in hostile environments and under the toughest operating conditions. GEO DYNAMICS continuously strives to improve the design of each system component. Several R&D projects are under way with the support of state and federal funding to keep our products at the leading edge of the technological development. The result? 100% reliable, best-in-class systems 'Made in Germany', that ease your work and help you to produce more energy with highest efficiency. They come with a legendary service to rely on.

Turnkey is the key to your success

An ESP is the heart of your geothermal plant. For this reason, we care with our very heart beat to provide you the best. As experts for innovative artificial lift systems OIL DYNAMICS and GEO DYNAMICS provide powerful answers: we combine best-in-class technologies to build the perfect, tailor-made system that meets your requirements. We design, engineer, package, test and supply the complete systems to pump your fluid to the surface and back into the ground.



Hydraulics

Flow rates in geothermal applications are demanding. Therefore, our ESP and injections systems come with a variety of specific speed designs that perfectly match your requirements in terms of pressure and production.

Efficiency

Since ESPs in geothermal plants are usually large power consumers, efficiency of the entire system becomes of utmost importance. Geometric precision and highest surface quality are the decisive factor for obtaining the best results. For this reason, we use a combination of 3D printing and standard casting technology to create our pump stages.

Pump materials

Geothermal fluids are not only hot, they also carry a large variety of dissolved minerals and various gases that require demanding answers to the construction materials of the pumping systems. GEO DYNAMICS has the answer and offers a wide selection of materials starting from high nickel iron over Ni Al Bronze all the way to duplex stainless steel.

Motor systems

GEO DYNAMICS offers a large selection of Induction- (IM) and Permanent Magnet Motors (PMM). The PMM operates with a high constant torque at the entire speed range, offers a higher motor efficiency with a resulting lower motor operating temperature compared to the IM. Based on OIL DYNAMICS unique Modular Motor System, both motor types allow for standard frame sizes to be combined into large drive systems to meet the power requirements of the individual ESP configuration.

System design

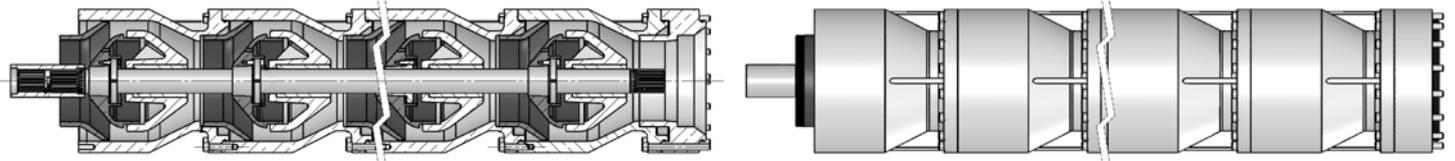
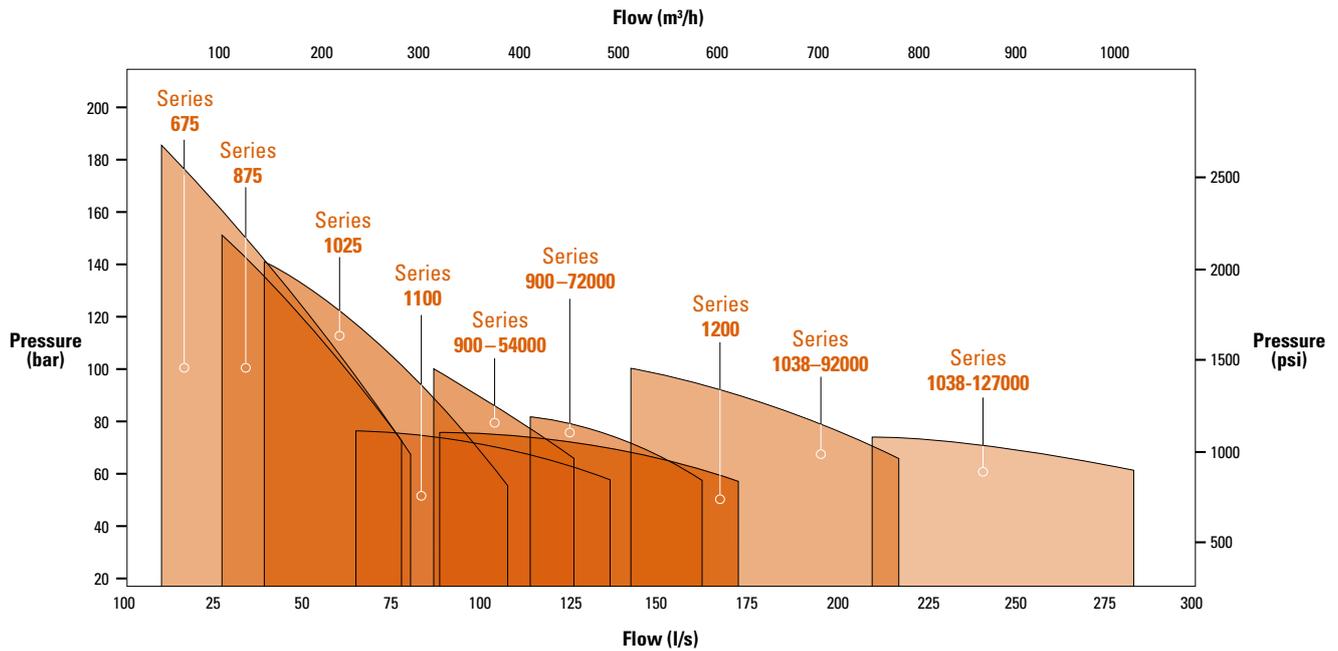
Each individual ESP and Injection System will be tailored by our powerful design software to match reservoir production requirements and your specific lift and fluid needs. Surface components are supplied as indoor configurations for existing buildings or containerized stand-alone units for more remote locations. GEO DYNAMICS supplies complete packaged systems including well heads, production tubing and other accessories.

