

## Operation

The balls can be injected by manually turning the Ball Injector's vane shaft with the supplied hand crank thereby releasing balls into the pressurized stream of acidic solution. However, because this pressurized stream can reach pressures of up to 15,000 PSI, most service companies use the GKD Ball Injector with the remote controlled Motor Drive Package for safer operation.

## Functionality

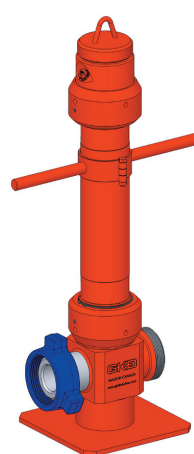
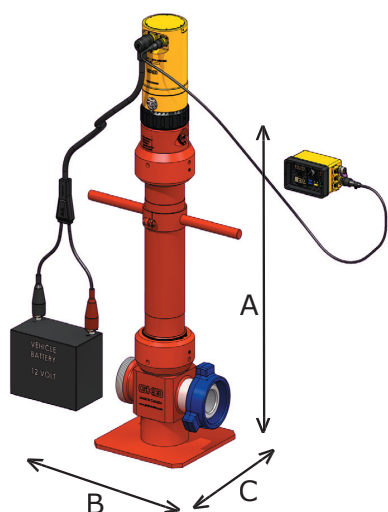
- DNV Type Approval for Model 201 Ball Injector
- The GKD Ball Injector, also known as a "Ball Gun" or a "Ball Sealer", originated in the late 1970's in response to requests from some of the leading well stimulation companies in Western Canada. The GKD Ball Injector and its predecessors have been successfully deployed in oil fields around the world since the early 1980's.

The most recent version of the GKD Ball Injector has been in operation since 1995.

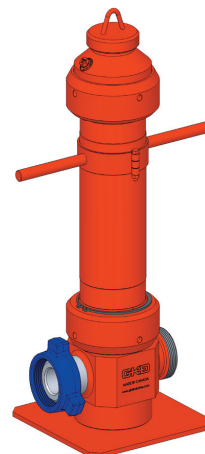
- The GKD Ball Injector is used to inject balls together with a pressurized acid solution into the well. The balls are carried down to the perforations by the acid at the rate that the acid is being pumped. The balls follow the flow towards the open perforations until they seal against the open perforations, at which point the acid and an increased pressure is applied against the perforations that are not open or not fully open. This reaction opens more perforations to the acid. This can be done throughout the acid job until all the perforations are open and all the perforation tunnels have been acidized, generally resulting in better flowback and increased inflow from the reservoir. When the acidization process is complete, the injected balls float to the top of the well if positively buoyant balls are used or sink to the bottom if negatively buoyant balls are used.

## Main Body Specifications

- Standard base configurations: Fig. 1502, Fig. 1002 and Fig. 602 in 2", 3" and 4" sizes, optional sizes are available and detachable wing nuts are included
- Standard equipment: Lifting Cap, Carrying Handle, Hand Crank and Spanner, Operating Service Manual and Documentation Package consisting of hydrostatic pressure test graph and material certifications for all critical components



Model 201



Model 202

|                                | Model 201  | Model 202   |
|--------------------------------|--|---|
| Ball capacity                  | 200 balls 7/8" diameter                                    | 150 balls 1-1/4" diameter                                   |
| Working pressure               | 15 000 PSI cwp <sup>(1)</sup>                              | 15 000 PSI cwp <sup>(1)</sup>                               |
| Working temperature            | -20°C (-4°F) to + 60°C (+140°F)                            | -20°C (-4°F) to + 60°C (+140°F)                             |
| Hand crank torque              | 18-22 lb-ft @ 15 000 PSI                                   | 18-22 lb-ft @ 15 000 PSI                                    |
| Body dimensions <sup>(2)</sup> | 43-7/8" (1114 mm) A<br>x 14" (356mm) B<br>x 14" (356 mm) C | 45-1/2" (1156 mm) A<br>x 17" (432 mm) B<br>x 17" (432 mm) C |
| Shipping weight <sup>(2)</sup> | 300 lb (136kg)   | 500lb (227 kg)  |

Notes: <sup>(1)</sup> maximum cold working pressure limited to lowest working pressure of base connections, <sup>(2)</sup> body dimensions and weights based on 3" Fig. 1502 base with Platform and Lifting Cap installed.





## BALL INJECTOR | MOTOR DRIVE PACKAGE

*Includes: Motor Drive, 20' (6m) long Power Supply Cable, Remote Control, 100' (30.5m) long Remote Control Cable (200' (61m) optional), Operating Manual and custom fitted heavy duty Carrying Case*

### Remote Control

- Used to monitor and control GKD Ball Injector Motor Drive
- Remote Control specification:
  - Injection speed adjustment from 0.1 to 100.0 balls per minute in automatic mode and greater than 240 balls per minute in manual mode
  - Two digital backlit displays provide real-time information on injection speed (in automatic mode only) and quantity of balls discharged
  - Overload injection alarm indicator light (LED) with reverse button and reset switch
  - Automatic and manual modes of operation
- Solid state power turn-on and totalizer-reset function
- Remote control enclosure made of anodized aluminium with clear silicon face plate cover for splash protection
- Utilizes single printed circuit board populated with high quality components for rugged long-term use
- Over-current protected with 3/4 AMP fuse
- Current consumption: 0.5 AMP max. @ 12 V DC
- Working temperature range of -20°C (-4°F) to +60°C (+140°F)
- Dimensions: 6-3/4" (171 mm) Long x 3-3/4" (95 mm) High x 4-3/4" (121 mm) Deep, weight 2 lb (0.9kg)

### Motor Drive Specification

- 0.6 HP 12 V DC motor coupled with planetary gear system provides 25 lb-ft of torque at 32 rpm (approximate), connected to 12V vehicle battery via heavy duty 20' (6 m) Power Cable utilizing military spec environmental resistant connectors
- Motor installed in an anodized aluminium housing with plated or stainless steel parts throughout for corrosion resistance – manual pressure equalizing valve enables pressure or vacuum relief if required.
- Anti-vibration spring-loaded nut with safety latch assembly prevents loosening of motor drive from the main body during operation
- Built-in automatically re-settable 50 AMP over-current protection
- Dimensions: 12-3/8" (314 mm) long x 6-3/8" (162 mm) diameter, weight 25lb (11.3 Kg)
- Working temperature range -40°C (-40°F) to +70°C (+160°F)
- Motor current consumption; 38-42 AMP @ 15,000 PSI (fully charged 12V vehicle battery used)
- Maximum injection rate at 15,000 PSI; 240-260 balls/minute (Remote control set to manual mode)

