FLOWSERVE

Pump Division

PLEUGER

Submersible Pumps & Water Filled Motors

FLOWSERVE

Pump Supplier To The World

Flowserve is the driving force in the global industrial pump marketplace. No other pump company in the world has the depth or breadth of expertise in the successful application of pre-engineered, engineered and special purpose pumps and systems.

Supplier of Choice for Water Resources

Throughout its history. Flowserve has been closely identified with pumping water resources. For more than a century and a half, Flowserve has been in the forefront of virtually every significant advancement in pumping technology to meet water-handling challenges. Today, Flowserve offers the word's most complete line of pumps and systems for water application along with a full menu of technical and service support.

Heritage Names of Distinction

ACEC™ Centrifugal Pumps
Aldrich® Pumps
Byron Jackson® Pumps
Gameron® Pumps
Durco® Pumps
Flowserve® Pumps
IDP® Pumps
Jeumont-Schneider™ Pumps
Pacific® Pumps
Pleuger® Pumps
Scienco® Pumps
Sier-Bath® Rotary Pumps
Stork™ Engineered Pumps
United® Centrifugal Pumps
Western Land Roller® Irrigation Pumps
Wilson-Snyder® Pumps
Worthington® Pumps
Worthington Simpson® Pumps

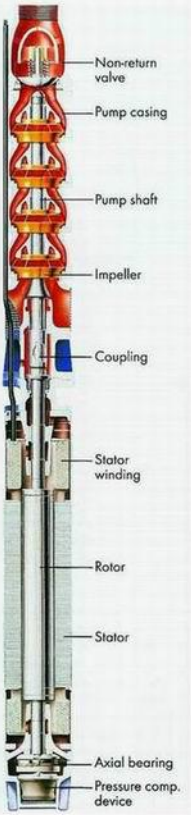
PLEUGER

Submersible Pump 8” + 10” Mixed Flow

Subm

Submersible Pump Units

Pleuger Submersible Pump Units are multistage centrifugal which operate below water level and are driven by water filed AC three phase submersible motors.
Pump and Motor forms a single enclosed unit which when installed vertically in a water well ,is held in position by the discharge pipe .
Our Submersible pump units are available for a wide range of applications.
Efficiency and long working life under the most adverse condition.



Pump Product range

The Pleuger pump line offers a comprehensive range of finely graduated performance for capacities and delivery heads . Pumps are available from 4” to 48” diameter with capacities and from1 to 80.000 m3/h and delivery heads up to 800 m .This means that pleuger has an economic solution for almost every user and requirements .

Operation Safety

Pleuger pump units are designed and manufactured to the highest quality . They are extensively tested and inspected to unsure operational safety .

Manufacturer

To meet the high quality of pleuger pumps and motors requires both specializes know how and continually manufacturing processes . All Pleuger products are produced using the most advanced manufacturing techniques ,. From initial development base on CAD through to quality controlled CNC production equipment .
It is not by chance that among experts Pleuger has been a byword for top product quality for decades.

Materials

Pleuger pump units are manufactured from variety of materials, depending on the specific application.
Whether you need nickel aluminium bronze, glass fiber or grey cast iron, we possesses the know-how and the experience to produce units that meet your requirements.

Design

Pleuger pump units are designed on the principle of a modular structure. Thus with a limited number of parts different requests can be achieved tailor – made . Pumps are equipped with non-return valves to guarantee optimal functional safety (water hammer).

PLEUGER
NB6 Submersible Pump

Pleuger submersible pumps for 6" wells have been performing successful service for many years in water extraction, water supply systems and the drainage of mining works. These compact units, consisting of pump assembly and three-phase asynchronous A.C. motor, are supplied for a wide range of applications. Incorporating many innovative technical features, they are robust and maintenance-free in service, and have acquired an excellent reputation for their reliability and long life time.

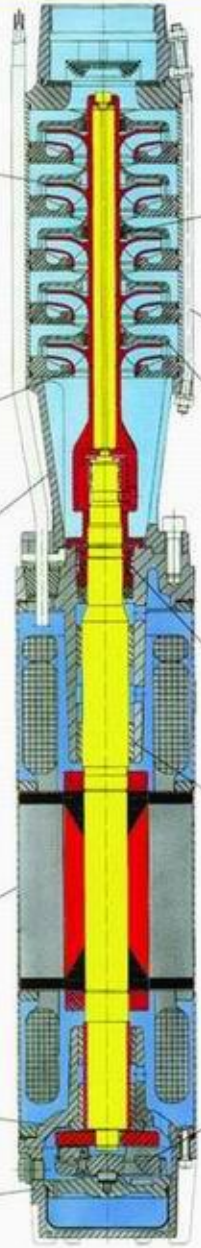
To ensure that they continue to live up to that reputation, Pleuger pump assemblies and motors have been further redesigned and developed. The new NB6 series features a number of detailed design improvements in the pump assembly and motor unit that set new standards in terms of efficiency and pumping capacity. New intermediate-capacity motors have now been added to the standard M6 motor range, specifically matched to the power consumption of each pump model. The result is a further improvement in overall operating efficiency. The range of pumps now includes six models with capacities of 3,8 m³/h up to 22,5 m³/h and heads of up to 400 m.

