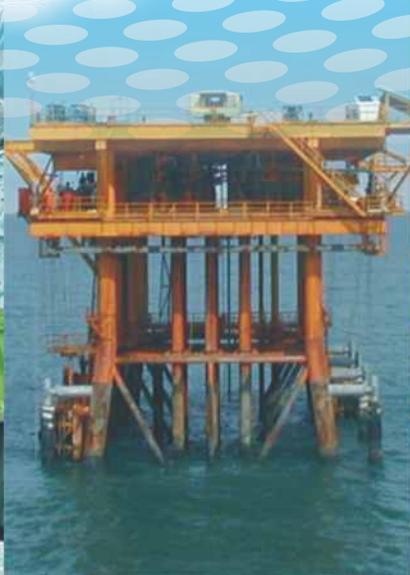
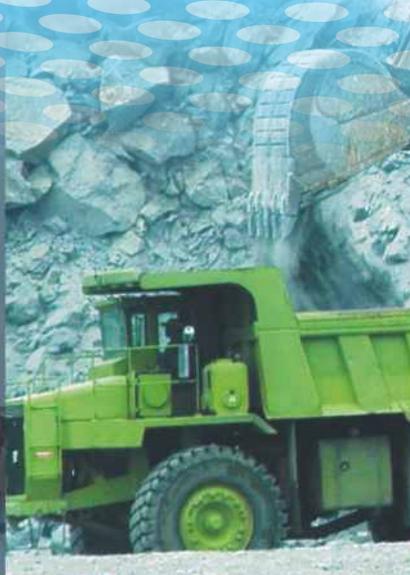
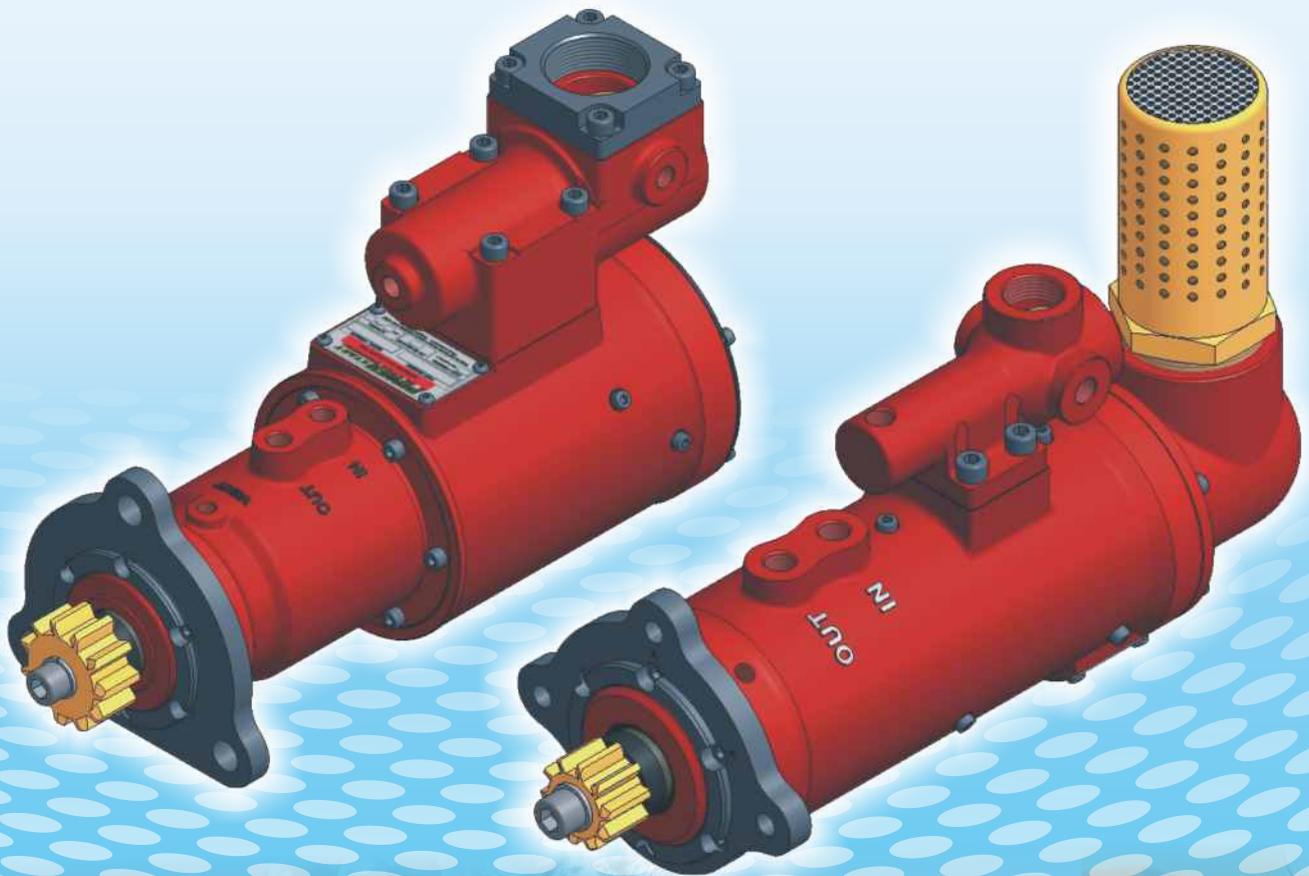


