ESP
The Electric Submersible Pumping system that lifts your crude oil and boosts your productivity!
YOUR KEY ADVANTAGES:

- **Short delivery times**: thanks to off-the-shelf components and pre-engineered design
- **Tough and proven solution**: over 100,000 installations worldwide
- **Stress resistant technology**: stable within harsh conditions with individual upgrades
- **Tailor-made system**: precisely customized for your needs
- **Flexible head generation**: multistage pump design allowing high head applications
THE MOST PRODUCTIVE ARTIFICIAL LIFT SOLUTION

Best performance in a hostile production environment

We make our Electric Submersible Pumping systems (ESP) a little bit better than the rest.

Because we know they have to perform in a hostile environment and under the toughest conditions. ESP from Oil Dynamics are premium systems that will deliver what they promise: German quality engineered systems tailor designed to suit your individual lift requirements and to elevate your MTBF to new horizons.

Our ESP system comes with a variety of specific speed designs that perfectly match your requirements in terms of pressure and production. The ESP can be installed in almost any production well regardless of depth, well inclination and operational conditions.

Due to its flexible design with a large variety of technology upgrades, metallurgy and coating options, the ESP is the ideal system to choose. The ESP design will be tailored by our design software to match reservoir conditions and your specific lift requirements.

Best productivity and reliable performance even to high free gas content at the pump intake

Depending on the well characteristics, additional gas separators and gas handling stages allow for safe operation even in wells with high GOR. A range of down-hole data sensors that transfer all critical system data to the surface combined with a smart monitoring software provide full system transparency and operational control.

Flexible motor concepts

Oil Dynamics offers two different motor technologies both specifically designed for submersible pumping systems in tough production environments: The Induction Motor (IM) and the Permanent Magnet Motor (PMM). While the IM is the workhorse of the industry and will be the perfect choice for most applications, the PMM offers a number of advantages like lower temperature rise, larger shaft diameter and shorter construction that fits the requirements of specific demanding applications.

Tailor made turnkey systems

The choice of the right power generators, variable frequency drives (VFD), transformers, surface and down-hole cable, flow meters, control valves and other surrounding material will make sure that your new artificial lift system will work efficient and reliable.

TYPICAL APPLICATIONS:

- Crude oil production
- Water production
- Mine dewatering systems
- Geothermal fluid production
- Thermal water production for Spa

THE MOST PRODUCTIVE ARTIFICIAL LIFT SOLUTION

Best performance in a hostile production environment
1. **ElektroMotion Technology™ ESP smartDRIVE**
The ESP smartDRIVE, configured and assembled around the industry-leading Mitsubishi inverter, brings the most robust and easy to operate drive technology to your artificial lift system. It incorporates a user friendly touchpad HMI that integrates all down hole and surface system information. → page 14

2. **Step-up transformer**
Our step-up transformers are specially designed for VFD operation. Multi-tap secondary allow for easy power supply optimization to extend the MTBF of the entire system. → page 6

3. **Power cable**
Oil Dynamics offers a unique range of possible ESP downhole Cables to meet the individual needs of every well. → page 16

4. **Pump section**
Our pump sections come with a large number of hydraulic designs to cover every application requirement from small well casings to high GOR. Flow rates stretch from 240 to 93,000 bpd. Many material options allow for operation in corrosive and abrasive services. Internal coatings to fight asphaltenes and paraffins are as much available as external coatings to fight corrosive environments. → page 10

5. **Gas separator/Gas handlers**
A wide selection of conventional gas separators and gas handling stages assure safe operation with up to 50% free gas at pump intake. → page 11

6. **Protector**
Our protector designs come in a multitude of material and design combinations to allow the best selection for every individual application. Special thrust bearing designs allow for high allowable thrust loads from compression or fixed stage pumps. → page 10

7. **Motor**
The electric motor design can be either standard induction (asynchronous) or permanent magnet (synchronous) design depending on application and customer preferences. Our modified designs allow for safe operation in high well temperature conditions. → page 12

