**Step 1:** Select the hydraulic cylinder that best suits the application. See page 179.
**Step 2:** Select the hydraulic pump, with valve option, that best matches the cylinder and application. See pages 178, 181-184.
**Step 3:** Select the hydraulic accessories you need. See pages 74-80, 156-171.

## Considerations:

1. What **push or pull tonnage** is required per cylinder in your application? (Rule of thumb; Always choose a cylinder with a tonnage rating of 20% or more than what is required to lift the load.)
2. What is the **push or pull stroke** length required?
3. Does the cylinder need to **push**, **pull or both**? (Single-acting cylinders extend the piston under hydraulic pressure; double-acting cylinders extend and retract the piston under pressure .)
4. Does the application require **multiple cylinders**?
5. Is the application **stationary**, or must the components be light in weight for easy **portability**?
6. Do you need to **extend a rod or cable through the center** of the cylinder for the application, as in a **tensioning** operation?
7. Does the application require that the cylinder fit within **limited-clearance** work areas?
8. Does the application require that the cylinder be **"dead-ended"** at the end of it's work stroke?
9. Will the cylinder need to withstand **off-center loads**? Cylinders with swivel caps are available.
10. Does the application require that the lifted load be **supported for extended periods** of time? **Locking collars** are ideal for such jobs, as are cribbing blocks.
11. Is **corrosion resistance** required? Our unique **"Power Tech"** surface treatment is standard on many Power Team cylinders, and optional on many of our cylinders which feature steel construction.
12. Will the application involve **high cycles** (over 2,500 in the cylinders lifetime)? Our "RD", "RH", "RP" and "C" series cylinders are ideal choices. Please refer to pages 176-177 for the capabilities of each cylinder.

## What type of cylinder do you need?

1. To determine a cylinder's force capacity

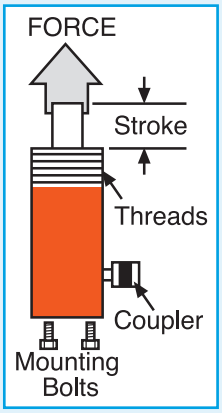
| ***Force*** kg (force) | Cylinder Effective Area (sq. cm.) | X | Bar from Pump |
|---|---|---|---|

2. To determine oil capacity of a cylinder
*Note: For double-acting cylinders, oil in rod end of cylinder must be subtracted to determine capacity.*

| ***Oil Capacity*** (cu. cm.) | Cylinder Effective Area (sq. cm.) | X | Cylinder Stroke (cm) |
|---|---|---|---|

3. To determine reservoir capacity needed for a multiple cylinder system

| ***Usable Oil*** | Oil Cap. of Cyl. (cu. cm.) | X | Number of Cyl. in System |
|---|---|---|---|




### Superior Features of Power Team Hydraulic Cylinders:

*Good reasons to specify Power Team hydraulic cylinders: We build our own cylinders in our ISO 9001 registered manufacturing facility, honored by Industry Week magazine as one of the 10 best plants in the United States. All Power Team cylinders are date-coded and maximum pressure rating and capacity are metal stamped on the cylinder. All cylinders comply to the demanding ASME B30.1 standard. All cylinders are proof tested to 125% of capacity before leaving our factory. Cylinder bores are roller burnished to harden surface and make it smoother, increasing seal life by 30%. Base mounting holes withstand full capacity of cylinder. Typical cylinder burst pressures range from 1,723 to 2,412 bar. Cylinders with gland nuts may be "dead-ended" at 700 bar. Cylinders are assembled and tested by certified assemblers. Eddy current and mag particle inspection detects flaws in the steel. Cylinder bodies are solid steel, not welded like some competitive cylinders. Material is removed from surface, to assure that any flaws are removed. Others use material just as it is rolled at the mill.*

# Choosing the right cylinder
## Cylinder selection basics

### Only Power Team provides the "Power Tech" surface treatment:

*•High corrosion and wear resistance, anti-galling properties. •Significantly increases the life expectancy of a cylinder. •Retains lubricants, prevents bronze and other materials from sticking to surface. •Increases fatigue strength and impact strength. •Increases surface yield and tensile strength. •Provides improved abrasion and scratch resistance. •Causes no appreciable dimensional change. •56 Rc minimum surface hardness. •Passes ASTM B117-85 100 hour salt spray corrosion resistance tests.*

*The "Power Tech" surface treatment is standard on the gland nut, cylinder body and piston/piston rod of the following cylinders: RLS50, RLS100, RLS200, RLS300, RLS500S, RLS750S, RLS1000S, RLS1500S, and RSS1002.* ***NOTE****: Bronze plating may be used in place of the "Power Tech" surface finish for the piston/piston rod of any of the above cylinders.The "Power Tech" surface treatment is standard on the standpipe of all "RH" series single and double- acting cylinders. The "Power Tech" surface treatment is standard on the piston/piston rod of the RT172, RT302 and RT503 cylinders.*

## *General purpose, "C" Series*

### Single-acting Cylinders

**(Listed on pages 6-7. Threaded end models listed on page 8)**

**Capacity** range from **5 to 100 tons**, stroke lengths from 25.4 to 406.4 mm. Over 40 models to choose from. On 5 to 25 ton cylinders, **adapters** and **accessories** are available for attachment to the cylinder's base or piston, to apply force for spreading, lifting or other tasks. Swivel caps are available for 10, 15, 25, 55 and 75 ton cylinders. **Collar threads** permit mounting cylinders in a fixture or attachment. Base mounting holes and threaded piston rod ends also provided for versatility of application.

## *Low Profile, "RLS" Series*

### Single-acting Cylinders

**(Listed on page 10)**

**Capacity** range from **5 to 150 tons**, stroke lengths from 11.1 to 15.9 mm. These are **low profile** "pancake" cylinders for use where clearances are limited. A unique heavy duty return spring provides rapid return of the piston. Swivel caps reduce the effects of **off-center loading**. Unique **"Power-Tech"** surface treatment for **corrosion resistance**.

## *"Shorty", "RSS" Series*

### Single-acting Cylinders

**(Listed on page 11)**

Capacity range from 10 to 250 tons, stroke lengths from 38.1 to 76.2 mm. "Shorty" cylinders have a heavy duty **return spring** for rapid piston return and **low collapsed height** for limited-clearance jobs. Large capacity models have **removable carrying handles**. Optional swivel caps minimize effects of **off-center loading**. **Cribbing block accessories** available for use with these cylinders give stable load support and increase cylinder stroke.

## *Center hole, "RH" Series*

### Single and Double-acting Cylinders

**(Listed on pages 12-13)**

**Capacity** range of **10 to 200 tons**, stroke lengths of 7.9 to 257.2 mm. **"Center-Hole"** design enables you to run cables, screws, etc, through the center of the cylinder, enabling cylinder to push or pull, if a pull rod is used. Withstand full "dead-end" loads, **double-acting** models provide **rapid piston return**. Standpipe has unique **"Power-Tech"** surface treatment for **corrosion resistance. Threaded, plain** or **solid head inserts** are available for most models. Cylinders have removable **carrying handles**. **Lightweight aluminum** models now available. These have high corrosion resistance and are one half the weight of a steel cylinder.

## *Center Hole "Twin", "RT" Series*

### Single & Double-acting Cylinders

**(Listed on page 14)**

**Capacities** of **17½ to 100 tons**, stroke lengths of 50.8 to 123.8 mm. **"Center-Hole"** allows jacking screws, puller screws, cables, etc., to be extended through the cylinder for application versatility. A record of proven **reliability** for over 40 years!

# Pull Cylinders "RP" Series

## Pull Cylinders

**(Listed on page 15)**

In **capacities** of **2 and 5 tons**, stroke lengths of 127 and 139.7 mm. Designed for **pulling** and **tensioning** applications. Heavy duty compression spring provides long cycle life and rapid extension of piston; **spring automatically extends piston rod** when pump pressure is released.

# "RD" Series

## Double-acting Cylinders

**(Listed on pages 16-17)**

In capacities of **10 to 500 tons**, stroke lengths of 152.4 to 511.2 mm. Ideally suited to **severe applications**, high cycle usage, various mountings, production fixturing, cabling, ect. Accessory swivel caps on some models reduce the effects of **off-center loads**. Ideal for bridge lifting, building reconstruction, shipyard, utility, mining equipment maintenance and high cycle production applications.

# "R" Series

## Load-Return Cylinders

**(Listed on page 18)**

In **capacities** of **150 to 565 tons**, stroke lengths of 50.8 to 254 mm. Features an improved **overflow port design** for stroke limiting. Optional swivel caps reduce effects of **off-center loading**.

## Load-Return, Locking Collar Cylinders

**(Listed on page 21)**

In **capacities** of **55 to 565 tons**, stroke lengths of 50.8 to 254 mm. Ideal for certain applications allowing pump to be disconnected from cylinder while retaining lifted load on **locking collar**. Optional swivel caps reduce the effect of off-center loading.

## Double-acting

**(Listed on page 19)**

In **capacities** of **100 to 565 tons**, stroke lengths of 50.8 to 254 mm. Swivel caps reduce the effects of **off-center loading;** cylinders may be "dead-ended" without damage. Removable carrying handles.

# "RA" Series

## Aluminum Single-acting Cylinders

**(Listed on pages 9)**

In **capacities** of **20 to 100 tons**, stroke lengths of 54 to 254 mm. **Half the weight of steel** cylinders of comparable capacity! Ideal for applications in which **portability** is a key factor. Designed for jacking and other non-production applications. Special **corrosion resistant** finish. Optional swivel caps reduce the effects of **off-center loading**; models with **locking collars** allow load to be supported without the pump being pressurized.

# "RL" Locking Collar Cylinders

## Spring Return

**(Listed on page 20)**

**Locking collar** enables cylinder to support load indefinitely with hydraulic pressure released. **Aluminum** models available in **55 and 100 ton capacities**, stroke lengths of 156 and 159 mm; **steel** models available in **55, 100 and 150 ton capacities**, 152 and 159 mm stroke lengths. Special **corrosion resistant finish**.