JETSTREAM

The **FIRST** air turbine *to start diesel engines* at **low or high pressure**



How does it work?

The turbine starter works by allowing a stream of compressed air to enter the casing of the unit which is guided via the inlet nozzles to strike the primary turbine wheel. On impact with the primary wheel, the energy transfer makes the wheel rotate at very high speed. This effect is repeated as the air exits the first wheel, is redirected by the stator wheel and strikes the secondary wheel, with the turbine finally reaching speeds of 25 to 40 thousand rpm. This high speed is reduced by approximately 10 times inside a precision planetary gearbox and the resultant speed reduction and torque magnification then drives the pinion gear to start the engine.

The First Turbine Designed for High Pressure Starting

Jetstream is unique in its ability to start at low or high pressures. Costly and bulky pressure reduction valves are no longer required to operate the starter at pressures up to 30 bar (435 psi). *Jetstream* starters can be ordered to operate as low as 3 bar (45 psi) or as high as 30 bar (435 psi)



Making Installation Easier

Jetstream is the only turbine starter designed from the ground up with an integral relay valve option for both *Jetstream* 4 and 5 starters. This option, along with exhaust adapters and mufflers can be ordered pre-installed and configured as part of the starter, thus making installation quicker, easier and less expensive. There are no fittings to seal and tighten, so the starter can be unpacked and bolted straight onto the engine.



The Pre-engaged Outboard Bearing Starter

Outboard bearing starters have a nosecone and the drive shaft is supported at both ends. Because of this support they can be made shorter and more robust than overhung starters, which have a cantilevered pinion.

The engagement principle is similar to overhung starters in that they only begin to rotate once fully engaged.

Available on *Jetstream* 5 only.

The Inertia Starter

With inertia starters, the sudden impulse of the pinion shaft as it begins to rotate causes the gear to move forward along a helix shaft. This in turn engages the pinion with the ring gear and continues rotating to start the engine.

As soon as firing speed has been reached, centrifugal weights move outwards enabling the engine to kick the pinion gear backwards to its disengaged position. This method of engagement is simple, reliable and well proven.

Available on *Jetstream* 4 only.

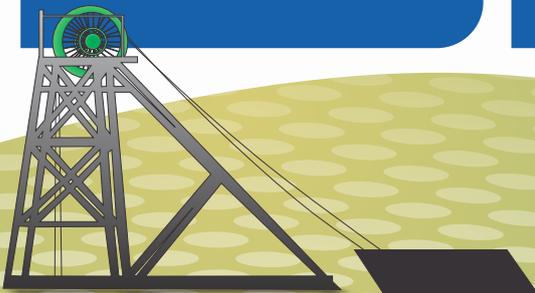
The Overhung Pre-engaged Starter

Overhung starters have no outboard bearing or nosecone and as such pocket depth or starter indexing is not an issue.

Being pre-engaged, they first engage into the ring gear whilst stationary and only once they are fully engaged do they begin to rotate. This system ensures that the starter cannot rotate prior to being engaged with the ring gear, thus reducing wear and the risk of sparking.

Pre-engaged starters are a requirement of the European ATEX directive.

Available on *Jetstream* 4 and 5.