Impeller with three-dimensional twisted blades
Improved efficiency, significantly lower power consumption • higher head per stage, less stages required for a given delivery head

New gap design
Labyrinth design • narrow clearance • renewable wear ring, simplified maintenance • increased efficiency due to reduction in gap flow

Suction casing with enlarged water inlets
Optimized water intake • less sensitive to unfavourable flow conditions and sedimentation • ribbed deflector to neutralize turbulence • casing now also available in cost effective grey cast iron for non-aggressive media

New motor laminations
Rotor and stator laminations electromagnetically optimized • reduced lamination length means shorter motor and lower investment costs • improved efficiency



New bearing housing
Larger water inlets for optimized water circulation, improved lubrication of bearings, better heat exchange • longer service life.

Heavy-duty axial bearing housing
Fitted with breather diaphragm to compensate for pressure and volume variations between motor interior and external medium suitable for installation at extreme depths

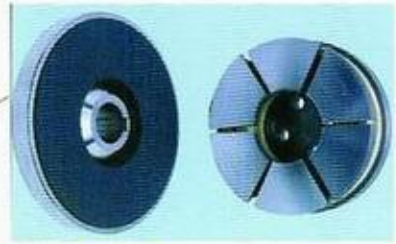
Heavy-duty rubber-lined bearings
Reduced bearing clearance, minimized gap flow, increased efficiency * smooth-running, long service life

New tie rods
Threaded at both ends, easily accessible, easy assembly/disassembly *disassembling of non-return possible, independently from pump disassembly

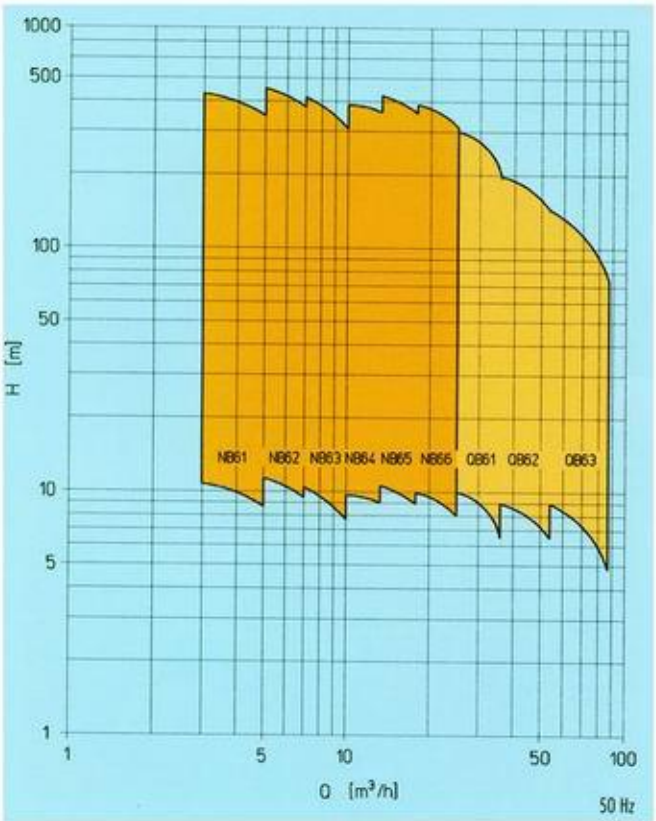
Diffuser with streamlined flow design
Optimized flow geometry, improved efficiency

Long-life mechanical seal
Reliable sealing of motor unit, maintenance-free

New motor bearing design
Upper and lower bearing housings each fitted with 2 bearings * smooth-running and long life time



Axial thrust bearings
Available in various options, AF 75 (carbon) or rubber-lined



Advanced materials concept

Only selected high-grade materials, resistant to wear and corrosion, are used in the construction of the NB6 Series. Tested and proven over many years, these materials ensure a high degree of reliability and suitability for a wide range of applications. For more specialized requirements and applications, special materials and combina - tions of materials are available that are designed to ensure optimum efficiency and a long service life. We can, for example, supply pumps fitted with impellers and diffusers fabricated from high-grade alloys.
For capacities exceeding 22,5 m /h we recommend the use of the Pleuger 6" Pump Series QB61-63 with semi-axial impellers. Please ask for further information.

Materials NB6-Pump

Part	Material Construction 1)	Material Construction 3*)
Impellers/ Diffusers/ Intermediate disks	PPE + 30% CF Fiberglass-reinforced Nory 1	PPE + 30% CF Fiberglass-reinforced Nory 1
Stage Tubes	1.4571/3261 Ti Stainless CrNiMo Steel	1.4571/361 Ti Stainless CrNiMo Steel
Bearing Housing / Pressure -/Valve Casing	0.6025 / A 48 CL 35 Cast Iron (GG 25)	2.0970/UNS C958000 Ni Al-Bronze
Shaft , Sleeves	1.4057/431 Stainless CrNiMo Steel	1.4057/431 Stainless CrNi Steel
Tie Rods	1.4571/361 Ti Stainless CrNiMo Steel	1.4571/316 Ti Stainless CrNiMo Steel
Nuts And Bolts	A4 / 316 Stainless CrNiMo Steel	A4 / 316 Stainless CrNiMo Steel
Coupling	2.0980 / UNS C95500 Ni Al-Bronze	2.0980/ UNS C95500 Ni Al-Bronze
Radial Bearings	Rubber	Rubber

