



## Hydraulic Starting Systems for Diesel Engines



- Hydraulic starting systems are suitable for engines up to 150 litres
- Independent or back-up start system in sub-zero conditions or hazardous areas





## Introduction

**IPU hydraulic diesel engine starting systems provide guaranteed reliability, no matter how challenging or unpredictable the environment. This truly independent, dead ship or black start capability is ideal as your only method of starting for stand by and emergency, marine and offshore generators.**

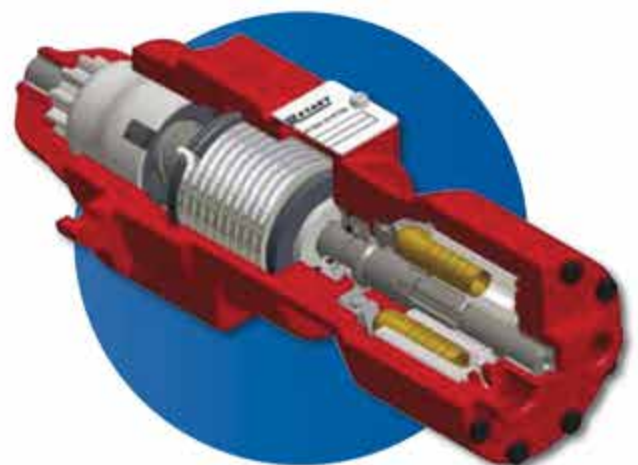
**Manufactured from aluminium or cast iron, hydraulic starter motors can be supplied with Beryllium Copper non-sparking pinions eliminating potential explosion, together with remote or auto start options, electric motor driven recharge pumps and solenoid valves.**

And, because IPU Starting specialise in helping you find the right start system for the generator application you can be sure that the solution we provide will be more than up to the job, however demanding. From offshore projects in hazardous areas to auxiliary marine generator sets, hydraulic power is perfect for both single and multiple starts.

Hydraulic starting systems all come complete with a hand pump for manual charging and system purging. When the system is pressurised it gives fast, positive cranking combined with quick acceleration and high torque output providing effective operation in the harshest conditions such as extreme temperatures and dampness even after long shutdown periods.

## How hydraulic starters work

The concept is to store energy in the form of hydraulic fluid under pressure inside an accumulator. This energy is provided via a manual hand pump or a power driven recharge pump, which in turn can be released via a valve to turn the hydraulic starter motor.





## Hydraulic starting system components



### Hydraulic cranking motor

Starter motors are available for engines from 1-80 litres and above. Manufactured from cast iron, the unique design of the starter motors allows the displacement to be easily increased, to provide greater torque and more power to start larger engines or compensate for greater starting torque requirements in extreme cold environments.



### Accumulators

The SC range of accumulators is fully Lloyds approved and come in sizes from 1-16 litres. Bladder accumulators available in sizes up to 54 litres, with TUV, Lloyds ASME and other approvals.



### Hand pump

To manually recharge the hydraulic accumulators.



### Foot start valve

VF foot start valve. Simple rugged design, with wiper seal for self cleaning, and easy to repair design.

## Re-charging options



### Engine pump

Suitable in applications where there is no other source of power. The engine is then used to recharge the accumulators to starting pressure. Engine driven pumps can be belt or power take off driven (PTO).



### Motor driven

Suitable in applications with an electrical supply present with the major advantage of not relying on the engine to recharge as a pressure switch senses a drop in pressure, which in turn fills the accumulators automatically. Motors are available in most voltages and certifications. ATEX (hazardous area) motors are also available as standard.



### Combined

Benefit of both systems offers higher level of guarantee and may be a specific project requirement.



### Pneumatic recharge

Pneumatic recharge systems rely on an external source of compressed air to drive a hydro-pneumatic pump. The hydro-pneumatic pump works on a ratio of 60:1 as standard which means a pneumatic input pressure of 50 psi (3.5 bar) drives the pump to reach 3000 psi (207 bar) hydraulic oil pressure in the accumulator.

## Mini pack hydraulic starting system

Suitable for engines typically up to 12 litres. These systems are widely used in marine environments for standby emergency starting for auxiliary generators. They come completely assembled and supplied with hoses and a starter motor. The dimensions of the system are typically 425mm long x 217mm wide x 430mm high excluding handle.