### CYLINDER/PUMP SELECTION/MATCHING CHART

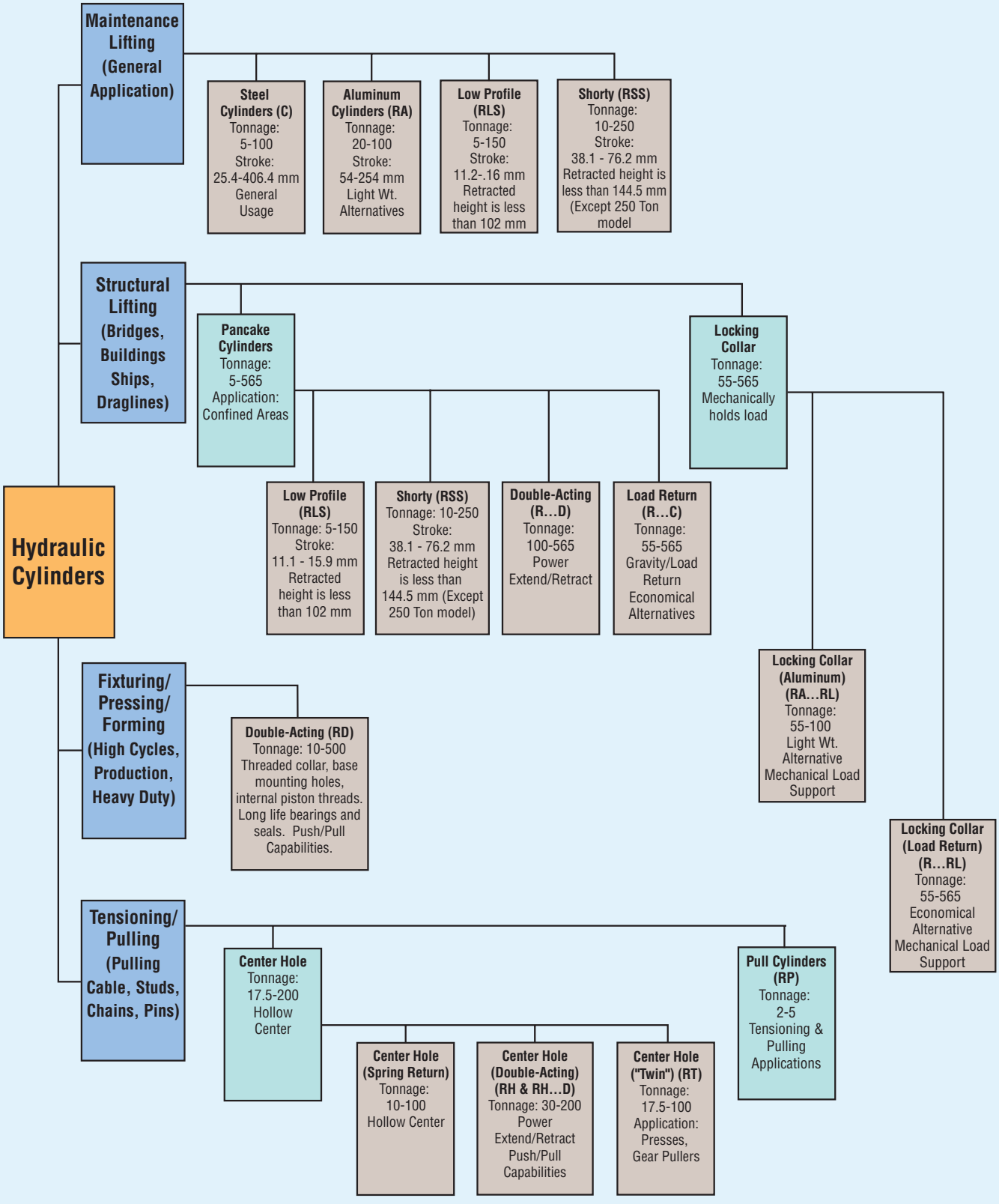
**The following guidelines are for general lifting and construction applications. Hydraulic tools, pullers and presses may fall outside these recommendations. Always check to see that the pump's "usable reservoir capacity" exceeds the cylinder(s) oil capacity.**

* Hand Pumps = Number of Strokes Required to Move Piston 25.4 mm.
Air, Electric and Gasoline Engine/Hydraulic Pumps = Number of Seconds Required To Move Piston 25.4 mm.

| 700 bar Maximum Working Pressure | | PRESSURE STAGE ▼ | Cylinder Capacity (Tons) 5 | 10 | 15 | 20 | 25 | 30 | 55 | 75 | 100 | 150 | 200 | 300 | 400 | 500 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Hand Pumps**  | P12‡ | Single | 14 | 32 | 44 | 65 | 72 | 93 | – | | | | | | | |
| | P55‡ | Single | 6 | 14 | 19 | 28 | 31 | 40 | 71 | – | | | | | | |
| | P19‡ | Low | 4 | 8 | 10 | 15 | 17 | 21 | – | | | | | | | |
| | | High | 13 | 30 | 42 | 59 | 68 | 86 | | | – | – | – | | | |
| | P59F | Low | 1.8 | 4.1 | 5.7 | 8 | 9 | 12 | 20 | 29 | | | | – | – | |
| | | High | 8 | 17 | 24 | 34 | 40 | 50 | 85 | 122 | | | | | | |
| | P59‡/ P157‡ | Low | 1.5 | 3.2 | 4.7 | 7 | 7.7 | 9.7 | 16.7 | 23.9 | | | | | | |
| | | High | 6 | 14 | 19 | 28 | 31 | 40 | 71 | 101 | | | | | | |
| | P159‡/ P300‡ | Low | .5 | 1 | 1.3 | 1.9 | 2.2 | 2.8 | 5 | 7 | 9 | 13 | 18 | | | |
| | | High | 7 | 15 | 21 | 30 | 34 | 43 | 77 | 110 | 143 | 200 | 250 | | | |
| | P460‡ | Low | .1 | .3 | .6 | .6 | .7 | .9 | 1.5 | 2.2 | 2.8 | 4.2 | 5.6 | 8.4 | 11.2 | – |
| | | High | 3.3 | 7.7 | 9 | 14 | 17.5 | 22 | 37 | 55 | 71 | 105 | 143 | 213 | 284 | |
| **Electric/Hydraulic Pumps**  | PE10 | Low | .5 | 1.2 | 1.6 | 2.2 | 2.6 | 3.2 | 5.5 | – | – | – | – | | | |
| | | High | 6 | 13.4 | 18.9 | 27 | 31 | 39 | 66.2 | – | – | – | – | | | |
| | PE17‡ | Low | .2 | .5 | .7 | .9 | 1.1 | 1.4 | 2.3 | 3.3 | 4.3 | 6.5 | 8.7 | – | – | |
| | | High | 3.5 | 7.9 | 10.9 | 16 | 18 | 23 | 39 | 56.3 | 73 | 109 | 146 | | | |
| | PE18 | Low | .4 | .8 | 1.2 | 1.6 | 1.8 | 2.3 | 3.9 | 5.7 | 7.3 | 10.8 | 14.6 | 21.9 | 29.2 | |
| | | High | 3.3 | 7.5 | 10.3 | 15 | 17 | 21 | 37 | 53 | 69 | 102 | 136 | 207 | 276 | |
| | PE21‡ | Low | .2 | .5 | .7 | 1.0 | 1.1 | 1.4 | 2.5 | 3.6 | 4.6 | 6.8 | 9.2 | 13.8 | 18.4 | |
| | | High | 2.8 | 6.4 | 9 | 13 | 15 | 19 | 32 | 45.5 | 59 | 88 | 118 | 177 | 236 | |
| | PED25 | Low | .2 | .4 | .6 | .9 | 1.0 | 1.3 | 2.2 | 3.2 | 4.1 | 6.1 | 8.3 | 12.0 | 15.7 | 19.9 |
| | | High | 2.4 | 5.4 | 7.5 | 10.6 | 12.4 | 15.6 | 26.5 | 38.2 | 49.5 | 73.6 | 99.1 | 144.3 | 188.5 | 238.6 |
| | PE30‡ | Low | .2 | .45 | .6 | .9 | 1 | 1.3 | 2.2 | 3.2 | 4.1 | 6 | – | – | – | |
| | | High | 2 | 4.5 | 6 | 9 | 10 | 13 | 22 | 32 | 41 | 60 | – | – | – | |
| | PE46‡ | Low | .1 | .3 | .4 | .5 | .6 | .7 | 1.3 | 1.8 | 2.4 | 3.5 | 4.7 | 7.2 | 9.6 | – |
| | | High | 1.3 | 2.9 | 4.1 | 5.9 | 6.8 | 8.6 | 14 | 22 | 28 | 42 | 56 | 84 | 112 | |
| | PE55‡/ PE60‡ | Low | .1 | .2 | .3 | .4 | .4 | .6 | .9 | 1.4 | 1.8 | 2.6 | 3.5 | 5.4 | 7.2 | |
| | | High | 1.1 | 2.4 | 3.4 | 4.8 | 5.6 | 7.1 | 12 | 17.8 | 23 | 34 | 45 | 69 | 92 | |
| | PQ60 | Low | .1 | .2 | .3 | .4 | .4 | .5 | .9 | 1.3 | 1.7 | 2.5 | 3.4 | 5.1 | 6.8 | 8.5 |
| | | High | 1 | 2.2 | 3.3 | 4.4 | 5.2 | 6.5 | 11 | 16.2 | 21 | 31 | 41 | 63 | 84 | 105 |
| | PQ120 | Low | .1 | .2 | .3 | .4 | .4 | .5 | .9 | 1.3 | 1.7 | 2.5 | 3.4 | 5.1 | 6.8 | 8.5 |
| | | High | .5 | 1.1 | 1.6 | 2.2 | 2.6 | 3.2 | 5.5 | 7.7 | 10 | 15 | 21 | 30 | 40 | 50 |
| | PE400 | Low | .1 | .1 | .2 | . 2 | .3 | .3 | .6 | .8 | 1 | 1.5 | 2.1 | 3 | 4 | 5 |
| | | High | .1 | .3 | .4 | .6 | .7 | .9 | 1.6 | 2.2 | 2.9 | 4.4 | 5.9 | 8.7 | 11.6 | 14.5 |
| **Air/Hydraulic Pumps**  | PA6‡/ | Single | 10 | 22.4 | 31 | 44.4 | 51.3 | 65.2 | – | – | – | – | – | | | |
| | PA9‡ | Single | 10 | 22.4 | 31 | 44.4 | 51.3 | 65.2 | | | | | | – | – | |
| | PA17‡ | Low | .2 | .5 | .7 | .9 | 1.1 | 1.4 | 2.3 | 3.3 | 4.3 | 6.5 | 8.7 | | | |
| | | High | 3.5 | 7.9 | 10.9 | 16 | 18 | 23 | 39 | 56 | 73 | 109 | 146 | | | |
| | PA46‡ | Low | .1 | .3 | .4 | .5 | .6 | .7 | 1.3 | 2 | 2.4 | 3.5 | 4.7 | 7.2 | 9.6 | – |
| | | High | 1.3 | 2.9 | 4.1 | 5.9 | 6.8 | 8.6 | 14 | 22 | 28 | 42 | 56 | 84 | 112 | |
| | PA55‡ | Low | .1 | .3 | .4 | .6 | .7 | .9 | 1.5 | 2.2 | 2.8 | 4.1 | 5.5 | 8.4 | 11.2 | |
| | | High | 1.1 | 2.4 | 3.4 | 4.8 | 5.6 | 7.1 | 12 | 18 | 23 | 34 | 45 | 69 | 92 | |
| **Gas/Hydraulic Pumps**  | PG30 | Low | .3 | .7 | 1 | 1.3 | 1.6 | 2 | 3.3 | 4.8 | 6.2 | 9.3 | 12.4 | 18.1 | – | |
| | | High | 2 | 4.5 | 6.3 | 8.9 | 10.3 | 13 | 22 | 31.8 | 41.3 | 61.4 | 83 | 121 | – | |
| | PG55‡ | Low | .1 | .3 | .4 | .6 | .7 | .8 | 1.4 | 2 | 2.6 | 3.9 | 5.2 | 7.6 | 9.9 | 12.5 |
| | | High | 1.1 | 2.5 | 3.5 | 4.9 | 5.6 | 7.1 | 12.1 | 17.3 | 22.5 | 33.5 | 45 | 66 | 86 | 109 |
| | PG120‡ | Low | .1 | .3 | .4 | .6 | .7 | .8 | 1.4 | 2 | 2.6 | 3.9 | 5.2 | 7.6 | 9.9 | 12.5 |
| | | High | .5 | 1.0 | 1.5 | 2.0 | 2.4 | 3.0 | 5.1 | 7.3 | 9.5 | 14.2 | 19.1 | 27.8 | 36.3 | 46.0 |
| | PG400 | Low | .1 | .1 | .2 | .2 | .3 | .3 | .6 | .8 | 1.0 | 1.5 | 2.0 | 3.0 | 3.8 | 4.9 |
| | | High | .2 | .3 | .5 | .7 | .8 | 1.0 | 1.7 | 2.4 | 3.1 | 4.6 | 6.2 | 9.0 | 11.8 | 15.0 |