Materials M6 Motor

part	Material Construction 1)	Material Construction 3*)
Shaft	1.4462 / UNS S 31803 Duplex Stainless Steel	1.4462/UNS S31803 Duplex Stainless Steel
Outer ensigns	0.6025/A UNS c95800 NI AL-Bronze	2.0970/UNS C95800 NI AL-Bronze
Stators	1.4571/361 Ti Stainless CrNiMo Steel	1.4571/316 Ti Stainless CrNiMo Steel
Be dial Bearings	AF 75 (Carbon)	AF 75 (Carbon)
Axial Bearing	AF 75 (carbon)/ Rubber	AF 75 (Carbon)/ Rubber
Mechanical Seal	Carbon / Ceramic	Carbon / Ceramic
Nuts and Bolts	A4 / 316 Stainless CrNiMo Steel	A4 /316 Stainless CrNiMo Steel

*** DIN\ASTM dctails subject to alteration**

PLEUGER

Submersible Bottom Intake Pumps

Design Features

- **Standard submersible**

A bottom intake pump is a centrifugal pump, single-stage or multi-stage, driven by a submersible motor, featuring the same standard components used in Pleuger's renowned submersible pumps.
The bottom intake pump is suspended from the riser pipe without any other support.

- **Water filled motor**

The submersible motor is a water- filled 3-phase AC asynchronous motor.
A breather diaphragm is fitted to compensate the pressure inside the motor.
This means there is no pressure differential across the mechanical seal.

- **Perfect cooling**

The motor is fitted on top of the pump inside a shroud, so that the water is pumped through the annular space between stator tube and shroud providing excellent cooling for the motor.

- **MAT-System**

The Modular Assembly Technique is used for the bottom intake pumps. A large variety of Pleuger pumps bottom intake pumps. A Large variety of Pleuger pumps and motors is available and can be combined to meet site conditions.

Benefits

- **Long Life**

The Pleuger Bottom intake Pump offers all the advantages of Pleuger Submersibles :
Pump and motor are equipped with advanced radial journal bearings and heavy duty thrust bearings.
All bearings are water lubricated making the life virtually unlimited.

- **Environmentally safe**

The motor is filled with water. Neither oil nor grease are employed so that the water pumped cannot be contaminated.

- **Wet Motor**

The submersible motor is of the "wet" type.
The stator winding has a water proof insulation of high di-electric strength and is immersed in the motor filling.
The stator can be rewound locally if necessary.

- **Low noise level**

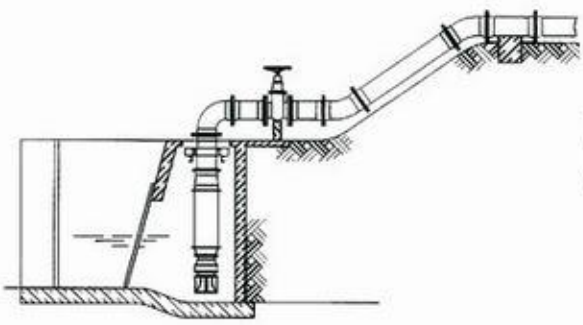
Pump and motor have water lubricated journal bearings. Therefore the unit runs quietly without vibration.

- **No flood hazard**

Since the motor is filled with water potential damage from floods is eliminated.

Pleuger Bottom Intake Pumps are designed to pump from low water levels. The pumps can be installed in rivers, lakes, shafts, sumps, ponds, quarries and mines.

Pleuger Bottom Intake Pumps are environmentally friendly. No pump house is required, the civil works can be reduced to a minimum saving installation cost.



Because of the low NPSH required the Pleuger Bottom Intake Pump is the perfect solution where other pumps are threatened by low submergence.

Since the Bottom Intake Pumps are suspended from the riser pipe without any other support they can easily be installed or removed.

The installation on the left is a cross section of the "open air" pumping station shown on the picture on the front page.

PLEUGER

Submersible Motors

A Dimension of Power

Pleuger submersible motors have been providing successful and reliable service since 1929 . The three – phase motors are water – filled AC –Squirrel cage induction motors . Lubrication and cooling is provided by a filling of potable water or with a mixture of environmentally safe anti-freeze . The corrosion – resistant stainless steel stator contains the aging – resistant , waterproof insulated windings of high di-electric strength . The stator is fully rewind able . The electrical power supply is provided by a specially developed and water proof submersible motor cable , led into the motor through easy – to – assemble cable glands . The dynamically balanced rotor rotates in oversized twin bearings on each and .A diaphragm in the motor base provides pressure / volume compensation of the motor during temperature changes . A high quality mechanical seal prevents the ingress of ambient liquid to the motor, fully protecting the motor against contamination . An adjustable , self-aligning thrust bearing allows high thrust service life , even under the heaviest duty condition.

Pleuger submersible motors are available for vertical or horizontal installation, and also for hot water applications.

In maintaining our reputation, Pleuger continues to update and develop the outstanding design of the motors.

- Pleuger offers motors up to 5.000kW and high voltage up to 6.600 V.
- Motors can be offered in all materials from cast iron, bronze, up to super duplex stainless steel.
- Pleuger motors are designed to operate with variable frequency drive (VFD).

New features ....