8. **Down-hole-sensor**
With our down-hole-sensors all critical information can be transmitted to the surface HMI via the main power cable. No additional sensor cable required. The surface HMI allows for easy immediate and long-term diagnostics of the entire down-hole system. → page 17
1. ElektroMotion Technology™
   ESP smartDRIVE

2. Step-up transformer

3. Power cable

4. Pump section

5. Gas separator / Gas handlers

6. Pump section
BEST-IN-CLASS TECHNOLOGY
Choosing the best components to build the most reliable system for you

So called “Thrust Washers” are provided to absorb the hydraulic up- or down-thrust generated by the impeller. Only the residual thrust and the weight of the shaft are carried by the thrust bearing situated in the protector. Hydraulics should be carefully selected to avoid unnecessary and excessive up- or down-thrust.

Compressing Design
Contrary to the floater design, compression design stages are mounted on the pump shaft in a fixed position. During the assembly process of pump section and protector, the shaft position is fixed by means of shims so that the shaft including the impellers can rotate freely without touching the stationary diffusor.

In this design thrust washers are not required and the full hydraulic up- or down-thrust including the weight of the shaft has to be carried in the thrust bearing located in the protector.

Floater or Compression Design?
Floater design pumps minimize the thrust load on the thrust bearings in the protector but require “lubrication” for the thrust absorbing thrust washers between impellers and diffusors. They are the first choice in applications with low GOR and fluids with low abrasive content.

In wells with high GOR and/or high abrasive content, compression design pumps will be the first choice since no physical contact between impellers and diffusors eliminate the need for “lubrication”.

From an installation point of view the floater design can be handled more easily since no shimming is required and tolerances are not as sensitive as with compression design pumps.

Oil Dynamics offers a large number of hydraulic selections and many sophisticated material and coating options that will give you the perfect match for your individual application.

Floater Design
In the floater design configuration the impellers are allowed to move freely up and down in axial direction. The only limitation is the upper or lower part of the stationary diffusor.

Radial
Mixed-Flow

Pump section

Floater design in down-thrust condition

Compression design with ample clearances between impeller and diffusor

Shaft
Impeller
Diffusor
Thrust Washer
Spacer Sleeves
Pump Upgrade and Metallurgy Options

**Pump Stages**
- Standard material Ni-Resist Type I
- Boron gas diffusion treatment for abrasive conditions
- Teflon coating to eliminate depositions from asphaltines, waxes and scale
- Nickle-Aluminium-Bronze or Duplex SS optional

**Stage Bearings**
- NI-Resist Type I
- Tungsten Carbide for abrasive conditions

**Pump Shaft**
- Standard material Monel
- Inconel optional for high torque conditions

**Pump Housing**
- Standard material Carbon Steel
- 9Cr1Mo or 13Cr steels
- External Monel and Hastelloy coating for corrosive applications
REDUCED WORKOVERS 
INCREASED PRODUCTIVITY

Best fitting system is our target

The perfect match: using a tailored pumping system will increase the productivity of your well. Increased Mean Time Between Failures (MTBF), higher production and better asset utilization.

Using Oil Dynamics ESP means that you will get:

Matching ESP: Oil Dynamics scope of supply is engineered to offer ESP solutions with a production range starting from 240 bpd up to 93,000 bpd.

This range covers crude oil production as well as water lifting application with a standard temperature range up to 140°C. Sizes vary from 338 series up to the biggest 1200 series for any casing configuration and with a maximum power of 2,000 HP.

Extended Lifetime: Multiple upgrade options on metallurgy and coatings will enhance your pumping system to increase both total lifetime and durability in terms of efficiency.

Oil Dynamics pumps are designed for stress resistant applications. Our pump experts will help you in selecting the right solution depending on the individual well and environmental condition based on experience and state-of-the-art design software.

Proven technology: Electric Submersible Pump (ESPs) are proven pumping solutions in the upstream industry with a long track record for over 90 years. They are adaptable to highly deviated and horizontal wells and permit to use a minimum amount of space for surface controls and production facilities. ESPs are quiet and safe for operating in environmentally sensitive areas.