TYPICAL ESP OPERATING DATA – GEOTHERMAL

Pump Series	Flow Range (m ³ /hr)		Shaft Power (HP)		Min. Casing Size (Inch)
	Min.	Max.	Standard	High Strength	
675	29	286	637	1019	8-5/8"
875	85	274	760	1216	10-3/4"
900–54000	307	454	1500	2500	10-3/4"
900–72000	409	591	1500	2500	10-3/4"
1025	132	390	800	1250	13-3/8"
1038–92000	519	779	2200	2800	13-3/8"
1038–127000	772	1022	2200	2800	13-3/8"
1100	238	497	2000	2500	13-3/8"
1200	318	616	2000	2500	16"

Modifications are available upon request

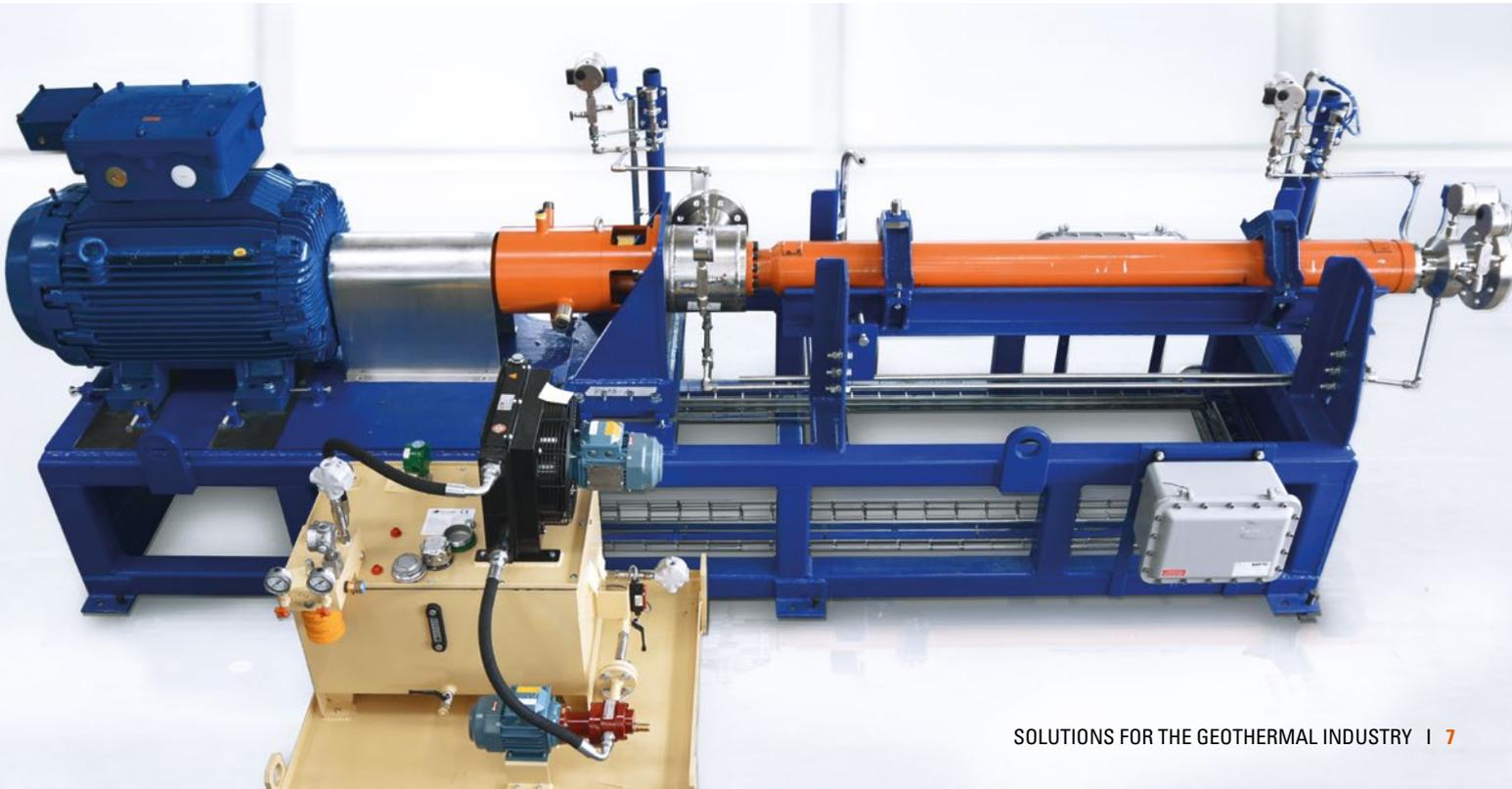
Performance Envelope at 3,500 rpm (60 Hz)