## Customer benefits

### Safe in hazardous area

Hydraulic starters meet ATEX regulations for offshore projects in hazardous areas to auxiliary marine diesel engine generator sets.



### Guaranteed start

The energy can be stored indefinitely providing the system is installed and maintained to IPU specifications and can be manually re-charged via a hand pump quickly and easily.

### Performance in all conditions

Performance of hydraulic starters is unaffected by either very hot or cold conditions, provided the correct viscosity of oil is used and operate efficiently following extensive periods of shut down.



### Low maintenance

Hydraulic starting systems are designed to last as long as your engine so why not enjoy low maintenance and replacement costs, as well as peace of mind? The system is totally enclosed with all internal components immersed in oil, thus protecting it from the adverse environmental elements and conditions detrimental to electric or vane starters.

## Applications



### Marine applications

Marine based systems for auxiliary, critical situations and 'dead ship' requirements are designed to meet specific classification systems. These societies include Lloyd's register of shipping, DNV, BV, GL and NK with each sharing a common minimum standard for a hand-pumped system capable of delivering three starts within a 30-minute period.

### Choice of accumulation certification for marine applications:

- PED/CE
- ASME
- ASME + PED
- BV
- LLOYDS
- DNV
- NK
- DPP

### Offshore generator set and pump applications

Offshore generator or pump sets require either three or six start attempts without a specific time limit. The number of start attempts required is based on either a customer or project based requirement, such as NFPA20.





## Technical information

### Hydraulic cranking motor

Maximum working pressure	21 Mpa (3000 psi)
Torque range	From 30 Nm to 216 Nm (22 lbf.ft. to 160 lbf.ft.)
Displacements in cc/rev	10, 16, 22, 28, 38, 66
Displacements in cu.in/rev	0.6, 0.95, 1.35, 1.71, 2.32, 4.0
Minimum efficiency	95%
Seals	Nitrile (standard), viton (optional)

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### Foot start valve

Maximum working pressure	21 Mpa (3000 psi)
Flow rate (3/8" NPT port)	75 l/min (20 usgpm)
Flow rate (1/2" NPT port)	100 l/min (26 usgpm)
Part number	VF (3/8" NPT port)
VF8 (1/2" NPT port)	

### Hand pump

Maximum working pressure	21 Mpa (3000 psi)
Suction pressure	75 kPa (11 psi)
Displacement	20 cc/cycle (1.22 cu.in.)
Part number	PH20

### Accumulators - Piston type

Construction	Certified seamless tube
Max working pressure	21 Mpa (3000 psi)
Test pressure	35 Mpa (5000 psi)
Average burst pressure	120 Mpa (20000 psi)
Safety factor	In excess of 4:1
Seals	Nitrile (standard), Viton (optional)
Nominal volumes in litres	1.0, 2.5, 4.0, 5.5, 7.5, 10.0, 12.0, 16.0
Nominal volumes in usg	0.25, 0.66, 1.06, 1.50, 1.88, 2.60, 3.20, 4.20