Extended MTBF

non standard product: tailored design
by Oil Dynamics

YOUR KEY ADVANTAGES:

- Extraordinarily reliable solution, even under extreme conditions: simple, rugged, technically matured
- Highly flexible: for multiphase and GOR wells, for viscous (> API 11) and corrosive (H₂S, CO₂, etc.) fluids
- Oil-Dynamics-USPs:
  - Local Presence: ensuring fast reaction and professional local field service
  - Tailormade pumping design: for maximized production and life cycle based on experience and world-class design software.
- Made in Germany: Recognized high quality standard, certified with Factory Acceptance Test (FAT)
- BEST-IN-CLASS (BIC) Concept: Long experienced supplier and partnership program for critical system components
- Single Source Concept: Turnkey and FAT-based supply concept proving the systems reliability including drive, control units and power supply systems.

ESP OPERATING DATA

<table>
<thead>
<tr>
<th>Series</th>
<th>Flow-Range min (BPD)</th>
<th>Flow-Range max (BPD)</th>
<th>Shaft-Power Standard (HP)</th>
<th>Shaft-Power High Strength (HP)</th>
<th>Minimum Casing Size (&quot;)</th>
</tr>
</thead>
<tbody>
<tr>
<td>338</td>
<td>340</td>
<td>2,250</td>
<td>125</td>
<td>200</td>
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<td>400</td>
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<td>538</td>
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<td>600</td>
<td>6-5/8</td>
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<tr>
<td>562</td>
<td>7,000</td>
<td>32,000</td>
<td>637</td>
<td>1,019</td>
<td>7</td>
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<tr>
<td>675</td>
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<td>43,200</td>
<td>637</td>
<td>1,019</td>
<td>8-5/8</td>
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<tr>
<td>875</td>
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<td>41,350</td>
<td>1,000</td>
<td>1,600</td>
<td>10-3/4</td>
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<tr>
<td>1100</td>
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<td>75,000</td>
<td>2,000</td>
<td>2,500</td>
<td>13-3/8</td>
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<tr>
<td>1200</td>
<td>48,000</td>
<td>93,000</td>
<td>2,000</td>
<td>2,500</td>
<td>16</td>
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</table>

Get your quote. Get your design. Look page 18/19
### TECHNOLOGY COMPARISON ESP / PCP / SRP

<table>
<thead>
<tr>
<th>CRITERIA</th>
<th>ESP</th>
<th>PCP</th>
<th>SRP</th>
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</thead>
<tbody>
<tr>
<td>Flow rate capacity</td>
<td>HIGH</td>
<td>MEDIUM</td>
<td>LOW</td>
</tr>
<tr>
<td>System efficiency</td>
<td>MEDIUM</td>
<td>HIGH</td>
<td>HIGH</td>
</tr>
<tr>
<td>Return of invest</td>
<td>HIGH</td>
<td>LOW</td>
<td>MEDIUM</td>
</tr>
<tr>
<td>Free gas content</td>
<td>HIGH</td>
<td>MEDIUM</td>
<td>MEDIUM</td>
</tr>
<tr>
<td>MTBF</td>
<td>HIGH</td>
<td>LOW</td>
<td>MEDIUM</td>
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<tr>
<td>Handling viscosity</td>
<td>LOW</td>
<td>HIGH</td>
<td>MEDIUM</td>
</tr>
<tr>
<td>Deviated wells</td>
<td>HIGH</td>
<td>LOW</td>
<td>LOW</td>
</tr>
</tbody>
</table>

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**Optimized production**

system components that assure the highest return on investment

**High durability**

the right choice of upgrade and metallurgy options to meet the toughest operating conditions

**Intelligent asset utilization**

remote monitoring to allow early mobilization and less downtime

**Reliable and fast Service**

ensuring fast response by local presence of qualified personnel

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Performance Envelope at 3,500 rpm

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![Image of ESP system components]
SEAL/PROTECTOR SECTION
Increasing the motor’s lifetime and insuring smooth pump operation

The protector section has four main functions in the ESP string:

1. The protector protects the motor oil from contamination by the wellbore fluid
2. The protector equalizes the pressure between the interior of the motor and the wellbore
3. The protector acts as an expansion chamber for the motor oil due to temperature changes
4. The protector contains the thrust bearing that carries the axial thrust developed by the pump section

Design combinations to optimize MTBF:

The selection of the proper design combination of the motor protector will increase the ESP string MTBF (Mean Time Between Failures) significantly.