**Generally Recommended** **Marginal, Check Requirements** **Not recommended for most applications.**

‡ Some Power Team pumps are available in special configurations not listed in this catalog. Power Team can "Assemble to Order" pumps with special seals, voltages, valves, relief valve settings, etc. For your special requirements please consult your local distributor or the Power Team factory.


Hydraulic Cylinders
Maintenance Lifting (General Application)
Steel Cylinders (C) Tonnage: 5-100 Stroke: 25.4-406.4 mm General Usage
Aluminum Cylinders (RA) Tonnage: 20-100 Stroke: 54-254 mm Light Wt. Alternatives
Low Profile (RLS) Tonnage: 5-150 Stroke: 11.2-.16 mm Retracted height is less than 102 mm
Shorty (RSS) Tonnage: 10-250 Stroke: 38.1 - 76.2 mm Retracted height is less than 144.5 mm (Except 250 Ton model
Structural Lifting (Bridges, Buildings Ships, Draglines)
Pancake Cylinders Tonnage: 5-565 Application: Confined Areas
Low Profile (RLS) Tonnage: 5-150 Stroke: 11.1 - 15.9 mm Retracted height is less than 102 mm
Shorty (RSS) Tonnage: 10-250 Stroke: 38.1 - 76.2 mm Retracted height is less than 144.5 mm (Except 250 Ton model)
Double-Acting (R...D) Tonnage: 100-565 Power Extend/Retract
Load Return (R...C) Tonnage: 55-565 Gravity/Load Return Economical Alternatives
Locking Collar Tonnage: 55-565 Mechanically holds load
Locking Collar (Aluminum) (RA...RL) Tonnage: 55-100 Light Wt. Alternative Mechanical Load Support
Locking Collar (Load Return) (R...RL) Tonnage: 55-565 Economical Alternative Mechanical Load Support
Fixturing/ Pressing/ Forming (High Cycles, Production, Heavy Duty)
Double-Acting (RD) Tonnage: 10-500 Threaded collar, base mounting holes, internal piston threads. Long life bearings and seals. Push/Pull Capabilities.
Tensioning/ Pulling (Pulling Cable, Studs, Chains, Pins)
Center Hole Tonnage: 17.5-200 Hollow Center
Center Hole (Spring Return) Tonnage: 10-100 Hollow Center
Center Hole (Double-Acting) (RH & RH...D) Tonnage: 30-200 Power Extend/Retract Push/Pull Capabilities
Center Hole ("Twin") (RT) Tonnage: 17.5-100 Application: Presses, Gear Pullers
Pull Cylinders (RP) Tonnage: 2-5 Tensioning & Pulling Applications

### Cylinders by tonnage, stroke and retracted height

All Power Team cylinders are furnished with cylinder half couplers.

| Cyl. Cap. (tons) | Cyl. Stroke (mm) | Retracted Height (mm) | ORDER NUMBER |
|---|---|---|---|
| 2 ton pull | 127 | 233 | RP25 |
| 5 ton pull | 139.7 | 302 | RP55 |
| 5 | 14.3 | 41 | RLS50 |
| | 25.4 | 111 | C51C |
| | 82.6 | 165 | C53C |
| | 133.4 | 216 | C55C |
| | 133.4 | 267 | C55CBT |
| | 184.2 | 273 | C57C |
| | 235 | 324 | C59C |
| 10 | 11.1 | 45 | RLS100 |
| | 25.4 | 92 | C101C |
| | 38.1 | 89 | RSS101 |
| | 54 | 121 | C102C |
| | 63.5 | 133 | RH102 |
| | 104.8 | 172 | C104C |
| | 155.6 | 248 | C106C |
| | 155.6 | 292 | C106CBT |
| | 158.8 | 297 | RD106 |
| | 203.2 | 287 | RH108 |
| | 206.4 | 299 | C108C |
| | 254 | 391 | RD1010 |
| | 257.2 | 349 | C1010C |
| | 257.2 | 394 | C1010CBT |
| | 308 | 400 | C1012C |
| | 358.8 | 451 | C1014C |
| 12 | 7.9 | 56 | RH120 |
| | 41.3 | 122 | RH121 |
| | 41.3 | 122 | RH121T |
| 15 | 25.4 | 124 | C151C |
| | 54 | 149 | C152C |
| | 104.8 | 200 | C154C |
| | 155.6 | 271 | C156C |
| | 206.4 | 322 | C158C |
| | 257.2 | 373 | C1510C |
| | 308 | 424 | C1512C |
| | 358.8 | 475 | C1514C |
| | 406.4 | 522 | C1516C |
| 17.5 | 50.8 | 175 | RT172 |
| 20 | 11.1 | 50.8 | RLS200 |
| | 44.5 | 95 | RSS202 |
| | 50.8 | 156 | RH202 |
| | 54 | 162 | RA202 |
| | 76.2 | 154 | RH203 |
| | 104.8 | 213 | RA204 |
| | 152.4 | 308 | RH206 |
| | 155.6 | 264 | RA206 |

| Cyl. Cap. (tons) | Cyl. Stroke (mm) | Retracted Height (mm) | ORDER NUMBER |
|---|---|---|---|
| 25 | 25.4 | 140 | C251C |
| | 50.8 | 165 | C252C |
| | 101.6 | 216 | C254C |
| | 158.8 | 273 | C256C |
| | 158.8 | 314 | C256CBT |
| | 158.8 | 340 | RD256 |
| | 209.6 | 324 | C258C |
| | 260.4 | 375 | C2510C |
| | 311.2 | 425 | C2512C |
| | 362 | 476 | C2514C |
| | 362 | 543 | C2514CBT |
| | 362 | 518 | RD2514 |
| 30 | 12.7 | 59 | RLS300 |
| | 54 | 187 | RA302 |
| | 61.9 | 117 | RSS302 |
| | 63.5 | 159 | RH302 |
| | 63.5 | 214 | RT302 |
| | 76.2 | 179 | RH303 |
| | 104.8 | 238 | RA304 |
| | 149.2 | 283 | RHA306 |
| | 152.4 | 248 | RH306 |
| | 152.4 | 281 | RH306D |
| | 155.6 | 289 | RA306 |
| | 257.2 | 438 | RH3010 |
| 50 | 15.9 | 67 | RLS500S |
| | 60.3 | 127 | RSS502 |
| | 76.2 | 181 | RH503 |
| | 76.2 | 268 | RT503 |
| 55 | NEW 50.8 | 125.4 | R552C |
| | 50.8 | 162 | R552L |
| | 50.8 | 175 | C552C |
| | 54 | 171 | RA552 |
| | 104.8 | 222 | RA554 |
| | 108 | 232 | C554C |
| | NEW 152.4 | 264 | R556C |
| | 152.4 | 321 | R556L |
| | 155.6 | 273 | RA556 |
| | 155.6 | 318 | RA556L |
| | 158.8 | 283 | C556C |
| | 158.8 | 329 | RD556 |
| | NEW 254 | 328.6 | R5510C |
| | 254 | 365 | R5510L |
| | 254 | 384 | RA5510 |
| | 260.4 | 384 | C5510C |
| | 333.4 | 504 | RD5513 |
| | 336.6 | 460 | C5513C |
| | 463.6 | 657 | RD5518 |
| 60 | 76.2 | 235 | RH603 |
| | 101.6 | 241 | RHA604D |
| | 127 | 241 | RH605 |
| | 152.4 | 318 | RH606 |
| | 257.2 | 459 | RH6010 |
| 75 | 15.9 | 79 | RLS750S |
| | 155.6 | 314 | C756C |
| | 333.4 | 492 | C7513C |

