THE LEADING FORCE behind liquids ${ }^{\text {T" }}$ since 1857


## 3600 Series <br> Heavy Duty Pumps

General Purpose Pumps for Mixing, Blending, Recirculating, Fixed and Mobile Transfer

## The Roper Pump Family of Gear Pumps

|  |  | Typical Applications | Primary Features |
| :---: | :---: | :---: | :---: |
|  | $\begin{aligned} & \text { O} \\ & \hline \mathbf{0} \end{aligned}$ | - Mix, circulate, and transfer viscous liquids <br> - Gasoline, asphalt, molasses <br> ■ Ink, roofing compounds, oils | Precise tolerances for maximum efficiency <br> Direct drive or built-on gear reducers <br> Bi-directional rotation* <br> Configurations available for close coupled drive and close coupled hydraulic drive |
|  | N | Industrial applications requiring a special mechanical seal | - ANSI Flanges <br> - Many parts interchangeable with 3600 Series <br> - Direct drive or built-on gear reducers <br> - Bi-directional rotation* <br> - Configurations available for close coupled drive and close coupled hydraulic drive |
|  | $\begin{aligned} & 8 \\ & \stackrel{\circ}{\infty} \end{aligned}$ | ■ Oilfields including light \& heavy crude oil Kerosene mixtures, condensates and hot oils | - Sealed ball bearings <br> - Quadruple grease purged lip seals <br> - Helical gears for quiet operation <br> - Bi-directional rotation* |
|  | $\stackrel{\text { 羔 }}{\overline{\mathrm{m}}}$ | - Fuels, solvents, petrochemicals <br> - Residual fuel oils, molasses, resins <br> - Tankers, barges, process plants, refineries | Large ports (6" and 8" available) allow more efficient transfer of fluids Thru port design allows for lower inlet and outlet losses |
|  | $\begin{aligned} & 8 \\ & \hline 0 \\ & \hline \end{aligned}$ | Hydroseeding Grouting, seal coating, oil and sand Wastewater, waste oil, sludge, slurries Brine, paper pulp, fertilizer feeds | Rubber covered gears Bi-directional rotation Abrasive applications; up to pea size particles |
|  | < | Pressure lubrication Hydraulic service General transfer applications | Operates at motor speeds Bi-directional rotation* Close coupled capability |
|  | $\stackrel{\stackrel{L}{\infty}}{\stackrel{\infty}{\sim}}$ | Roofing Compounds Molasses Feed Supplements | ■ Operates at standard motor speeds <br> - Large ports allow easier fluid entry <br> ■ Built-in relief valve |
|  | > | Hazardous liquid transfer "Zero leakage" applications due to environmental concerns Chemical and petroleum applications | - Mag-drive, sealless design eliminates seal repair costs and down time <br> - C-face mount eliminates misalignment <br> $\square \mathrm{Bi}$-directional rotation and self-priming |
|  | 4 | Hydraulic power for lifts, machine actuation, fuel burners, and blenders General transfer of oil and petroleum fluids | 2 inlet ports, 2 outlet ports allows multiple piping arrangements (except F150-F300) <br> - High Pressure Range <br> - Maintain pump without pipe removal |
| $F$ | $\begin{aligned} & \text { U } \\ & \text { O } \end{aligned}$ | $\begin{aligned} & \text { Chemical processing } \\ & \text { Pharmaceutical industry } \\ & \text { Injection or transfer of acids \& solvents } \end{aligned}$ | Stainless steel construction Bi-directional rotation* Mag-drive, sealless option (X5-03 only) |
|  | N্ㅇㅇ | Chemical and transport applications | 316SS Housing 17-4 PH SST Gears / Shafts Built-in Relief Valve |
|  | U | Viscous, abrasive and solids-containing liquids Transfer of wastewater sludge, polymers, grouts, paints and adhesives | - Pulsation free pumping <br> - High suction lift capabilities <br> - Ideal for shear sensitive liquids |

*Pump reconfiguration may be required.

# 3600 Series Heavy Duty Pumps 

General Purpose Pumps for Mixing, Blending, Recirculating, Fixed and Mobile Transfer



Up to 468 GPM • Up to 125 PSI

These pumps operate smoothly and with equal efficiency in either direction of rotation. They effectively handle heavy, viscous materials such as asphalt, molasses, roofing compounds, and printing inks, as well as fuel oils, gasolines, and similar thin liquids.

Pumps can be supplied in several materials of construction, with or without built-in relief valves.

Pumps can be assembled either hi-drive or low-drive, and are available with conventional packed box or lapped-face mechanical shaft seal. They can be direct driven or driven through a built-in gear reduction with a wide range of ratios. These pumps operate equally well regardless of the mounting configuration or the direction of rotation.

## MATERIALS OF CONSTRUCTION

Standard Fitted

*Some of the optional materials may not be available for all sizes.
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## FEATURES

## Quiet-Running Helical Gears

$\square$ Heat treated cast-iron pumping gears are accurately machined for quiet, efficient operation and long life.

- The pumping gears are keyed to their shafts with a sliding fit and are easily replaced.
- Accurate machining insures proper meshing, and reduces friction and vibration.

Long-Lasting Bearing Surfaces
■ Bearings are special wear-resistant, high-lead bronze. Iron and carbon bearings are available.

- Four heavy duty sleeve bearings give positive support to pumping gears and insure long, efficient service.
$\square$ Bearing grooves allow circulation of the liquid being pumped for lubrication \& control of bearing temperature.
- Outboard drive shaft bearing supports external radial loads and absorbs thrust loads.


## Precision-Ground Shafts

- The steel shafts are induction hardened in the bearing and sealing areas and are precision ground to exacting standards for maximum life.
- Hardened stainless steel shafts available.


## Rugged Housing

- Standard castings are cast iron.
- Precise manufacturing tolerances provide minimum clearances for maximum pumping efficiency.
- Large, hardened steel dowel pins insure positive alignment between the faceplate, case, and backplate.

THE LEADING FORCE behind liquids ${ }^{\text {™ }}$ since 1857

## Capacities \& Nomenclature




NOMENCLATURE - 3611 G HB FR V

| 3 | Port Location | 3 - Right Angle Ports |  |
| :---: | :---: | :---: | :---: |
|  |  | 4 - Straight Through Ports |  |
| 6 | Seal Option | 5 - Triple Lip Seal |  |
|  |  | 6 - Packing |  |
|  |  | 7 - Mechanical Seal |  |
|  |  | 8 - Lip Seal with Ball Bearings |  |
| 11 | Size | 11 - $11 \mathrm{Gal} / 100 \mathrm{Rev}$ [41.6 L/100 Rev] | $35-35 \mathrm{Ga} / 100 \mathrm{Rev}$ [132.5 L/100 Rev] |
|  |  | 17 - $17 \mathrm{Gal} / 100 \mathrm{Rev}$ [64.4 L/100 Rev] | $43-43 \mathrm{Gal} / 100 \mathrm{Rev}$ [162.8 L/100 Rev] |
|  |  | 22 - $22 \mathrm{Gal} / 100 \mathrm{Rev}$ [83.3 L/100 Rev] | 48 - $48 \mathrm{Gal} / 100 \mathrm{Rev}$ [181.7 L/100 Rev] |
|  |  | $32-32 \mathrm{Gal} / 100 \mathrm{Rev}$ [121.1 L/100 Rev] | $58-58 \mathrm{Gal} / 100 \mathrm{Rev}$ [219.6 L/100 Rev] |
|  | H | Pump Head without Outboard Ball Bearing |  |
|  | HB | Tapped Port Case with Outboard Ball Bearing |  |
|  | HBF | Flanged Ports with Outboard Bearing |  |
|  | HBFRV | Flanged Ports with Outboard Bearing and Relief Valve |  |
|  | GHBFRV | Flanged Ports with Outboard Bearing, Relief Valve, and Gear Reducer |  |
|  | BH | Tapped Ports, No Outboard Bearing, Mounting for Hyd. Drive or CCD Bracket |  |
|  | BHF | Flanged Ports, No Outboard Bearing, Mounting for Hyd. Drive or CCD Bracket |  |
|  | BHFRV | Flanged Ports, No Outboard Bearing, Mounting for Hyd. Drive or CCD Bracket, Relief Valve |  |

[^0]
## Key Components



## BEARINGS

Four heavy duty sleeve bearings give positive support to pumping gears and ensure long, efficient service. A special wear-resistant, high-lead bronze bearing is standard on 3600 Series Pumps. For thin non-abrasive liquids we offer optional carbon bearings, as well as iron bearings for abrasive liquids. The bearings are grooved to allow circulation of the liquid being pumped for lubrication \& control of bearing temperature.


## GEARS

The helical pumping gears are machined from heat treated cast iron because of its excellent wear resistance.
For chemical pumping applications, the standard gears can be replaced with stainless steel or bronze. An optional Delrin ${ }^{\circledR}$ idler gear can be used for quieter operation when running thin liquids.


## SHAFTS

Standard steel shafts are induction hardened in the bearing and sealing areas, and are precision ground to exacting standards for maximum life. Hardened stainless steel shafts are also available upon request.


## HOUSING

Our rugged cast-iron housings are manufactured to precise tolerances, providing minimum clearances for maximum pumping efficiency. Large, hardened steel dowel pins ensure positive alignment between the faceplate, case, and backplate.


## GASKETS

3600 Series Pumps come standard with fiber gaskets that are used up to $212^{\circ} \mathrm{F} / 100^{\circ} \mathrm{C}$. For higher temperature applications (up to $450^{\circ} \mathrm{F} / 232^{\circ} \mathrm{C}$ ) we offer other optional gasket materials.

## Relief Valves \& Jacketing

## RELIEF VALVE

In the event of overpressure situations, our adjustable relief valve protects personnel and equipment by returning liquids to the suction side of the pump. Various spring sizes can be specified to handle a wide range of operating conditions.

Roper Pump's inverted poppet relief valve is designed without close fitting guides that can clog and cause excessive pressures when the valve does not open freely. The valve will provide protection in only one direction of rotation. However it can be positioned easily to either side of the pump to accommodate flow direction.


## BI-DIRECTIONAL RELIEF VALVE*

Roper Pump's integral bi-directional pressure relief valve offers reliable protection of your personnel and equipment, regardless of which direction you are pumping. You can reverse flow without disabling pressure relief operability, or compromising operator safety. Based on our rugged and time proven standard relief valves, this offers you a lighter weight, lower cost alternative compared to externally plumbed systems.
*Available on 11, 17 and 22 sizes


## JACKETING**

Whether the fluid to be pumped must be heated, cooled, or maintained at a specific temperature, a jacketed Roper pump will handle difficult-topump materials such as Bunker C, molasses, asphalt mixes, refined sugars, creosote, printing ink, and other viscous fluids which require temperature control for satisfactory handling.

Roper Pump jacketed pumps provide efficient heat transfer to the packing, seal relief valve, bearing areas, and endplates of the pump. The jackets are suitable for use with steam, hot or cold water, heat transfer oil, etc., as heating or cooling mediums.

Jacketing is available on the faceplate only, backplate only, or on both.

[^1]

## Pump Seals



Mechanical seals are for those applications where product leakage is unacceptable. Under proper conditions the mechanical seal has a longer service life than the packed box and does not require adjustment. The standard mechanical seal is an elastomeric bellows type seal. A PTFE wedge seal is also available.


## TRIPLE LIP SEAL

Offering the same high degree of sealing reliability as a mechanical seal, triple lip seals are better suited for viscous products that tend to set up while the pump is idle, such as resins, glues and paints. The lips create an effective barrier to product leakage, and will move freely upon resumption of pumping a thickening substance. In cases where extreme circumstances can cause catastrophic failure of mechanical seals, the resilient nature of the triple lip seal makes it relatively immune to sudden failure.


## PACKED BOX

Our standard packing is suited for general purpose applications, and is easily replaced with split ring packing. For optimum performance, the gland should be adjusted to allow slight seepage. Standard packing is graphite, with several optional packing materials available for applications involving high temperatures or mildly corrosive liquids, or those requiring compatibility with food products.

## Need More Seal Options?

 OUR Z SERIES...Based on our 3600 Series, the Roper " $Z$ " Series features a larger seal chamber in a two-piece backplate that allows for virtually unlimited options, and facilitates easy seal maintenance. Many parts are interchangeable with the 3600 Series.


## Gear Reduction (GHB) Unit

Totally enclosed and running in oil, the reduction gears are made of steel to assure longer life. Antifriction bearings are used throughout. Three interchangeable gear ratios are available in each size. For additional ratios look at using a Roper Pump CCD bracket and an industrial standard gearmotor.

## PERFORMANCE CHARTS

Performance figures show maximum horsepower requirements for minimum rated gallons per minute at the various speeds, viscosities and pressures. The charts are intended as a guide for conditions at the pump. In determining the proper conditions of operation for the pump, many factors must be considered including inlet conditions, liquid characteristics, and temperature.

If there is any question concerning these charts or the recommended operating conditions, please consult your Roper distributor, district representative, or the home office.

| GEAR RATIOS AND CAPACITIES FOR GHB UNITS |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  | Motor RPM | $\begin{aligned} & \text { Gear } \\ & \text { Ratio } \end{aligned}$ | $\begin{aligned} & \text { Pump } \\ & \text { RPM } \end{aligned}$ | $\underset{\substack{\text { Max. } \\ \text { Permissible HP }}}{\text { and }}$ |
| 11through 22 | 1150 | $\begin{aligned} & 4.60: 1 \\ & 3.94: 1 \\ & 3.20: 1 \end{aligned}$ | $\begin{aligned} & 250 \\ & 290 \\ & 360 \end{aligned}$ | $\begin{aligned} & 5.5 \\ & 6.5 \\ & 8.0 \end{aligned}$ |
|  | 1750 | $\begin{aligned} & \text { 4.60:1 } \\ & 3.94: 1 \\ & 3.20: 1 \end{aligned}$ | $\begin{aligned} & 380 \\ & 445 \\ & 545 \end{aligned}$ | $\begin{gathered} 8.5 \\ 10.0 \\ 10.0 \end{gathered}$ |
|  | 3450* | 4.60:1 | 750 | 10.0 |
| $\begin{gathered} 32 \\ \text { through } \\ 58 \end{gathered}$ | 1150 | $\begin{aligned} & 5.66: 1 \\ & 4.88: 1 \\ & 4.26: 1 \end{aligned}$ | $\begin{aligned} & 203 \\ & 235 \\ & 270 \end{aligned}$ | $\begin{aligned} & \hline 8.5 \\ & 10.0 \\ & 11.0 \end{aligned}$ |
|  | 1750 | $\begin{aligned} & 5.66: 1 \\ & 4.88: 1 \\ & 4.26: 1 \end{aligned}$ | $\begin{aligned} & 309 \\ & 360 \\ & 410 \end{aligned}$ | $\begin{aligned} & 13.0 \\ & 15.0 \\ & 15.0 \end{aligned}$ |
|  | 3450* | 5.66:1 | 609 | 15.0 |

*3450 RPM motors are used in handling low viscosity lubricating liquids.