Oil Dynamics offers both bag and labyrinth protector designs and will combine these single systems based on the individual well condition. Motor and pump sizes, well temperature, well inclination, frequency of startup cycles and other parameters such as the chemical fluid composition will determine the perfect match of one or more bag and labyrinth systems into one single motor protector.

Material upgrades are available for flawless operation in H₂S, CO₂, and other challenging environments.

The modular design enables us to select the right motor protection system in terms of both, technical criteria and price.
Improving your production rate significantly

Centrifugal Pumps have limited capacity to handle free gas. Oil Dynamics is offering various gas handling technologies to separate free gas from the well fluid and/or to bring free gas back into solution before it enters the pump section.

For stable operations and improved gas separation: Rotary Gas Separator

Rotary Gas Separators (RGS) are designed to provide stable operation of ESP systems with GVF (Gas Volume Fraction) of more than 10% at pump intake. Single RGS provide separation efficiencies of up to 75%. For improved gas separation, a Tandem RGS is available with separation efficiencies of up to 85%.

The RGS is a classic gas separation device used with ESP systems for several decades. The RGS is based on the centrifuge principle, separating the fluid based on differences in specific gravities.

Light separated gas is vented to the well annulus and the heavier fluid is directed upwards into the pump section. Operating components of RGS are manufactured from Ni-Resist type I.

Designed for abrasive applications: Vortex Gas Separator

Since it has less rotating components, the parts washout observed under abrasive conditions in classic RGS designs is widely eliminated. The efficiency of the VGS is lower than the classic RGS but it can be improved when combining the VGS with an OD Kompressor Pump section.

OD Kompressor Pump

OD Kompressor Pumps are Oil Dynamics’ Gas Handling Pumps and they are designed to ensure stable operation of ESP systems with GVF up to 50%.

OD Kompressor Pumps can be operated in combination with VGS systems whereby the fluid is homogenized in the VGS and the remaining free gas is compressed back into solution in the OD Kompressor Pump before entering the pump section.

Stand-alone OD Kompressor Pumps have the added advantage to utilize the gas lifting effect during ESP operation whereas both, RGS and VGS extract the free gas and vent it to the well annulus. OD Kompressor Pumps will be typically used in gassy wells with packers above the ESP string. Standard OD Kompressor Pumps are manufactured from Ni-Resist type I.
The submersible electric motor is the workhorse of an ESP system. Oil Dynamics offer induction (asynchronous) motors and permanent magnet (synchronous) motors to cover the entire scope of possible ESP applications.

Via the motor lead extension and the tape-in pothead connection the ESP power cable supplies the motor with electrical power from the surface and the motor converts this energy into mechanical power to drive the ESP string.

All motors are oil filled and use high quality synthetic oils which communicate with the protector/seal assembly. The oils have high dielectric strength to maintain high insulation resistance and also provide ample thermal conductivity to assure proper cooling of the motor assembly.

The motors are directly coupled to the seal/protector assembly. The required pump torque will be transferred via the motor shaft. Involute spline shafts and couplings provide for maximum torque capacity.

A specially designed sensor adaptor is provided to facilitate the attachment of all commercially known down hole sensor products for real-time monitoring of ESP and reservoir parameters.

Standard motor casing material is carbon steel. Special materials as well as metal coatings with Monel or Hastelloy are optional.

**Induction Motor (IM)**

The IM are 2-pole AC squirrel cage asynchronous designs. The high quality of our rotors and the specially engineered shape of the winding slots in the stator laminations enhance the motor efficiency rating. The convincing result: less electrical losses and more operating power.

Oil Dynamics offers Induction Motors with a standard temperature rating of up to 230°C. OD IM operate at voltages between 380 V and 5,000 V depending on size and electrical configuration.

