

Technical Specification for

Model PGTLR-2250 Trailer Mounted Fracturing Unit

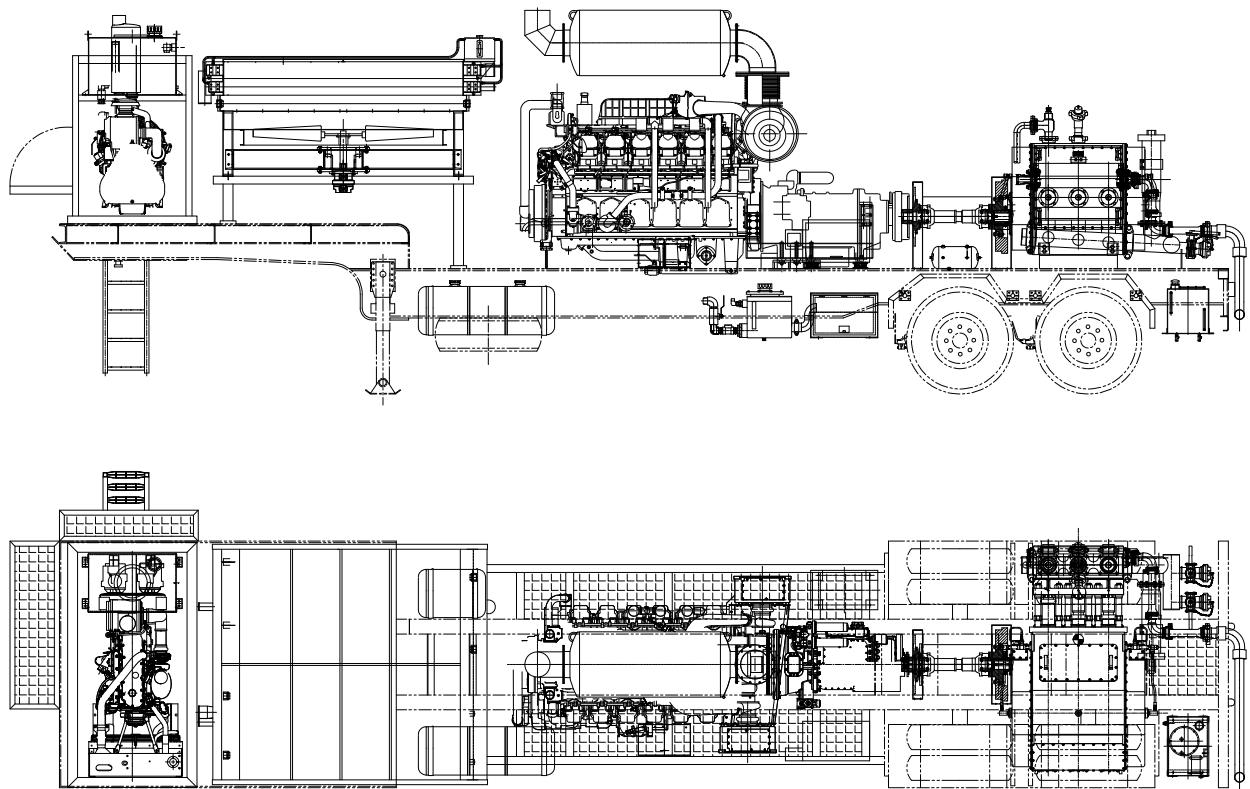


General Specifications

1. The equipment is suitable for operation in environmental temperatures between -20°C to 45°C with relative humidity of 90%.
2. All instruments and digital displays will function correctly within these temperature ranges. Drain openings/valves will be installed where required on all units to allow drainage of all operating fluids when required.
3. All gauges and instruments will read in Both U.S and metric units.
4. All equipment will be designed and built to recognized national/international standard and manufacturing practices. All equipment will be built under the Quality Standards of ISO 9001.
5. All instrumentation shall be weatherproof, dust proof and vibration protected.
6. All equipment will be brand new, will not be used or rebuilt returned equipment or any parts.
7. All units will be equipped with night working lights to ensure twenty-four (24) hours.
8. Sharp corners and edges to which operators and mechanics are vulnerable shall be ground smooth. Bolt holes for bolts shall be drilled (not torch cut). Welds shall be of good quality and of sufficient strength. Where applicable use self locking nuts.
9. All hoses/wires will be securely fastened and be well supported with support type clamps.
10. All tanks shall be equipped with open/close drain valves installed on the lowest point of the tanks.
11. All cable adapters and console are performed by waterproofing treatment.