| SIZE | RPM |  | 250 RPM |  |  |  | 290 RPM |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Pump | $\begin{array}{\|c} \hline \text { PSI } \\ \text { [bar] } \end{array}$ | SSU | 30 | 100 | 1000 | 10,000 | 30 | 100 | 1000 | 10,000 |
| 11 | $\begin{gathered} 25 \\ {[1.7]} \\ \hline \end{gathered}$ | $\begin{gathered} \text { GPM [lpm] } \\ \text { HP [kw] } \end{gathered}$ | $\begin{array}{r} \hline 25[95] \\ .7[.52] \\ \hline \end{array}$ | $\begin{gathered} \hline 26[98] \\ .7[.52] \\ \hline \end{gathered}$ | $\begin{gathered} 27[102] \\ .9[57] \\ \hline \end{gathered}$ | $\begin{gathered} 27[102] \\ 1.3[.97] \\ \hline \end{gathered}$ | $\begin{gathered} 29[110] \\ .9[.67] \\ \hline \end{gathered}$ | $\begin{gathered} 30[114] \\ .9[.67] \\ \hline \end{gathered}$ | $\begin{gathered} \hline 31[117] \\ 1.2[.89] \\ \hline \end{gathered}$ | $\begin{gathered} 31[117] \\ 1.5[1.12] \\ \hline \end{gathered}$ |
|  | $\begin{gathered} 50 \\ {[3.4]} \\ \hline \end{gathered}$ | $\begin{gathered} \hline \text { GPM [lpm] } \\ \text { HP [kw] } \end{gathered}$ | $\begin{aligned} & \hline 23 {[87] } \\ & 1.1 \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 25 {[95] } \\ & 1.1 \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 27[102] \\ & 1.3[.97] \\ & \hline \end{aligned}$ | $\begin{gathered} \hline 27[102] \\ 1.7[1.27] \\ \hline \end{gathered}$ | $\begin{gathered} \hline 27[102] \\ 1.3[.97] \\ \hline \end{gathered}$ | $\begin{gathered} \hline 29[110] \\ 1.3[.97] \\ \hline \end{gathered}$ | $\begin{array}{c\|} \hline 31[117] \\ 1.5[1.12] \\ \hline \end{array}$ | $\begin{aligned} & \hline 31[117] \\ & 1.9[1.42] \end{aligned}$ |
|  | $\begin{array}{\|l\|} \hline 100 \\ {[6.9]} \end{array}$ | GPM [lpm] HP [kw] |  | $\begin{gathered} \hline 23[87] \\ 1.9[1.42] \\ \hline \end{gathered}$ | $\begin{aligned} & \hline 26 \\ & 2.1 {[1.57] } \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 27[102] \\ & 2.5[1.86] \\ & \hline \end{aligned}$ |  | $\begin{array}{r} \hline 27[102] \\ 2.2[1.64] \\ \hline \end{array}$ | $\begin{array}{r} \hline 30[114] \\ 2.4[1.79] \\ \hline \end{array}$ | $\begin{aligned} & 31[117] \\ & 3.0[2.24] \end{aligned}$ |
|  | $\begin{array}{\|l\|l} \hline 125 \\ {[8.6]} \end{array}$ | $\begin{gathered} \text { GPM [lpm] } \\ \text { HP [kw] } \end{gathered}$ |  | $\begin{aligned} & \hline 22[83] \\ & 2.2[1.64] \end{aligned}$ | $\begin{aligned} & \hline 26[98] \\ & 2.4[1.79] \end{aligned}$ | $\begin{aligned} & \hline 27[102] \\ & 2.8[2.09] \end{aligned}$ |  | $\begin{aligned} & \hline 26[98] \\ & 2.7[2.01] \end{aligned}$ | $\begin{aligned} & \hline 30[114] \\ & 2.9[2.16] \end{aligned}$ | $\begin{aligned} & 31[117] \\ & 3.5[2.61] \end{aligned}$ |
| \|17| | $\begin{gathered} \hline 25 \\ {[1.7]} \\ \hline \end{gathered}$ | $\begin{gathered} \hline \text { GPM [pm] } \\ \text { HP [kw] } \end{gathered}$ | $\begin{gathered} \hline 38 \text { [144] } \\ .8[.6] \\ \hline \end{gathered}$ | $\begin{gathered} \hline 40[151] \\ .8[.6] \\ \hline \end{gathered}$ | $\begin{gathered} \hline 41[155] \\ 1.1[.82] \end{gathered}$ | $\begin{aligned} & 42[159] \\ & 1.8[1.34] \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 45[170] \\ & 1.0[.75] \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 47[178] \\ & 1.0[.75] \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 48[182] \\ & 1.3[.97] \\ & \hline \end{aligned}$ | $\begin{aligned} & 49[185] \\ & 2.2[1.64] \end{aligned}$ |
|  | $\begin{array}{\|c\|} \hline 50 \\ {[3.4]} \\ \hline \end{array}$ | $\begin{gathered} \text { GPM [lpm] } \\ \text { HP [kw] } \end{gathered}$ | $\begin{aligned} & 33[125] \\ & 1.4[1.04] \end{aligned}$ | $\begin{aligned} & \hline 38[144] \\ & 1.4[1.04] \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 41[155] \\ & 1.7[1.27] \\ & \hline \end{aligned}$ | $\begin{aligned} & 42[159] \\ & 2.4[1.79] \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 40[151] \\ & 1.6[1.19] \\ & \hline \end{aligned}$ | $\begin{gathered} \hline 45[170] \\ 1.6[1.19] \\ \hline \end{gathered}$ | $\begin{gathered} 48[182] \\ 1.9[1.42] \\ \hline \end{gathered}$ | $\begin{aligned} & 49 \text { [185] } \\ & 2.8[2.09] \end{aligned}$ |
|  | $\begin{aligned} & 100 \\ & {[6.9]} \\ & \hline \end{aligned}$ | $\begin{gathered} \hline \text { GPM [lpm] } \\ \text { HP [kw] } \end{gathered}$ |  | $\begin{aligned} & \hline 34[129] \\ & 2.5[1.86] \\ & \hline \end{aligned}$ | $\begin{aligned} & 40[151] \\ & 2.9[2.16] \\ & \hline \end{aligned}$ | $\begin{aligned} & 41[155] \\ & 3.6[2.68] \\ & \hline \end{aligned}$ |  | $\begin{aligned} & \hline 41[155] \\ & 3.0[2.24] \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 47[178] \\ & 3.3[2.46] \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 48[182] \\ & 4.2[3.13] \end{aligned}$ |
|  | $\begin{array}{\|c\|} \hline 125 \\ {[8.6]} \\ \hline \end{array}$ | $\begin{gathered} \hline \text { GPM [pm] } \\ \text { HP [kw] } \end{gathered}$ |  |  | $\begin{array}{r} 39[148] \\ 3.4[2.54] \\ \hline \end{array}$ | $\begin{aligned} & 41[155] \\ & 4.1[3.06] \\ & \hline \end{aligned}$ |  |  | $\begin{aligned} & 46[174] \\ & 4.0[2.98] \\ & \hline \end{aligned}$ | $\begin{aligned} & 48[182] \\ & 4.9[3.65] \\ & \hline \end{aligned}$ |
| 22 | $\begin{array}{c\|} \hline 25 \\ {[1.7]} \\ \hline \end{array}$ | $\begin{gathered} \hline \text { GPM [lpm] } \\ \text { HP [kw] } \end{gathered}$ | $\begin{aligned} \hline 52[197] \\ 1.1[.82] \\ \hline \end{aligned}$ | $\begin{array}{r} \hline 53[201] \\ 1.1[.82] \\ \hline \end{array}$ | $\begin{array}{r} 55[208] \\ 1.4[1.04] \\ \hline \end{array}$ | $\begin{array}{r} 55[208] \\ 1.9[1.42] \\ \hline \end{array}$ | $\begin{gathered} 60[227] \\ 1.3[.97] \end{gathered}$ | $\begin{array}{r} \hline 61[231] \\ 1.3[.97] \\ \hline \end{array}$ | $\begin{array}{r} 63[238] \\ 1.7[1.27] \\ \hline \end{array}$ | $\begin{gathered} 63[238] \\ 2.5[1.86] \end{gathered}$ |
|  | $\begin{array}{\|c\|} \hline 50 \\ {[3.4]} \\ \hline \end{array}$ | $\begin{gathered} \hline \text { GPM [lpm] } \\ \text { HP [kw] } \end{gathered}$ | $\begin{gathered} 52[197] \\ 2.0[1.49] \\ \hline \end{gathered}$ | $\begin{gathered} 52[197] \\ 2.0[1.49] \\ \hline \end{gathered}$ | $\begin{array}{r} 54[204] \\ 2.3[1.72] \\ \hline \end{array}$ | $\begin{array}{r} 55[208] \\ 2.8[2.09] \\ \hline \end{array}$ | $\begin{array}{r} 58[220] \\ 2.3[1.72] \\ \hline \end{array}$ | $\begin{array}{r} 60[227] \\ 2.3[1.72] \\ \hline \end{array}$ | $\begin{array}{r} \hline 62[235] \\ 2.6[1.94] \\ \hline \end{array}$ | $\begin{aligned} & 63[238] \\ & 3.4[2.54] \end{aligned}$ |
|  | $\begin{array}{\|l\|} \hline 100 \\ {[6.9]} \end{array}$ | $\begin{gathered} \hline \text { GPM [lpm] } \\ \text { HP [kw] } \end{gathered}$ | $\begin{aligned} & 44[167] \\ & 3.5[2.61] \end{aligned}$ | $\begin{aligned} & 50[189] \\ & 3.5[2.61] \end{aligned}$ | $\begin{aligned} & 53[201] \\ & 3.8[2.83] \end{aligned}$ | $\begin{gathered} 55[208] \\ 4.3[3.21] \end{gathered}$ | $\begin{aligned} & \hline 52[197] \\ & 4.2[3.13] \\ & \hline \end{aligned}$ | $\begin{gathered} 58[220] \\ 4.2[3.13] \end{gathered}$ | $\begin{array}{r} \hline 61[231] \\ 4.5[3.36] \\ \hline \end{array}$ | $\begin{gathered} 63[238] \\ 5.3[3.95] \end{gathered}$ |
|  | $\begin{array}{\|c\|} \hline 125 \\ {[8.6]} \end{array}$ | $\begin{gathered} \hline \text { GPM [pm] } \\ \text { HP [kw] } \end{gathered}$ |  | $\begin{aligned} & \hline 49[185] \\ & 4.2[3.13] \end{aligned}$ | $\begin{array}{r} 53[201] \\ 4.5[3.36] \\ \hline \end{array}$ | $\begin{aligned} & 55[208] \\ & 5.0[3.73] \\ & \hline \end{aligned}$ | $\begin{aligned} & 50[189] \\ & 5.2[3.88] \end{aligned}$ | $\begin{array}{\|c\|} \hline 57[216] \\ 5.2[3.88] \\ \hline \end{array}$ | $\begin{array}{r} \hline 61[231] \\ 5.5[4.1] \\ \hline \end{array}$ | $\begin{gathered} 63[238] \\ 6.3 \text { [4.7] } \end{gathered}$ |