| Cyl. Cap. (tons) | Cyl. Stroke (mm) | Retracted Height (mm) | ORDER NUMBER |
|---|---|---|---|
| 80 | 333.4 | 518 | RD8013 |
| 100 | 15.9 | 86 | RLS1000S |
| | 38.1 | 144 | RSS1002D |
| | 38.1 | 165 | RH1001 |
| | NEW 50.8 | 139.7 | R1002C |
| | 50.8 | 169 | R1002D |
| | 50.8 | 184 | R1002L |
| | 50.8 | 219 | C1002C |
| | 54 | 197 | RA1002 |
| | 57.2 | 139.7 | RSS1002 |
| | 76.2 | 254 | RH1003 |
| | 123.8 | 384 | RT1004 |
| | NEW 152.4 | 241.3 | R1006C |
| | 152.4 | 270 | R1006D |
| | 152.4 | 286 | R1006L |
| | 152.4 | 314 | RH1006 |
| | 158.8 | 298 | RA1006 |
| | 158.8 | 340 | RA1006L |
| | 168.3 | 337 | C1006C |
| | 168.3 | 350 | RD1006 |
| | NEW 254 | 342.9 | R10010C |
| | 254 | 372 | R10010D |
| | 254 | 387 | R10010L |
| | 260.4 | 503 | RH10010 |
| | 260.4 | 429 | C10010C |
| | 333.4 | 515 | RD10013 |
| | 511.2 | 718 | RD10020 |
| 150 | 14.3 | 102 | RLS1500S |
| | 50.8 | 162 | R1502C |
| | 50.8 | 189 | R1502D |
| | 50.8 | 206 | R1502L |
| | 127 | 308 | RH1505 |
| | 152.4 | 264 | R1506C |
| | 152.4 | 291 | R1506D |
| | 152.4 | 308 | R1506L |
| | 168.3 | 378 | RD1506 |
| | 203.2 | 349 | RH1508 |
| | 254 | 365 | R15010C |
| | 254 | 392 | R15010D |
| | 254 | 410 | R15010L |
| | 333.4 | 543 | RD15013 |
| | 460.4 | 674 | RD15018 |
| 200 | 50.8 | 191 | R2002C |
| | 50.8 | 207 | R2002D |
| | 50.8 | 241 | R2002L |
| | 152.4 | 292 | R2006C |
| | 152.4 | 308 | R2006D |
| | 152.4 | 343 | R2006L |
| | 168.3 | 406 | RD2006 |
| | 203.2 | 408 | RH2008 |
| | 254 | 394 | R20010C |
| | 254 | 410 | R20010D |
| | 254 | 445 | R20010L |
| | 333.4 | 572 | RD20013 |
| | NEW 18 1/8 | 723.9 | RD20018 |

| Cyl. Cap. (tons) | Cyl. Stroke (mm) | Retracted Height (mm) | ORDER NUMBER |
|---|---|---|---|
| 250 | 76.2 | 290 | RSS2503 |
| 280 | 50.8 | 191 | R2802C |
| | 50.8 | 234 | R2802D |
| | 50.8 | 248 | R2802L |
| | 152.4 | 292 | R2806C |
| | 152.4 | 335 | R2806D |
| | 152.4 | 349 | R2806L |
| | 254 | 394 | R28010C |
| | 254 | 437 | R28010D |
| | 254 | 451 | R28010L |
| 300 | 152.4 | 439 | RD3006 |
| | 330.2 | 617 | RD30013 |
| 355 | 50.8 | 232 | R3552C |
| | 50.8 | 292 | R3552L |
| | 50.8 | 290 | R3552D |
| | 152.4 | 333 | R3556C |
| | 152.4 | 394 | R3556L |
| | 152.4 | 448 | R3556D |
| | 254 | 435 | R35510C |
| | 254 | 495 | R35510L |
| | 254 | 550 | R35510D |
| 400 | 152.4 | 473 | RD4006 |
| | 330.2 | 651 | RD40013 |
| 430 | 50.8 | 264 | R4302C |
| | 50.8 | 333 | R4302L |
| | 50.8 | 313 | R4302D |
| | 152.4 | 365 | R4306C |
| | 152.4 | 435 | R4306L |
| | 152.4 | 413 | R4306D |
| | 254 | 467 | R43010C |
| | 254 | 537 | R43010L |
| | 254 | 516 | R43010D |
| 500 | 6 | 19 21/32 | RD5006 |
| | 13 | 26 21/32 | RD50013 |
| 565 | 50.8 | 292 | R5652C |
| | 50.8 | 371 | R5652L |
| | 50.8 | 345 | R5652D |
| | 152.4 | 394 | R5656C |
| | 152.4 | 473 | R5656L |
| | 152.4 | 447 | R5656D |
| | 254 | 495 | R56510C |
| | 254 | 575 | R56510L |
| | 254 | 548 | R56510D |

**Step 1:** Select the hydraulic cylinder that best suits the application. See pages 175-180.

**Step 2:** Select the series of hydraulic pump with adequate oil output and reservoir capacity to power cylinder. See page 184. Check speed/selection chart on page 178.

**Step 3:** Select pump within series with the valve option that is best suited to the cylinder and application. See pages 190-191.

## Hydraulic pump considerations:

1. What **maximum** system **operating pressure** (bar) is required?
2. What **volume of oil** delivery is required? (For manual pumps, cu. cm. of oil per handle stroke; for powered pumps, L/min. of oil).
3. Is a **single- or 2-speed pump** required? (2-speed pumps deliver high oil volume at low pressure for rapid cylinder piston advance, then shift to to the high pressure, low volume stage under load).
4. What is the **preferred source of power**?
   a) **Manual** (hand or foot operated). Provides portability, can be used where electricity or shop air are not available.
   b) **Air/Hydraulic**. Uses shop air or a portable air compressor.
   c) **Electric /Hydraulic**. What voltage is available? Is a battery operated pump preferred?
   d) **Gasoline Engine/Hydraulic**. Powers high-output pumps at remote job sites where air or electricity are unavailable.
5. Is **portability** of the pump a factor to consider?
6. Will the pump be used **intermittently**, or will it need to provide **high-cycle** operation? Does the application require that the pump be capable of starting under load?
7. Is **fluid heat build-up** a factor in your application? High cycle applications may require a larger capacity oil reservoir for cooling. Also, if you are using large displacement cylinders, the reservoir capacity must be sufficient to fully extend the piston of the cylinder.
8. Will the application require **large displacement or multiple cylinders**? Reservoir size and pump output levels will be factors to consider.
9. Does the working environment require a pump having a **low operating noise** (dBA) level?
10. Must the pump operate in a **spark-free** environment?

## Manually-operated hydraulic pumps

**P12, P23, P55.** These single-speed pumps are for use with single-acting cylinders. **See page 22**

**P19, P59, P59F, P157, P159, P300, P460.** These 2-speed pumps are used with single-acting cylinders. The 2-speed feature provides high oil volume for fast cylinder piston approach to the work; pump automatically shifts to the high pressure stage. This reduces the number of pump handle strokes required. **See pages 23-24.**

**P157D, P159D, P300D, P460D**. These 2-speed pumps are used with double-acting cylinders. **See page 24.**

## Air/hydraulic pumps

Used where air is the preferred energy source or where electricity is not available. Ideal for use in petrochemical, mines or other inflammable or explosive environments.

**PA6 Series**. These single-speed pumps drive single- or double-acting cylinders. **See pages 26-29.**

**PA9 Series**. These new single-speed pumps drive single-acting cylinders and are ideal for powering portable hydraulic tools. **See pages 30-31.**

**PA50 Series**. These single-speed pumps drive single- or double-acting low pressure (220 bar) cylinders. **See pages 34-35.**

**PA60**. This 2-speed pump is equipped with a manifold to operate multiple cylinders, and provides a 7.6 liter reservoir capacity.
**See pages 32-33.**

**PA64**. Similar to PA60, this 2-speed pump drives single- or double-acting cylinders. **See pages 32-33.**

**PA172** and **PA174**. These "economy" 2-speed pumps drive single- or double-acting cylinders, depending on the model chosen. Provide a low weight to output ratio. **See pages 36-37.**

**PA462** and **PA464 Series**. These 2-speed pumps drive single or double-acting cylinders, depending on the model selected. They offer high speed cylinder piston advance. **See pages 38-39.**

**PA554**. This 2-speed pump drives single- or double-acting cylinders, delivering a high volume of oil. **See pages 38-39.**

## Electric/Hydraulic pumps


All of the following pumps are 2-speed models, and can be used to drive single- or double-acting cylinders.