1. Weight, Dimensions and Main Parameters

- Model: PGTLR-2250
- Description: PGTLR-2250 Trailer Mounted Fracturing Unit
- Max working pressure: 14,147psi (99.7MPa)
- Maximum working flow: 494 GPM (1.87 m³/min)
- Maximum working temp: 55°C
- Overall Dimensions (LXWXH): 12,000X2,500X3,950
- Max. Weight: 38,000 kg (Approx.)



General Layout Drawing

2. General Description

The Model PGTLR-2250 Fracturing Trailer is suitable for all kinds of fracturing operations in deep, medium and shallow oil and gas wells. It is suitable for water fracturing, acidification fracturing, pumping fluid of high pressure pump, pressure

test, etc.

3. Main Components

- One (1) Caterpillar 3512B Engine, 2250BHP/ 1900RPM
- One (1) Caterpillar CAT C9 BHP 300/ 2200RPM
- One (1) Allison S9820M hydro-mechanic transmission
- One (1) Serva TPA 2250X4 1/2" triplex pump
- One (1) 40 ton capacity heavy-duty semi-trailer chassis
- Local and remote control system
- Low pressure suction and high pressure discharge manifold

4. Components Details

4.1 Trailer chassis

The trailer is a customer build, heavy duty, oilfield type, 40 ton capacity single drop semi-trailer chassis.

4.1.1 Parameters

Main Parameters	Length (mm)	12,000
	Width (mm)	2,500
	Axle base (mm)	1,300
	King Pin (fifth wheel)	50# (2")
	Saddle Height Without Load (mm)	1390

4.1.2 Specification

- Manufacturer of the chassis: Yangzhou Tonghua special vehicles, a member of CIMC group.
- Trailer Description: Single drop trailer chassis, designed for oilfield road and high temperature environment.
- Dual axle load capacity: 40,000 lb
- Tires: 9x12.00R20, plus one spare
- Brakes: air operated, w/24V ABS
- Frame: "H" type, high strength steel

- Rear suspension system: blade type spring
- King pin height: 1400 mm
- Electrical system: 24V, Side signal lights, rear signal lights, rear turn signals and foglight included.
- Mechanical jacks: Jost

4.2 Engine

- Model: Caterpillar 3512B Frac Ratings V-12
- Rated Horsepower: 2250BHP@1900rpm
- Cylinder bore: 170.0 mm (6.69 in)
- Stroke: 190.0 mm (7.48 in)
- Displacement: 51.8 L (3,160.84 cu in)
- ADEM II electrical system
- Cooling style: Remote hydraulically driven, Horizontal mounted multi-way 55°C radiator
- Start mode: hydraulic starters
- Muffler and accessories, w/ additional spark arrestor
- Bendix 16CFM Air compressor
- 24V Charging 75A alternator and batteries system
- Donaldson air cleaner
- Sound warning alarm for low oil pressure, high water temperature, over speed.
- Emergency shut down system
- Cooling system: Remote hydraulically driven, Horizontal mounted multi-way 55° C radiator

4.3 Transmission

- Model: S9820M hydraulic mechanical
- Max power input: 2250HP

- Max speed input: 2100RPM
- Max torque input: 8271N.m
- TC1080 Torque converter
- SAE 0# connected
- With direct installed type filter
- With top and side PTO port
- Manual electric control shift of transmission
- DC drive hydraulic shift assembly with torque converter lock limiter
- Clutch lock
- Drum brake device of output shaft
- 7 Gear ratio is as follows:
- 3.750; 2.694; 2.201; 1.776; 1.581; 1.268; 1.000

4.4 Draft shaft

The transmission is connected with a triplex fracturing pump by a 190 series driving shaft ("SPICER", "DANA"). A removable guard is installed on the driving shaft, which is easy for turning the driving shaft when the operator inspects the fluid end of pump. A removable metal protection is installed outside of guard.

4.5 Brake Device

Between transmission and shaft, an air driven brake device is installed to prevent the shaft from running the pump when engine runs but transmission is at neutral shifter. And also once the overpressure system functions, the brake device will start automatically. The air source for braking device comes from the air reservoir.