| SIZE | RPM |  | 203 RPM |  |  |  | 235 RPM |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Pump | $\left\lvert\, \begin{gathered} \text { PSI } \\ \text { [bar] } \end{gathered}\right.$ | SSU | 30 | 100 | 1000 | 10,000 | 30 | 100 | 1000 | 10,000 |
| $32$ | $\begin{array}{\|c\|} \hline 25 \\ {[1.7]} \end{array}$ | $\begin{gathered} \text { GPM [lpm] } \\ \text { HP [kw] } \end{gathered}$ | $\begin{array}{r} 54[204] \\ 1[.75] \end{array}$ | $\begin{gathered} 57[216] \\ 1.2[.89] \end{gathered}$ | $\begin{gathered} 61 \text { [231] } \\ 1.4 \text { [1.04] } \end{gathered}$ | $\begin{gathered} 65[246] \\ 1.8[1.34] \end{gathered}$ | $\begin{aligned} & 64[242] \\ & 1.3[9.7] \end{aligned}$ | $\begin{gathered} 67[254] \\ 1.5[1.12] \end{gathered}$ | $\begin{gathered} 71[269] \\ 1.8[1.34] \end{gathered}$ | $\begin{aligned} & 75 \text { [284] } \\ & 2.3[1.72] \end{aligned}$ |
|  | $\begin{array}{\|c\|} \hline 50 \\ {[3.4]} \end{array}$ | GPM [lpm] HP [kw] | $\begin{array}{\|c} \hline 41[155] \\ 2[1.49] \end{array}$ | $\begin{gathered} 47[178] \\ 2.2[1.64] \end{gathered}$ | $\begin{aligned} & 55[208] \\ & 2.4 \text { [1.79] } \end{aligned}$ | $\begin{gathered} 59[223] \\ 2.8[2.09] \end{gathered}$ | $\begin{array}{\|c\|} \hline 51[193] \\ 2.3[1.72] \\ \hline \end{array}$ | $\begin{gathered} 57[216] \\ 2.5[1.86] \end{gathered}$ | $\begin{gathered} 66[250] \\ 2.8[2.09] \end{gathered}$ | $\begin{aligned} & 70[265] \\ & 3.3[2.46] \end{aligned}$ |
|  | $\begin{array}{\|c\|} \hline 100 \\ {[6.9]} \\ \hline \end{array}$ | $\begin{gathered} \text { GPM [lpm] } \\ \text { HP [kw] } \end{gathered}$ |  |  | $\begin{gathered} 44[167] \\ 4.4[3.26] \end{gathered}$ | $\begin{gathered} 52[197] \\ 4.8[3.56] \end{gathered}$ |  |  | $\begin{aligned} & 54[204] \\ & 5.1[3.8] \end{aligned}$ | $\begin{gathered} 62[235] \\ 5.6[4.18] \end{gathered}$ |
|  | $\begin{gathered} 125 \\ {[8.6]} \\ \hline \end{gathered}$ | $\begin{gathered} \text { GPM [lpm] } \\ \text { HP [kw] } \end{gathered}$ |  |  |  | $\begin{aligned} & 49 \text { [185] } \\ & 5.8[4.33] \end{aligned}$ |  |  | $\begin{aligned} & 46[174] \\ & 6.6[4.92] \end{aligned}$ | $\begin{aligned} & 59 \text { [223] } \\ & 7.1[5.29] \end{aligned}$ |
| $35$ | $\begin{array}{\|c\|} \hline 25 \\ {[1.7]} \\ \hline \end{array}$ | $\begin{gathered} \hline \text { GPM [lpm] } \\ \text { HP [kw] } \\ \hline \end{gathered}$ | $\begin{aligned} & \hline 71[269] \\ & 2.6[1.94] \\ & \hline \end{aligned}$ | $\begin{array}{\|c\|} \hline 72[273] \\ 2.6[1.94] \\ \hline \end{array}$ | $\begin{gathered} 73[276] \\ 2.8[2.09] \\ \hline \end{gathered}$ | $\begin{array}{r} 75[284] \\ 4.3[3.21] \\ \hline \end{array}$ | $\begin{array}{\|c\|} \hline 83[314] \\ 3.1[2.31] \\ \hline \end{array}$ | $\begin{array}{\|c\|} \hline 84[318] \\ 3.1[2.31] \\ \hline \end{array}$ | $\begin{aligned} & \hline 85[322] \\ & 3.3[2.46] \\ & \hline \end{aligned}$ | $\begin{gathered} 87[329] \\ 5.2[3.88] \end{gathered}$ |
|  | $\begin{array}{\|c\|} \hline 50 \\ {[3.4]} \\ \hline \end{array}$ | $\begin{gathered} \text { GPM [lpm] } \\ \text { HP [kw] } \\ \hline \end{gathered}$ | $\begin{gathered} \hline 67[254] \\ 3.7[2.76] \end{gathered}$ | $\begin{aligned} & 69[261] \\ & 3.7[2.76] \end{aligned}$ | $\begin{gathered} 71 \text { [269] } \\ 3.9 \text { [2.91] } \end{gathered}$ | $\begin{aligned} & \hline 73 \text { [276] } \\ & 5.4[4.03] \end{aligned}$ | $\begin{gathered} 79[299] \\ 4.4[3.28] \\ \hline \end{gathered}$ | $\begin{gathered} 81[307] \\ 4.4[3.28] \end{gathered}$ | $\begin{gathered} \hline 83[314] \\ 4.6[3.43] \end{gathered}$ | $\begin{aligned} & \hline 85[322] \\ & 6.5[4.85] \end{aligned}$ |
|  | $\begin{array}{\|c\|} \hline 100 \\ {[6.9]} \\ \hline \end{array}$ | $\begin{gathered} \text { GPM [lpm] } \\ \text { HP [kw] } \\ \hline \end{gathered}$ |  | $\begin{aligned} & 61 \text { [231] } \\ & 5.8[4.33] \end{aligned}$ | $\begin{gathered} 68[257] \\ 6[4.47] \end{gathered}$ | $\begin{gathered} 71[269] \\ 7.5[5.59] \\ \hline \end{gathered}$ |  | $\begin{array}{\|c\|} \hline 73[276] \\ 6.8[5.07] \\ \hline \end{array}$ | $\begin{array}{r} \hline 80[303] \\ 7[5.22] \\ \hline \end{array}$ | $\begin{aligned} & \hline 83[314] \\ & 8.9[6.64] \end{aligned}$ |
|  | $\begin{array}{\|c\|} \hline 125 \\ {[8.6]} \end{array}$ | $\begin{gathered} \text { GPM [lpm] } \\ \text { HP [kw] } \end{gathered}$ |  |  | $\begin{array}{r} 65 \text { [246] } \\ 7.2 \text { [5.37] } \end{array}$ | $\begin{gathered} 70[265] \\ 8.7 \text { [6.49] } \end{gathered}$ |  |  | $\begin{gathered} \hline 77[291] \\ 8.3[6.19] \end{gathered}$ | $\begin{array}{r} 82[310] \\ 10.2[7.61] \end{array}$ |
| 43 | $\begin{gathered} \hline 25 \\ {[1.7]} \\ \hline \end{gathered}$ | $\begin{gathered} \text { GPM [lpm] } \\ \text { HP [kw] } \end{gathered}$ | $\begin{gathered} \hline 76[288] \\ 1.8[1.34] \\ \hline \end{gathered}$ | $\begin{array}{\|c\|} \hline 79 \text { [299] } \\ 2[1.49] \\ \hline \end{array}$ | $\begin{gathered} 83[314] \\ 2.3[1.72] \end{gathered}$ | $\begin{gathered} 85[322] \\ 3[2.24] \\ \hline \end{gathered}$ | $\begin{gathered} \hline 90[341] \\ 2[1.49] \\ \hline \end{gathered}$ | $\begin{gathered} 93[352] \\ 2.3[1.72] \end{gathered}$ | $\begin{gathered} 97[367] \\ 2.8[2.09] \end{gathered}$ | $\begin{array}{r} 99[375] \\ 3[2.24] \end{array}$ |
|  | $\begin{array}{\|c\|} \hline 50 \\ {[3.4]} \\ \hline \end{array}$ | $\begin{gathered} \text { GPM [lpm] } \\ \text { HP [kw] } \end{gathered}$ | $\begin{gathered} 62[235] \\ 2.5[1.86] \\ \hline \end{gathered}$ | $\begin{gathered} 68[257] \\ 2.7[2.01] \end{gathered}$ | $\begin{array}{\|c\|} \hline 77 \text { [291] } \\ 3[2.24] \end{array}$ | $\begin{array}{\|c\|} \hline 81[307] \\ 3.7[2.76] \end{array}$ | $\begin{aligned} & \hline 76[288] \\ & 3.2[2.39] \\ & \hline \end{aligned}$ | $\begin{gathered} 82[310] \\ 3.5[2.61] \end{gathered}$ | $\begin{array}{r} 91 \text { [344] } \\ 4[2.98] \end{array}$ | $\begin{gathered} 95[360] \\ 4.2[3.13] \end{gathered}$ |
|  | $\begin{gathered} 100 \\ {[6.9]} \\ \hline \end{gathered}$ | $\begin{gathered} \text { GPM [lpm] } \\ \text { HP [kw] } \end{gathered}$ |  |  | $\begin{gathered} 62[235] \\ 5.5[4.1] \end{gathered}$ | $\begin{gathered} 72[273] \\ 6.2[4.62] \end{gathered}$ |  |  | $\begin{gathered} 76[288] \\ 7[5.22] \end{gathered}$ | $\begin{aligned} & 86[326] \\ & 7.2[5.37] \end{aligned}$ |
|  | $\begin{array}{c\|} \hline 125 \\ {[8.6]} \\ \hline \end{array}$ | $\begin{gathered} \text { GPM [lpm] } \\ \text { HP [kw] } \\ \hline \end{gathered}$ |  |  | $\begin{gathered} 56[212] \\ 6.6[4.92] \end{gathered}$ | $\begin{array}{r} 69[261] \\ 7.3[5.44] \end{array}$ |  |  | $\begin{gathered} 70[265] \\ 8.5[6.34] \end{gathered}$ | $\begin{aligned} & 83[314] \\ & 8.7[6.49] \end{aligned}$ |
| $48$ | $\begin{array}{\|c\|} \hline 25 \\ {[1.7]} \\ \hline \end{array}$ | $\begin{gathered} \text { GPM [lpm] } \\ \text { HP [kw] } \end{gathered}$ | $\begin{gathered} 94[356] \\ 2.5[1.86] \\ \hline \end{gathered}$ | $\begin{gathered} 97[367] \\ 2.8[2.09] \end{gathered}$ | $\begin{gathered} 101[382] \\ 3.2[2.39] \\ \hline \end{gathered}$ | $\begin{gathered} 103[390] \\ 3.8[2.83] \\ \hline \end{gathered}$ | $\begin{array}{r} 111[420] \\ 3[2.24] \\ \hline \end{array}$ | $\begin{gathered} \hline 114[432] \\ 3.4[2.54] \\ \hline \end{gathered}$ | $\begin{array}{c\|} \hline 118[447] \\ 3.9[2.91] \\ \hline \end{array}$ | $\begin{gathered} 120[454] \\ 4.6[3.43] \end{gathered}$ |
|  | $\begin{array}{\|c\|} \hline 50 \\ {[3.4]} \\ \hline \end{array}$ | $\begin{gathered} \text { GPM [lpm] } \\ \text { HP [kw] } \\ \hline \end{gathered}$ |  |  | $\begin{array}{r} 93[352] \\ 4.7[3.5] \end{array}$ | $\begin{gathered} \hline 99[375] \\ 5.3[3.95] \\ \hline \end{gathered}$ |  | $\begin{array}{r} \hline 103[390] \\ 5.1[3.8] \\ \hline \end{array}$ | $\begin{gathered} \hline 110[416] \\ 5.6[4.18] \\ \hline \end{gathered}$ | $\begin{gathered} \hline 116[439] \\ 6.3[4.7] \\ \hline \end{gathered}$ |
|  | $\begin{gathered} \hline 100 \\ {[6.9]} \\ \hline \end{gathered}$ | $\begin{gathered} \text { GPM [lpm] } \\ \text { HP [kw] } \\ \hline \end{gathered}$ |  |  |  | $\begin{aligned} & 88[333] \\ & 8.5[6.34] \end{aligned}$ |  |  |  | $\begin{array}{r} 105[397] \\ 10[7.46] \\ \hline \end{array}$ |
|  | $\begin{array}{\|c} \hline 125 \\ {[8.6]} \\ \hline \end{array}$ | $\begin{gathered} \text { GPM [lpm] } \\ \text { HP [kw] } \end{gathered}$ |  |  |  |  |  |  |  | $\begin{gathered} 101[382] \\ 11.7[8.72] \end{gathered}$ |
| $58$ | $\begin{array}{\|c\|} \hline 25 \\ {[1.7]} \\ \hline \end{array}$ | $\begin{gathered} \text { GPM [lpm] } \\ \text { HP [kw] } \\ \hline \end{gathered}$ | $\begin{gathered} \hline 116[439] \\ 2.7 \text { [2.01] } \\ \hline \end{gathered}$ | $\begin{gathered} \hline 119 \text { [450] } \\ 2.7 \text { [2.01] } \\ \hline \end{gathered}$ | $\begin{gathered} \hline 121[458] \\ 2.8[2.09] \\ \hline \end{gathered}$ | $\begin{array}{r} 123[466] \\ 4.8[3.58] \\ \hline \end{array}$ | $\begin{gathered} 136[515] \\ 4.3[3.21] \\ \hline \end{gathered}$ | $\begin{array}{r} \hline 139[526] \\ 4.3[3.21] \\ \hline \end{array}$ | $\begin{gathered} \hline 141[534] \\ 4.6[3.43] \end{gathered}$ | $\begin{array}{r} 143[541] \\ 7[5.22] \end{array}$ |
|  | $\begin{array}{\|c\|} \hline 50 \\ {[3.4]} \end{array}$ | $\begin{gathered} \text { GPM [lpm] } \\ \text { HP [kw] } \end{gathered}$ | $\begin{gathered} \hline 106[401] \\ 5.6[4.18] \end{gathered}$ | $\begin{gathered} \hline 114[432] \\ 5.6[4.18] \end{gathered}$ | $\begin{gathered} 120 \text { [454] } \\ 5.7 \text { [4.25] } \end{gathered}$ | $\begin{gathered} \hline 122[462] \\ 7.7 \text { [5.74] } \end{gathered}$ | $\begin{gathered} 126[477] \\ 6.3[4.7] \end{gathered}$ | $\begin{gathered} \hline 134[507] \\ 6.3[4.7] \end{gathered}$ | $\begin{array}{r} \hline 140[530] \\ 6.6[4.92] \end{array}$ | $\begin{array}{r} 142 \text { [538] } \\ 9[6.71] \end{array}$ |
|  | $\begin{array}{c\|} \hline 100 \\ {[6.9]} \\ \hline \end{array}$ | $\begin{gathered} \text { GPM [lpm] } \\ \text { HP [kw] } \end{gathered}$ |  |  | $\begin{gathered} 117 \text { [443] } \\ 9.4 \text { [7.01] } \\ \hline \end{gathered}$ | $\begin{gathered} 121[458] \\ 11.4[8.5] \\ \hline \end{gathered}$ |  |  | $\begin{array}{r} 137[519] \\ 11[8.2] \end{array}$ | $\begin{gathered} 141[534] \\ 13.4[9.99] \end{gathered}$ |
|  | $\begin{array}{\|c\|} \hline 125 \\ {[8.6]} \\ \hline \end{array}$ | $\begin{gathered} \text { GPM [lpm] } \\ \text { HP [kw] } \end{gathered}$ |  |  | $\begin{array}{r} 115 \text { [435] } \\ 11.1 \text { [8.28] } \end{array}$ | $\begin{gathered} \hline 120 \text { [454] } \\ 13.1 \text { [9.77]] } \\ \hline \end{gathered}$ |  |  | $\begin{array}{r} 135[511] \\ 13[9.69] \end{array}$ | $\begin{gathered} 140[530] \\ 15.4[11.48] \end{gathered}$ |


