



**AURORA<sup>®</sup>**  
Pentair Water

**APLEX<sup>™</sup>**  
Series

# Triplex Pumps

MA-15M

MA-15H

MA-25L

MA-25M

MA-40L

MA-40M

SC-30

SC-30H

SC-45L

SC-45

SC-45H

SC-65L

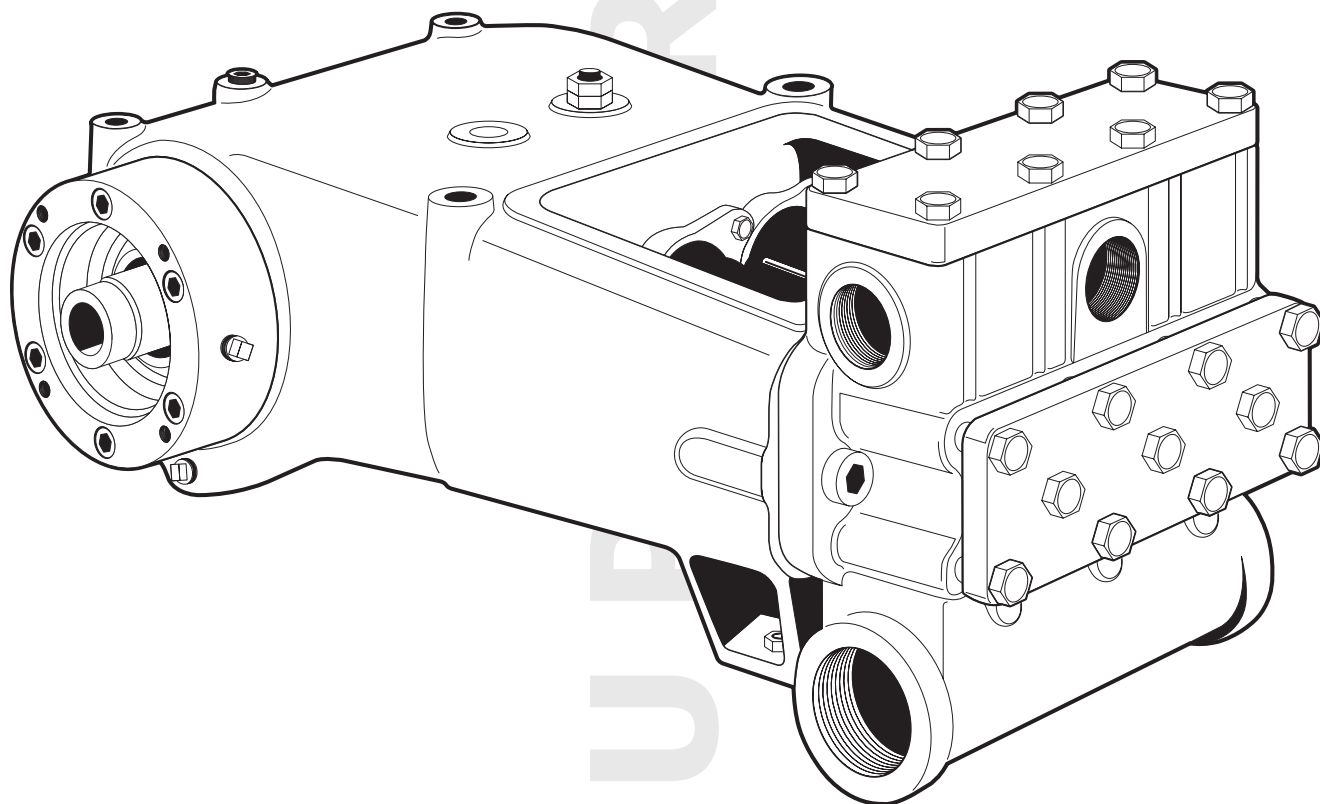
SC-65

SC-65H

RO-23

RO-38

RO-64



## ***INSTALLATION AND SERVICE MANUAL***

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MA-15M ENGINEERING DATA	
Power End	
Model Triplex Pump	MA-15M
Maximum Input HP at Speed	15 at 650 rpm
Rated Continuous Plunger Load	1,828 lbs.
Stroke	1-1/2"
Maximum Rated Continuous Speed	650 rpm
Normal Continuous Speed Range	150 to 600 rpm
Minimum Speed	100 rpm
Oil Capacity	2 U.S. Quarts
Viscosity, S.S.U. at 210°F	70 to 84
Power End Oiling System	Splash & Scoop
Power Frame, One Piece	Cast Iron
Crosshead, Full Cylindrical	Cast Iron
Crosshead, Diameter x Length	2-5/8" x 2-7/8"
Crankshaft	Ductile Iron
Crankshaft Diameters: At Drive Extension At Tapered Roller Bearings At Crankpin Bearings, Diameter x Length	1.750" 2.167" 1.750 x 1.063"
Crosshead (Wrist) Pin, Case-Hardened and Ground	AISI 8620
Main Bearings, Tapered Roller	Timken
Crankpin Bearings, Precision Automotive	Babbitt-Lined
Extension (Pony) Rod: Integral with Plungers 1-5/8" thru 7/8" Separate with Plungers 3/4" and 5/8"	316 S.S. 416 S.S.
Connecting Rod, Automotive Type	Ductile Iron
Average Crosshead Speed: At 600 rpm At 450 rpm	150 fpm 112 fpm
Minimum Life Expectancy, Main Bearings, L <sub>10</sub>	60,000+hr
Liquid End	
Plunger Size Range, Diameter	1-5/8" thru 5/8"
Maximum Continuous Working Pressure	3,500 psi
Hydrostatic Test	5,250 psi
Discharge Connection Size	1" NPTF
Suction Connection Size	2" NPTF
Available Liquid End Materials, ASTM: Nickel Aluminum Bronze Forged Steel Block Ductile Iron	B148-C955 A516 Grade 70 A536 80-55-06

MA-15M ENGINEERING DATA	
Liquid End (Continued)	
Plunger Type Rokide® Stainless Steel: Chromium Oxide-Coated	316 S.S.
Stuffing Boxes, Field-Removable and Replaceable: Stainless Steel, Hardened Carbon Steel	17-4PH 1020
Packing Types Available: Gland-loaded, Nonadjustable Spring-loaded, Cup-Type Spring-loaded, Braided Teflon® & Kevlar® Spring-loaded, Garlock	Style 838 Style 120X Style 140 Style 8921K