**"Quarter Horse" Series**. These pumps feature a .19 kW electric motor. A battery-powered version is available. Having a low noise level and weighing just 9.1 kg., they are ideal for powering portable hydraulic spreaders, nut splitters, pipe flange spreaders and other tools. **See pages 40-41.**

**PE17 Series**. CSA rated for intermittent duty, these feature a .37 kW, single phase induction motor with a low noise level (67-81 dBA). Smaller generators and low amperage circuits can be used as a power source. **See pages 42-43.**

**PE46 Series**. Powered by a 1.12 kW, single phase induction motor, operate at a moderate noise level of 77-81 dBA. CSA rated for intermittent duty. **See pages 54-55.**

**PE18 Series**. CSA rated for intermittent duty, these feature a .37 kW, single phase universal motor with a noise level of 85-90 dBA. Provide high performance at a low price. Has low amperage draw. **See pages 44-45.**

**PE30 Series**. Equipped with a .75 kW, single phase permanent magnet motor, have a noise level of only 82-87 dBA. CSA rated for intermittent duty, and require a relatively low voltage; ideal for use in general construction applications. Roll cage/handle protects the motor and controls. **See pages 50-51.**

**PE55** and **PED25 Series**. The famous Vanguard® pumps have been continually upgraded for 40 years; some of the originals are still in service! Equipped with a .84 kW, single phase universal motor, have a high noise level (90-95 dBA). Offer the best weight to performance ratio of any Power Team electric/hydraulic pump. CSA rated for intermittent duty. The PED25 versions are "dual flow" pumps which deliver the same low and high pressures to both valves, and have a noise level of 80-85 dBA. They have a 1.12 kW induction motor. **See pages 48-49, 56-57.**

**PE60 Series**. The Vanguard® Supreme® pumps provide trouble-free service in the most severe working environments. Powered by a .84 kW, single phase motor, has a moderate noise level of 80-85 dBA. Start well under load even at the reduced voltages encountered on construction sites. High-output pumps, ideal for use with post-tensioning/pre-stressing jacks and other high-pressure hydraulic tools.
**See pages 58-59.**

**"Custom-built" pumps**. Power Team offers you "assemble to order" electric/hydraulic pumps to suit unique applications. You can choose from pre-engineered, off the-shelf components to customize your pump. **See pages 70-73.**

**PE21 Series**. Ideal for heavy-duty, extended-cycle applications. Powered by a .75 kW, single phase motor, pump operates a very low noise level of 70 dBA. Pump automatically shuts down in the event of a power failure. CSA rated for intermittent duty. **See pages 46-47.** "**Quiet" Pumps**. Our PQ60 and PQ120 series operate at a very low noise level of between 73-78 dBA. The PQ60 has a 1.49 kW (single phase) motor; the PQ120 has a 2.24 kW (3-phase) motor. These pumps are designed for heavy-duty, extended cycle operations. CSA rated for intermittent duty. **See pages 60-63.**

**PE400 Series**. High-flow units deliver a large volume of high pressure oil for heavy construction and maintenance operations employing high tonnage cylinders. The PE400 is powered by a 7.46 kW, 3-phase motor. Low noise rating of 73-80 dBA. **See pages 64-65.**

## *Gasoline-driven hydraulic pumps*

These two-speed pumps are ideal for use in remote applications, such as construction sites. May be used with single- or double-acting cylinders.

**PG30 Series**. Powered by a 2-cycle, 1.49 kW Tecumseh engine, these have an integral, protective "roll cage" and adequate reservoir capacity for cylinders up to 100 tons capacity or more. Readily portable; popular in the railroad, rescue and construction markets. **See pages 66-67.**

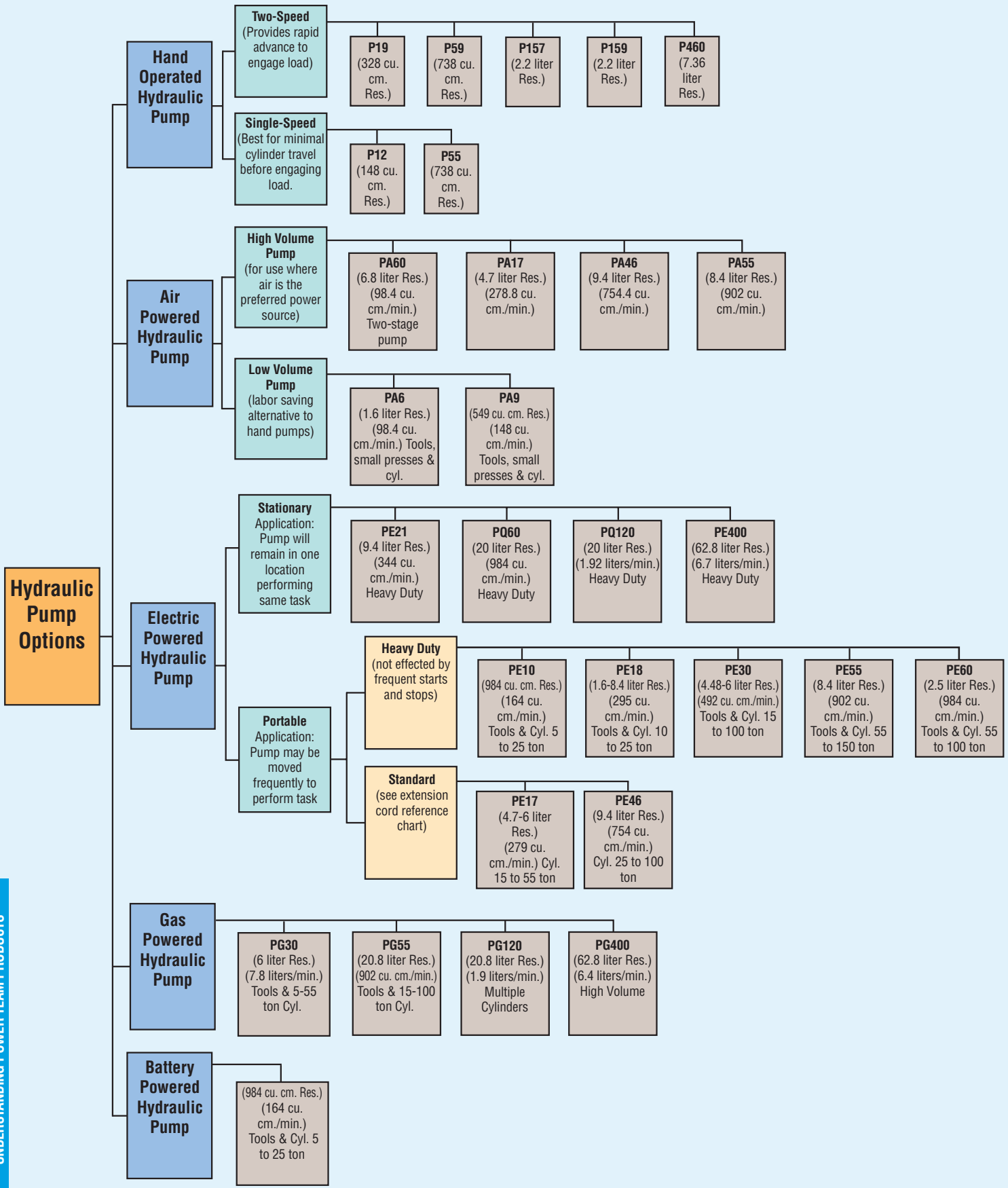
**PG55 Series**. With a 4-cycle, 2.98 kW Briggs & Stratton engine, this pump is based on our popular Vanguard® Series. It has a generous 19 liter reservoir capacity. **See pages 66-67.**

**PG120 Series**. Powered by a 4-cycle, 4.1 kW Honda engine. Has a 19 liter reservoir; capable of handling multiple-cylinder lifting tasks. Ideal for the structure moving, pier setting, bridge lifting and concrete contracting industries. **See pages 68-69.**

**PG4004**. Featuring a 4-cycle, 13.43 kW Briggs & Stratton engine, this unit has a big 75.8 liter reservoir. Rugged steel "roll cage" has a hook on top and swivel casters for ease of mobility. Popular for concrete stressing applications.
**See pages 68-69.**


## *Hydraulic intensifier*

**HB Series**. Turns low pressure hydraulic pumps into high pressure power sources to operate single-acting or double-acting cylinders and tools such as crimpers, spreaders, cutters, etc. Compact and portable for use inside a utility vehicle aerial bucket or stowing in a vehicle. **See pages 52-53.**

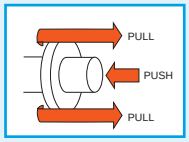

Hydraulic Pump Options
Hand Operated Hydraulic Pump
Two-Speed (Provides rapid advance to engage load)
P19 (328 cu. cm. Res.)
P59 (738 cu. cm. Res.)
P157 (2.2 liter Res.)
P159 (2.2 liter Res.)
P460 (7.36 liter Res.)
Single-Speed (Best for minimal cylinder travel before engaging load.
P12 (148 cu. cm. Res.)
P55 (738 cu. cm. Res.)
Air Powered Hydraulic Pump
High Volume Pump (for use where air is the preferred power source)
PA60 (6.8 liter Res.) (98.4 cu. cm./min.) Two-stage pump
PA17 (4.7 liter Res.) (278.8 cu. cm./min.)
PA46 (9.4 liter Res.) (754.4 cu. cm./min.)
PA55 (8.4 liter Res.) (902 cu. cm./min.)
Low Volume Pump (labor saving alternative to hand pumps)
PA6 (1.6 liter Res.) (98.4 cu. cm./min.) Tools, small presses & cyl.
PA9 (549 cu. cm. Res.) (148 cu. cm./min.) Tools, small presses & cyl.
Electric Powered Hydraulic Pump
Stationary Application: Pump will remain in one location performing same task
PE21 (9.4 liter Res.) (344 cu. cm./min.) Heavy Duty
PQ60 (20 liter Res.) (984 cu. cm./min.) Heavy Duty
PQ120 (20 liter Res.) (1.92 liters/min.) Heavy Duty
PE400 (62.8 liter Res.) (6.7 liters/min.) Heavy Duty
Portable Application: Pump may be moved frequently to perform task
Heavy Duty (not effected by frequent starts and stops)
PE10 (984 cu. cm. Res.) (164 cu. cm./min.) Tools & Cyl. 5 to 25 ton
PE18 (1.6-8.4 liter Res.) (295 cu. cm./min.) Tools & Cyl. 10 to 25 ton
PE30 (4.48-6 liter Res.) (492 cu. cm./min.) Tools & Cyl. 15 to 100 ton
PE55 (8.4 liter Res.) (902 cu. cm./min.) Tools & Cyl. 55 to 150 ton
PE60 (2.5 liter Res.) (984 cu. cm./min.) Tools & Cyl. 55 to 100 ton
Standard (see extension cord reference chart)
PE17 (4.7-6 liter Res.) (279 cu. cm./min.) Cyl. 15 to 55 ton
PE46 (9.4 liter Res.) (754 cu. cm./min.) Cyl. 25 to 100 ton
Gas Powered Hydraulic Pump
PG30 (6 liter Res.) (7.8 liters/min.) Tools & 5-55 ton Cyl.
PG55 (20.8 liter Res.) (902 cu. cm./min.) Tools & 15-100 ton Cyl.
PG120 (20.8 liter Res.) (1.9 liters/min.) Multiple Cylinders
PG400 (62.8 liter Res.) (6.4 liters/min.) High Volume
Battery Powered Hydraulic Pump
(984 cu. cm. Res.) (164 cu. cm./min.) Tools & Cyl. 5 to 25 ton

**Power Team offers the most complete lines of manual and hydraulic pullers anywhere in the world. Combine the most complete line of pullers with our wide array of attachments, adapters and capacities and you now have a solution for nearly every pulling application imaginable.**

## Considerations:

1. Determine the type of puller or puller combination. Which puller type is best suited for gripping the part?
2. Is a combination of puller types required?
3. Determine the reach needed for your particular pulling problem. The puller you select must have a reach equal to or greater than the corresponding sizes of the part to be pulled.
4. Determine the spread needed. The spread is determined by the width of the part being pulled. The puller's spread should be greater than the width of the part to be pulled.
5. Estimate the force needed to solve your pulling problem. A puller with the proper reach and spread will usually have enough capacity to remove the corresponding part. When in doubt, always use a puller with a larger capacity than what may be needed. Rusted parts or parts with a large area of resistance may need more pulling force.