**Permanent Magnet Motor (PMM)**

Contrary to the induction motor the PMM has no squirrel cage rotor design. The copper bars, shortening rings and rotor laminations are eliminated. Instead the rotor design includes permanent magnets that are made of sintered hard-magnetic materials. These permanent magnets ensure a direct interaction with the rotating magnetic field of the stator once power is transmitted to the stator windings (rotor flux). This design eliminates the electrical losses in the rotor and allows for a significantly higher motor efficiency. It also provides for synchronous speed operation.

The PMM operates with a high constant torque at the entire speed range. The higher motor efficiency results in a lower motor temperature rise during operation compared to the IM.

In addition, the larger shaft diameters for given frame sizes allow for higher torque transmission in single frame motors.

Oil Dynamics offers Permanent Magnet Motors with a standard temperature rating of up to 150°C. OD PMM operate at voltages between 380 V and 4,200 V depending on size and electrical configuration.
### Induction Motor (IM)

<table>
<thead>
<tr>
<th>MOTOR SERIES</th>
<th>Standard shaft rating (HP@60 Hz)</th>
<th>High Strength shaft rating (HP@60 Hz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Series 375</td>
<td>260</td>
<td>289</td>
</tr>
<tr>
<td>Series 456</td>
<td>480</td>
<td>534</td>
</tr>
<tr>
<td>Series 540</td>
<td>850</td>
<td>946</td>
</tr>
<tr>
<td>Series 562</td>
<td>850</td>
<td>946</td>
</tr>
<tr>
<td>Series 738</td>
<td>1,600</td>
<td>1,782</td>
</tr>
</tbody>
</table>

### Permanent Magnet Motor (PMM)

<table>
<thead>
<tr>
<th>MOTOR SERIES</th>
<th>Pole</th>
<th>Torque rating (Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Series 456</td>
<td>4/10</td>
<td>980</td>
</tr>
<tr>
<td>Series 562</td>
<td>4/10</td>
<td>1960</td>
</tr>
</tbody>
</table>

Loss Comparison Induction Motor (IM) vs. Permanent Magnet Motor (PMM)
MORE LONG-TERM RELIABILITY AND EFFICIENCY

The intelligent configuration with the ElektroMotion Technology™ by Oil Dynamics

For the most demanding Artificial Lift services: the outstanding ElektroMotion Technology™ improves the long-term functionality of your entire Artificial Lift system.

With variable frequency drives, switchboards, process control systems and local/remote monitoring devices, tailor-made for your ESP system and intelligently configured for your special requirements, ElektroMotion Technology™ stands for an outstanding technology and will determine the long-term functionality, reliability and efficiency of your system.

The unique ElektroMotion series

ElektroMotion is an innovative series of unique electrical systems that can be combined to satisfy the requirements of any demanding Artificial Lift 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.

For more profitable wells: ESP smartDRIVE

ESP smartDRIVE with induction and permanent magnet motors brings the most robust and easy to operate drive technology to your pumping system. The application driven design will allow you to operate your wells more profitable, to reduce the overall cost and to increase your system MTBF.

For an optimized production: ESP smartCONTROL

One single control center for multiple pumping systems: The custom build ESP smartCONTROL unit enables you to monitor, control and operate multiple pumping systems. It integrates all local functions including flow meters, control valves, pressure- and temperature sensors etc. into one single cabinet. Read and write options are available for local and remote operations.

THE HIGHLIGHTS:
- easy user interface (intuitive touch pad controls)
- easy set-up
- low maintenance
- robust, oil-field type design
- less effort to find the best operating point
- intelligent learning to optimize your system
For practically maintenance free operations: ESP smartSWITCHBOARD

The cost-effective ESP smartSWITCHBOARD with many safety options is the right choice for fixed speed systems. It comes with the latest technology in pump protection and guarantees easy-to-use and practically maintenance free operation.

For 24/7 information all around the world: ESP smartMONITORING

Bring your pumping system online and make it Industry 4.0 ready: the ESP smartMONITORING remote system gives you 24/7/365 access to all necessary and desired information with maximum integration flexibility – either into your company owned Intranet or web-based around the globe. Full Read functionality; Write functionality optional.

The ESP smartMONITORING technology is scalable from a simple single pump installation up to a remote monitoring system for your complete production site. The integration of other pump systems is possible and recommended.