| 360 RPM |  |  |  | 380 RPM |  |  |  | 445 RPM |  |  |  | 545 RPM |  |  |  | 750 RPM |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 30 | 100 | 1000 | 10,000 | 30 | 100 | 1000 | 10,000 | 30 | 100 | 1000 | 10,000 | 30 | 100 | 1000 | 10,000 | 30 | 100 | 1000 | 10,000 |
| $\begin{gathered} 37[140] \\ 1.1[.82] \\ \hline \end{gathered}$ | $\begin{aligned} & \hline 38[144] \\ & 1.1[.82] \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 39[148] \\ & 1.4[1.04] \\ & \hline \end{aligned}$ | $\begin{aligned} & 39[148] \\ & 2.2[1.64] \\ & \hline \end{aligned}$ | $\begin{gathered} \hline 40[151] \\ 1.1[.82] \\ \hline \end{gathered}$ | $\begin{gathered} \hline 41[155] \\ 1.1[82] \\ \hline \end{gathered}$ | $\begin{aligned} & \hline 42[159] \\ & 1.5[1.12] \\ & \hline \end{aligned}$ | $\begin{array}{r} 42[159] \\ 2.3[1.72] \\ \hline \end{array}$ | $\begin{gathered} \hline 47[178] \\ 1.4[1.04] \\ \hline \end{gathered}$ | $\begin{aligned} & \hline 48[181] \\ & 1.4[1.04] \\ & \hline \end{aligned}$ | $\begin{array}{\|ll\|} \hline 49 & {[185]} \\ 2.0 & {[1.49]} \\ \hline \end{array}$ |  | $\begin{array}{\|ll\|} \hline 58 & {[220]} \\ 1.9 & {[1.42]} \\ \hline \end{array}$ | $\begin{array}{\|ll\|} \hline 59 & {[223]} \\ 1.9 & {[1.42]} \\ \hline \end{array}$ | $\begin{array}{ll} \hline 60 & {[227]} \\ 2.7 & {[2.01]} \\ \hline \end{array}$ |  | $\begin{array}{\|ll\|} \hline 80 & {[303]} \\ 2.8 & {[2.09]} \\ \hline \end{array}$ | $\begin{array}{ll\|} \hline 81 & {[307]} \\ 2.8 & {[2.09]} \\ \hline \end{array}$ | $\begin{array}{\|ll\|} \hline 82 & {[310]} \\ 3.8 & {[2.83]} \\ \hline \end{array}$ |  |
| $\begin{gathered} \hline 35[132] \\ 1.7[1.27] \end{gathered}$ | $\begin{aligned} & \hline 37[140] \\ & 1.7[1.27] \end{aligned}$ | $\begin{array}{\|l\|} \hline 39[148] \\ 2.0[1.49] \end{array}$ | $\begin{array}{r} 39[148] \\ 2.8[2.09] \end{array}$ | $\begin{gathered} \hline 38[144] \\ 1.7[1.27] \end{gathered}$ | $\begin{aligned} & \hline 40[151] \\ & 1.7[1.27] \end{aligned}$ | $\begin{aligned} & \hline 42[159] \\ & 2.1[1.57] \end{aligned}$ | $\begin{aligned} & \hline 42[159] \\ & 2.9[2.16] \end{aligned}$ | $\begin{aligned} & \hline 45[170] \\ & 2.1[1.57] \end{aligned}$ | $\begin{aligned} & \hline 47 \text { [178] } \\ & 2.1[1.57] \end{aligned}$ | $\left\|\begin{array}{ll} \hline 49 & {[185]} \\ 2.6 & {[1.94]} \end{array}\right\|$ |  | $\begin{array}{\|ll\|} \hline 56 & {[212]} \\ 2.7 & {[2.01]} \\ \hline \end{array}$ | $\begin{array}{\|ll\|} \hline 58 & {[223]} \\ 2.7 & {[2.01]} \\ \hline \end{array}$ | $\begin{array}{ll} \hline 60 & {[227]} \\ 3.5 & {[2.61]} \end{array}$ |  | $\begin{array}{\|ll\|} \hline 78 & {[295]} \\ 3.9 & {[2.91]} \end{array}$ | $\begin{array}{ll} \hline 80 & {[303]} \\ 3.9 & {[2.91]} \end{array}$ | $\left.\begin{array}{\|ll} \hline 82 & {[310]} \\ 4.9 & {[3.65]} \end{array} \right\rvert\,$ |  |
|  | $\begin{array}{r} 35[132] \\ 2.8[2.09] \\ \hline \end{array}$ | $\begin{aligned} & \hline 38[144] \\ & 3.1[2.31] \\ & \hline \end{aligned}$ | $\begin{aligned} & 39[148] \\ & 3.9[2.91] \\ & \hline \end{aligned}$ | $\begin{array}{r} \hline 33[125] \\ 2.9[2.16] \\ \hline \end{array}$ | $\begin{gathered} \hline 38[144] \\ 2.9[2.16] \\ \hline \end{gathered}$ | $\begin{aligned} & \hline 41[155] \\ & 3.3[2.46] \\ & \hline \end{aligned}$ | $\begin{aligned} & 42[159] \\ & 4.1[3.06] \\ & \hline \end{aligned}$ | $\begin{aligned} & 40[151] \\ & 3.5[2.61] \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 45[170] \\ & 3.5[2.61] \\ & \hline \end{aligned}$ | $\begin{array}{\|ll\|} \hline 48 & {[182]} \\ 4.0 & {[2.98]} \\ \hline \end{array}$ |  | $\begin{array}{\|ll\|} \hline 51 & {[193]} \\ 4.4 & {[3.28]} \\ \hline \end{array}$ | $\begin{array}{\|ll\|} \hline 56 & {[212]} \\ 4.4 & {[3.28]} \\ \hline \end{array}$ | $\begin{array}{ll} \hline 59 & {[223]} \\ 5.2 & {[3.88]} \\ \hline \end{array}$ |  | $\begin{array}{\|cc\|} \hline 73 & {[276]} \\ 6.3 & {[4.7]} \\ \hline \end{array}$ | $\begin{array}{ll} \hline 78 & {[295]} \\ 6.3 & {[4.7]} \\ \hline \end{array}$ | $\begin{array}{\|ll\|} \hline 81 & {[307]} \\ 7.3 & {[5.44]} \\ \hline \end{array}$ |  |
|  | $\begin{aligned} & 34[129] \\ & 3.3[2.46] \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 38[144] \\ & 3.6[2.68] \\ & \hline \end{aligned}$ | $\begin{aligned} & 39[148] \\ & 4.4[3.28] \\ & \hline \end{aligned}$ |  | $\begin{aligned} & \hline 37[140] \\ & 3.5[2.61] \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 41[155] \\ & 3.9[2.91] \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 42[159] \\ & 4.7[3.5] \\ & \hline \end{aligned}$ |  | $\begin{aligned} & \hline 44[167] \\ & 4.2[3.13] \\ & \hline \end{aligned}$ | $\begin{array}{\|ll\|} \hline 48 & {[182]} \\ 4.7 & {[3.5]} \end{array}$ |  | $\begin{array}{\|ll\|} \hline 48 & {[181]} \\ 5.4 & {[4.03]} \\ \hline \end{array}$ | $\begin{array}{\|ll\|} \hline 55 & {[208]} \\ 5.4 & {[4.03]} \\ \hline \end{array}$ | $\begin{array}{ll} \hline 59 & {[223]} \\ 6.2 & {[4.62]} \\ \hline \end{array}$ |  | $\begin{array}{\|ll\|} \hline 70 & {[265]} \\ 7.5 & {[5.59]} \\ \hline \end{array}$ | $\left.\begin{array}{ll} \hline 77 & {[291]} \\ 7.5 & {[5.59]} \end{array}\right]$ | $\begin{array}{ll\|} \hline 81 & {[307]} \\ 8.5 & {[6.34]} \\ \hline \end{array}$ |  |
| $\begin{gathered} 57[216] \\ 1.2[.89] \end{gathered}$ | $\begin{gathered} 59[223] \\ 1.2[89] \end{gathered}$ | $\begin{gathered} \hline 60[227] \\ 1.8[1.34] \end{gathered}$ | $\begin{aligned} & 61[231] \\ & 3.0[2.24] \end{aligned}$ | $\begin{gathered} 60[227] \\ 1.3[.97] \end{gathered}$ | $\begin{gathered} \hline 62[235] \\ 1.3[.97] \end{gathered}$ | $\begin{gathered} 63[238] \\ 1.9[1.42] \end{gathered}$ | $\begin{aligned} & 64[242] \\ & 3.3[2.46] \end{aligned}$ | $\begin{aligned} & \hline 71[269] \\ & 1.7[1.27] \end{aligned}$ | $\begin{aligned} & \hline 73[276] \\ & 1.7[1.27] \end{aligned}$ | $\begin{array}{\|ll\|} \hline 74 & {[280]} \\ 2.5 & {[1.86]} \end{array}$ |  | $\begin{array}{\|ll\|} \hline 88 & {[333]} \\ 2.3 & {[1.72]} \end{array}$ | $\begin{array}{\|ll\|} \hline 90 & {[341]} \\ 2.3 & {[1.72]} \\ \hline \end{array}$ | $\begin{array}{ll} \hline 91 & {[344]} \\ 3.6 \\ {[2.68]} \end{array}$ |  | $\begin{array}{\|cc\|} \hline 123 & {[466]} \\ 3.5 & {[2.61]} \end{array}$ | $\begin{array}{\|c\|} \hline 125 \\ \hline \end{array} \text { [473] }$ | $\begin{array}{\|c\|} \hline 126[477] \\ 6.0[4.47] \end{array}$ |  |
| $\begin{aligned} & 52[197] \\ & 2.1[1.57] \\ & \hline \end{aligned}$ | $\begin{gathered} 57[216] \\ 2.1[1.57]] \\ \hline \end{gathered}$ | $\begin{array}{r} 60[227] \\ 2.7[2.01] \\ \hline \end{array}$ | $\begin{aligned} & 61[231] \\ & 3.9[2.91] \\ & \hline \end{aligned}$ | $\begin{array}{r} 55[208] \\ 2.3[1.72] \\ \hline \end{array}$ | $\begin{array}{r} 60[227] \\ 2.3[1.72] \\ \hline \end{array}$ | $\begin{array}{r} 63[238] \\ 2.9[2.16] \\ \hline \end{array}$ | $\begin{array}{r} 64[242] \\ 4.3[3.21] \\ \hline \end{array}$ | $\begin{array}{r} 66[250] \\ 2.9[2.16] \\ \hline \end{array}$ | $\begin{aligned} & 71[269] \\ & 2.9[2.16] \\ & \hline \end{aligned}$ | $\begin{array}{\|ll\|} \hline 74 & {[280]} \\ 3.7 & {[2.76]} \\ \hline \end{array}$ |  | $\begin{array}{\|ll\|} \hline 83 & {[314]} \\ 3.6 & {[2.68]} \\ \hline \end{array}$ | $\begin{array}{\|ll\|} \hline 88 & {[333]} \\ 3.6 & {[2.68]} \\ \hline \end{array}$ | $\begin{array}{ll} 91 & {[344]} \\ 4.9 & {[3.65]} \end{array}$ |  | $\begin{array}{\|ll\|} \hline 118 & {[447]} \\ 5.4 & {[4.03]} \\ \hline \end{array}$ | $\begin{array}{\|cc\|} \hline 123 & {[466]} \\ 5.4 & {[4.03]} \\ \hline \end{array}$ | $\left.\begin{array}{\|ll\|} \hline 126 & {[477]} \\ 7.9 & {[5.89]} \end{array} \right\rvert\,$ |  |
| $\begin{aligned} & 49[185] \\ & 3.8[2.83] \\ & \hline \end{aligned}$ | $\begin{aligned} & 53[201] \\ & 3.8[2.83] \\ & \hline \end{aligned}$ | $\begin{array}{r} 59[223] \\ 4.4[3.28] \\ \hline \end{array}$ | $\begin{gathered} 60[227] \\ 5.6[4.18] \end{gathered}$ | $\begin{array}{r} 52[197] \\ 4.2[3.13] \\ \hline \end{array}$ | $\begin{aligned} & 56[212] \\ & 4.2[3.13] \\ & \hline \end{aligned}$ | $\begin{array}{r} 62[235] \\ 4.8[3.58] \\ \hline \end{array}$ | $\begin{aligned} & 63[238] \\ & 6.2[4.62] \\ & \hline \end{aligned}$ | $\begin{gathered} 63[238] \\ 5.0[3.73] \end{gathered}$ | $\begin{gathered} 67[254] \\ 5.0[3.73] \\ \hline \end{gathered}$ | $\left.\begin{array}{ll} 73 & {[276]} \\ 5.8 & {[4.33]} \end{array}\right]$ |  | $\begin{array}{\|ll\|} \hline 80 & {[303]} \\ 6.3 & {[4.7]} \end{array}$ | $\begin{array}{\|ll\|} \hline 84 & {[318]} \\ 6.3 & {[4.7]} \\ \hline \end{array}$ | $\left.\begin{array}{ll} 90 & {[341]} \\ 7.6 & {[5.67]} \end{array}\right]$ |  | $\begin{array}{\|cc\|} \hline 115 & {[435]} \\ 9.0 & {[6.71]} \end{array}$ | $\left.\begin{array}{\|l\|} \hline 119[450] \\ 9.0 \\ 9.6 .71] \end{array} \right\rvert\,$ | $\begin{array}{\|cc\|} \hline 125 & {[473]} \\ 11.5 & {[8.58]} \\ \hline \end{array}$ |  |
| $\begin{aligned} & 49[185] \\ & 4.6[3.43] \\ & \hline \end{aligned}$ | $\begin{aligned} & 51[193] \\ & 4.6[3.43] \\ & \hline \end{aligned}$ | $\begin{aligned} & 58[220] \\ & 5.2[3.88] \\ & \hline \end{aligned}$ | $\begin{array}{r} 60[227] \\ 6.4[4.77] \\ \hline \end{array}$ | $\begin{aligned} & 52[197] \\ & 5.0[3.73] \\ & \hline \end{aligned}$ | $\begin{gathered} 54[204] \\ 5.0[3.73] \\ \hline \end{gathered}$ | $\begin{array}{r} 61[231] \\ 5.6[4.18] \\ \hline \end{array}$ | $\begin{array}{r} 63[238] \\ 7.0[5.22] \\ \hline \end{array}$ | $\begin{aligned} & 63[238] \\ & 6.0[4.47] \\ & \hline \end{aligned}$ | $\begin{gathered} 65[246] \\ 6.0[4.47] \\ \hline \end{gathered}$ | $\begin{array}{\|ll\|} \hline 72 & {[273]} \\ 6.8 & {[5.07]} \\ \hline \end{array}$ |  | $\begin{array}{\|ll\|} \hline 80 & {[303]} \\ 7.5 & {[5.59]} \\ \hline \end{array}$ | $\begin{array}{\|ll\|} \hline 82 & {[310]} \\ 7.5 & {[5.59]} \\ \hline \end{array}$ | $\begin{array}{ll\|} \hline 89 & {[337]} \\ 8.8 & {[6.56]} \\ \hline \end{array}$ |  | $\begin{array}{\|ll\|} \hline 115 & {[435]} \\ 10.8 & {[8.05]} \\ \hline \end{array}$ | $\begin{array}{\|c\|} \hline 117 \\ 10.8[843] \\ \hline \end{array}$ | $\begin{array}{\|l\|l\|} \hline 124 & {[469]} \\ 13.3 & \text { [9.92] } \\ \hline \end{array}$ |  |
| $\begin{aligned} & \hline 76[288] \\ & 2.0[1.49] \\ & \hline \end{aligned}$ | $\begin{array}{r} 77[291] \\ 2.0[1.49] \\ \hline \end{array}$ | $\begin{array}{r} 79[299] \\ 2.6[1.94] \\ \hline \end{array}$ | $\begin{aligned} & 79[299] \\ & 3.9[2.91] \\ & \hline \end{aligned}$ | $\begin{array}{r} 80[303] \\ 2.2[1.64] \\ \hline \end{array}$ | $\begin{gathered} 81[307] \\ 2.2[1.64] \\ \hline \end{gathered}$ | $\begin{aligned} & 83[314] \\ & 3.0[2.24] \\ & \hline \end{aligned}$ | $\begin{array}{r} 83[314] \\ 4.3[3.21] \\ \hline \end{array}$ | $\begin{array}{r} 94[356] \\ 2.7[2.01] \\ \hline \end{array}$ | $\begin{aligned} & \hline 95[360] \\ & 2.7[2.01] \\ & \hline \end{aligned}$ | $\begin{array}{\|ll\|} \hline 97 & {[367]} \\ 3.5 & {[2.61]} \\ \hline \end{array}$ |  | $\begin{array}{\|r\|c\|} \hline 116 & {[439]} \\ 3.2 & {[2.39]} \\ \hline \end{array}$ | $\begin{array}{\|cc\|} \hline 117 & {[443]} \\ 3.2 & {[2.39]} \end{array}$ | $\begin{gathered} 119[450] \\ 4.4[3.28] \\ \hline \end{gathered}$ |  | $\begin{array}{\|cc\|} \hline 162 & {[613]} \\ 5.1 & {[3.8]} \end{array}$ | $\begin{array}{\|cc\|} \hline 163 & {[617]} \\ 5.1 & {[3.8]} \\ \hline \end{array}$ | $\begin{array}{\|l\|} \hline 165[625] \\ 7.2[5.37] \\ \hline \end{array}$ |  |
| $\begin{aligned} & 74[280] \\ & 3.1[2.31] \end{aligned}$ | $\begin{aligned} & 76[288] \\ & 3.1[2.31] \end{aligned}$ | $\begin{aligned} & \hline 78[295] \\ & 3.7[2.76] \\ & \hline \end{aligned}$ | $\begin{gathered} \hline 79[299] \\ 5.0[3.73] \end{gathered}$ | $\begin{aligned} & \hline 78[295] \\ & 3.3[2.46] \end{aligned}$ | $\begin{aligned} & 80[303] \\ & 3.3[2.46] \end{aligned}$ | $\begin{gathered} \hline 82[310] \\ 4.1[3.06] \end{gathered}$ | $\begin{gathered} 83[314] \\ 5.4[4.03] \end{gathered}$ | $\begin{gathered} 92[348] \\ 4.1[3.06] \end{gathered}$ | $\begin{aligned} & \hline 94[356] \\ & 4.1[3.06] \end{aligned}$ | $\begin{array}{\|ll\|} \hline 96 & {[363]} \\ 4.9 & {[3.65]} \end{array}$ |  | $\begin{array}{\|cc\|} \hline 114 & {[432]} \\ 4.8 & {[3.58]} \\ \hline \end{array}$ | $\begin{array}{\|ll\|} \hline 116 & {[439]} \\ 4.8 & {[3.58]} \\ \hline \end{array}$ | $\begin{aligned} & 118[447] \\ & 6.0[4.47] \end{aligned}$ |  | $\begin{array}{\|ll\|} \hline 161 & {[609]} \\ 7.3 & {[5.44]} \end{array}$ | $\begin{aligned} & \hline 162[613] \\ & 7.3[5.44] \end{aligned}$ | $\begin{array}{\|cc\|} \hline 164[621] \\ 9.4 & \text { [7.01] } \end{array}$ |  |
| $\begin{aligned} & 68[257] \\ & 5.4[4.03] \\ & \hline \end{aligned}$ | $\begin{aligned} & 74[280] \\ & 5.4[4.03] \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 77[291] \\ & 6.0[4.47] \end{aligned}$ | $\begin{array}{r} 79[299] \\ 7.3[5.44] \\ \hline \end{array}$ | $\begin{array}{r} 72[273] \\ 5.7[4.25] \\ \hline \end{array}$ | $\begin{array}{r} 78[295] \\ 5.7[4.25] \\ \hline \end{array}$ | $\begin{array}{\|c\|} \hline 81[307] \\ 6.5[4.85] \\ \hline \end{array}$ | $\begin{array}{r} 83[314] \\ 7.8[5.82] \\ \hline \end{array}$ | $\begin{aligned} & \hline 86[326] \\ & 6.8[5.07] \\ & \hline \end{aligned}$ | $\begin{gathered} \hline 92[348] \\ 6.8[5.07] \\ \hline \end{gathered}$ | $\begin{array}{ll} \hline 95 & {[360]} \\ 7.6 & {[5.67]} \end{array}$ |  | $\begin{array}{\|cc\|} \hline 108 & {[409]} \\ 8.2 & {[6.11]} \end{array}$ | $\begin{array}{\|cc\|} \hline 114 & {[432]} \\ 8.2 & {[6.11]} \\ \hline \end{array}$ | $\begin{array}{ll} 117[443] \\ 9.4 & {[7.01]} \end{array}$ |  | $\begin{array}{\|l\|} \hline 154 \\ 1583] \\ 12.0 \\ \hline \end{array}$ | $\begin{array}{\|l\|} \hline 160[606] \\ 12.0[8.95] \\ \hline \end{array}$ | $\begin{array}{\|l\|} \hline 163 \\ 14.1[617] \\ \hline 10.51] \end{array}$ |  |
| $\begin{aligned} & 66[250] \\ & 6.5[4.85] \end{aligned}$ | $\begin{aligned} & \hline 73[276] \\ & 6.5[4.85] \end{aligned}$ | $\begin{aligned} & \hline 77 \text { [291] } \\ & 7.1[5.29] \end{aligned}$ | $\begin{aligned} & \hline 79 \text { [299] } \\ & 8.4[6.26] \end{aligned}$ | $\begin{array}{\|c} \hline 70[265] \\ 6.9[5.15] \\ \hline \end{array}$ | $\begin{aligned} & \hline 77 \text { [291] } \\ & 6.9[5.15] \end{aligned}$ | $\begin{aligned} & \hline 81[307] \\ & 7.7[5.74] \end{aligned}$ | $\begin{aligned} & \hline 83[314] \\ & 9.0[6.71] \end{aligned}$ | $\begin{aligned} & \hline 84[318] \\ & 8.3[6.19] \end{aligned}$ | $\begin{gathered} 91[344] \\ 8.3 \text { [6.19] } \end{gathered}$ | $\begin{array}{\|ll\|} \hline 95 & {[360]} \\ 9.1 & {[6.79]} \end{array}$ |  | $\begin{array}{\|l\|} \hline 106[401] \\ 10.2[7.61] \end{array}$ | $\begin{array}{\|ll\|} \hline 113 & {[428]} \\ 10.2 & {[7.61]} \\ \hline \end{array}$ | $\begin{array}{\|l\|} \hline 117[443] \\ 11.4[8.5] \\ \hline \end{array}$ |  | $\begin{array}{\|ll\|} \hline 152 & {[575]} \\ 14.7 & {[10.96]} \end{array}$ | $\begin{array}{\|l\|} \hline 159[602] \\ 14.7[10.96] \end{array}$ | $\begin{array}{\|l\|} \hline 163[617] \\ 16.8[12.53] \end{array}$ |  |