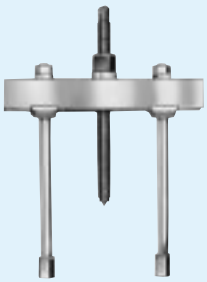
## PROBLEM #1 Pulling a gear, bearing, wheel, pulley, ect., from a shaft




In order to perform a proper pull, be certain that you firmly grip the gear, bearing, wheel, pulley, ect., and apply force to the shaft. Use a 3-jaw puller, instead of a 2-jaw, whenever possible for better gripping power and a more uniform displacement of pulling force.

### Recommended tools:

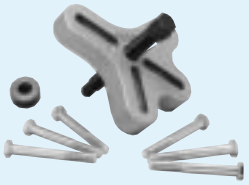
**Jaw-type pullers**: Either manual or hydraulic. For extra force and convenience, use a hydraulic puller. Both are available in 2 or 3 jaw configurations and are used to grip the outer circumference of a part or can be used with a pulling attachment, such as a bearing/pulley attachment. **( pages 116-117, 129-131, 140-141)**



**Push-Pullers** can thread directly into a threaded part for easy and secure removal. Push-Pullers can be used in conjunction with bearing/pulley attachments which grip the part from behind. A wide assortment of male and female threaded adapters are available as well as metric adapters. **(pages 118-119, 132-133)**

**Slide hammers** are best suited for light-duty tasks. Slide hammers can be used for multiple pulling problems when combined pulling attachments. **(pages 122-123)**

**Bearing/pulley attachments** provide a "knife-like" edge to get behind parts for added versatility and secure removal of parts. Great for parts that don't offer adequate grip with jaw-type pullers. **(page 121)**



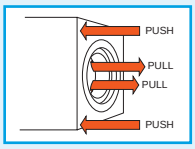
**Adapters**. Whether you need an adapter compatible with any number of threaded hole sizes, protection of part to be pulled or for assisting the installation of a component; Power Team offers a variety of adapters to assist in the removal or installation of parts. **(pages 126-127)**


**Mechanical Parts Catalog PC97**

To order catalog #PC97, please contact your nearest Power Team distributor.

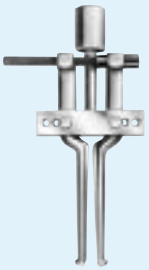
PROBLEM #2

## Pulling internal bearing races, retainer, seals, ect.

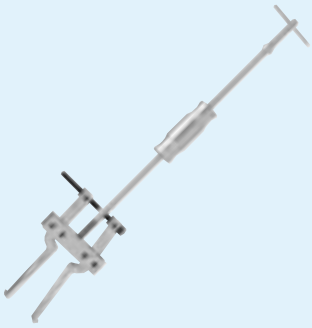



By extending the narrow jaws of an internal pulling attachment through the center of the part to be pulled, a straight pull is insured, and damage to the housing is avoided. While parts within a "blind hole" in a housing do present a problem, Power Team has the internal pulling attachment or a combination of an internal pulling attachment and puller to handle the situation.

### Recommended tools:

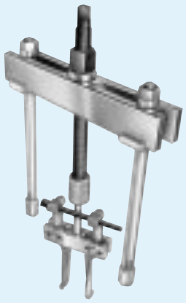


**Internal pulling attachments** have narrow jaws which extend through the center of the part to be pulled. They provide a straight pull and avoid damaging housings. Internal attachments feature adjustable jaws to fit various diameter parts. **(page 120)**



**Slide hammer with internal attachment** is ideal for removing parts from blind holes, especially where there is no housing to brace puller legs against.

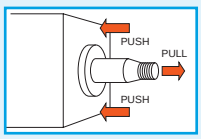
**(pages 122-123)**

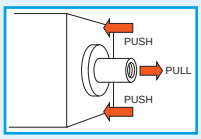


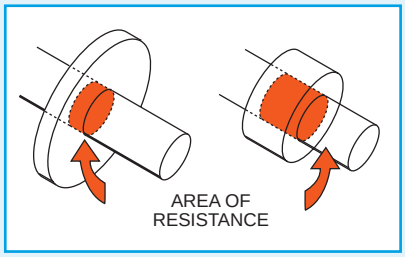
**Push-puller with internal attachment.** Push-puller is available in both manual and hydraulic versions. **(pages 118-120, 132-133)**

PROBLEM #3

## Pulling a press-fitted shaft from a housing



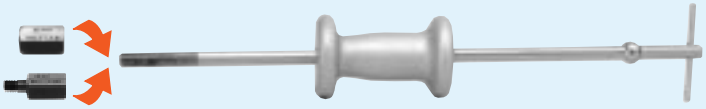



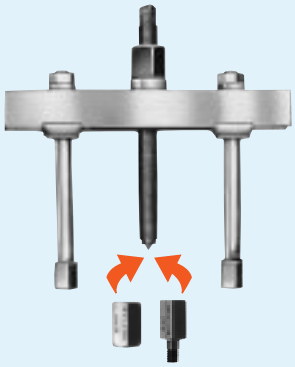

A shaft with a threaded end can be removed without damage by using one of our slide hammer, manual Push-puller or hydraulic Push-pullers, in conjunction with the proper threaded adapter. Removal is easy! If the shaft to be removed has external threads, simply choose one of our female threaded adapters of proper size/thread. If the shaft has internal threads, simply choose the correct size male threaded adapter.

**Note:** Manual pullers require that the shaft being pulled is no more than twice the diameter of the puller's forcing screw. To determine the recommended tonnage for hydraulic pullers, multiply the diameter (inches) of the shaft to be pulled by ten. Example: For a 25.4 mm (1") shaft, we recommend 10 tons of pulling force.

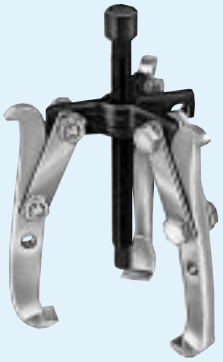
### Recommended tools:



**Slide hammer puller** matched with a set of threaded adapters is a perfect tool for light duty pulling needs. **(pages 122-123, 126-127)**



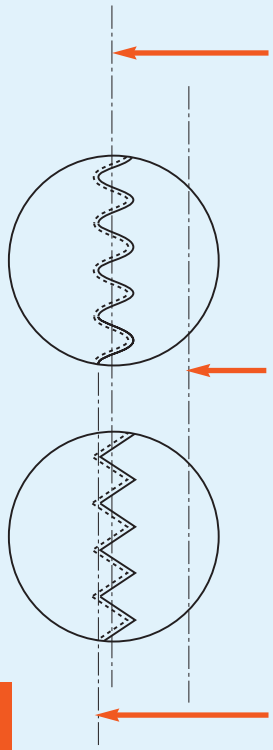
**Push-pullers** matched with a set of threaded adapters make for an extra versatile pulling tool. **(pages 118-119, 126-127, 132-133)**



| Features: | Benefits: |
|---|---|
| • Grip-O-Matic® feature on jaw type pullers | • The harder the pulling force, the tighter the jaws grip |
| • 2-way, 3-way and 2/3-way combination pullers<br>1 to 37 ton mechanical pullers<br>5 to 50 ton hydraulic pullers<br>54 mm (2 1/8") to 702 mm (27 5/8") reach<br>83 mm (3 1/4") to 1,118 mm (44") of spread | • A wide variety of pullers; select a specific puller for a specific application or select one or more pullers for general applications |
| • Forged alloy steel jaws | • Strongest possible part; the grain of the material follows the contour of the part. |
| • Machined puller jaw toes | • Larger and stronger pulling toe than most competitors |
| • Alloy steel heads (forged or flame cut) | • Heat treated and designed for maximum strength |
| • Rolled "V" threads | • Stronger and smoother than cut threads |
| • Special coating on threads | • Resists corrosion, traps lubrication better than black oxide |
| • Heat treated alloy steel cross bolts | • Designed for max. shear strength |
| • Standard hydraulic cylinders on Grip-O-Matic® series | • Cylinder can be removed from puller and used in other hydraulic applications |
| • Adjusting nut on Super Grip-O-Matic® series | • Allows for controlled jaw spread adjustment |

SGH153CR with a bearing pulling attachment was used to take a bearing off a utilities well pump motor.

## Why our rolled puller threads are superior:




Rolled threads start with a material O.D. equal to the pitch diameter of the thread. The rolling process moves material from below the pitch diameter and creates a smoother and stronger thread.

Cut threads start with a material O.D. equal to the thread O.D.. Cutting can cause tears on the thread surface which can make it rough and can cause minute cracks at root of thread which can open up during heat treat and lessen the capacity of the screw.

**NOTE: The puller application photos shown in this catalog are shown without protective blankets for clarity of photos. Power Team strongly recommends you always make your pull with a protective device in place.**

## Operator Safety Comes FIRST!

**Tons of force are being exerted with your Pulling System. You must respect this force, and observe safety precautions at all times**

### ⚠ CAUTION

It is impossible to predict the exact force required for every pulling job: setup requirements and the size, shape and condition of the parts being pulled vary a great deal. In addition, the Power Team Pulling System is so versatile, it is possible that components in a pulling setup may have different tonnage ratings. The lowest "capacity" component, then, determines the capacity of the setup. For example: When an accessory with a 1 ton capacity is used with a 10 ton capacity puller, the setup can be used only at a force of one ton.