Valve Cover and Cylinder Head Plugs	416 S.S. or 316 S.S.
Retainer Plates, Steel, ASTM	A36
Seals, Stuffing Boxes, Valve Covers, Cylinder Heads	Buna-N
Bolting, High Strength, Heat Treated	Alloy Steel
Valve Type, Double Stem-Guided	17-4PH S.S.
Valve Seat, Liquid Passage Areas	.573 sq. in.
Average Liquid Velocity with 1-5/8" Plungers, Stem-Guided Valves: At 600 Crankshaft rpm At 450 Crankshaft rpm	9.04 fps 6.78 fps
Average Liquid Velocity at 600 rpm: Suction Manifold Discharge Manifold	2.32 fps 10.7 fps
General	
Overall Dimensions: Length Width Height	26-1/8" 16-9/16" 10-3/4"
Approximate Weights: With Nickel Aluminum Bronze Liquid End With Ductile Iron Liquid End With Forged Steel Liquid End	235 lbs. 225 lbs. 240 lbs.

MA-15H ENGINEERING DATA	
Power End	
Model Triplex Pump	MA-15H
Maximum Input HP at Speed	15 at 650 rpm
Rated Continuous Plunger Load	2,209 lbs.
Stroke	1-1/2"
Maximum Rated Continuous Speed	650 rpm
Normal Continuous Speed Range	150 to 600 rpm
Minimum Speed	100 rpm
Oil Capacity	2 U.S. Quarts
Viscosity, S.S.U. at 210°F	70 to 84
Power End Oiling System	Splash & Scoop
Power Frame, One Piece	Cast Iron
Crosshead, Full Cylindrical	Cast Iron
Crosshead, Diameter x Length	2-5/8" x 2-7/8"
Crankshaft	Ductile Iron
Crankshaft Diameters: At Drive Extension At Tapered Roller Bearings At Crankpin Bearings, Diameter x Length	1.750" 2.167" 1.750" x 1.063"
Crosshead (Wrist) Pin, Case-Hardened and Ground	AISI 8620
Main Bearings, Tapered Roller	Timken
Crankpin Bearings, Precision Automotive	Babbitt-Lined
Extension (Pony) Rod: Separate with Plungers 3/4"	416 S.S.
Connecting Rod, Automotive Type	Ductile Iron
Average Crosshead Speed: At 600 rpm At 450 rpm	150 fpm 112 fpm
Minimum Life Expectancy, Main Bearings, L <sub>10</sub>	60,000+hr
Liquid End	
Plunger Size Range, Diameter	3/4"
Maximum Continuous Working Pressure	5,000 psi
Hydrostatic Test	7,500 psi
Discharge Connection Size	1" NPTF
Suction Connection Size	1-1/2" NPTF
Available Liquid End Materials, ASTM: Forged Steel Block Forged Stainless Steel Block	4140 15-5PH

