Sucker Rod Pump

Working Principle, Catalog Dimensions, Field Applications & Capacity Calculation



WORKING PRINCIPLE Updated with a more realistic internal pump structure graphic.	CATALOG DATA Bore, pump constant, max. OD and connection threads.	FIELD CONDITIONS Sand, gas and corrosive-service considerations.	CAPACITY Theoretical displacement and a worked example.

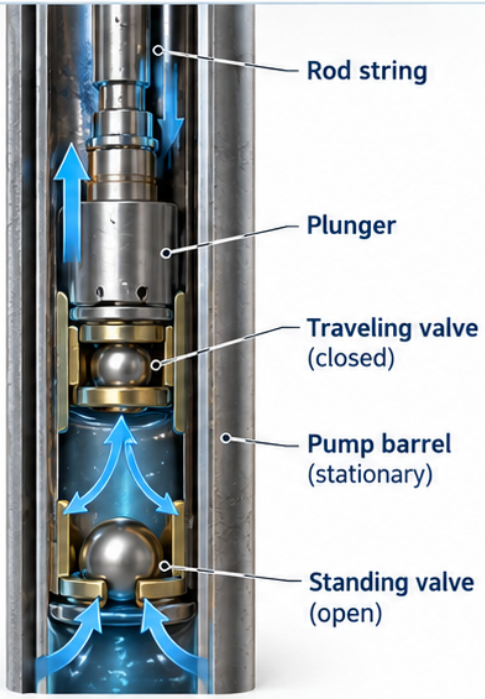
Visuals are illustrative. Confirm all model data and acceptance criteria against the approved supplier documents.

01 | Pumping Cycle and Valve Action

The cutaway below compares the upstroke and downstroke, identifying the rod string, plunger, pump barrel and both check valves. Blue arrows indicate fluid movement.

UPSTROKE

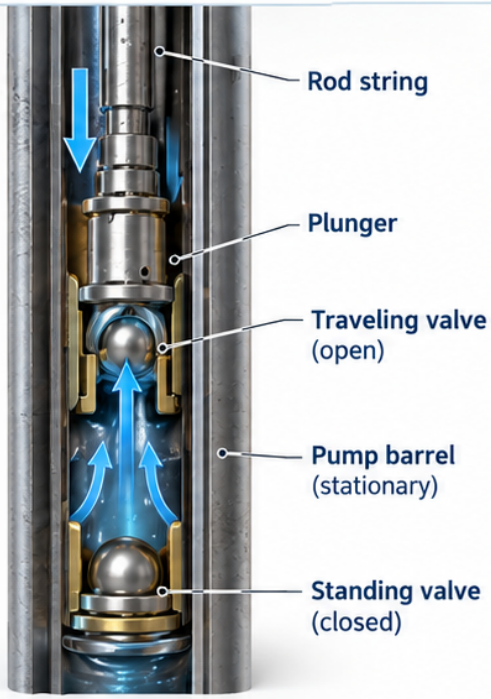
Rod string lifts the plunger, increasing the chamber volume and drawing well fluid into the pump from below.



Traveling valve: **CLOSED** | Standing valve: **OPEN**

DOWNSTROKE

Rod string pushes the plunger down, increasing pressure in the chamber and forcing fluid through the plunger into the tubing above.



Traveling valve: **OPEN** | Standing valve: **CLOSED**

Cycle stage	Traveling valve	Standing valve	Fluid movement
Upstroke	Closed	Open	Rod lifts the plunger, chamber volume increases, and well fluid enters from below.
Downstroke	Open	Closed	Rod pushes the plunger down, forcing fluid through the plunger into the tubing above.
Stroke reversal	Changes state	Changes state	Pressure differential reverses, causing the valves to switch state.

Upstroke and downstroke valve states are shown for a conventional stationary-barrel pump.

02 | Components & Common Pump Configurations

The barrel and plunger form the primary displacement pair. The traveling and standing valves control intake and transfer, while the seating assembly secures an insert pump inside the tubing.

Component	Primary function
Pump barrel	Provides the cylindrical working surface for plunger movement.
Plunger	Moves inside the barrel to displace fluid.
Traveling valve	Controls flow through the moving plunger.
Standing valve	Admits well fluid and limits reverse flow at the pump intake.
Valve cage	Houses and guides the valve ball and fluid passage.
Seating assembly	Locks and seals an insert pump inside the tubing seating nipple.



Illustrative factory inspection scene for pump components and dimensional checks.

Catalog model names

Model	Catalog configuration	Key distinction
RHAM	Top-anchor mechanical rod pump	Top mechanical seating
RHAC	Top-anchor cup-type rod pump	Top cup-type seating
RHAM-AC	Top-anchor double-clip rod pump	Double-clip seating arrangement
RHBM	Bottom-anchor mechanical rod pump	Bottom mechanical seating
RHBC	Bottom-anchor cup-type rod pump	Bottom cup-type seating