These tools should be used only by trained personnel familiar with them. Always wear eye protection during a job since work parts, or the pulling tool itself, may break and parts may fly. It is recommended to cover the work with a Power Team Protective Blanket or use a shield while force is being applied. If you are at all unsure which tool or attachment to select, contact the Power Team factory.

### A FEW EASY TIPS TO REMEMBER:

**1. Wear safety glasses at all times!** You have only one pair of eyes, so protect them from possible flying parts.

**2. Keep your pulling tools in shape!** Clean and lubricate the puller's forcing screw frequently, from threads to tip, to assure long service life and proper operation.

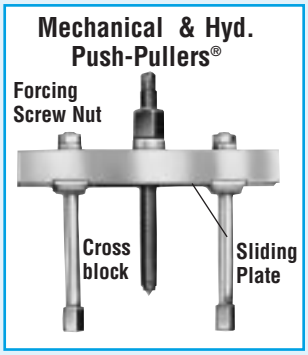
**3. Cover work with a protective blanket!** With high forces being exerted on the part being pulled, breakage may sometimes result. By covering the work with a protective blanket, the mechanic reduces the danger of flying parts.

**4. Apply force gradually!** The component should give a little at a time. Do not try speed removal by using an impact wrench on the puller screw.

**5. Use the right size puller!** If you have applied maximum force and the part has not moved, go to a larger capacity puller. Resist sledging.

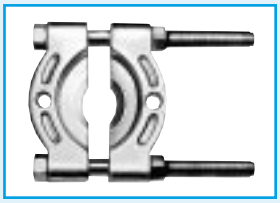
**6. Align puller legs and jaws!** Be sure the setup is rigid and that the puller is square with the work.

**7. Mount puller so grip is tight!** Tighten the adjusting strap-bolts when using a jaw type puller. ■ Always use a 3-jaw puller whenever possible. A 3-jaw puller gives a more secure grip, more even pulling power. ■ Apply force gradually. — Never use an extension on a wrench. — Never use an impact wrench. — Never strike the end of the forcing screw. ■ Always cover work with a protective blanket.




**8. Do not couple puller legs!** The tonnage capacity of a Push-Puller® is reduced when longer than standard legs are used, or when legs are in compression. The chance of breaking, bending or misaligning legs increases. ■ Keep reach to a minimum. Use shortest legs possible to reach work-piece. ■ Thread legs into workpiece, pulling attachment or adapters evenly. Uneven legs will cause greater pull or push on one side, creating a bending action which could cause damage to work piece or cause a leg to break. ■ The sliding plates must always be on the opposite side of the cross block from the forcing screw nut or hydraulic cylinder. ■ Always cover work with a protective blanket.

### Bearing pulling attachments

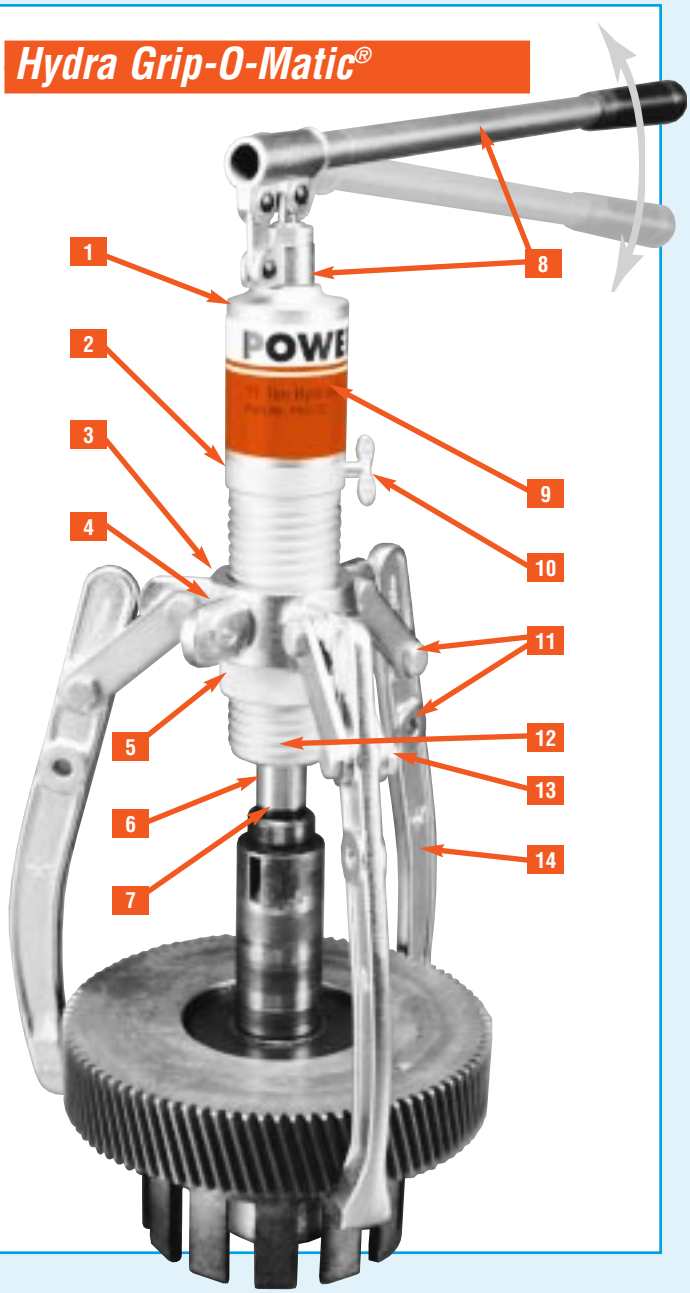


These attachments may not withstand the full tonnage of the pullers with which they are used. The shape and condition of the part being pulled affects the tonnage at which the puller blocks and/or studs may bend or break. Always select the largest attachment which will fit the part to be pulled.

**A self contained pulling system in a compact package! You get a 2/3 way combination puller, hydraulic cylinder and built-in hand pump in one integral, lightweight unit with its own carrying case.**

**You get the world's most copied puller design; the harder the pulling force, the tighter the jaws grip for secure holding force. Power Team pullers are tested for top performance and reliability at maximum capacity and jaw spread. Use them with confidence! Removing a wide variety of gears, bearings, bushings, pulleys and other press-fitted parts becomes a routine task.**

## Hydra Grip-O-Matic®







### *Compare these Power Team features and benefits with any other pullers on the market!*

1. **Bright chrome finish.** Resists corrosion.
2. **Integral safety relief valve.** Prevents overloading puller.
3. **Heat treated forged alloy steel head.** Provides much more strength and durability than a casting.
4. **2/3-way combination puller head.** Provides the stability of a 3-jaw puller plus the 2-jaw option when space is limited. Three jaws give a more secure grip and more even pulling force. It's like getting two pullers for the price of one!
5. **Rapid adjustment.** Acme thread and knurled adjusting nut provide for rapid adjustment of the hydraulic cylinder to the work surface.
6. **Heat treated and chrome plated cylinder piston rod provides linear force.** Eliminates torque and friction forces encountered with conventional screw type pullers.
7. **Spring loaded live centering cone (removable).** Centers puller on shafts with drilled centers and automatically retracts when pressing against plain or rusted shaft ends. Helps keep puller on the shaft when attaching and adjusting it to the part to be pulled.
8. **Pump handle rotates 360°, is removable.** Flexibility in positioning handle at the most convenient pumping location. Handle is removed for compact storage of puller in the furnished, tough plastic carrying/storage case.
9. **Bladder type oil reservoir.** Allows unit to be operated in any position/orientation.
10. **Easily metered release valve control knob.** For retraction of cylinder rod.
11. **Multiple cross bolt mountings.** Provide additional setup versatility.
12. **Spring return hydraulic cylinder.** Provides rapid retraction of cylinder rod upon completion of the pull.
13. **Heat treated alloy steel cross bolts.** For maximum shear strength.
14. **Heat treated, forged alloy steel jaws are machined and serrated.** You get maximum durability, and an improved grip on the part being pulled.

# Choosing the right valve
## Valve selection basics

**Step 1:** Select the hydraulic cylinder that best suits the application. See pages 175-180.

**Step 2:** Select the series of hydraulic pump with adequate oil output and reservoir capacity to power cylinder. See pages 181-184. Check speed chart on page 178.

**Step 3:** Select pump within series with the valve option that is best matches cylinder, pump and application. See pages 190-191.

## *Hydraulic valve considerations:*

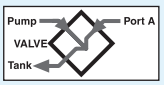
1. Will the valve be used with **single**- or **double-acting cylinders**?
2. Will the valve be **mounted on the pump, away from the pump** or **directly into the hydraulic lines**?
3. Will the valve be **manually-operated** or is **remote control** preferred?
4. Is **independent control** of multiple cylinders, or hydraulics tools preferred?
5. What **directional control** and **pressure control** valve functions are needed for the application?

## *Directional control valves*

**Basic types include manually operated, air or solenoid operated and pilot operated. Special application valves for pre-stressing and post-tensioning are also offered. Consult selection chart on page 144 for listings of all Power Team valves.**

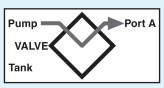
**2-way, 2-position** (For control of single-acting cylinders):


**Pos. 1.** Oil goes from pump to cylinder; pressure is held from valve to cylinder when pump is shut off.

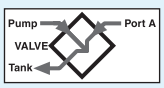



**Pos. 2.** Oil returns to reservoir, cylinder retracts.

**3-way, 2-position** (For control of single-acting cylinders):

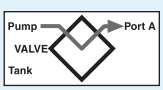



**Pos. 1.** Oil goes from pump to cylinder and holds when pump is shut off. Return line to reservoir is blocked.

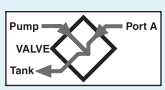



**Pos. 2.** Cylinder retracts, oil returns to reservoir.

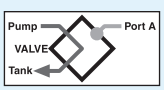
**3-way, 3-position** (For control of single-acting cylinders):




**Pos. 1.** Oil goes from pump to cylinder and holds when pump is shut off. Return line to reservoir is blocked.




**Pos. 2.** All oil is open to reservoir through return line.




**Center Pos.** Cylinder pressure is held; pump can remain running and oil returns to reservoir.

**3/4-way, 2-position** (For control of single- or double-acting cylinders):


**Pos. 1.** Oil goes to the "extend" side of the cylinder. The oil from the "retract" side returns to reservoir. Cylinder holds with pump shut off.