MA-15H ENGINEERING DATA	
Liquid End (Continued)	
Plunger Type Rokide® Stainless Steel: Chromium Oxide-Coated	316 S.S.
Stuffing Boxes, Field-Removable and Replaceable: Stainless Steel, Hardened Carbon Steel	17-4PH 1020
Packing Types Available: Spring-loaded, Cup-Type Spring-loaded, Braided Teflon® & Kevlar®	Style 120X Style 140
Valve Cover and Cylinder Head Plugs	416 S.S. or 316 S.S.
Retainer Plates, Steel, ASTM	A36
Seals, Stuffing Boxes, Valve Covers, Cylinder Heads Optional	Buna-N Teflon®
Bolting, High Strength, Heat Treated	Alloy Steel
Valve Type: Dual Stem-Guided Ball Disc	17-4PH S.S. S.S. S.S.
Valve Seat, Liquid Passage Areas	.573 sq. in.
General	
Overall Dimensions: Length Width Height	26-1/8" 16-9/16" 10-3/4"
Approximate Weights: With Forged Steel Liquid End	240 lbs.

MA-25L ENGINEERING DATA	
Power End	
Model Triplex Pump	MA-25L
Maximum Input HP at Speed	25 at 600 rpm
Rated Continuous Plunger Load	2,475 lbs.
Stroke	2"
Maximum Rated Continuous Speed	600 rpm
Normal Continuous Speed Range	150 to 500 rpm
Minimum Speed	100 rpm
Oil Capacity	5 U.S. Quarts
Viscosity, S.S.U. at 210°F	70 to 84
Power End Oiling System	Splash & Scoop
Power Frame, One Piece	Cast Iron
Crosshead, Full Cylindrical	Cast Iron
Crosshead, Diameter x Length	3-1/4" x 3-5/8"
Crankshaft	Ductile Iron
Crankshaft Diameters: At Tapered Roller Bearing At Crankpin Bearings, Diameter x Length	3.15" 2.250" x 1.625"
Crosshead (Wrist) Pin, Case-Hardened and Ground	AISI 8620
Main Bearings, Tapered Roller	Timken
Crankpin Bearings, Precision Automotive	Steel Backed, Babbitt-Lined
Extension (Pony) Rod: Integral with Plungers, 2-1/4" thru 1-7/8" sizes	316 S.S.
Connecting Rod, Automotive Type	Ductile Iron
Average Crosshead Speed: At 600 rpm	150 fpm
Minimum Life Expectancy, Main Bearings, L <sub>10</sub>	50,000+hr
Liquid End	
Plunger Size Range, Diameter	2" thru 2-1/4"
Maximum Continuous Working Pressure	789 psi
Hydrostatic Test	1184 psi
Discharge Connection Size	1-1/2" NPTF
Suction Connection Size	2-1/2" NPTF
Available Liquid End Materials, ASTM: Ductile Iron Carbon Steel	A536 80-55-06 A516 Gr. 70 or 105

MA-25L ENGINEERING DATA	
Liquid End (Continued)	
Plunger Type Rokide® Stainless Steel: Chromium Oxide-Coated	316 S.S.
Stuffing Boxes, Field-Removable and Replaceable: Carbon Steel	1020
Packing Types Available: Gland-loaded, Nonadjustable Spring-loaded, Cup-Type Spring-loaded, Braided Teflon® & Kevlar® Spring-loaded, Garlock	Style 838 Style 120X Style 140/141 Style 8921K
Valve Cover and Cylinder Head Plugs	416 S.S.
Retainer Plates, Steel, ASTM	A36
Seals, Stuffing Boxes, Valve Covers, Cylinder Heads	Buna-N
Bolting, High Strength, Heat Treated	Alloy Steel
Available Valve Types: Standard, Acetal Resin Optional, Hardened and Lapped Double Stem-Guided	Delrin® 17-4PH S.S. 17-4PH S.S.
Valve Seat, Liquid Passage Areas: Plate (Disc) Valves, (Delrin® or S.S.) Double Stem-Guided Valve	1.400 sq. in. .958 sq. in.
Average Liquid Velocity with 2-1/4" at 600 rpm: Thru Plate Valves Thru Dual Stem Guided Valves Thru Suction Manifold Thru Discharge Manifold	6.5 fps 9.8 fps 4.5 fps 9.7 fps
General	
Overall Dimensions: Length Width Height	30-1/2" 18-5/8" 12-3/8"
Approximate Weights: With Ductile Iron Liquid End	440 lbs.