Injection pumps

All our ESP hydraulics are also available as horizontal surface pumps for re-injection service. These pumps are built to individual specifications to completely match the flow regime of the ESP production pump. Hydraulic stages are

normally interchangeable with the corresponding ESP thus making maintenance easy and less costly. Offering field service for both systems, the ESP and the injection pump will come from the same provider.



IMPROVE YOUR EFFICIENCY

The unique *ElektroMotion Technology™*



For the most demanding operating conditions: The *ElektroMotion Technology™* stands for an outstanding series of electrical power and control products that significantly improve the efficiency of your pumping systems. With variable frequency drives, switchboards, pump control systems and remote monitoring solutions, tailored for your special process conditions, *ElektroMotion Technology™* will enhance the long-term functionality, reliability and efficiency of your system.

ElektroMotion is an innovative series of unique state-of-the-art electrical systems.

They can be combined to satisfy the requirements of any demanding application. All system components are tested under load and for full functionality in our facility before delivered to the field. All *ElektroMotion* products can be provided for indoor and the most demanding outdoor service including desert and offshore conditions.

ElektroMotion smartDRIVE Variable Frequency Drives (VFD)

The *ElektroMotion smartDRIVE* is OIL DYNAMICS' answer to current and future challenges in variable speed pumping applications. It combines that latest state-of-the-art high quality industrial products with innovative application engineering.

OIL DYNAMICS *ElektroMotion smartDRIVE* offers you a stand-alone solution for your pumping system. The **smartDRIVE** comes with build-in functionality and algorithms to meet every requirement of your production system.

Production maintenance, production optimization, pump system protection, data storage as well as data monitoring and integration is all build into the **smartDRIVE** operating software.

The **ElektroMotion smartDRIVE** is available with different harmonic filtering systems:

- 6-pulse with large AC and DC choke (**smartDRIVE "Gold" or "Platinum"**)
- 12-pulse with large AC and DC choke (DSF 12 pulse)
- Active Front End – equivalent or better 24-pulse (DSF AF)

YOUR KEY ADVANTAGES:

- Easy, user friendly interface (touchpad controlled HMI)
- Intuitive graphical design
- Data storage and trending
- Low maintenance
- Robust, in-the-field type design with variable enclosures
- Full CE and IEEE compliance
- Many valuable options
- Intelligent learning to optimize your system



Depending on the individual configuration, the OIL DYNAMICS **smartDRIVE** comes with different options and accessories to fulfill the needs of a cost-effective yet state-of-the-art standalone production unit. The units are equipped with intuitive colored, clear text touchscreen as operator interface. The local logging capabilities provide historical alarm and trend data, which can be easily exported to standard office software packages via the remote monitoring function and SCADA/Modbus connections.

In addition a high performance industrial PLC can be integrated to use the **smartDRIVE** as monitoring and control device for your entire production site.

ElektroMotion smartCONTROL

The OIL DYNAMICS **smartCONTROL** can be used with different types of manufacturer independent end devices such as variable speed drives, flow control valves, direct-on-line starters, diesel generators, soft starters, analog and digital gauges, level control systems etc.