THE HIGHLIGHTS:
- small foot print
- intuitive touch pad controls
- wide operating range
- robust design
- fully electronic pump protection
- low maintenance
- economical investment

THE HIGHLIGHTS:
- Maintenance staff can monitor the operating condition of each single system component
- Production Engineers can monitor production, predict well draw down and the production of the past and upcoming weeks
- Field Managers can see the up-time of each production well; receive early alerts on potential maintenance issues and schedule rig movement and well intervention as per actual requirements
**ACCESSORIES**

Delivering proven BEST-IN-CLASS turnkey solutions

**Turnkey System concepts**

ESP systems are the main artery of crude oil production. As an expert for artificial lift solutions, Oil Dynamics is a provider of powerful answers: We combine best-in-class solutions and materials to build the perfect, tailor-made system fulfilling your needs.

We design, engineer, package, test and supply the complete system to pump your fluid to the surface and transfer it through your pipelines.

The choice of the right power generators, transformers, cables, sensors and surrounding material such as collar guards, well heads and tubing will make sure that your new system will be fully harmonized and trouble-free.

The result will be a highly efficient and reliable turnkey artificial lift and pump system delivered from one supplier with one responsibility: customer satisfaction.

**Scope of supply:**
- Production Tubing
- Wellheads
- Packers
- Electrical Feed Throughs
- Pressure/Temperature Transmitters
- Flow Meters
- Surface Cabling
- Transformers
- Island power Generators
- Down-hole Sensors

**A unique range: ESP cables**

The right choice of cable depends on motor voltage and amperage and the specific well conditions. Oil 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 crush resistance and flat design, which is ideal for tight fits between well casing and production tubing.

**AVAILABLE OPTIONS**

<table>
<thead>
<tr>
<th>Conductors</th>
<th>Solid or stranded tinned copper</th>
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</thead>
<tbody>
<tr>
<td>Insulation</td>
<td>Polypropylene or EPDM</td>
</tr>
<tr>
<td>Tape</td>
<td>Fluoropolymer</td>
</tr>
<tr>
<td>Braid</td>
<td>Synthetic</td>
</tr>
<tr>
<td>Barriers</td>
<td>Fatigue &amp; corrosion resistant extruded lead sheath</td>
</tr>
<tr>
<td>Jackets</td>
<td>EPDM or Nitrile Rubber</td>
</tr>
<tr>
<td>Armour</td>
<td>Interlocking, fully galvanized steel, stainless steel or Monel 400 tape. Profile options are available</td>
</tr>
<tr>
<td>Capillary Tubing</td>
<td>Integrated tubing in various materials</td>
</tr>
</tbody>
</table>
**Proven transformers for any ESP system**

We provide a full range of step-down and step-up transformers for any ESP application.
- Step-down transformers from high voltage to medium and low voltage including phase shifter options for 6, 12 and 24 pulse operation
- Step-up transformers VFD rated with multi-tap arrangement (400V to 5,000V)
- Enclosures up to IP66 / Class1 Division 2 Hazardous
- Offshore designs in stainless steel
- High temperature designs up to 65°C ambient

**Proven sensors for any ESP motor**

Our proven downhole sensors fit any ESP induction or permanent magnet motor.
- Available in 150°C or 175°C temperature ratings
- Standard parameters are: pump intake pressure, pump intake temperature, motor oil/motor winding temperature, vibration-x axis, vibration-y axis and current leakage
- Optional parameters can be measured and/or calculated such as the motor star point voltage, pump discharge pressure, fluid level above the pump and much more. Furthermore, a ground fault immunity option is available as well as a sensor providing accurate information of the pump placement in complex or uncertain geometry wells (inclination sensor).
- 3.75in OD, 2.6 ft length, ~30 kg, carbon or stainless steel

### STEP-UP TRANSFORMERS

<table>
<thead>
<tr>
<th>Range</th>
<th>100 – 1,600 kVA</th>
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</thead>
<tbody>
<tr>
<td><strong>Primary Voltage</strong></td>
<td>400 / 480 Volt</td>
</tr>
<tr>
<td><strong>Secondary Voltage</strong></td>
<td>400 – 5,000 Volt</td>
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</tbody>
</table>