MA-25M ENGINEERING DATA	
Power End	
Model Triplex Pump	MA-25M
Maximum Input HP at Speed	25 at 600 rpm
Rated Continuous Plunger Load	2,475 lbs.
Stroke	2"
Maximum Rated Continuous Speed	600 rpm
Normal Continuous Speed Range	150 to 500 rpm
Minimum Speed	100 rpm
Oil Capacity	5 U.S. Quarts
Viscosity, S.S.U. at 210°F	70 to 84
Power End Oiling System	Splash & Scoop
Power Frame, One Piece	Cast Iron
Crosshead, Full Cylindrical	Cast Iron
Crosshead, Diameter x Length	3-1/4" x 3-5/8"
Crankshaft	Ductile Iron
Crankshaft Diameters: At Drive Extension At Tapered Roller Bearings At Crankpin Bearings, Diameter x Length	2.125/2.124" 3.15" 2.250" x 1.625"
Crosshead (Wrist) Pin, Case-Hardened and Ground	AISI 8620
Main Bearings, Tapered Roller	Timken
Crankpin Bearings, Precision Automotive	Babbitt-Lined
Extension (Pony) Rod: Integral with Plungers, 1-7/8" thru 1-1/8" Separate with Plungers, 1" thru 3/4"	316 S.S. 416 S.S.
Connecting Rod, Automotive Type	Ductile Iron
Average Crosshead Speed: At 600 rpm At 450 rpm	200 fpm 150 fpm
Minimum Life Expectancy, Main Bearings, L <sub>10</sub>	50,000+hr
Liquid End	
Plunger Size Range, Diameter	1-7/8" thru 3/4"
Maximum Continuous Working Pressure	3,500 psi
Hydrostatic Test	5,250 psi
Discharge Connection Size	1-1/4" NPTF
Suction Connection Size	2" NPTF
Available Liquid End Materials, ASTM: Nickel Aluminum Bronze Carbon Steel Block Ductile Iron Stainless Steel Block	B148-C955 A516 Grade 70 A536 80-55-06 Various Grades

MA-25M ENGINEERING DATA	
Liquid End (Continued)	
Plunger Type Rokide® Stainless Steel: Chromium Oxide-Coated	316 S.S.
Stuffing Boxes, Field-Removable and Replaceable: Stainless Steel, Hardened Carbon Steel	17-4PH 1020
Packing Types Available: Gland-loaded, Nonadjustable Spring-loaded, Cup-Type Spring-loaded, Braided Teflon® & Kevlar® Spring-loaded, Garlock	Style 838 Style 120X Style 140/141 Style 8921K
Valve Cover and Cylinder Head Plugs	416 S.S. or 316 S.S.
Retainer Plates, Steel, ASTM	A36
Seals, Stuffing Boxes, Valve Covers, Cylinder Heads	Buna-N
Bolting, High Strength, Heat Treated	Alloy Steel
Available Valve Types: Standard, Acetal Resin Optional, Hardened and Lapped Double Stem-Guided	Delrin® 17-4PH S.S. 17-4PH S.S.
Valve Seat, Liquid Passage Areas Plate (Disc) Valves, (Delrin® or S.S.) Double Stem-Guided Valve	1.400 sq. in. .96 sq. in.
Average Liquid Velocity with 1-7/8" Plungers, Plate Valves: At 600 Crankshaft rpm At 450 Crankshaft rpm	6.57 fps 4.93 fps
Average Liquid Velocity with 1-7/8" Plungers, Stem-Guided Valves: At 600 Crankshaft rpm At 450 Crankshaft rpm	9.61 fps 7.21 fps
Average Liquid Velocity 1-7/8" Plungers at 600 rpm: Suction Manifold Discharge Manifold	4.12 fps 10.75 fps
General	
Overall Dimensions: Length Width Height	31-3/4" 20-3/8" 12-3/8"
Approximate Weights: With Nickel Aluminum Bronze Liquid End With Ductile Iron Liquid End With Stainless Steel Liquid End	430 lbs. 420 lbs. 455 lbs.