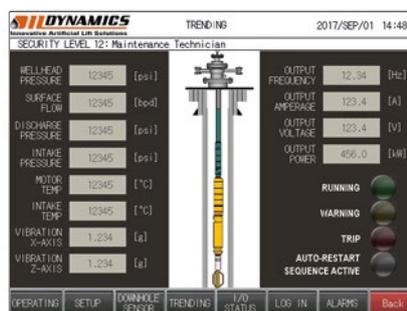
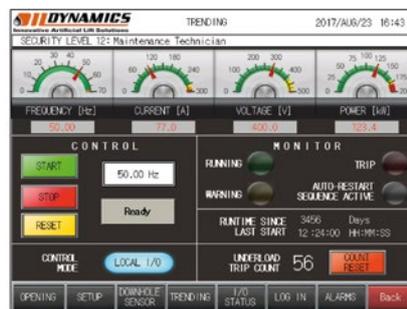
TYPICAL APPLICATIONS:

- Enhanced pump system protection and process control
- Enhanced ESP and production site protection and control
- Multiple centrifugal pump management systems
- Pipeline booster systems
- Transfer pumping station control

ElektroMotion smartMONITORING

The OIL DYNAMICS **smartMONITORING** is OIL DYNAMICS answer to the growing demand of digitalizing different widely distributed remote assets into one management system.

The **smartMONITORING** enables you to connect nearly every device to a common control system. Your remote assets turn digital and will start talking to you so that you can manage your systems intelligently.



ESP smartCONTROL Operator Touchscreen

SURFACE EQUIPMENT AND ACCESSORIES

Engineered to build the best performing system for you



Containerized ESP smartDRIVE and Transformer Package

Customized surface equipment packages for your application

GEO DYNAMICS engineers, builds, tests and installs complete ESP surface equipment and artificial lift control systems that will perfectly match your individual application. We work closely with our clients to deeply understand the project requirements and to offer the most suitable solutions. The surface equipment can be delivered inside portable containers or ready for installation inside stationary buildings.



Control Package Container

Variable frequency drives

GEO DYNAMICS reliable smartDrives are assembled and load-tested in house. Various sizes, types and configurations are available fitting each client's individual needs.

smartMonitoring systems allow for complex data transmission from the wellsite to remote users via mobile, intranet or web-based networks, SCADA or any other means.

ESP transformers

We provide oil-cooled and dry-type step-up and step-down ESP transformers for indoor and housed for outdoor installations matching the required voltage and power specifications. A wide range of voltages and protection configurations are available to meet any site requirements.

ESP cables

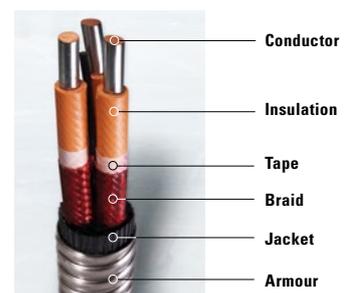
The right choice of cable depends on motor voltage and amperage and the specific well conditions. GEO DYNAMICS offers a unique range of ESP down-hole cables to withstand high temperatures and harsh environment as well as high resistance to gassy and corrosive well conditions. Cables are offered in two basic constructions; round design to provide a high degree of flexibility and crash resistance and flat design, which is ideal for tight fits between well casing and production tubing.

Downhole sensors

Most ESP systems nowadays are equipped with downhole sensors for a better process monitoring and control. While the main sensor typically is attached to the pump's electrical motor and communicates with the surface equipment via the ESP cable, additional backup sensors are equipped with a separate cable. OIL DYNAMICS selection includes various manufacturers and types of downhole sensors combining several temperature ratings and sensor parameters.

Accessories

Such as wellheads, electrical feed-throughs, cross coupling, protectors, surface cabling, pressure-/ temperature transmitters, flow meters, centralizers, protectolizers, crossovers and many more are available to complete the ESP systems.



Round cable



Flat cable

WE STRIVE TO MAKE YOU BETTER

Our service makes the difference

Our experienced factory field service installs your pumping system, starts it securely up and keeps it efficiently running. We assist you to exploit the full potential of your pump and maximize the utilization of your production facilities.

Optimize your production and operational efficiency

At OIL DYNAMICS' field service it does not just come into play when things go bad; our service assures that everything goes well all the time, that your system produces with best efficiency, that you maintain your best possible MTBF. We make sure your employees can utilize their experience in the best possible way.

In short: OIL DYNAMICS' service helps you to optimize your production and operational efficiency.

Onshore and offshore at the highest level: our field service

OIL DYNAMICS' field service engineers have extensive industry and cross-OEM experience and hence the capability to work on many pump types and system components within the O&G, geothermal and water markets – onshore and offshore. Whether you require technical support on site, supervision service for your installation, inventory control and management or system optimization, OIL DYNAMICS will ensure that you will receive the right response with highly skilled and trained personnel.

OUR SERVICES:

- Field installation and start-up
- Field project management
- System troubleshooting
- Field engineering
- System and production optimization
- Emergency Field Response (EFR)
- System monitoring service
- Inventory management



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LIFTING NEW ENERGY.

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Technical data are subject to modification.