### STEP-DOWN TRANSFORMERS

<table>
<thead>
<tr>
<th>Range</th>
<th>300 – 2,800 kVA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary Voltage</strong></td>
<td>10 / 15 / 21 KV</td>
</tr>
<tr>
<td><strong>Secondary Voltage</strong></td>
<td>400 / 480 Volt</td>
</tr>
</tbody>
</table>

### MEASUREMENT

**Primary Parameters** for essential pump and well surveillance and protection

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Range</th>
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</thead>
<tbody>
<tr>
<td>pump intake pressure</td>
<td>0 – 5,800psi</td>
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<tr>
<td>pump discharge pressure</td>
<td>0 – 5,800psi</td>
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<tr>
<td>pump intake temperature</td>
<td>0 – 175°C</td>
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<tr>
<td>motor oil/motor winding temp.</td>
<td>0 – 250°C</td>
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<td>vibration – x axis</td>
<td>0 – 10G</td>
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<tr>
<td>vibration – y axis</td>
<td>0 – 10G</td>
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</table>

**Predictive Parameters** for preventative maintenance and effective workover management

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Range</th>
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</thead>
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<tr>
<td>current leakage</td>
<td>0 – 10mA</td>
</tr>
<tr>
<td>wye point voltage</td>
<td>5 – 700V</td>
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</tbody>
</table>

**Intelligent Parameters** for advanced well and field management and optimisation

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Range</th>
</tr>
</thead>
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<tr>
<td>bottom hole flowing pressure*</td>
<td>✔</td>
</tr>
<tr>
<td>fluid level above pump*</td>
<td>✔</td>
</tr>
<tr>
<td>wellhead pressure</td>
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<tr>
<td>total liquid flow rate*</td>
<td>✔</td>
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<tr>
<td>water cut*</td>
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</table>

*calculated parameter
CONTAINERIZED SURFACE PACKAGES
Engineered to build the best performing system for you

The perfect surface package for any environment

Oil Dynamics engineers, packages, tests and installs complete ESP surface power supply and Artificial Lift control systems that will give you the perfect match for your individual application. For any environment, onshore and offshore. Our objective is to closely work with our clients to understand the actual needs and to offer the most suitable solutions.

Power Supply Packages

We provide power supply packages with single and dual generators with automatic power transfer modules (ATM) to assure uninterrupted power supply to Artificial Lift systems. A wide range of command and control systems as well as voltages and protection configurations are available to meet any site requirements.

Portable Control and Transformer Skids

The Oil Dynamics portable control and transformer skids are rugged oil field style designs that combine protected transformer areas with air-conditioned rooms for ESP smartDRIVES and controls. Packages can be widely customized to meet all requirements of the client.

Pre-assembled Control Rooms for Offshore Platforms

Oil Dynamics engineers and supplies pre-assembled control rooms for offshore platforms based on individual client requirements and specifications.

Each unit will undergo a full load and functional test before shipping to location.

Tailor designed life cycle programs

Each package will come with a tailor designed life cycle program that will ensure proper training of field operators and long, trouble-free operation of the entire system.
GET YOUR TAILORED ESP NOW!

Dear Customer,

We highly appreciate your interest in our products. Please use this Request for Quotation Form to share with us the information required to design the ideal ESP system for your conditions. Please bear in mind that the quality of your data will determine the quality of our design. We assure you of treating the provided information confidentially and not sharing it without your explicit permission.

Fields marked with “*” are essential for a precise design.

Thank you very much for filling the Request For Quotation form. We will try to get back to you very soon.

Any additional information which would help us to prepare a better design for you e.g. scale or sand problem, corrosive or erosive environment, etc. is very welcome.