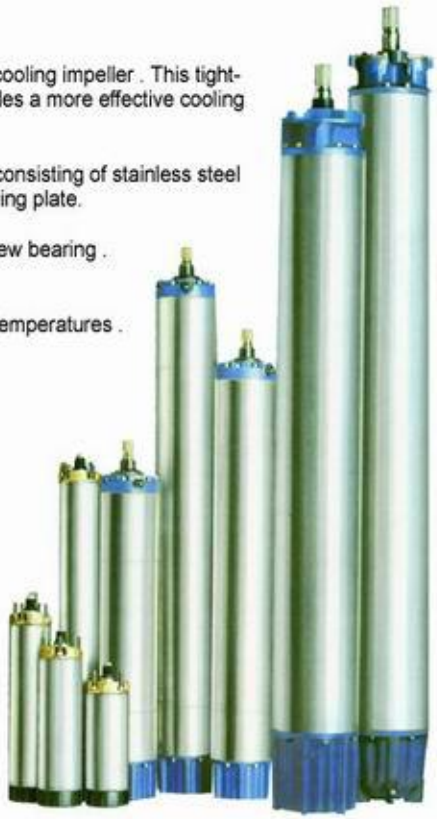
* Improved internal cooling system ,a development using an improved design of cooling impeller . This tighter , with the highly developed design of the flow – conducting components provides a more effective cooling circuit , ensuring sufficient thermal reserves for most pumped waters.

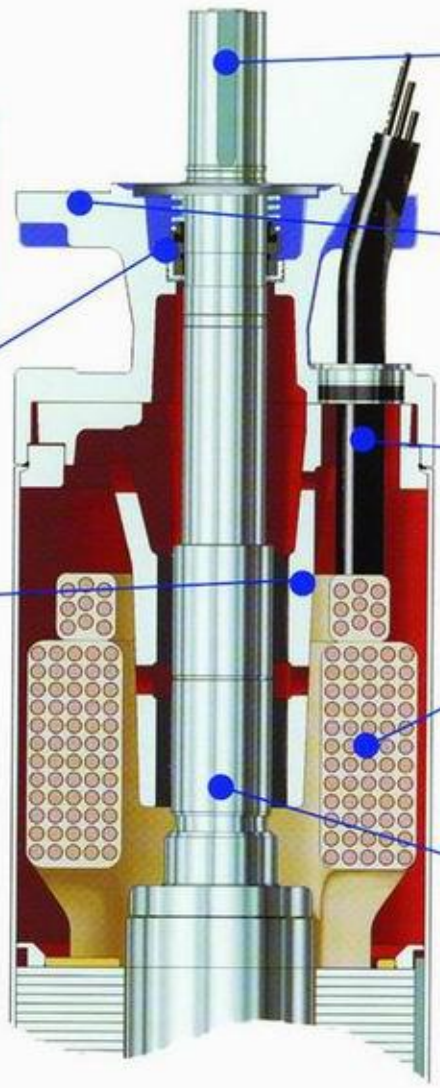
* A new thrust bearing . The bearing is water – lubricated : a tilting pad bearing , consisting of stainless steel pads running against a hard carbon surface , which is itself part of the thrust bearing plate.

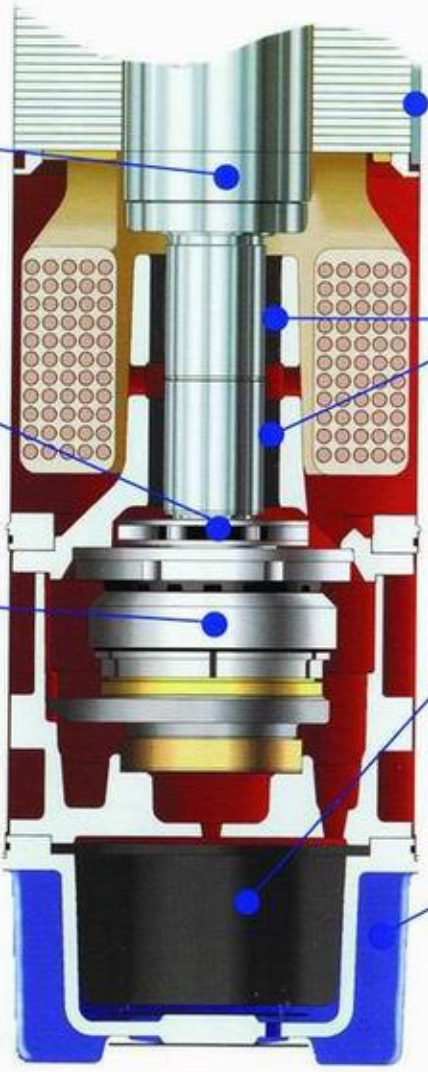
* Load gradients of 1500 KN/second are possible with the highly wear resistant new bearing . This can be particularly important in case of water hammer.

*The MI10 can be modified for special applications which involve high operating temperatures . The modification enables the thrust bearing in temperatures up to 12oC.

* As an option , a stainless steel sand guard can be supplied which protects the motor against corrosive and / or abrasive liquids.







Corrosion resistant stainless steel shaft ends.

NEMA connections for 6" and 8". Others upon request.

Mechanical seal standard.

Cable internally connected.

Sleeve bearing housing.