| 270 RPM |  |  |  | 309 RPM |  |  |  | 360 RPM |  |  |  | 410 RPM |  |  |  | 609 RPM |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 30 | 100 | 1000 | 10,000 | 30 | 100 | 1000 | 10,000 | 30 | 100 | 1000 | 10,000 | 30 | 100 | 1000 | 10,000 | 30 | 100 | 1000 | 10,000 |
| $\begin{aligned} & \hline 75[284] \\ & 1.7[1.27] \end{aligned}$ | $\begin{aligned} & \hline 78[295] \\ & 1.9[1.42] \end{aligned}$ | $\begin{aligned} & 82[310] \\ & 2.5[1.86] \end{aligned}$ | $\begin{gathered} 86[326] \\ 3[2.24] \end{gathered}$ | $\begin{array}{\|r\|} \hline 88[333] \\ 2.1[1.57] \end{array}$ | $\begin{aligned} & 91[344] \\ & 2.3[1.72] \end{aligned}$ | $\begin{aligned} & 95[360] \\ & 2.8[2.09] \end{aligned}$ | $\begin{gathered} 99[375] \\ 3.4[2.54] \end{gathered}$ | $\begin{aligned} & 104 \text { [394] } \\ & 2.8[2.09] \end{aligned}$ | $\begin{array}{r} 107[405] \\ 3[2.24] \end{array}$ | $\begin{array}{\|c\|} \hline 111[420] \\ 3.6[2.68] \\ \hline \end{array}$ | $\begin{array}{\|cc\|} \hline 115 & {[435]} \\ 4.3 & {[3.21]} \end{array}$ | $\left.\begin{array}{\|cc\|} \hline 120 & {[454]} \\ 3.5 & {[2.61]} \end{array} \right\rvert\,$ | $\begin{array}{\|cc\|} \hline 123 & {[466]} \\ 3.7 & {[2.76]} \\ \hline \end{array}$ | $\begin{aligned} & 127[481] \\ & 4.3[3.21] \\ & \hline \end{aligned}$ | $\begin{aligned} & 131[496] \\ & 5.2[3.88] \end{aligned}$ | $\begin{array}{\|c\|} \hline 184[697] \\ 6[4.47] \end{array}$ | $\begin{array}{\|ll\|} \hline 187 & {[708]} \\ 6.7 & {[5.0]} \end{array}$ | $\begin{array}{\|cc\|} \hline 191[723] \\ 8 & {[5.97]} \end{array}$ | $\begin{array}{\|ll\|} \hline 195 & {[738]} \\ 10 & {[7.46]} \\ \hline \end{array}$ |
| $\begin{gathered} 62[235] \\ 3[2.24] \\ \hline \end{gathered}$ | $\begin{aligned} & 68[257] \\ & 3.2[2.39] \\ & \hline \end{aligned}$ | $\begin{aligned} & 77[291] \\ & 3.8[2.83] \end{aligned}$ | $\begin{array}{r} 81[307] \\ 4.3[3.21] \\ \hline \end{array}$ | $\begin{aligned} & 75[284] \\ & 3.5[2.61] \end{aligned}$ | $\begin{aligned} & \hline 81[307] \\ & 3.7[2.76] \\ & \hline \end{aligned}$ | $\begin{aligned} & 89[337] \\ & 4.2[3.13] \\ & \hline \end{aligned}$ | $\begin{aligned} & 93[352] \\ & 4.8[3.58] \end{aligned}$ | $\begin{aligned} & 91[344] \\ & 4.5[3.36] \\ & \hline \end{aligned}$ | $\begin{aligned} & 97[367] \\ & 4.7 \text { [3.5] } \\ & \hline \end{aligned}$ | $\begin{array}{\|l\|l\|} \hline 106 & {[401]} \\ 5.3 & {[3.95]} \\ \hline \end{array}$ | $\begin{array}{\|cc\|} \hline 110 & {[416]} \\ 6 & {[4.47]} \\ \hline \end{array}$ | $\begin{array}{\|ll\|} \hline 107 & {[405]} \\ 5.5 & {[4.1]} \\ \hline \end{array}$ | $\begin{array}{\|ll\|} \hline 113 & {[428]} \\ 5.7 & {[4.25]} \\ \hline \end{array}$ | $\begin{array}{ll} 122 & {[462]} \\ 6.3 & {[4.7]} \\ \hline \end{array}$ | $\begin{aligned} & 126[477] \\ & 7.2[5.37] \\ & \hline \end{aligned}$ | $\left.\begin{array}{\|cc\|} \hline 171 & {[647]} \\ 9 & {[6.71]} \end{array} \right\rvert\,$ | $\begin{array}{\|l\|l\|} \hline 177 & {[670]} \\ 9.7 & 7.23] \\ \hline \end{array}$ | $\begin{array}{\|cc\|} \hline 185 & {[700]} \\ 11 & {[8.2]} \end{array}$ | $\begin{array}{\|ll} \hline 189 & {[715]} \\ 13 & {[9.69]} \\ \hline \end{array}$ |
|  | $\begin{aligned} & \hline 47[178] \\ & 5.9[4.4] \\ & \hline \end{aligned}$ | $\begin{gathered} \hline 65[246] \\ 6.5[4.85] \\ \hline \end{gathered}$ | $\begin{array}{\|c\|} \hline 73[276] \\ 7[5.22] \\ \hline \end{array}$ |  | $\begin{gathered} \hline 60[227] \\ 6.7[5.0] \\ \hline \end{gathered}$ | $\begin{gathered} \hline 78[295] \\ 7.2[5.37] \\ \hline \end{gathered}$ | $\begin{array}{\|c\|} \hline 86[326 \\ 7.8[5.82] \\ \hline \end{array}$ | $\begin{aligned} & \hline 65[246] \\ & 7.5[5.59] \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 76[288] \\ & 7.7[5.74] \\ & \hline \end{aligned}$ | $\begin{array}{\|cc\|} \hline 94 & {[356]} \\ 8.3 & {[6.19]} \\ \hline \end{array}$ | $\begin{array}{\|cc\|} \hline 102 & {[386]} \\ 9 & {[6.71]} \\ \hline \end{array}$ | $\begin{array}{\|ll\|} \hline 81 & {[307]} \\ 9.5 & {[7.08]} \\ \hline \end{array}$ | $\begin{array}{\|ll\|} \hline 92 & {[348]} \\ 9.7 & {[7.23]} \\ \hline \end{array}$ | $\begin{aligned} & \hline 110 \\ & 10.3[716] \\ & \hline \end{aligned}$ | $\begin{array}{\|l\|} \hline 118 \text { [447] } \\ 11.2[8.35] \\ \hline \end{array}$ | $\begin{array}{\|l\|l\|} \hline 145[549] \\ 14.5[10.81] \\ 1 \end{array}$ | $\begin{array}{\|l\|l\|} \hline 156[590] \\ 15.2[11.33] \\ \hline \end{array}$ | $\begin{array}{\|l\|} \hline 174 \text { [659] } \\ 16.5[12.3] \\ \hline \end{array}$ | $\begin{array}{\|l\|} \hline 182 \\ 18.5[1398] \\ \hline \end{array}$ |
|  |  | $\begin{array}{r} 57[216] \\ 8[5.97] \end{array}$ | $\begin{aligned} & \hline 70[265] \\ & 8.5[6.34] \end{aligned}$ |  |  | $\begin{aligned} & \hline 70[265] \\ & 8.7[6.49] \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 83[314] \\ & 9.3[6.94] \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 45[170] \\ & 9.2[6.86] \end{aligned}$ | $\begin{aligned} & \hline 65 \text { [246] } \\ & 9.4 \text { [7.01] } \\ & \hline \end{aligned}$ | $\begin{array}{ll} \hline 86 & {[326]} \\ 10 & {[7.46]} \\ \hline \end{array}$ | $\begin{array}{\|cc\|} \hline 99 & {[375]} \\ 10.7 & {[7.98]} \end{array}$ |  | $\begin{array}{\|cc\|} \hline 81 & {[307]} \\ 11.5 & {[8.58]} \\ \hline \end{array}$ | $\begin{array}{ll} \hline 102 & {[386]} \\ 12.1[9.02] \end{array}$ | $\begin{array}{\|cc\|} \hline 115 & {[435]} \\ 13 & {[9.69]} \\ \hline \end{array}$ |  | $\begin{array}{\|ll\|} \hline 145 & {[549]} \\ 17.8 & {[13.27]} \end{array}$ | $\begin{array}{\|l\|} \hline 166[628] \\ 19.1[14.24] \end{array}$ | $\begin{array}{\|ll\|} \hline 179 & {[678]} \\ 21.1 & {[15.73]} \end{array}$ |
| $\begin{aligned} & \hline 96[363] \\ & 3.7[2.76] \end{aligned}$ | $\begin{array}{l\|} \hline 97[367] \\ 3.7[2.76] \\ \hline \end{array}$ | $\begin{gathered} 98[371] \\ 3.9[2.91] \\ \hline \end{gathered}$ | $\begin{aligned} & 100[379] \\ & 6.2[4.62] \end{aligned}$ | $\begin{gathered} 110[416] \\ 4.4[3.28] \end{gathered}$ | $\begin{gathered} 111[420] \\ 4.4[3.28] \\ \hline \end{gathered}$ | $\begin{gathered} 112[424] \\ 4.6[3.43] \\ \hline \end{gathered}$ | $\begin{aligned} & 114[432] \\ & 7.5[5.59] \\ & \hline \end{aligned}$ | $\begin{aligned} & 129[488] \\ & 5.3[3.95] \end{aligned}$ | $\begin{gathered} 130[492] \\ 5.3[3.95] \\ \hline \end{gathered}$ | $\begin{array}{\|c\|} \hline 131[496] \\ 5.7[4.25] \\ \hline \end{array}$ | $\begin{array}{\|cc\|} \hline 133[503] \\ 9.4[7.01] \\ \hline \end{array}$ | $\begin{array}{ll\|} \hline 148 & {[560]} \\ 6.2 & {[4.62]} \\ \hline \end{array}$ | $\begin{array}{\|ll\|} \hline 149 & {[564]} \\ 6.2 & {[4.62]} \\ \hline \end{array}$ | $\begin{array}{ll} 150 & {[568]} \\ 6.7 & {[5.0]} \end{array}$ |  | $\begin{array}{\|l\|l\|} \hline 221[837] \\ \hline 10.9[8.13] & 1 \\ \hline \end{array}$ | $\begin{array}{\|l\|} \hline 222 \\ 10.9 \\ 1040] \\ \hline \end{array}$ | $\begin{array}{\|l\|} \hline 223 \\ 11.9[844] \\ \hline \end{array}$ |  |
| $\begin{aligned} & \hline 92[348] \\ & 5.1[3.8] \\ & \hline \end{aligned}$ | $\begin{gathered} \hline 94[356] \\ 5.1[3.8] \\ \hline \end{gathered}$ | $\begin{gathered} 96[363] \\ 5.3[3.95] \\ \hline \end{gathered}$ | $\begin{aligned} & \hline 98[371] \\ & 7.6[5.97] \\ & \hline \end{aligned}$ | $\begin{array}{r} 106[401] \\ 6[4.47] \\ \hline \end{array}$ | $\begin{array}{r} 108[409] \\ 6[4.47] \\ \hline \end{array}$ | $\begin{gathered} \hline 110[416] \\ 6.2[4.62] \\ \hline \end{gathered}$ | $\begin{aligned} & 112[424] \\ & 9.1[6.79] \\ & \hline \end{aligned}$ | $\begin{gathered} 125[473] \\ 7.1[5.29] \\ \hline \end{gathered}$ | $\begin{gathered} 127[481] \\ 7.1[5.29] \\ \hline \end{gathered}$ | $\begin{array}{\|l\|} \hline 129 \end{array} \text { [488] } \mid,$ | $\begin{array}{\|l\|} \hline 131[496] \\ 11.2[8.35] \\ \hline \end{array}$ | $\begin{array}{\|l\|l\|} \hline 144 & {[545]} \\ 8.4 & {[6.26]} \\ \hline \end{array}$ | $\begin{array}{\|l\|} \hline 146[553] \\ 8.4 \\ \hline \end{array}$ | $\begin{array}{ll} \hline 148 & {[560]} \\ 8.9 & {[6.64]} \\ \hline \end{array}$ |  | $\begin{array}{\|l\|} \hline 217 \\ \hline 14.2[820.59] \\ \hline \end{array}$ | $\begin{array}{\|l\|} \hline 219 \\ 14.2[829] \\ 14.59] \\ \hline \end{array}$ | $\begin{array}{\|l\|} \hline 221[837] \\ 15.2[11.33] \\ \hline \end{array}$ |  |
| $\begin{gathered} 82[310] \\ 8[5.97] \end{gathered}$ | $\begin{array}{r} 86[326] \\ 8[5.97] \\ \hline \end{array}$ | $\begin{gathered} 93[352] \\ 8.2[6.11] \end{gathered}$ | $\begin{array}{\|r\|} \hline 96[363] \\ 10.5[7.83] \end{array}$ | $\begin{aligned} & \hline 96[363] \\ & 9.4[7.01] \end{aligned}$ | $\begin{gathered} 100[379] \\ 9.4[7.01] \\ \hline \end{gathered}$ | $\begin{aligned} & \hline 107 \text { [405] } \\ & 9.6[7.16] \end{aligned}$ | $\begin{gathered} \hline 110[416] \\ 12.5[9.32] \\ \hline \end{gathered}$ |  |  | $\begin{array}{\|l\|} \hline 126[477] \\ 11.4[8.5] \\ \hline \end{array}$ | $\begin{array}{\|l\|} \hline 129 \text { [488] } \\ 15.1 \text { [11.26] } \\ \hline \end{array}$ |  |  | $\left.\begin{array}{\|ll\|} \hline 145 & {[549]} \\ 13.4 & {[9.99]} \end{array} \right\rvert\,$ |  |  |  | $\begin{array}{\|cc\|} \hline 218 & {[825]} \\ 21.8 & {[16.26]} \\ \hline \end{array}$ |  |
|  | $\begin{gathered} \hline 83[314] \\ 9.5[7.08] \\ \hline \end{gathered}$ | $\begin{aligned} & 90[341] \\ & 9.7[7.23] \\ & \hline \end{aligned}$ | $\begin{array}{r} 95[360] \\ 12.0[8.95] \\ \hline \end{array}$ |  |  | $\begin{array}{r} 104[394] \\ 11.2[8.35] \\ \hline \end{array}$ | $\begin{array}{r} 109[413] \\ 14.1[10.51] \\ \hline \end{array}$ |  |  | $\begin{array}{\|l\|} \hline 123 \\ 13.4 \\ \hline 1969] \\ \hline \end{array}$ | $\begin{array}{\|l\|} \hline 128 \\ \hline 17.1[485] \\ \hline \end{array}$ |  |  | $\left.\begin{array}{\|l\|l\|} \hline 142 & {[538]} \\ 15.6[11.63] \end{array} \right\rvert\,$ |  |  |  | $\begin{array}{\|ll\|} \hline 215 & {[814]} \\ 25.2 & {[18.79]} \\ \hline \end{array}$ |  |
| $\begin{gathered} 105[397] \\ 2.4[1.79] \end{gathered}$ | $\begin{aligned} & 108[409] \\ & 2.9[2.16] \\ & \hline \end{aligned}$ | $\begin{gathered} 112[424] \\ 3.3[2.46] \end{gathered}$ | $\begin{gathered} 114[432] \\ 3.7[2.78] \\ \hline \end{gathered}$ | $\begin{array}{r} 122[462] \\ 3[2.24] \\ \hline \end{array}$ | $\begin{gathered} 125[473] \\ 3.2[2.39] \\ \hline \end{gathered}$ | $\begin{aligned} & 128[485] \\ & 3.7[2.76] \\ & \hline \end{aligned}$ | $\begin{gathered} 131[496] \\ 4.4[3.28] \\ \hline \end{gathered}$ | $\begin{gathered} 144[545] \\ 3.7[2.76] \\ \hline \end{gathered}$ | $\begin{gathered} 147[556] \\ 3.9[2.91] \\ \hline \end{gathered}$ | $\begin{array}{\|cc\|} \hline 150[568] \\ 4.7 & {[3.5]} \\ \hline \end{array}$ | $\begin{array}{\|c\|} \hline 153[579] \\ 5.6[4.18] \\ \hline \end{array}$ | $\begin{array}{\|ll\|} \hline 165 & {[625]} \\ 4.4 & {[3.28]} \end{array}$ | $\begin{array}{\|l\|l\|} \hline 168 & {[636]} \\ 4.9 & {[3.65]} \end{array}$ | $\begin{aligned} & \hline 172[651] \\ & 5.7[4.25] \end{aligned}$ | $\begin{array}{cc} \hline 174 & {[659]} \\ 7 & {[5.22]} \end{array}$ | $\begin{array}{\|l\|} \hline 251[950] \\ 8.2[6.11] \end{array}$ | $\left.\begin{array}{\|cc\|} \hline 254 & {[961]} \\ 9 & {[6.71]} \end{array} \right\rvert\,$ | $\begin{array}{\|cc\|} \hline 257 & {[973]} \\ 11 & {[8.2]} \end{array}$ | $\left.\begin{array}{\|r\|} \hline 260 \end{array}\right][984] \mid \text { 14 }[10.44] \mid$ |