### Accumulators - Bladder type

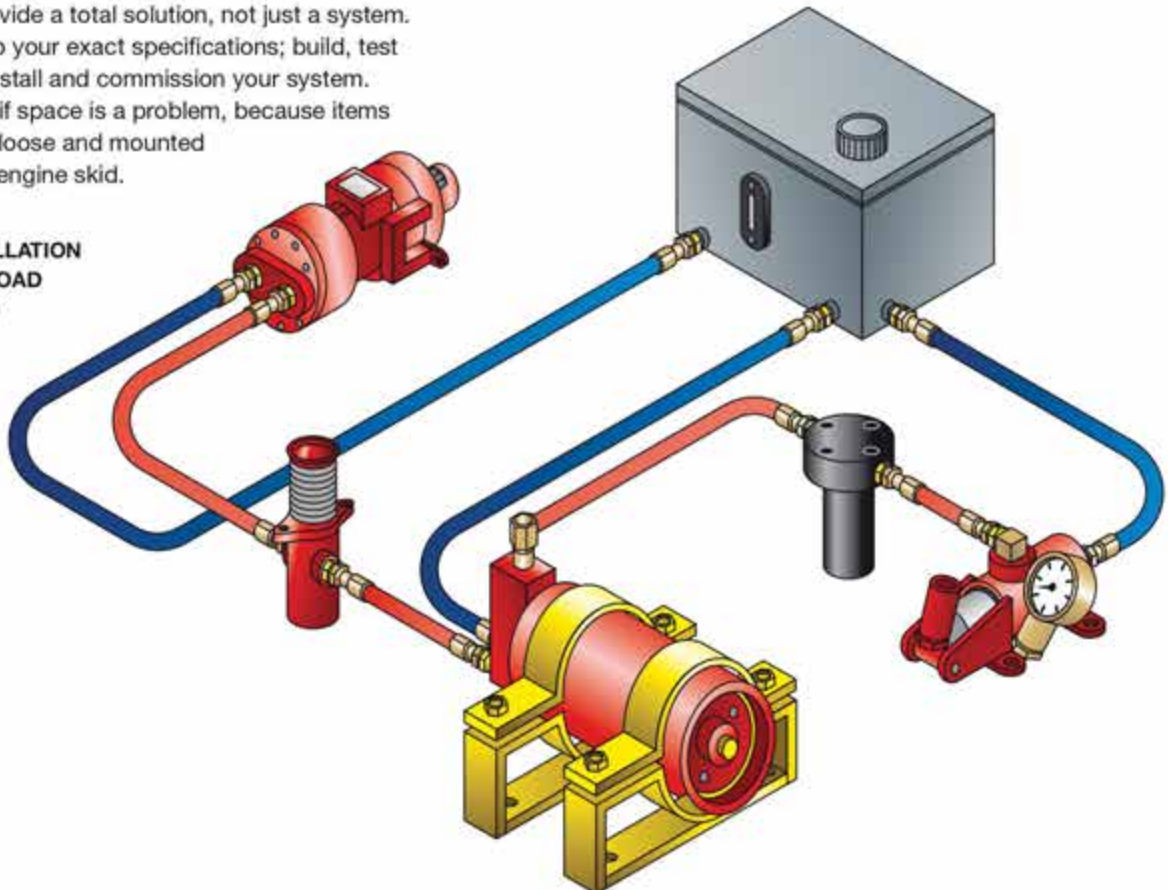
Construction	Forged certified steel
Max working pressure	21 Mpa (3000 psi)
Test pressure	35 Mpa (5000 psi)
Average burst pressure	120 Mpa (20000 psi)
Safety factor	In excess of 4:1
Bladder	Nitrile (standard), Viton (optional)
Nominal volumes in litres	10, 20, 37, 54
Nominal volumes in usg	3.0, 5.5, 10, 15

**FOR FULL TECHNICAL INFORMATION DOWNLOAD OUR HYDRAULIC MANUAL FROM OUR WEBSITE [www.ipu.co.uk](http://www.ipu.co.uk)**

## Installation

Our aim is to provide a total solution, not just a system. We can design to your exact specifications; build, test and if required install and commission your system. And don't worry if space is a problem, because items can be supplied loose and mounted in or around the engine skid.

**FOR FULL INSTALLATION DETAILS DOWNLOAD OUR HYDRAULIC MANUAL**





## Hydraulic starting case study – Sakhalin Island

IPU recently supplied three hydraulic start systems for the Sakhalin Arkutun-Dagi project, to be used on Caterpillar 3516HD engines. The start systems were designed to provide emergency black start capacity, of 3 starts each with a 10 second starting cycle, for the emergency generator sets.

This application is particularly difficult as the generator sets have been designed to withstand some of the harshest environments on the planet, with temperatures reaching -45°C. The generators, and associated IPU starting systems, will be used on an Exxon-Mobil operated platform which will be operating 25km off the north east coast of Sakhalin Island in the Sea of Okhotsk, it is amongst the biggest in the industry with a 'topside' of 28000 tons.

## Hydraulic starting case study – Buzzard Field (North Sea)

The hydraulic starting system was designed for black start operation on a multi-role generator set being used for emergency and essential services with a primary function to supply power to a 1000Kw fire pump motor.

The IPU solution guaranteed three start attempts each with a five second duration and incorporated a manual start valve and an engine driven PTO pump. In addition the system was designed to meet the Pressure Equipment Directive (PED) which requires assemblies of pressure equipment to meet essential safety criteria necessitating a full risk assessment and design appraisal, all of which was reviewed and approved by Lloyds Register of Shipping before being CE marked. All materials used met the needs of the offshore environment including stainless steel and a special paint finish to Norsok N501 standard.



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