4.6 High Pressure Triplex Plunge Pump

- Model: Serva TPA 2250
- Stroke: 8" (203.2 mm)
- Plunger: 4 1/2" (127.0mm)
- Max power output: 2250HP
- Max working pressure: 14460 psi, with pressure relief

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- Maximum working flow 11.76 BPM, (1.87 cubic meter per minute)
- The performance of 4 1/2" fluid end is as follow:

Gear	Transmission Gear Ratio	Shaft Speed (Rpm)	Pressure (Mpa)	Flow (L/M)	Brake Horse Power (Hp)
1	3.75	80	99.7	498.8	
2	2.69	111	99.7	695.4	
3	2.2	136	90.5	850.3	
4	1.77	169	72.8	1056.9	2250
5	1.58	189	65.0	1183.9	2250
6	1.27	235	52.2	1472.9	2250
7	1	299	41.1	1870.6	2250

- The data above is based on:
 - ✧ 1. Input horsepower 2250hp;
 - ✧ 2. Mechanical efficiency is 90% and 100%;

4.6.1 Power end lubrication system

The power end adopts continuous pressure lubrication and the lubrication is done by the lubricating pump driven by PTO mounted on transmission.

Lubricating system of power end includes pressure release valve, filter, instrument, oil pump, lube cooler, oil reserving tank, etc. The oil reserving tank has fluid-level indicator which is easy for inspecting oil level.

4.6.2 Packing lubrication system

The plunger lubrication system is provided by a pressurized oil supply system. The packing lubrication system contains:

- Lube oil reservoir, 13gal (50L)
- Distribution manifold
- Required plumbing and hoses
- Pressure gauge
- Pressure regulator
- Flow control valves for each plunger with setting locks

4.7 Over pressure shutdown device for the plunger pump

- The over pressure shutdown device consist of pressure transducer, electromagnetic valve, reset switch, and so on.
- The over pressure shutdown device shall be set on the computer according to the pump or job requirements. When the pressure reaches the set value, the pressure transducer transfers the signal to the computer system, then the computer sends the signal to the electromagnetic valve. The valve connected with the air circuit system controls the throttle of the diesel engine and pull the engine to idle. Press the reset switch to restart the system.

4.8 Controls & instruments

Pumper control system consists of local manual control system and remote network auto control system.

4.8.1 Local control system

Local auto control system includes stainless steel control console and stainless steel control panel. Its panel consists of:

- Hydraulic and Air pressure gauges
- Voltage meter
- Main power switch
- Working light switch
- Main engine controls
- auxiliary engine controls

Function of the local control system is below:

- Engine control & data acquisition

Control:

Engine throttle

Engine start/kill/e-stop

Acquire:

Engine speed

Engine cooling water temperature

Engine oil pressure

Engine alarm state

Engine failure code

- Transmission control & data acquisition

Control:

Transmission gear

Transmission unlock/brake

Acquire:

Transmission lubrication oil temperature

Transmission lubrication oil pressure

Transmission locking state

Transmission alarm state

Transmission failure code

- Plunger pump signal acquisition

Acquire:

Plunger pump lubrication oil temperature

Plunger pump lubrication oil pressure

Plunger pump discharge flow

Plunger pump discharge pressure

Plunger pump alarm state



Remote auto control system consists of 1 set of operation screen and 1 set of reel with 200FT long cable.

Operation screen:

Ultra-portable design with net weight 1.4Kg

Anti-shock: Top level reinforced platform, anti-shock and irrefrangibility

Wide-temperature design: $-40^{\circ}\text{C} \sim 70^{\circ}\text{C}$ working temperature

Friendly interface and simple operation: Full touch screen, design to prevent mistaken operation.

Function of the remote control system is below:

- Engine control & data acquisition

Control:

Engine throttle

Engine start/kill/e-stop

Acquire:

Engine speed

Engine cooling water temperature

Engine oil pressure

Engine alarm state

- Transmission control & data acquisition

Control:

Transmission gear

Transmission unlock/brake

Acquire:

Transmission lubrication oil temperature

Transmission lubrication oil pressure

Transmission locking state

Transmission alarm state

- Plunger pump signal acquisition

Acquire:

Plunger pump lubrication oil temperature

Plunger pump lubrication oil pressure

Plunger pump discharge flow

Plunger pump discharge pressure

Plunger pump alarm state



4.9 Low pressure manifold

- The low pressure manifold has a working pressure rating of 1.6 MPa. It comprises of inlet manifold, suction dampener, butterfly valves and pipelines.
- The pump inlet manifold has two connection for large displacement operation, each is equipped with a 4" butterfly valve and a 4" Fig. 206 female (external thread) union joint.
- A N2 charged suction pulsation dampener is equipped in order to deduct the vibration due to the inlet pressure pulsation.