| $\begin{gathered} 91[344] \\ 4[2.98] \end{gathered}$ | $\begin{array}{\|} \hline 97[367] \\ 4.5[3.36] \\ \hline \end{array}$ | $\begin{gathered} 106[401] \\ 4.9[3.65] \end{gathered}$ | $\begin{aligned} & 110[416] \\ & 5.3[3.95] \\ & \hline \end{aligned}$ | $\begin{array}{r} 108[409] \\ 5[3.73] \end{array}$ | $\begin{gathered} 114[432] \\ 5.2[3.88] \end{gathered}$ | $\begin{gathered} 123[466] \\ 5.7[4.25] \\ \hline \end{gathered}$ | $\begin{aligned} & 127[481] \\ & 6.4[4.77] \\ & \hline \end{aligned}$ | $\begin{gathered} 130[492] \\ 5.8[4.33] \end{gathered}$ | $\begin{array}{r} 136[515] \\ 6[4.47] \\ \hline \end{array}$ | $\begin{array}{\|cc\|} \hline 145 & {[549]} \\ 6.8 & {[5.07]} \end{array}$ | $\begin{array}{l\|} \hline 149[564] \\ 7.7[5.74] \end{array}$ | $\begin{array}{\|ll\|} \hline 151 & {[572]} \\ 7.1 & {[5.29]} \\ \hline \end{array}$ | $\begin{array}{\|ll\|} \hline 157 & {[594]} \\ 7.6 & {[5.67]} \end{array}$ | $\begin{gathered} 166[628] \\ 8.4[6.26] \end{gathered}$ | $\begin{array}{\|l\|l\|} \hline 170 & {[644]} \\ 9.7 & {[7.23]} \\ \hline \end{array}$ | $\left.\begin{array}{\|cc\|} \hline 237 & {[897]} \\ 12 & {[8.95]} \end{array} \right\rvert\, 1$ | $\begin{array}{\|l\|l\|} \hline 243 & {[920]} \\ 12.8 & {[9.54]} \end{array}$ | $\begin{array}{\|c\|} \hline 252 \text { [954] } \\ 14.8 \text { [11.04] } \end{array}$ | $\begin{array}{\|l\|} \hline 256[969] \\ 17.8[13.27] \end{array}$ |
|  | $\begin{array}{r} 73[276] \\ 8[5.97] \end{array}$ | $\begin{aligned} & \hline 91[344] \\ & 8.4[6.26] \end{aligned}$ | $\begin{aligned} & \hline 101[382] \\ & 8.8[6.56] \end{aligned}$ |  | $\begin{aligned} & 90[341] \\ & 9.2[6.86] \end{aligned}$ | $\begin{aligned} & 108[409] \\ & 9.7[7.23] \end{aligned}$ | $\begin{aligned} & \hline 118[447] \\ & 10.4[7.76] \end{aligned}$ | $\begin{array}{r} 95[360] \\ 10.6[7.9] \end{array}$ | $\begin{gathered} 112[424] \\ 10.8[8.05] \end{gathered}$ | $\begin{array}{\|l\|} \hline 130 \\ 11.6[492] \\ \hline \end{array}$ | $\begin{array}{\|l\|} \hline 140[530] \\ 12.5[9.32] \end{array},$ | $\begin{array}{\|cc\|} \hline 116[439] \\ 12.2[9.1] \end{array}$ | $\left.\begin{array}{\|ll\|} \hline 133 & {[503]} \\ 12.7 & {[9.47]} \end{array} \right\rvert\,$ | $\begin{array}{\|l\|} \hline 151 \\ 13.5[10.07] \\ \hline \end{array}$ | $\begin{array}{l\|} \hline 161 \\ 14.8[11.04] \end{array}$ | $\left.\begin{array}{\|c\|c\|} \hline 202[765] \\ 19.4[14.47] \end{array} \right\rvert\, 2$ | $\left\|\begin{array}{ll} 219 & {[829]} \\ 20.2 & {[15.08]} \end{array}\right\|$ | $\left.\begin{array}{\|c\|c\|} \hline 237 \\ 22.2[897] \\ \hline 165] \end{array} \right\rvert\,$ | $\begin{array}{\|ll\|} \hline 247 & {[935]} \\ 25.2 & {[18.79]} \end{array}$ |
|  |  | $\begin{gathered} 85[322] \\ 9.5[7.08] \\ \hline \end{gathered}$ | $\begin{aligned} & \hline 98[371] \\ & 9.9[7.38] \\ & \hline \end{aligned}$ |  |  | $\begin{gathered} 102[386] \\ 11.2[8.35] \\ \hline \end{gathered}$ | $\begin{gathered} 115[435] \\ 11.9[8.87] \\ \hline \end{gathered}$ | $\begin{array}{r} 55[208] \\ 13.1[9.77] \end{array}$ | $\begin{array}{r} 97[367] \\ 13.3[9.92] \\ \hline \end{array}$ | $\begin{array}{\|ll\|} \hline 124 & {[469]} \\ 14.1 & {[10.51]} \end{array}$ | $\begin{array}{\|cc\|} \hline 137 & {[519]} \\ 15 & {[11.19]} \end{array}$ |  | $\begin{array}{\|l\|} \hline 118 \\ 15.4 \\ 1547] \\ \hline \end{array}$ | $\begin{array}{\|l\|} \hline 145 \\ 16.2[12.08] \\ \hline \end{array}$ | $\begin{array}{\|l\|} \hline 158[598] \\ 17.5[13.05] \\ \hline \end{array}$ | $\left.\begin{array}{\|l\|} \hline 162 \\ 23.2[17.3] \end{array} \right\rvert\,$ | $\begin{array}{\|cc\|} \hline 204 & {[772]} \\ 24 & {[17.9]} \\ \hline \end{array}$ | $\begin{array}{\|cc\|} \hline 231 & {[874]} \\ 26 & {[19.39]} \end{array}$ | $\begin{array}{\|cc\|} \hline 244 & {[924]} \\ 29 & {[21.63]} \\ \hline \end{array}$ |
| $\begin{gathered} 129[488] \\ 3.7[2.76] \\ \hline \end{gathered}$ | $\begin{gathered} 132[500] \\ 3.9[2.91] \\ \hline \end{gathered}$ | $\begin{gathered} \hline 136[515] \\ 4.7[3.5] \\ \hline \end{gathered}$ | $\begin{gathered} 138[522] \\ 5.7[4.25] \\ \hline \end{gathered}$ | $\begin{gathered} 149[564] \\ 4.4[3.28] \\ \hline \end{gathered}$ | $\begin{gathered} 152[575] \\ 4.7[3.5] \\ \hline \end{gathered}$ | $\begin{aligned} & \hline 156[591] \\ & 5.7[4.25] \\ & \hline \end{aligned}$ | $\begin{aligned} & 158[598] \\ & 6.9[5.15] \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 176[666] \\ & 5.4[4.03] \end{aligned}$ | $\begin{gathered} \hline 179[678] \\ 5.9[4.4] \\ \hline \end{gathered}$ | $\begin{array}{\|cc\|} \hline 183 & \text { [693] } \\ 7 & {[5.22]} \end{array}$ | $\begin{array}{\|cc\|} \hline 185 & {[700]} \\ 8.5 & {[6.34]} \end{array}$ | $\begin{array}{\|ll\|} \hline 202 & {[765]} \\ 6.3 & {[4.7]} \\ \hline \end{array}$ | $\begin{array}{\|ll\|} \hline 205 & {[776]} \\ 6.8 & {[5.07]} \\ \hline \end{array}$ | $\begin{aligned} & \hline 209[791] \\ & 8.4[6.26] \\ & \hline \end{aligned}$ | $\begin{array}{\|l\|l\|} \hline 211 & {[799]} \\ 10.3 & {[7.68]} \\ \hline \end{array}$ | $\begin{array}{\|l\|} \hline 305[1155] \\ 10.9[8.13] \\ \hline \end{array}$ | $\begin{array}{\|cc\|} \hline 308 & {[1166]} \\ 12 & {[8.95]} \\ \hline \end{array}$ | $\begin{array}{\|l\|} \hline 312[1181] \\ 16.8[12.53] \\ \hline \end{array}$ | $\begin{array}{\|l\|} \hline 314[1189] \\ 19.7 \text { [14.69] } \\ \hline \end{array}$ |
|  | $\begin{gathered} 121[458] \\ 5.9[4.4] \\ \hline \end{gathered}$ | $\begin{gathered} 128[485] \\ 6.7[5.0] \\ \hline \end{gathered}$ | $\begin{aligned} & 134[507] \\ & 7.7[5.74] \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 133[503] \\ & 6.8[5.07] \end{aligned}$ | $\begin{aligned} & 141[534] \\ & 7.1[5.29] \\ & \hline \end{aligned}$ | $\begin{aligned} & 148[560] \\ & 8.1[6.04] \\ & \hline \end{aligned}$ | $\begin{aligned} & 154[583] \\ & 9.3[6.94] \\ & \hline \end{aligned}$ | $\begin{gathered} \hline 160[606] \\ 8.0[5.97] \end{gathered}$ | $\begin{gathered} \hline 168[636] \\ 8.5[6.34] \end{gathered}$ | $\begin{array}{\|c\|} \hline 175 \text { [662] } \\ 9.6[7.16] \\ \hline \end{array}$ | 181 [685] 11.1 [8.28] | $\begin{array}{\|ll\|} \hline 186 & {[704]} \\ 9.5 & {[7.08]} \\ \hline \end{array}$ | $\begin{array}{\|ll\|} \hline 194 & {[734]} \\ 10 & 7.46] \\ \hline \end{array}$ | $\begin{gathered} \hline 201[761] \\ 11.6[8.65] \\ \hline \end{gathered}$ | $\begin{array}{\|l\|} \hline 207 \\ 13.5[784] \\ \hline \end{array}$ | $\begin{array}{\|l\|l\|} \hline 209[791] \\ 15.4[11.48] & 2 \\ \hline \end{array}$ | $\begin{array}{\|l\|} \hline 297 \\ 16.5[1124] \\ 12.3] \end{array}$ | $\begin{array}{\|c\|} \hline 304[1151] \\ 19.3[14.39] \end{array}$ | $\begin{array}{\|l\|} \hline 310[1173] \\ 24.2[18.05] \end{array}$ |
|  |  |  | $\begin{array}{\|c\|} \hline 123[466] \\ 11.1[8.28] \\ \hline \end{array}$ |  |  | $\begin{array}{r} \hline 132[500] \\ 12.7[9.47] \\ \hline \end{array}$ | $\begin{array}{r} 143[541] \\ 13.9[10.37] \\ \hline \end{array}$ |  |  | $\begin{array}{\|l\|} \hline 159[602] \\ 15.1[11.26] \\ \hline \end{array}$ | $\begin{array}{\|l\|} \hline 170[644] \\ 16.6[12.38] \\ \hline \end{array}$ |  |  | $\left.\begin{array}{\|l\|} \hline 185 \\ 1700] \\ 17.7 \end{array}\right]$ | $\begin{array}{\|l\|} \hline 196[742] \\ 19.6[14.62] \\ \hline \end{array}$ |  | $\begin{array}{\|l\|} \hline 266[1007] \\ 25.6[19.26] \\ \hline \end{array}$ | $\begin{array}{\|l\|} \hline 288[1090] \\ 28.4[21.18] \end{array}$ | $\begin{array}{\|l\|l\|} \hline 299 \\ 33.3[132] \\ \hline 34.83] \\ \hline \end{array}$ |
|  |  |  | $\begin{gathered} \hline 119 \text { [450] } \\ 14[10.44] \end{gathered}$ |  |  |  | $\begin{aligned} & \hline 139[526] \\ & 16.2[12.08] \end{aligned}$ |  |  |  | $\begin{array}{\|l\|} \hline 166[628] \\ 19.2[14.32] \end{array}$ |  |  | $\begin{array}{\|c\|} \hline 176[666] \\ 20.8[15.51] \end{array}$ | $\left.\begin{array}{\|cc\|} \hline 192 & {[727]} \\ 22.7 & {[16.93]} \end{array} \right\rvert\,$ |  |  | $\begin{array}{\|l\|} \hline 279[1056] \\ 32.9[24.53] \end{array}$ | $\begin{array}{\|l\|l\|} \hline 295[1117] \\ 37.3[27.81] \end{array}$ |
| $\begin{array}{r} 157[594] \\ 5[3.73] \end{array}$ | $\begin{array}{r} 160[606] \\ 5[3.73] \end{array}$ | $\begin{gathered} \hline 162[613] \\ 5.5[4.1] \\ \hline \end{gathered}$ | $\begin{aligned} & \hline 164[621] \\ & 9.8[7.31] \end{aligned}$ | $\begin{array}{r} 181[685] \\ 6[4.47] \end{array}$ | $\begin{array}{r} 184[697] \\ 6[4.47] \\ \hline \end{array}$ | $\begin{aligned} & 186[704] \\ & 6.7[5.0] \end{aligned}$ | $\begin{gathered} 188[712] \\ 11[8.2] \end{gathered}$ | $\begin{gathered} \hline 212[803] \\ 6.3[4.7] \end{gathered}$ | $\begin{gathered} 215[814] \\ 7.1[5.29] \end{gathered}$ | $\begin{array}{\|c\|} \hline 217 \text { [821] } \\ 8.2[6.11] \end{array}$ | $\begin{array}{\|l\|} \hline 219 \text { [829] } \\ 13.5[10.07] \end{array}$ | $\begin{array}{\|cc\|} \hline 243 & {[920]} \\ 8.3 & {[6.19]} \end{array}$ | $\begin{array}{\|cc\|} \hline 246 & {[931]} \\ 8.4 & {[6.26]} \end{array}$ | $\begin{array}{\|l\|} \hline 248 \\ 10.2[7.61] \\ \hline \end{array}$ | $\begin{array}{\|cc\|} \hline 250 & {[946]} \\ 18 & {[13.42]} \end{array}$ |  |  | $\begin{array}{\|l\|} \hline 369[1397] \\ 18.8[14.02] \end{array}$ |  |
| $\begin{aligned} & 147[556] \\ & 7.3[5.44] \end{aligned}$ | $\begin{aligned} & \hline 155[587] \\ & 7.3[5.44] \end{aligned}$ | $\begin{gathered} 161[609] \\ 7.8[5.82] \end{gathered}$ | $\begin{array}{\|c\|} \hline 163[617] \\ 12.1[9.02] \end{array}$ | $\begin{aligned} & \hline 171[647] \\ & 8.7[6.49] \end{aligned}$ | $\begin{array}{c\|} \hline 179[678] \\ 8.7[6.49] \end{array}$ | $\begin{aligned} & 185[700] \\ & 9.4[7.01] \end{aligned}$ | $\begin{gathered} 187[708] \\ 13.7[10.22] \end{gathered}$ | $\begin{aligned} & \hline 202[765] \\ & 10.1[7.53] \end{aligned}$ | $\begin{aligned} & \hline 210[795] \\ & 10.4[7.76] \end{aligned}$ | $\begin{array}{\|l\|} \hline 216[818] \\ 11.5[8.58] \end{array}$ | $\begin{array}{\|l\|} \hline 218[825] \\ 16.8[12.53] \end{array}$ | $\begin{array}{\|l\|} \hline 233 \\ 11.9[882] \\ \hline 8.87] \end{array}$ | $\begin{array}{\|cc\|} \hline 241 & {[912]} \\ 12 & {[8.95]} \\ \hline \end{array}$ | $\begin{array}{\|l\|} \hline 247 \\ 13.8[935] \\ \hline \end{array}$ | $\left\|\begin{array}{\|ll\|} \hline 249 & {[943]} \\ 21.6 & \text { [16.11] } \end{array}\right\|$ |  |  | $\begin{array}{\|l\|} \hline 368[1393] \\ 24.3[18.12] \end{array}$ |  |
|  |  | $\begin{gathered} 158[598] \\ 12.6[9.4] \end{gathered}$ | $\begin{array}{\|c\|} \hline 162[613] \\ 16.9[12.6] \end{array}$ |  |  | $\begin{gathered} 182[689] \\ 14.9[11.11] \end{gathered}$ | $\begin{gathered} 186[704] \\ 19.2[14.32] \end{gathered}$ |  |  | $\begin{array}{\|l\|} \hline 213[806] \\ 17.8[13.27] \end{array}$ | $\begin{array}{\|l\|} \hline 217 \\ 23.1[821] \\ \hline 17.23] \end{array}$ |  |  | $\begin{array}{\|cc\|} \hline 244 & {[924]} \\ 21 & {[15.66]} \end{array}$ | $\begin{array}{\|ll\|} \hline 248 & {[939]} \\ 28.8 & {[21.48]} \end{array}$ |  |  | $\begin{array}{\|cc\|} \hline 365 & {[1382]} \\ 35 & {[26.1]} \end{array}$ |  |
|  |  | $\begin{aligned} & 156[591] \\ & 15.1[11.26] \end{aligned}$ | $\begin{array}{\|c\|} \hline 161[609] \\ 19.4[14.47] \end{array}$ |  |  | $\begin{aligned} & 180[681] \\ & 17.8[13.27] \end{aligned}$ | $\begin{aligned} & 185[700] \\ & 22.1[16.48] \end{aligned}$ |  |  | $\begin{array}{\|cc\|} \hline 211 & {[799]} \\ 21 & {[15.66]} \end{array}$ | $\begin{array}{\|l\|} \hline 216[818] \\ 26.3[19.61] \end{array}$ |  |  | $\left.\begin{array}{\|ll\|} \hline 242 & {[916]} \\ 24.7 & {[18.42]} \end{array} \right\rvert\,$ | $\left.\begin{array}{\|l\|} \hline 247 \\ 32.5 \\ \hline \end{array} 234.24\right] \mid$ |  |  | $\begin{array}{\|l\|} \hline 363[1374] \\ 40.5[30.2] \\ \hline \end{array}$ |  |