Rewindable "wet-type" motors with watertight insulated windings (not canned).

High grade stainless steel bearing sleeves.

Stainless steel stator tubes are standard.

Dynamically balanced rotors.

Large journal bearings water-lubricated maintenance-free for long life operation.

Cooling Impeller

Heavy duty adjustable self-aligning thrust bearings.

Diaphragms for pressure/ volume compensation.

Cast iron housings. Optional high corrosion resistant materials.

PLEUGER
Submersible Pump Units
Offshore Industry

From the very beginning of the offshore industry, Pleuger Worthington has been supplying pumps for platforms. Their design is based on the experience of submersible units since 1929. The pump units are operating as **seawater lift pumps, drains caisson, fire, crude oil export, ballast and deballast pumps.**

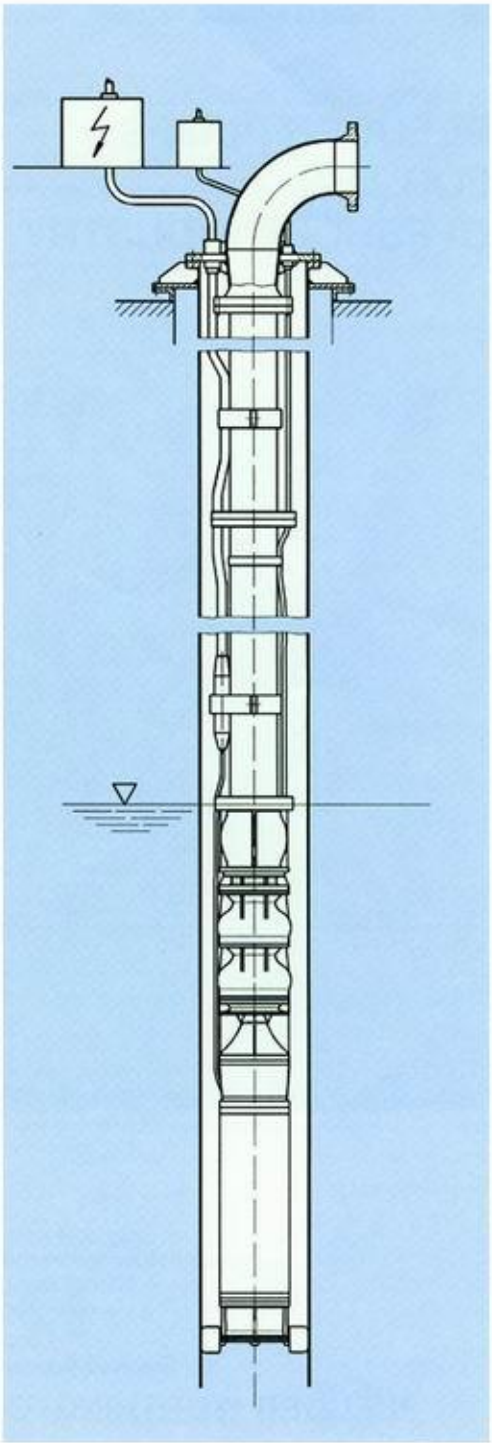
After the change of philosophy in the offshore industry the "wet" motor driven pumps have be gun to displace the lineshaft driven pumps which in the case of the fire pumps has lead to a dual role. Today it is not unusual for the pump to operate as an auxiliary pump in continuous service, and in the event of a fire they are automatically switched to the fire main thus ensuring an instant supply of fire water.
The pumps are there fore designed both in accordance with API 610 and NFPA 20.

The heart of such a compact pump unit is the so-called "wet" electric motor directly coupled to the pump.
Such a unit is usually installed in a caisson or stilling tube, freely suspended at the rising main and needs no space on deck except for the electric power supply cable and the discharge pipe.

A further advantage of pump units with water filled ("wet") motors is, that at larger sizes the motor can be operated with voltages up to 6600 Volts, giving a corresponding reduction in the cross section of the supply cable.

The motor bearings are lubricated by the motor filling water and the pump bearings by the pumped fluid giving maintenance free operation. In the event of leakage at the motor seal and the mixing of the motor filling water with the pumped fluid, the motor still remains operational. This being especially advantageous on emergency services, which is not the case with the oil filled type of motor.

Picture 1 shows such a typical pump Unit installation
Picture 2 shows the pump unit itself



Picture 1

Picture 2

Seawater Lift Pumps			
type:		200VT-2H + VI22-200-4	
capacity	:	1525	m³/h
head	:	113,3	m
voltage	:	6000	V
frequency	:	50	Hz
motor output	:	750	kW
weight	:	7	t
length	:	5,5	m

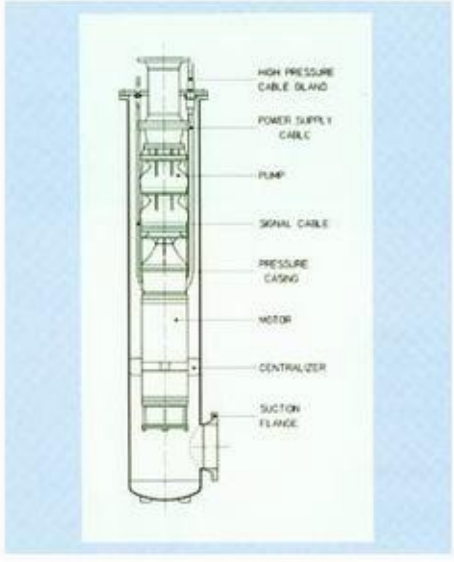
Based on the life expectancy required for each specific service, be it temporary or permanent Pleuger Worthington is manufacturing these offshore units in various materials of construction from zinc free bronze through to 6 Mo (UNS - S 31254).