**Pos 2.** Oil goes to the "retract" side of the cylinder, oil from the "extend" side returns to reservoir.

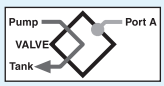
**4-way, 3-position** (For control of double-acting cylinders):


**Pos. 1.** Oil goes to the "extend" side of the cylinder, oil from the "retract" side returns to reservoir. Cylinder holds with pump shut off.

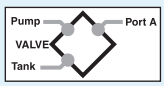

**Pos. 2.** Oil goes to "retract" side of cylinder. Oil from the "extend" side returns to the reservoir.


**Center Pos**. Holds pressure even if pump is running. Oil from pump goes through valve, back to reservoir.

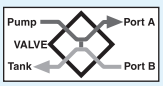
## OTHER VALVE CHARACTERISTICS:




**Tandem Center** - Cylinder ports are blocked, oil from pump goes to reservoir. Used when pump remains running. Example: gasoline-driven pumps.




**Closed Center** - Generally used when running multiple valves in series from one pump.




**Open Center** - Used when holding is not a requirement, as when running two separate hydraulic tools such as cutters and crimpers.

## *In-line Hydraulic Valves*

**Load Lowering Valve** - Provides precision metering for controlled return of the cylinder piston.

**Sequence Valve** - Used when a cylinder in a multiple cylinder application must advance before any other.

**Pressure Reducing Valve** - Permits independent pressure control to two or more clamping systems operated by a single power source.

**Shut-off Valve**- For fine metering of hydraulic oil. Several may be used to control multiple single-acting cylinders.

**Check Valve** - Permits flow of hydraulic oil in one direction only.

**Pressure Relief Valve**- Used at remote locations in a hydraulic circuit where maximum pressure requirements are less than the setting of the basic overload valve in the pump.

**Metering Valve**- Restricts surges by restricting flow to a certain level; when flow subsides, valve reopens automatically. For systems using large cylinders or extended lengths of hose.

**Pressure Regulator Valve**- Permits adjustment of operating pressures at various values below the relief valve setting of the pump.

**Relief Valve**- Protects a hydraulic system against over pressurization.

# Conversion Formulas

## SI* Conversion Formulas

| APPROXIMATE CONVERSION | | | | |
|---|---|---|---|---|
| MULTIPLY SI* UNIT | BY CONV FACTOR | TO GET OR MULTIPLY NON-SI UNIT | BY CONV FACTOR | TO GET SI* UNIT |
| **LENGTH** | | | | |
| millimeter (mm) (1 inch = 25.4 mm exactly) | X 0.03937 | = inch | X 25.4 | = mm |
| centimeter (cm) 10 mm | X 0.3937 | = inch | X 2.54 | = cm |
| meter (m) 1000 mm | X 3.28 | = foot | X 0.305 | = m |
| meter (m) | X 1.09 | = yard | X 0.914 | = m |
| kilometer (km) 1000 m | X 0.62 | = mile | X 1.61 | = km |
| **AREA** | | | | |
| millimeter$^2$ (mm$^2$) | X 0.00155 | = inch$^2$ | X 645 | = mm$^2$ |
| centimeter$^2$ (cm$^2$) | X 0.155 | = inch$^2$ | X 6.45 | = cm$^2$ |
| meter$^2$ (m$^2$) | X 10.8 | = foot$^2$ | X 0.0929 | = m$^2$ |
| meter$^2$ (m$^2$) | X 1.2 | = yard$^2$ | X 0.836 | = m$^2$ |
| hectare (ha) 10,000 m$^2$ | X 2.47 | = acre | X 0.405 | = ha |
| kilometer$^2$ (km$^2$) | X 0.39 | = mile$^2$ | X 2.59 | = km$^2$ |
| **VOLUME** | | | | |
| centimeter$^3$ (cm$^3$) | X 0.061 | = inch$^3$ | X 16.4 | = cm$^3$ |
| liter (l) | X 61 | = inch$^3$ | X 0.016 | = l |
| milliliter (ml) = 1 cm$^3$) | X 0.034 | = oz-liq | X 29.6 | = ml (1 ml |
| liter (l) 1000 ml | X 1.06 | = quart | X 0.946 | = l |
| liter (l) | X 0.26 | = gallon | X 3.79 | = l |
| meter$^3$ (m$^3$) 1000 l | X 1.3 | = yard$^3$ | X 0.76 | = m$^3$ |
| **MASS** | | | | |
| gram (g) | X 0.035 | = ounce | X 28.3 | = g |
| kilogram (kg) 1000 g | X 2.2 | = pound | X 0.454 | = kg |
| metric ton (t) 1000 kg | X 1.1 | = ton (short) | X 0.907 | = t |

| APPROXIMATE CONVERSION | | | | |
|---|---|---|---|---|
| MULTIPLY SI* UNIT | BY CONV FACTOR | TO GET OR MULTIPLY NON-SI UNIT | BY CONV FACTOR | TO GET SI* UNIT |
| **FORCE (N = kg • m/s$^2$)** | | | | |
| newton (N) | X 0.225 | = pound | X 4.45 | = N |
| kilonewton (kN) | X 225 | = pound | X 0.00445 | = kN |
| **TORQUE** | | | | |
| newton meter (N•m) | X 8.9 | = lb. in. | X 0.113 | = N•m |
| newton meter (N•m) | X 0.74 | = lb. ft. | X 1.36 | = N•m |
| **PRESSURE (Pa = N/m$^2$)** | | | | |
| kilopascal (kPa) | X 4.0 | = in. $H_2O$ | X 0.249 | = kPa |
| kilopascal (kPa) | X 0.30 | = in. Hg | X 3.38 | = kPa |
| kilopascal (kPa) | X 0.145 | = p.s.i. | X 6.89 | = kPa |
| megapascal (MPa) | X 145 | = p.s.i. | X 0.00689 | = MPa |
| Bar | X 14.5 | = p.s.i. | X .0689 | = Bar |
| **POWER (w = J/s)** | | | | |
| kilowatt (kw) | X 1.34 | = hp | X 0.746 | = kw |
| kilowatt (kw) | X 0.948 | = Btu/s | X 1.055 | = kw |
| watt (w) | X 0.74 | = ft. lb/s | X 1.36 | = w |
| **TEMPERATURE** | | | | |
| °C = (°F - 32) ÷ 1.8 | °F = (°C X 1.8) + 32 | | | |
| **FLOW** | | | | |
| cu. cm./min. | X .061 | = cu. in/min. | X 16.4 | = cu. cm./min. |
| liters/min. | X .2642 | = GPM | X 3.785 | = liters/min. |

* System International (Modern Metric System)

## Decimal & Millimeter Equivalents

| | DECIMALS | MILLIMETERS |
|---|---|---|
| 1/64 | .015625 | — 0.397 |
| 1/32 | .03125 | — 0.794 |
| 3/64 | .046875 | — 1.191 |
| 1/16 | .0625 | — 1.588 |
| 5/64 | .078125 | — 1.984 |
| 3/32 | .09375 | — 2.381 |
| 7/64 | .109375 | — 2.778 |
| 1/8 | .1250 | — 3.175 |
| 9/64 | .140625 | — 3.572 |
| 5/32 | .15625 | — 3.969 |
| 11/64 | .171875 | — 4.366 |
| 3/16 | .1875 | — 4.763 |
| 13/64 | .203125 | — 5.159 |
| 7/32 | .21875 | — 5.556 |
| 15/64 | .234375 | — 5.953 |
| 1/4 | .2500 | — 6.350 |
| 17/64 | .265625 | — 6.747 |
| 9/32 | .28125 | — 7.144 |
| 19/64 | .296875 | — 7.541 |
| 5/16 | .3125 | — 7.938 |
| 21/64 | .328125 | — 8.334 |
| 11/32 | .34375 | — 8.731 |
| 23/64 | .359375 | — 9.128 |
| 3/8 | .3750 | — 9.525 |
| 25/64 | .390625 | — 9.922 |
| 13/32 | .40625 | — 10.319 |
| 27/64 | .421875 | — 10.716 |
| 7/16 | .4375 | — 11.113 |
| 29/64 | .453125 | — 11.509 |
| 15/32 | .46875 | — 11.906 |
| 31/64 | .484375 | — 12.303 |
| 1/2 | .5000 | — 12.700 |
| 33/64 | .515625 | — 13.097 |
| 17/32 | .53125 | — 13.494 |
| 35/64 | .546875 | — 13.891 |
| 9/16 | .5625 | — 14.288 |
| 37/64 | .578125 | — 14.684 |
| 19/32 | .59375 | — 15.081 |
| 39/64 | .609375 | — 15.478 |
| 5/8 | .6250 | — 15.875 |
| 41/64 | .640625 | — 16.272 |
| 21/32 | .65625 | — 16.669 |
| 43/64 | .671875 | — 17.066 |
| 11/16 | .6875 | — 17.463 |
| 45/64 | .703125 | — 17.859 |
| 23/32 | .71875 | — 18.256 |
| 47/64 | .734375 | — 18.653 |
| 3/4 | .7500 | — 19.050 |
| 49/64 | .765625 | — 19.447 |
| 25/32 | .78125 | — 19.844 |
| 51/64 | .796875 | — 20.241 |
| 13/16 | .8125 | — 20.638 |
| 53/64 | .828125 | — 21.034 |
| 27/32 | .84375 | — 21.431 |
| 55/64 | .859375 | — 21.828 |
| 7/8 | .8750 | — 22.225 |
| 57/64 | .890625 | — 22.622 |
| 29/32 | .90625 | — 23.019 |
| 59/64 | .921875 | — 23.416 |
| 15/16 | .9375 | — 23.813 |
| 61/64 | .953125 | — 24.209 |
| 31/32 | .96875 | — 24.606 |
| 63/64 | .984375 | — 25.003 |
| 1 | 1.000 | — 25.400 |

**1 mm = .03937"**
**.001" = .0254 mm**