## Direction of Rotation

Rotation direction is determined when facing the drive shaft. The diagrams will serve as a helpful basis for you to determine the direction of rotation wanted according to your piping system. We can build the pump at the factory to meet your installation requirements. If the pump build is not specified, it will be shipped the standard "W" configuration. Once in the field, if you need to change the configuration, it can be done easily by disassembling the pump and rebuilding it to your desired arrangement. No new parts are needed.
Note: Top picture in each section is a standard pump, and the bottom picture is the same pump with gear box added.


## 3600 SERIES $\left(90^{\circ}\right)$ WITH LOW DRIVE



4600 SERIES ( $180^{\circ}$ ) WITH LOW DRIVE


## Base Mounted Units



## CLOSE COUPLED DRIVES (CCD)

The close coupled drive configuration provides an enhanced level of safety in a compact package. Guards and alignment are not required because this complete drive package easily mounts to DIN flanged gear motors.

Since the CCD bracket creates a unified system from the motor to the pump, the baseplate becomes an optional component to the system. These units will attach to our standard 3600 BH pumps.

## ROPER GHB GEARBOX

The versatile GHB gearbox configuration features a built-on gear reduction unit that allows minute adjustments for various driver shaft heights.

This feature makes alignment to the motor shaft very simple. The carefully selected ratios convert standard motor speeds to ranges suitable for most pumping applications. See page 8 for more information on available gear ratios.

## INDUSTRIAL STANDARD

Using an industrial standard gearbox offers virtually unlimited gear ratio options, including the ability to easily change pump speeds by simply changing the gearbox.

Roper Pump offers extensive expertise in spacing, mounting and aligning the complete drive package of motor, gearbox and pump.


4600 SERIES - Thru Ports $180^{\circ}$



| $\begin{gathered} \mathrm{IN} \\ {[\mathrm{~mm}]} \end{gathered}$ | 4600 SERIES |  | C | HIGH |  | E | F | G |  | K | N | NM | 0 | P | R | U | V | W | X | KEY | PORTS |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 11 | $\begin{aligned} & \mathrm{HF} \& \\ & \text { HFRV (SPEC G) } \end{aligned}$ | $\begin{array}{\|l} 15.97 \\ {[405]} \end{array}$ | $\begin{gathered} 6.44 \\ {[163]} \end{gathered}$ | $\begin{gathered} 3.56 \\ {[90]} \end{gathered}$ | $\begin{aligned} & 0.88 \\ & {[22]} \\ & {[28} \end{aligned}$ | $\begin{aligned} & 2.75 \\ & {[69]} \end{aligned}$ | $\begin{aligned} & 0.62 \\ & {[15]} \\ & {\left[\begin{array}{l} \end{array}\right.} \end{aligned}$ | $\begin{aligned} & 0.56 \\ & {[14]} \end{aligned}$ | $\left[\begin{array}{c} 5 \\ {[127]} \end{array}\right.$ | $\begin{aligned} & 2.58 \\ & \text { [65] } \end{aligned}$ | $\begin{aligned} & 10.34 \\ & {[262]} \end{aligned}$ | $\begin{aligned} & 9.44 \\ & {[239]} \end{aligned}$ | $\begin{gathered} 4.17 \\ {[105]} \end{gathered}$ | $\begin{array}{r} 19.57 \\ {[497]} \\ \hline \end{array}$ | $\begin{aligned} & 1.06 \\ & {[26]} \end{aligned}$ | N/A | N/A | N/A | . 25 SQ $\times 1.50$ | 2 NPT TAPPED |
|  | 17 | $\begin{array}{\|l\|} \hline \text { HF \& } \\ \text { HFRV (SPEC G) } \\ \hline \end{array}$ | $\left.\begin{array}{\|l\|l} \hline 16.72 \\ \hline \end{array} 424\right] \text { 1 }$ |  |  |  |  | $\begin{aligned} & 0.75 \\ & {[19]} \end{aligned}$ |  |  | $\begin{aligned} & 1.83 \\ & \text { [46] } \end{aligned}$ |  |  | $\begin{array}{r} 4.41 \\ {[112]} \\ \hline \end{array}$ | $\begin{aligned} & 20.33 \\ & {[516]} \end{aligned}$ |  |  |  |  |  | 3NPT FLANGE |
|  | 22 | $\begin{array}{\|l} \hline \text { HF \& } \\ \text { HFRV (SPEC G) } \end{array}$ | $\begin{array}{\|l} \hline 18.59 \\ {[472]} \\ \hline \end{array}$ |  |  |  |  |  |  |  | $\begin{aligned} & 2.2 \\ & {[55]} \end{aligned}$ | $\begin{aligned} & 11.46 \\ & {[291]} \end{aligned}$ |  | $\begin{aligned} & 4.85 \\ & {[123]} \end{aligned}$ | $\begin{aligned} & 22.19 \\ & {[563]} \end{aligned}$ |  |  |  |  |  | 4NPTELANGE |
|  | 58 | $\begin{aligned} & \text { HF \& } \\ & \text { HFRV (SPEC G) } \end{aligned}$ | $\begin{array}{\|l\|l} \hline 22.51 \\ {[571]} \end{array}$ | $\begin{aligned} & 9.25 \\ & {[234]} \end{aligned}$ | $\stackrel{5}{[127]}$ |  | $\begin{gathered} 5.19 \\ {[131]} \end{gathered}$ | $\begin{aligned} & 1.5 \\ & {[38]} \end{aligned}$ | $\begin{aligned} & 0.69 \\ & {[17]} \end{aligned}$ | $\begin{aligned} & 9.25 \\ & {[234]} \end{aligned}$ | $\begin{aligned} & 2.29 \\ & \text { [58] } \end{aligned}$ | $\begin{aligned} & 13.52 \\ & {[343]} \\ & \hline \end{aligned}$ | $\begin{aligned} & 9.25 \\ & {[234]} \end{aligned}$ | $\begin{gathered} 8.1 \\ {[205]} \end{gathered}$ | $\begin{aligned} & 26.02 \\ & {[660]} \end{aligned}$ | $\begin{aligned} & 1.44 \\ & {[36]} \end{aligned}$ |  |  |  | . 38 SQ. $\times 1.62$ | 4NPFPLANGE |
| $\frac{\stackrel{\rightharpoonup}{4}}{4}$ | 11 | $\begin{aligned} & \text { HBF \& } \\ & \text { HBFRV } \end{aligned}$ | $\begin{array}{\|l} \hline 19.32 \\ {[490]} \end{array}$ |  |  |  |  | $\begin{aligned} & 0.62 \\ & {[15]} \end{aligned}$ |  |  | $\begin{aligned} & 3.8 \\ & {[9]} \end{aligned}$ |  |  | $\begin{aligned} & 4.17 \\ & {[105]} \end{aligned}$ | $\begin{aligned} & 22.92 \\ & {[582]} \\ & \hline \end{aligned}$ |  |  |  |  |  | 2 NPT TAPPED |
|  | 17 | $\begin{aligned} & \hline \text { HBF \& } \\ & \text { HBFRV } \end{aligned}$ | $\begin{array}{\|l} 20.07 \\ {[509]} \\ \hline \end{array}$ | $\begin{gathered} 6.44 \\ {[163]} \end{gathered}$ | $\begin{aligned} & 3.56 \\ & {[90]} \end{aligned}$ | 0.88 | $\begin{aligned} & 2.75 \\ & {[69]} \\ & \hline 6 \end{aligned}$ | 0.75 | $\begin{aligned} & 0.56 \\ & {[14]} \end{aligned}$ | $\stackrel{5}{[127]}$ | 3.05 | [347] | $\stackrel{5}{5}$ | $\begin{gathered} 4.41 \\ {[112]} \end{gathered}$ | $\begin{aligned} & 23.67 \\ & {[601]} \end{aligned}$ | $\begin{gathered} 1 \\ {[25]} \end{gathered}$ |  |  |  | . 25 SQ. $\times 1.50$ | 3 NPT FLANGE |
|  | 22 | HBF \& HBFRV | $\begin{aligned} & 21.57 \\ & {[547]} \end{aligned}$ |  |  | [22] |  | [19] |  |  | [77] | $\begin{aligned} & 14.44 \\ & {[366]} \end{aligned}$ |  | $\begin{aligned} & 4.85 \\ & {[123]} \end{aligned}$ | $\begin{aligned} & 25.17 \\ & \text { [639] } \end{aligned}$ |  | N/A | N/A | N/A |  |  |
| $\stackrel{5}{3}$ | 58 | HBF \& HBFRV | $\begin{aligned} & 26.53 \\ & {[6731} \end{aligned}$ | $\begin{array}{\|l} 9.25 \\ {[234]} \\ \hline \end{array}$ | ${ }_{[127]}^{5}$ |  | $\begin{gathered} 5.19 \\ {[131]} \end{gathered}$ | $\begin{aligned} & 1.5 \\ & {[38]} \end{aligned}$ | $\left.\begin{array}{l} 0.69 \\ {[17]} \end{array}\right]$ | $\begin{aligned} & 9.25 \\ & {[234]} \end{aligned}$ | $\begin{aligned} & 3.25 \\ & \text { B2] } \end{aligned}$ | $\begin{aligned} & {[1000]} \\ & \hline 17.54 \\ & {[445]} \end{aligned}$ | $\begin{aligned} & 9.25 \\ & {[234]} \\ & \hline 25 \end{aligned}$ | $\begin{gathered} 8.1 \\ {[205]} \end{gathered}$ | $\begin{array}{r} 30.04 \\ {[763]} \\ \hline \end{array}$ | $\begin{aligned} & 1.25 \\ & {[32]} \\ & {[3]} \end{aligned}$ |  |  |  | . 25 SQ. $\times 1.62$ | 4NPT FLANGE |
| 은 | 11 | GHBF \& GHBFRV | $\begin{aligned} & 20.47 \\ & {[519]} \end{aligned}$ |  |  |  |  | $\begin{aligned} & 0.62 \\ & {[15]} \\ & \text { [10 } \end{aligned}$ |  |  |  | $\begin{aligned} & 14.83 \\ & {[376]} \end{aligned}$ |  |  | $\begin{aligned} & 24.07 \\ & {[611]} \end{aligned}$ |  |  |  |  |  | 2 NPT TAPPED |
|  | 17 | GHBF \& GHBFRV | $\begin{array}{\|l} 21.97 \\ {[558]} \end{array}$ | $\begin{gathered} 6.44 \\ {[163]} \\ \end{gathered}$ | $\begin{gathered} 3.56 \\ {[90]} \end{gathered}$ |  | $\begin{aligned} & 2.75 \\ & {[69]} \\ & \text { [6] } \end{aligned}$ |  | $\begin{aligned} & 0.56 \\ & {[14]} \end{aligned}$ | $\underset{[127]}{5}$ | $\begin{aligned} & 1.744 \\ & \text { [44] } \end{aligned}$ | $\begin{aligned} & 15.58 \\ & {[395]} \end{aligned}$ | $\underset{[127]}{5}$ | $\begin{gathered} 4.3 \\ {[109]} \end{gathered}$ | $\begin{aligned} & 25.57 \\ & {[649]} \\ & \hline \end{aligned}$ | $\begin{gathered} 1 \\ {[25]} \end{gathered}$ |  | $\begin{gathered} 3.523 \\ {[89]} \end{gathered}$ | $\begin{aligned} & 10.24 \\ & {[260]} \end{aligned}$ | . 25 SQ. $\times 1.50$ | 3NPT FLANGE |
|  | 22 | $\begin{aligned} & \text { GHBF \& } \\ & \text { GHBFRV } \end{aligned}$ | $\begin{array}{\|l\|l} 23.47 \\ {[596]} \\ \hline \end{array}$ |  |  | [22] |  | [19] |  |  |  | $\begin{aligned} & 16.33 \\ & {[414]} \end{aligned}$ |  |  | $\begin{aligned} & 27.07 \\ & {[687]} \end{aligned}$ |  | N/A |  |  |  |  |
| $\stackrel{5}{5}$ | 58 | $\begin{aligned} & \text { GHBF \& } \\ & \text { GHBFRV } \end{aligned}$ | $\begin{array}{\|l} 28.72 \\ {[729]} \\ \hline \end{array}$ | $\begin{aligned} & 9.25 \\ & {[234]} \\ & \hline \end{aligned}$ | ${ }_{[127]}{ }^{2}$ |  | $\begin{gathered} 5.19 \\ {[131]} \\ \hline \end{gathered}$ | $\begin{array}{r} 1.5 \\ {[38]} \\ \hline \end{array}$ | $\begin{aligned} & 0.69 \\ & {[17]} \\ & \hline \end{aligned}$ | $\begin{gathered} 9.25 \\ {[234]} \\ \hline \end{gathered}$ | $\begin{aligned} & 2.29 \\ & {[58]} \end{aligned}$ | $\begin{array}{r} 19.73 \\ {[501]} \\ \hline \end{array}$ | $\begin{aligned} & 9.25 \\ & {[234]} \\ & \hline \end{aligned}$ | $\begin{gathered} 8.1 .1 \\ {[205]} \end{gathered}$ | $\begin{array}{r} 32.23 \\ {[818]} \\ \hline \end{array}$ | $\begin{aligned} & 1.25 \\ & {[32]} \\ & \hline \end{aligned}$ |  | $\begin{array}{r} 4.189 \\ {[106]} \\ \hline \end{array}$ | $\begin{array}{r} 11.25 \\ {[285]} \\ \hline \end{array}$ | . 25 SQ. $\times 2.25$ | 4NPT FLANGE |