The Quality Assurance aspect in offshore can be compared with the nuclear power industry and Pleuger Worthington is following this demand

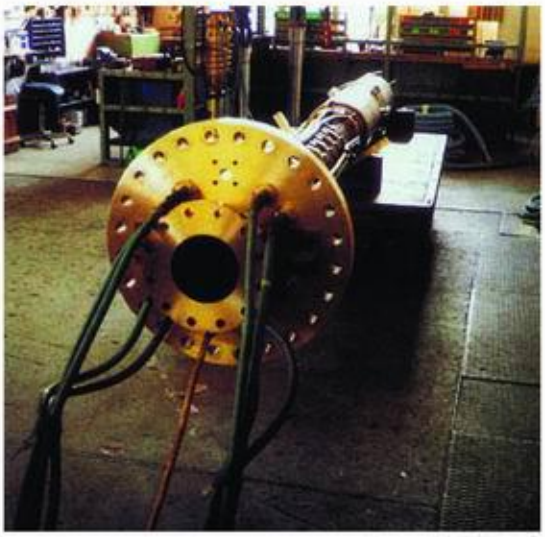
Also due to the structure of the Pleuger Worthington Company the order handling and manufacturing for these mostly tailor made unitsis guaranteed.

The ballast and deballast pumps, are mainly installed in pressure casings which are manufactured in accordance with the ASME code for boilers and pressure vessels.

Picture 3 shows such an installation and Picture 4 such a unit itself.



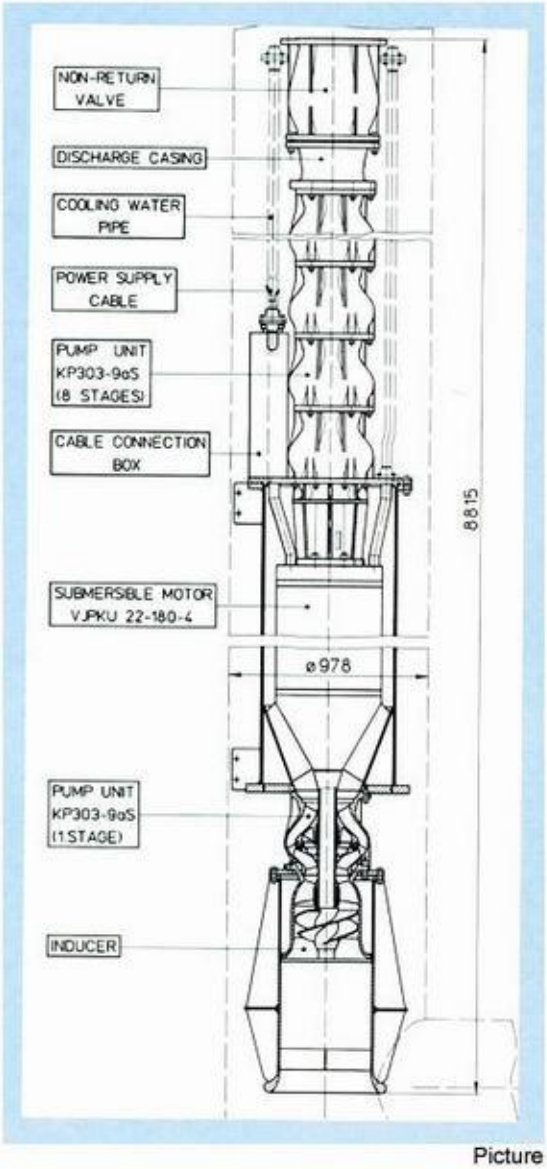
Picture 3



Picture 4

Due to the length of legs of large GBS's (Gravity Base Structure) the installation depth is at 300 m, consequently an internal pressure of 30 bar can occur. Pleuger Worthington has a well proven design of cable penetration through top flange that can withstand pressures up to 100 bar. And the motor itself is pressure compensated and therefore does not need to be sealed against high pressure.

Picture 5 and 6 shown a typical tailor made offshore pump.



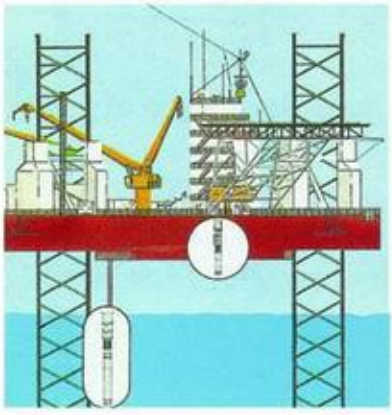
Picture 5

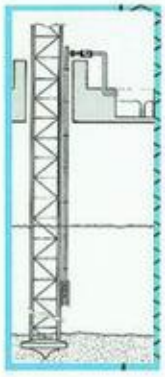
This unit was designed for a GBS where crude oil is temporary stored in the cells of platforms foundations. The goal of minimizing the dead stock in the cells was achieved by using an inducer in front of the first stage of a bottom intake pump. The main pressure is produced with the additional 8 stages above the motor. In addition the motor is also equipped with made to order power supply cable which is resistant to the composition of the crude oil being pumped.