OCTAL SUCKER ROD

03 | Catalog Dimensions & Pump Constants

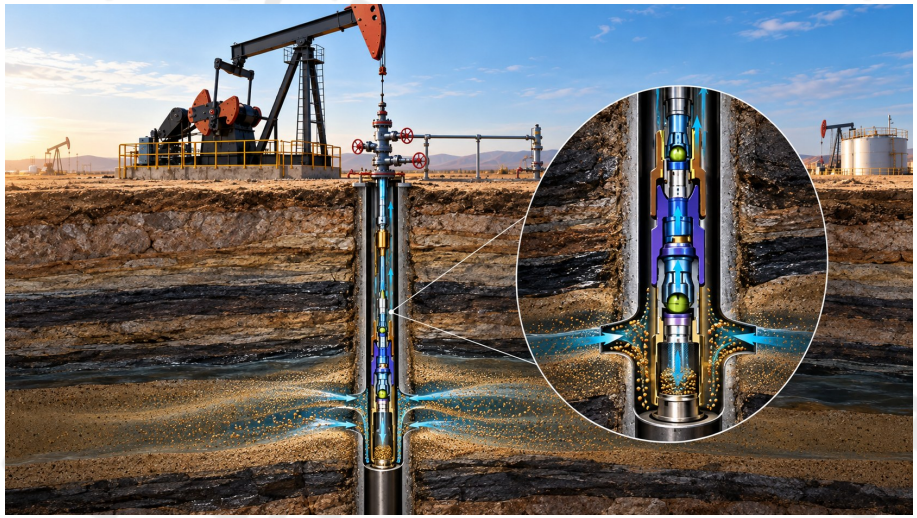
Bore (mm)	Catalog K	Max. OD (mm)	Upper tubing thread	Lower tubing thread	Sucker rod thread
28	0.88	88.9	2 7/8 in NU	2 7/8 in NU	3/4 in
31.75	1.14	88.9	2 7/8 in NU	2 7/8 in NU	3/4 in
38.1	1.64	88.9	2 7/8 in NU	2 7/8 in NU	3/4 in
44.45	2.24	88.9	2 7/8 in NU	2 7/8 in NU	3/4 in
57.15	3.69	88.9	2 7/8 in NU	2 7/8 in NU	3/4 in
69.85	5.50	108	3 1/2 in NU	2 7/8 in NU	7/8 in
82.55	7.79	114	4 in NU	3 1/2 in NU	1 in
95.25	10.20	132	4 1/2 in NU	3 1/2 in NU	1 in

Catalog feature	Published value	Applicability note
Plunger length	1,200 mm	Supplied tubing-pump series
Barrel length	3,000–12,000 mm	Supplied tubing-pump series
Long-plunger anti-sand design	Plunger 3.0–9.0 m; barrel 1.2 m	Separate specialty family; verify exact assembly drawing.

Note: the 82.55 mm bore is listed by the supplier with K = 7.79. A geometric calculation from nominal bore gives a slightly different value, so the supplier's catalog number should be verified before engineering use.

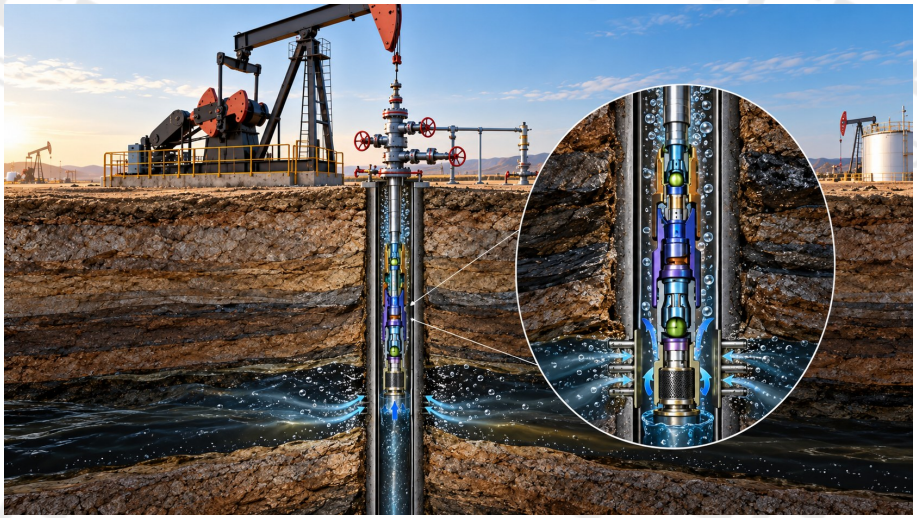
04 | Field Applications: Sand, Gas & Corrosion

Specialty designs address specific downhole conditions. Selection should be based on fluid properties, solids, free-gas content, completion geometry and the approved product configuration.



Anti-sand / sand-settling

Long-plunger and settling-passage concepts are intended to reduce solids accumulation and abrasive contact around the plunger-barrel interface.



Anti-gas

Hollow anti-gas and forced-mechanical-valve configurations address free-gas interference and unstable valve action under gas-prone conditions.

Well condition	Design response to evaluate	Verify before selection
Sand / fine solids	Long-plunger or sand-settling configuration	Solids loading, particle size and settling path
Free gas / gas lock	Hollow anti-gas or forced mechanical valve design	Free-gas fraction, intake pressure, submergence and fillage
H_2S / CO_2 / saline water	Materials and protected working surfaces compatible with the fluid	Actual chemistry, temperature, stress and sour-service requirements
Deep / deviated well	Pump seating and rod/tubing system matched to the completion	Setting depth, rod loads, tubing movement and deviation

05 | Capacity Calculation & Example

Theoretical displacement is a geometric estimate based on effective downhole plunger stroke and pumping speed. Actual production is usually lower because of incomplete fillage, gas interference and wear.

Expression	Description
$Qt = K \times S \times N$	Theoretical daily displacement, where Qt is in m^3/day, K is the catalog pump constant, S is effective downhole stroke (m), and N is strokes/min.
$Qa = Qt \times \eta v$	Estimated actual liquid production when a volumetric-efficiency assumption is applied.

Worked example

Input	Value
Nominal bore	44.45 mm
Catalog pump constant K	2.24
Effective downhole stroke S	2.0 m (illustrative assumption)
Pumping speed N	6 strokes/min (illustrative assumption)
Theoretical displacement Qt	$2.24 \times 2.0 \times 6 = 26.88$ m^3/day
At assumed volumetric efficiency $\eta v = 70\%$	$26.88 \times 0.70 = 18.82$ m^3/day ≈ 118 bbl/day