Jetstream 4

Key features:

- Available as PRE-ENGAGED with overhung pinion or INERTIA DRIVE with outboard bearing
- Suitable for engines up to 12 litres (730 cubic inches)
- Jetstream inertia starters use heavy duty spring drives proven in hydraulic starters for over 30 years
- Can be ordered complete with integral relay valve and exhaust adapters or mufflers, reducing fitting and installation time
- Available in 3 pressure configurations
 - Low pressure for 3 - 5 bar (45 - 75 psi) applications
 - Medium pressure for 5 - 8 bar (75 - 120 psi) applications
 - High pressure for 25 - 30 bar (360 - 435 psi) applications
- Exhaust options: Simple guard, straight or 90 degree threaded adapters to suit piping or mufflers



Jetstream 5

Key features:

- Available as PRE-ENGAGED with overhung pinion or compact pre-engaged with OUTBOARD BEARING and nosecone
- Suitable for engines up to 80 litres (5000 cubic inches)
- Multiple starters can be used to start larger engines
- Can be ordered complete with integral relay valve and exhaust adapters or mufflers, reducing fitting and installation time
- Available in 3 pressure configurations:
 - Low pressure for 3 - 5 bar (45 - 75 psi) applications
 - Medium pressure for 5 - 10 bar (75 - 150 psi) applications
 - High pressure for 25 - 30 bar (360 - 435 psi) applications
- Exhaust options: Simple guard, straight or 90 degree threaded adapters to suit piping or mufflers
- Sealed for life turbine section eliminates maintenance
- Easily removable pinion and flange for simple change over depending on engine applications. No starter disassembly required to change pinion or flange.
- Bolt-on inlet adapters simplify the removal of the starter without affecting the pipe work and add the flexibility of using different thread connections
- Bolt-on inlet adapters also prevent distortion of the starter housing and eliminate the risk of cracking it if over tightened



Available accessories for all starters



Exhaust muffler
Greatly reduces noise



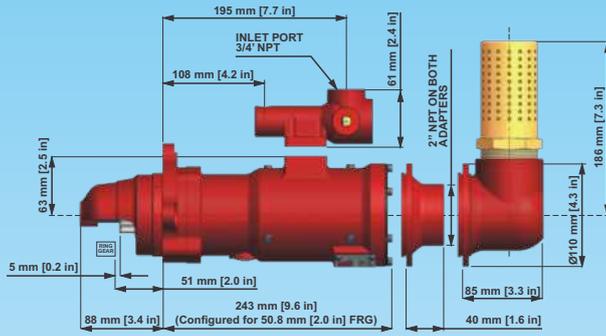
Exhaust Adapters (straight and 90°)
For piping away air and connecting mufflers



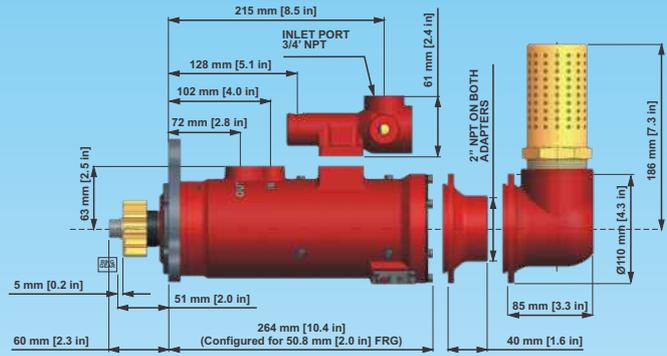
Integrated Relay Valves
Fit directly onto the starters