Picture 6

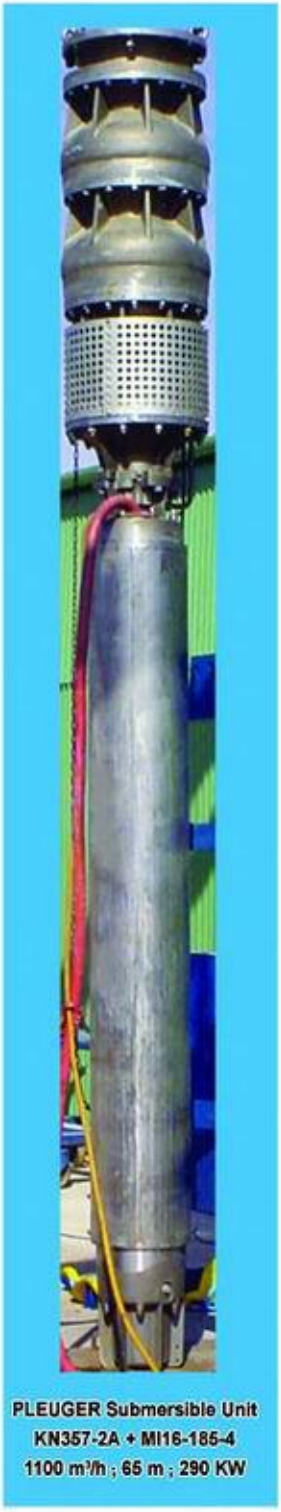
Oil -Export Pumps			
type:		**KP 303-9aS + VJPKU 22-180-4**	
capacity	:	**750**	**m^3/h**
head	:	**201,8**	**m**
$NPSH_R$	:	**2,7**	**m**
voltage	:	**6000**	**V**
frequency	:	**50**	**Hz**
motor output	:	**600**	**kW**
weight	:	**8**	**t**
length	:	**9**	**m**

Offshore platform inthe North Sea equipped with
Pleuger Worthington auxiliary pumps





Further examples of installation
with submersiblepump units
in offshore



PLEUGER Submersible Unit
KN357-2A + MI16-185-4
1100 m³/h ; 65 m ; 290 KW

PLEUGER
Submersible Pump Units
Applications

Irreigation

PLEUGER submersible pumpsare the optimum selection for the econmic raising of water from wells, rivers, channels or lakes. Their wide capacity range permits simple integration in automatic

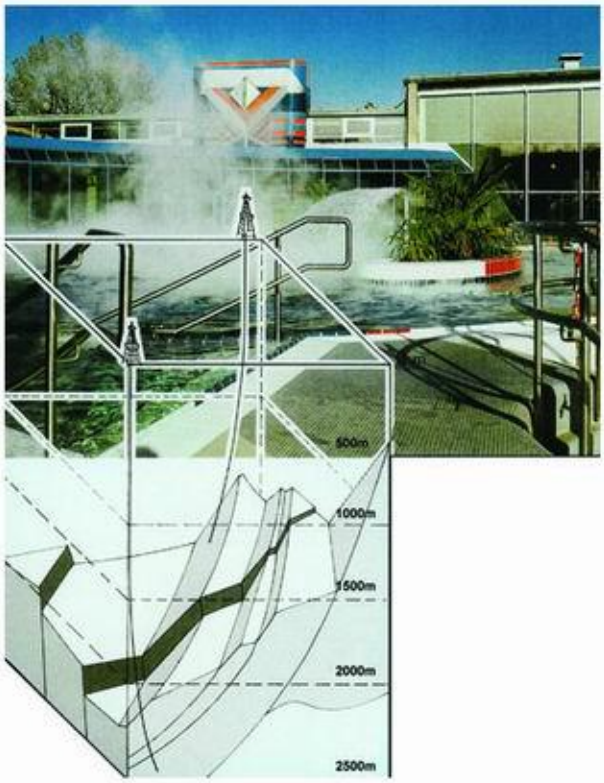
irrigation systems and for fine tuning to match flow requirements. Because of their high qualily, Pleuger submersible pump units have a very long product life and are maintenance Free even under extreme conditions.

Booster stations

For increasing pressure in pipeline networks, PLEUGER submersible pumps equipped with booster casings are integrated into the system. Thanks to their slim space-saving design, our maintenance-free PLEUGER booster pumps can be installed without extensive construction work (underground installation, etc.) even in areas where access is difficult. The booster pumps can be fitted horizontally or vertically, depending on requirements. They work extremely quietly and are easy to operate. Economic and reliable operation is ensured by the high efficiency of PLEUGER pumps and precise selection for the desired operating point.

Hot Water and Geothermal

For the pumping of high-temperature water, PLEUGER offers of a wide range of submersible pumps with different design features to cope increasing temperature loads; i. e. standard units modified standard units and special designs for hot water.