| $\begin{gathered} \mathrm{IN} \\ {[\mathrm{~mm}]} \end{gathered}$ | 3600 SERIES ANGLED GEARS |  | C | NM | R | PORT |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 32 | HF \& HFRV | $\begin{aligned} & 20.48 \\ & {[520]} \end{aligned}$ | $\begin{aligned} & 12.25 \\ & {[311]} \end{aligned}$ | $\begin{aligned} & \hline 21.40 \\ & {[544]} \end{aligned}$ | 3 NPT FLANGE |
|  | 43 |  | $\begin{aligned} & 22.10 \\ & {[561]} \end{aligned}$ | $\begin{aligned} & 13.07 \\ & {[332]} \end{aligned}$ | $\begin{aligned} & 23.02 \\ & {[585]} \end{aligned}$ | 3 NPT FLANGE |
|  | 48 |  | $\begin{aligned} & 23.19 \\ & {[589]} \end{aligned}$ | $\begin{aligned} & 13.66 \\ & {[347]} \end{aligned}$ | $\begin{aligned} & 24.21 \\ & {[615]} \end{aligned}$ | 4 NPT FLANGE |
|  | 32 | HBF \& HBFRV | $\begin{aligned} & 23.67 \\ & {[601]} \end{aligned}$ | $\begin{aligned} & 15.44 \\ & {[392]} \end{aligned}$ | $\begin{aligned} & 24.58 \\ & {[624]} \end{aligned}$ | 3 NPT FLANGE |
|  | 43 |  | $\begin{aligned} & 25.32 \\ & {[643]} \end{aligned}$ | $\begin{aligned} & 16.29 \\ & {[414]} \end{aligned}$ | $\begin{aligned} & 26.24 \\ & {[666]} \end{aligned}$ | 3 NPT FLANGE |
|  | 48 |  | $\begin{aligned} & 27.02 \\ & {[686]} \end{aligned}$ | $\begin{aligned} & 17.38 \\ & {[441]} \end{aligned}$ | $\begin{aligned} & 27.93 \\ & {[709]} \end{aligned}$ | 4 NPT FLANGE |
|  | 32 | GHBF \& GHBFRV | $\begin{aligned} & 25.82 \\ & {[656]} \end{aligned}$ | $\begin{aligned} & 17.59 \\ & {[447]} \end{aligned}$ | $\begin{aligned} & \hline 26.74 \\ & {[679]} \end{aligned}$ | 3 NPT FLANGE |
|  | 43 |  | $\begin{aligned} & 27.43 \\ & {[697]} \end{aligned}$ | $\begin{aligned} & 18.40 \\ & {[467]} \end{aligned}$ | $\begin{aligned} & 28.35 \\ & {[720]} \\ & \hline \end{aligned}$ | 3 NPT FLANGE |
|  | 48 |  | $\begin{aligned} & 28.63 \\ & {[727]} \end{aligned}$ | $\begin{aligned} & 19.00 \\ & {[482]} \end{aligned}$ | $\begin{aligned} & 29.55 \\ & {[751]} \end{aligned}$ | 4 NPT FLANGE |

## Flanges

A variety of fittings makes these pumps adaptable to almost all mounting requirements. With these flanges, unions and


| PUMP SIZE | FITTING TYPE | PORT SIZE | ASSEMBLY NUMBER | FLANGE PART NO. | A | B | C | D |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\begin{aligned} & 3611 \\ & 4611 \end{aligned}$ | Straight Flange (Std.) Flanged Elbow (vertical) Flanged Elbow (horizontal) | $\begin{aligned} & 2^{\prime \prime} \\ & 2 " \\ & 2^{\prime \prime} \\ & \hline \end{aligned}$ |  | P23-30 P23-32 P23-31 | $7 / 8$ | $\begin{gathered} - \\ 33 / 16 \\ 37 / 16 \end{gathered}$ | $\begin{gathered} - \\ 1^{11 / 116} \\ 1^{15 / 16} \\ \hline \end{gathered}$ | $\begin{gathered} - \\ 3^{13 / 16} \\ 21 / 2 \end{gathered}$ |
| 3617 | Straight Flange (Std.) <br> Flanged Elbow Flanged Elbow Straight Flange | $\begin{gathered} \hline 2^{\prime \prime} \\ 2^{\prime \prime} \\ 3^{\prime \prime} \\ 2^{1 ⁄ 2} 2^{\prime \prime} \\ \hline \end{gathered}$ | N14-17 <br> N14-19 <br> N14-20 <br> N14-62 | $\begin{aligned} & \text { P23-12 } \\ & \text { P23-60 } \\ & \text { P23-36 } \\ & \text { P23-72 } \end{aligned}$ | $7 / 8$ | $\begin{gathered} - \\ 37 / 16 \\ 47 / 16 \end{gathered}$ | $\begin{gathered} - \\ 15 / 16 \\ 23 / 8 \end{gathered}$ | $\begin{gathered} - \\ 27 / 16 \\ 43 / 16 \end{gathered}$ |
| 4617 | Straight Flange (Std.) <br> Flanged Elbow <br> Flanged Elbow <br> Straight Flange | $\begin{gathered} 3^{\prime \prime} \\ 2^{\prime \prime} \\ 3^{\prime \prime} \\ 2^{1} / 2^{\prime \prime} \\ \hline \end{gathered}$ | N14-18 <br> N14-19 <br> N14-20 <br> N14-62 | $\begin{aligned} & \text { P23-35 } \\ & \text { P23-60 } \\ & \text { P23-36 } \\ & \text { P23-72 } \end{aligned}$ | $\begin{gathered} 11 / 8 \\ - \\ - \\ 11 / 8 \\ \hline \end{gathered}$ | $\begin{gathered} - \\ 3^{7} / 16 \\ 4^{7 / 16} \end{gathered}$ | $\begin{gathered} - \\ 15 / 16 \\ 23 / 8 \end{gathered}$ | $\begin{gathered} - \\ 27 / 16 \\ 43 / 16 \end{gathered}$ |
| 3622 | Straight Flange <br> Straight Flange Straight Flange (Std.) Flanged Elbow Straight Flange | $\begin{gathered} \hline 2^{\prime \prime} \\ 2^{1 / 2 "} \\ 3^{\prime \prime} \\ 3^{\prime \prime} \\ 4^{\prime \prime} \\ \hline \end{gathered}$ | N14-28 <br> N14-29 <br> N14-30 <br> N14-31 <br> N14-59 | $\begin{aligned} & \hline \text { P23-18 } \\ & \text { P23-22 } \\ & \text { P23-10 } \\ & \text { P23-59 } \\ & \text { P23-19 } \end{aligned}$ | $\begin{gathered} \hline 11 / 8 \\ 11 / 8 \\ 11 / 8 \\ - \\ 15 / 16 \\ \hline \end{gathered}$ | $\begin{gathered} - \\ - \\ 41 / 4 \end{gathered}$ | $21 / 8$ | $45 / 8$ |
| 3632 | Straight Flange (Std.) | 3" | N14-121 | P23-150 | $11 / 8$ | $4^{7 / 16}$ | $23 / 8$ | $43 / 16$ |
| 3635 | Straight Flange (Std.) Flanged Elbow | $\begin{aligned} & \hline 3^{\prime \prime} \\ & 3 " \end{aligned}$ | $\begin{aligned} & \hline \text { N14-76 } \\ & \text { N14-77 } \end{aligned}$ | $\begin{aligned} & \hline \text { P23-35 } \\ & \text { P23-36 } \end{aligned}$ | $11 / 8$ | $4^{7 / 16}$ | $23 / 8$ | 43/16 |
| $\begin{aligned} & 4622 \\ & 3643 \\ & 3648 \end{aligned}$ | Straight Flange <br> Straight Flange Straight Flange (Std.) <br> Flanged Elbow <br> Flanged Elbow | $\begin{aligned} & 2^{\prime \prime} \\ & 3^{\prime \prime} \\ & 4^{\prime \prime} \\ & 3^{\prime \prime} \\ & 4^{\prime \prime} \end{aligned}$ | $\begin{aligned} & \text { N14-57 } \\ & \text { N14-21 } \\ & \text { N14-22 } \\ & \text { N14-23 } \\ & \text { N14-24 } \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline \text { P23-18 } \\ & \text { P23-10 } \\ & \text { P23-19 } \\ & \text { P23-59 } \\ & \text { P23-37 } \end{aligned}$ | $\begin{aligned} & 11 / 8 \\ & 11 / 8 \\ & 15 / 16 \end{aligned}$ | $\begin{aligned} & 41 / 4 \\ & 51 / 2 \\ & \hline \end{aligned}$ | $\begin{aligned} & 21 / 8 \\ & 23 / 4 \end{aligned}$ | $\begin{array}{r} 45 / 8 \\ 53 / 8 \\ \hline \end{array}$ |
| 3658, 4658 | Straight Flange (Std.) | 4" | N14-26 | P23-52 | 15/16 | - | - | - |

Each assemby includes: flange, gasket, and hardware.
For simplicity, the pump sizes above are only shown with PACKING ("6" in the model number).
Flanges are interchangeable with 3500 (triple lip seal), 3600 (packing) and 3700 (mechanical seal) variations.

## THE LEADING FORCE behind liquids ${ }^{T M}$ since 1857



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From a small pump company founded in 1857, Roper Pump Company has grown into a technological leader. With a large installed base, we have both the knowledge and experience to help you solve your most challenging pumping problems...and our strong global distribution network ensures that your needs are met on time, every time.

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Roper Pump Company's rugged and dependable range of positive displacement pumps provides versatile pumping solutions for even the most challenging industrial applications.


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[^0]:    * There are over 40 basic configurations and several thousand custom designs.

    Please consult your local Roper Pump distributor to decide which configuration best fits your needs.

[^1]:    **Jacketing is not available on 32, 43 and 48 sizes