4.10 High pressure manifold

- Rated working pressure of discharging manifolds, pipes and valves for fracturing pump: 105 MPa (15000PSI)
- A 3" Fig. 1502 discharge manifold including a model 50 swivel joint, 3" pipe nipple and 3" plug valve is installed at the outlet of fracturing pump.
- A 2" 15,000psi pressure sensor and safety valve are installed on the end of pump.
- The discharging manifold is fixed slantwise at the end of unit.

4.11 Air Control System

- Air system mainly consists of air compressor, air tank, sequence valve, relief valve, air-water separator, oil fogger, air pipeline, joints and so on.
- Air system is used for controlling brake system and supplying air for pump fluid end lubrication.

4.12 Hydraulic system of start & fan drive

An auxiliary CAT C9 engine is utilized for driving the start & fan hydraulic system.

Auxiliary Engine

- Model: CAT C9
- Rated horse power: 300HP@2200RPM
- Start mode: electric start
- accessories: air compressor, starter, alternator, etc.

Hydraulic System

- Hydraulic system contains of pumps, motors, stainless steel reservoir with sight gauge, filtration system, heat exchanger, hoses and the other complete accessories.
- Hydraulic system is used to drive main engine starter and remote fan motor.
- adopts Parker hydraulic components

4.13 Painting

- The unit will have the following finish and preparations:
- All steel parts will be sand blasted to white metal
- Primer will be zinc rich
- Color will be polyurethane paint with catalyst
- High grade yellow clear coat

5. Attachment Tools and Spare Parts List

5.1 Attachment Tools List

<u>Description</u>	<u>Quantity</u>
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- Pipe Wrench,36 Inch 1
- Wrench, Standard Set 1
- Screwdriver,12 Sizes Each Set 1
- Wrench,25 Sizes Each Set 1
- Pump Maintenance Tools 1

5.2 Attachment Spare Parts List

Item	Qty	Description
1	2	Element, Air Cleaner
2	2	Element, Fuel Filter
3	2	Filter, Oil Filter
4	2	Element, transmission oil

6. Documentation

- 2 sets of engine operation manual
- 2 sets of engine parts manual
- 2 sets of transmission operation manual
- 2 sets of transmission parts manual
- 2 sets of transmission pump manual
- 2 sets of unit operation manual
- 2 sets of pump operation manual

7. Warranty

STATEMENT OF WARRANTY POLICY

1. Serva SJS. ("SJS") warrants the Equipment to be free from defects in material and workmanship for a period of twelve (12) months from the Date of receiving the unit.
2. SJS reserves the right to inspect the Equipment to determine the validity of the warranty claim and if determined to be valid, SJS will, at its option: (1) replace the defective Equipment or parts thereof; or (2) authorize the Equipment or part to be returned to its authorized repair facility for repair; or (3) authorize the

Equipment or part to be repaired at your plant. SJS will not be responsible for any transportation costs.

3. Repair or replacement will be without charge, but removal and installation of other parts, including additional parts furnished, will be made at Purchaser's expense. No charges will be accepted for returns, repairs or alternations done by the Purchaser unless previously authorized in writing by SJS.
4. Purchaser acknowledges that the Equipment is of a size, design and type requested by the Purchaser and agrees that, except as stated herein, there are no other warranties, express or implied, including those of merchantability or fitness for particular use, which SJS hereby disclaims.
5. Purchaser to pay all charges for travel time, kilometer charges and travel expenses for warranty work performed away from the SJS facility.

NOT COVERED UNDER THIS WARRANTY

1. Equipment or parts manufactured by others however, SJS will assign the benefits of any manufacturers ' warranty if assignable.
2. Equipment or parts that are or have been in contact with corrosive chemicals or corrosive materials.
3. Equipment, fluids or parts customarily subject to wear.
4. Failure resulting from improper use or inadequate maintenance.
5. Personal injuries or death to any person (including the Purchaser and any of its employees, agents and contractors) or claims for loss or damage to property or business either direct, indirect or consequential, caused or contributed to by the Equipment or any failure thereof, regardless of whether caused by SJS or any other person or by any default or negligence of SJS, its employees, agents and contractors.