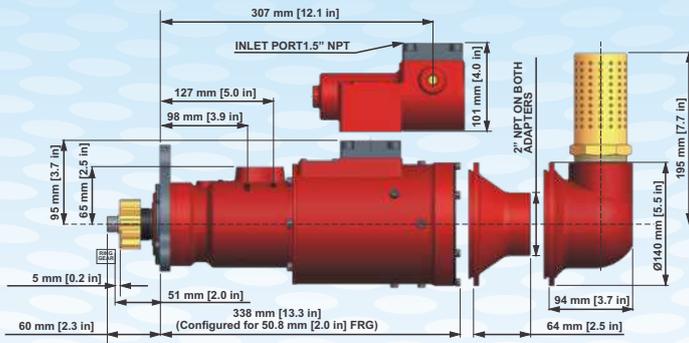
Jetstream 4 Inertia



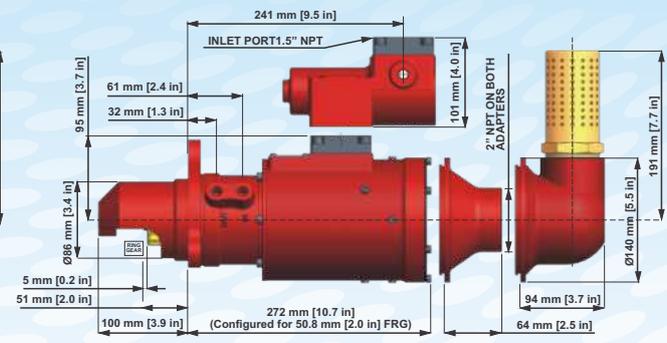
Jetstream 4 Pre-engaged



Jetstream 5 Overhung Pre-engaged



Jetstream 5 Outboard Bearing pre-engaged



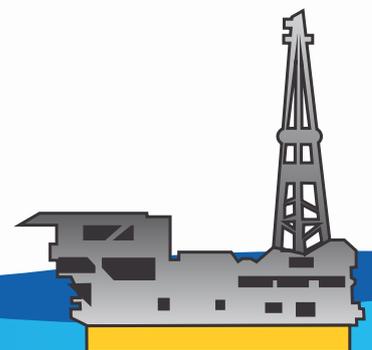
Performance, Consumption and Product Weights

	Pressure Rating	Nozzles	Inlet Pressure		Breakaway Torque		Max. Power		Consumption	
			bar	psi	Nm	lb.ft	kW	HP	m ³ /sec	scfs
Jetstream 4	High	1	30	435	78	57	7.8	10.5	0.37	13.1
	Medium	5	8	116	12	70	12	16.1	0.29	10.3
	Low	12	4	58	100	74	9.5	12.7	0.27	9.4
			2.5	36	60	44	4.5	6.0	0.20	6.9
Jetstream 5	High	2	30	435	230	169	25	33.5	0.54	19.2
	Medium	6	10	145	180	132	17	22.8	0.35	12.5
		8	116	147	108	12.5	16.8	0.27	9.6	
	Medium	10	8	116	233	171	23.7	31.8	0.42	15.0
		6	87	194	143	16.5	22.1	0.33	11.5	
		8	116	338	249	26.4	35.4	0.55	19.4	
	Medium	14	6	87	260	191	19.6	26.3	0.43	15.2
			3	44	120	88	8.4	11.3	0.22	7.8

	Component	Mass	
		kg	lb.
Jetstream 4	Inertia starter	10.0	22.0
	Pre-engaged starter	10.0	22.0
	Relay valve	1.0	2.2
	Exhaust adapter, straight	0.6	1.3
	Exhaust adapter, 90°	1.4	3.1
	Exhaust muffler	0.8	1.8
Jetstream 5	Overhung starter	17.0	37.4
	Outboard bearing starter	16.0	35.2
	Relay valve	3.0	6.6
	Exhaust adapter, straight	1.3	2.9
	Exhaust adapter, 90°	2.1	4.6
	Exhaust muffler	0.8	1.8

Above masses are *nett* product masses excluding packaging

All performance tests conducted with exhaust guard configuration.



Why Jetstream turbine air starting?

Powerworks and Powerstart have been synonymous with reliable alternative starting for over three decades. Our success can be attributed to a total dedication to satisfying the needs of the customer in record-breaking time, thus providing first-class service to support our first-class products. We differ from most manufacturers in that our experience includes installing and repairing systems, thus giving us first hand knowledge of real world applications and problems.

Jetstream turbine air starters offer many advantages over electric starting which may vary depending on applications and environments:

- Jetstream turbine starters require no electricity and therefore are non-sparking and this makes them ideal for flameproof applications.
- Jetstream turbine starters offer more power and torque per kilogram than electric starters. The entire starting system with air reservoir is far lighter than an electric starter with its heavy batteries.
- Jetstream turbine starters are relatively immune to air contamination as opposed to older vane motors.
- Jetstream turbine starters offer faster cranking than electric starters. This means higher compression, in turn raising combustion temperatures and improving starting ability.
- Very rapid recharge of air tank (even with a small compressor). It would take minutes to charge an air reservoir compared with the hours required to fully recharge a bank of batteries.
- Jetstream turbine starters require no in-line lubrication and are therefore very environmentally friendly, with only air being emitted from the exhaust. This is far cleaner than the oil mist being expelled from vane starters or the environmental unfriendliness of batteries and their associated chemical reactions.
- All Jetstream starters can be fitted with optional beryllium copper pinions for more stringent non-sparking applications where this is a requirement.
- Jetstream turbine elements feature a proprietary wear resistant coating for extended service life and greater protection from contaminated and dirty air.
- Jetstream Turbine starters are available with or without integral relay valves.
- Jetstream pre-engaged starters are compliant with the European ATEX directive.

Typical layout of an air starting system