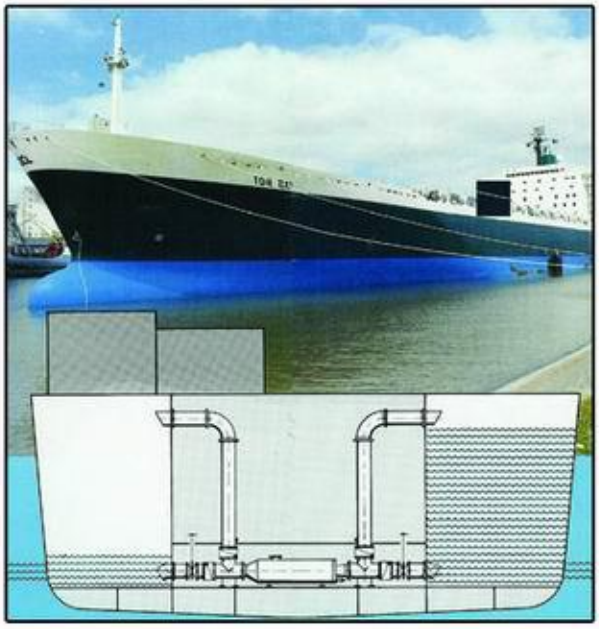


The extreme demands made on material stability are met by careful selection of materials.

Thanks to its highly developed motor technology, PLEUGER is also specialized in hot -water pumping for industrial water and therm water applications (swimming pools, greenhoses, district heating). PLEUGER is thus making a great contribution to the utilization of alternative energies.

Ships

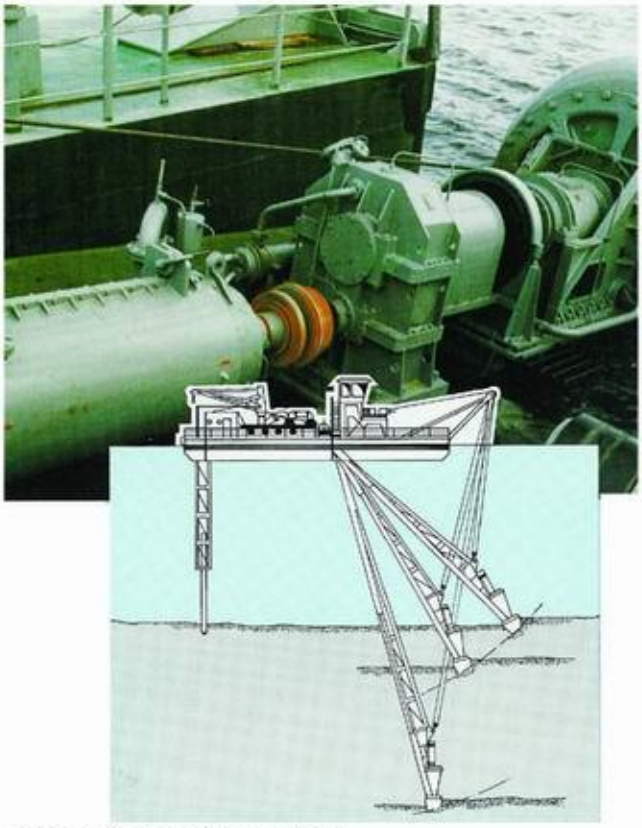
PLEUGER submersible pumps are used in a varity of applications on ships in water ballast or trimming systems.
The space-saving compact design and the maintenance-free operation of the submersible pumps permit installtion even in area where access is difficult.
PLEUGER submersible pumps can be used in any installation position.
Because PLEGER axial flow pumps can be operated in reverse, they have the advantage that the system can be operated in either direction with a single pump.



PLEUGER
Submersible Motors Applications

Dredgers

One further special field of application for Pleuger submersible motors is in dredgers which excavate far below the water surface. The submersible motors can be utilized both to drive the dredger pumps and the cutter heads. Power transmission shafts with multiple bearings are not required.
The pressure- compensated submersible motors drive the cutter heads on the dredger's ladder directly by



means of a reduction gear box.
Because of their robust construction,
the submersible motors are able to withstand the hard strokes and the high acceleration forces arising during the piling operation.

Special Designs

PLEUGER manufactures submersible motors according to special customer requirements and for specific applications – e.g. foot-mounted motors for horizontal installation motors with modified motor shafts for the direct connection of all types of machines, motors for hot water or for utilization in special media (see photo: PLEUGER submersible motor VNR 50 with a directly coupled centrifugal dredger pump). The high efficiency, the robust construction and the long life of the maintenance-free PLEUGER submersible motor permits unrestricted utilization of all advantages offered by a submersible drive.

PLEUGER
Accessories

Measuring/Controlling/Regulating

Water level measuring equipment

For remote measuring of water levels, level monitoring and control of pumps in deep wells and tanks over any required distance with instruments for display and recording.

Water level monitoring equipment

For protection against dry run pumps and for automatic submersible pumps.

Control equipment

For regulation of the flow rate or delivery head for optimal operation.

Mechanical accessories

-Fittings / tanks
-Well heads
-Booster casings
-Flap valves
-Bends
-Cooling jackets
-Fitting tools
-Screen cleaning machines
-Sand protection jackets
-Piping
-Suction shrouds
-Gate valves
-Water meters
-Centering devices

Electrical Accessories

-Frequency converters
-Cables
-Cable connectors
-Motor control panels
-Motor starters
-Electrical controls
-Motor protection switches
-Transformers

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