OIL DYNAMICS GMBH

REQUEST FOR QUOTATION
Electrical Submersible Pumping System (ESP)
Downhole & Surface Equipment Design Data Sheet

Contact Information
- Company *
- City
- Contract Person(s) *
- Phone/Telefax *
- E-Mail *
- Well Location or Field
- Well Name *
- Available(s) *
- Date of Completion
- Planned Delivery Date *

Fluid Data*

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Unit</th>
<th>Value</th>
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<tbody>
<tr>
<td>Oil Gravity</td>
<td>API</td>
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</tr>
<tr>
<td>Oil Viscosity</td>
<td>cP</td>
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For additional data and requirements, please refer to the next page.

Request for Quotation
Provision of Electrical Submersible Pumps (ESP)

1 DOWNHOLE EQUIPMENT
Required data for downhole equipment selection

2 SURFACE EQUIPMENT
Required data for surface equipment selection

Thank you for your cooperation.

Rudolf-Diesel-Str. 11, 69115 Heidelberg, Germany
Tel.: +49 6221 759 770, Fax: +49 6221 759 7728, info@oildynamics.de
ESPECIALLY CREATED FOR YOU: SOLUTIONS BY OIL DYNAMICS

Your success story starts with pumping systems by Oil Dynamics:
Our application engineers design your pump especially for you. That way, we find the perfectly fitting solution for you – considering efficiency, reliability, MTBF and your budget.

The breakthrough pump technology:
Horizontal Pump Systems (HPS)

For efficient oil production and transportation, our HPS-systems are an important success factor in the Oil & Gas industry. The HPS system from Oil Dynamics has been optimized to handle low flow, high head applications under severe operating conditions. As a result of the modular, standard component based design, our HPS systems are not only more reliable in their day-to-day performance but also excel with shorter delivery time than any other comparable pumping systems.

HPS is the pump generation that provides more:
- more robustness
- more profit
- more flexibility
- more availability and reliability
Born to increase your uptime and to reduce your operating costs

The proper solution for multiphase fluids:
Multiphase Pumping Systems (MPS)

The MPS technology is based on a fully compliant API 676 twin-screw concept allowing to pump multiphase fluids such as oil, gas and water mixtures. Our pumps are self-priming and come along with a low noise level. The MPS is pumping nearly pulsation free without shear and emulsification of the medium.

The MPS package can be tailored to your individual requirements and standards and are fully tested in our facility before shipping to location.

The reliable Horizontal Pumping System (HPS)

Multiphase Pumping Systems (MPS)
EXCEEDING INDUSTRY STANDARDS

100% testing in one of the finest testing facilities worldwide

With our test facilities we can meet all applicable industry standards:
- API – RP 11S
- API – 610 / ISO 13709
- DIN EN 50110/VDE 0105 … and other as per customer requirements.

Exceeding the industry standards

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 entire pumping system.

Going the extra mile: 100% in-house testing of all our products

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 integrity in the field. This guarantees a reliable and trouble-free start from day one!

THE HIGHLIGHTS:
- Pump performance test
- Hydrostatic test
- Full string pump test
- Drive and switchboard test
- Thrust chamber testing
- Motor test
The world has become smaller. Competition stronger. Service makes the difference. The Oil Dynamics Service not only keeps your pumping systems running: our service also helps you to exploit your full potential and to maximize the utilization of your production facilities. 24 hours a day, 7 days a week, 365 days a year.

Service makes the difference

At Oil Dynamics Service 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 Oil & Gas market – 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

WE STRIVE TO MAKE YOU BETTER
The Oil Dynamics Service. Professional. Local.
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, we provide complete 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 fits to your requirements. You will get what you expect. As your perfect partner we will go out of our way to ease your path to success.

Your success is our success

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

German quality culture

Oil Dynamics is a highly flexible company founded by a group of seasoned and experienced professionals from within the Pump- and Oil & Gas industry. We are focused to engineer, manufacture, test, supply and service premium products for the upstream industry both on- and offshore.

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).

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.

Knowledge is the most valuable asset: the Oil Dynamics Academy

Without knowing what, when or how to do something, even the best system will be useless. Therefore, we make our customers fit for any challenge by passing on our knowledge – with technical classes and hands-on training in our Oil Dynamics Academy.

MADE IN GERMANY

100% QUALITY CONTROL

Come and visit us: We will be happy to show you our testing facilities, our Oil Dynamics Academy and our team!