MA-40L ENGINEERING DATA	
Power End	
Model Triplex Pump	MA-40L
Maximum Input HP at Speed	40 at 550 rpm
Rated Continuous Plunger Load	3,456 lbs.
Stroke	2-1/2"
Maximum Rated Continuous Speed	550 rpm
Normal Continuous Speed Range	100 rpm
Minimum Speed	100 rpm
Oil Capacity	8 U.S. Quarts
Viscosity, S.S.U. at 210°F	70 to 84
Power End Oiling System	Splash & Scoop
Power Frame, One Piece	Cast Iron
Crosshead, Full Cylindrical	Cast Iron
Crosshead, Diameter x Length	4" x 4-1/2"
Crankshaft	Ductile Iron
Crankshaft Diameters: At Drive Extension	2.500/2.499"
At Tapered Roller Bearings	3.35"
At Crankpin Bearings, Diameter x Length	2.750" x 2.000"
Crosshead (Wrist) Pin, Case-Hardened and Ground	AISI 8620
Wrist Pin Bushing, SAE 660, Diameter x Width	1-5/16" x 2"
Main Bearings, Tapered Roller	Timken
Crankpin Bearings, Precision Automotive	Steel Backed, Babbitt-Lined
Extension (Pony) Rod: Integral with Plunger	316 S.S.
Extension Rod Diameter	1-1/4"
Connecting Rod, Automotive Type	Ductile Iron
Average Crosshead Speed: At 550 rpm	252 fpm
Minimum Life Expectancy, Main Bearings, L <sub>10</sub>	100,000+hr
Liquid End	
Plunger Size Range, Diameter	2-3/4" thru 2-1/4"
Maximum Continuous Working Pressure	779 psi
Hydrostatic Test	1200 psi
Discharge Connection Size	2" NPTF
Suction Connection Size	3" NPTF
Available Liquid End Materials, ASTM: Ductile Iron Steel Stainless Steel	A536 80-55-06 Forged A105 Forged 2205 Duplx.

MA-40L ENGINEERING DATA	
Liquid End (Continued)	
Plunger Type Rokide® Stainless Steel: Chromium Oxide-Coated	316 S.S.
Stuffing Boxes, Field-Removable and Replaceable: Stainless Steel, Hardened Carbon Steel	17-4PH 1020
Packing Types Available: Gland-loaded, Nonadjustable Spring-loaded, Cup-Type Spring-loaded, Braided Teflon® & Kevlar® Spring-loaded, Garlock	Style 838 Style 120X Style 140/141 Style 8921K
Valve Cover and Cylinder Head Plugs	1020 or 316 S.S.
Retainer Plates, Ductile Iron, ASTM	A536 80-55-06
Seals, Stuffing Boxes, Valve Covers, Cylinder Heads	Buna-N
Bolting, High Strength, Heat Treated	Alloy Steel
Available Valve Types: Standard, Acetal Resin Optional, Hardened and Lapped Abrasion Resistant	Delrin® 17-4PH S.S. 17-4PH S.S.
Valve Spring Material	Inconel®
Valve Seat, Liquid Passage Areas: Plate (Disc) Valves, (Delrin® or S.S.) Abrasion Resistant	2.3 sq. in. 1.5 sq. in.
Average Liquid Velocity thru Seat with 2-3/4" Plungers & Plate Valves: At 550 Crankshaft rpm At 350 Crankshaft rpm	7.3 fps 4.6 fps
Average Liquid Velocity thru Seat with 2-3/4" Plungers & Abrasion Resistant Valves: At 550 Crankshaft rpm At 350 Crankshaft rpm	12.3 fps 7.8 fps
Average Liquid Velocity with 2-3/4" Plungers at 550 rpm: Thru Suction Manifold Thru Discharge Manifold	5.2 fps 14.1 fps
General	
Overall Dimensions: Length Width Height	36-1/4" 26-1/4" 14-3/4"
Approximate Weights: With Ductile Iron Liquid End With Forged Steel Liquid End	730 lbs. 775 lbs.



MA-40M ENGINEERING DATA	
Power End	
Model Triplex Pump	MA-40M
Maximum Input HP at Speed	33 at 600 rpm
Rated Continuous Plunger Load	2,851 lbs.
Stroke	2-1/2"
Maximum Rated Continuous Speed	550 rpm
Normal Continuous Speed Range	150 to 500 rpm
Minimum Speed	100 rpm
Oil Capacity	5 U.S. Quarts
Viscosity, S.S.U. at 210°F	70 to 84
Power End Oiling System	Splash & Scoop
Power Frame, One Piece	Cast Iron
Crosshead, Full Cylindrical	Cast Iron
Crosshead, Diameter x Length	4" x 4-1/2"
Crankshaft	Ductile Iron
Crankshaft Diameters: At Drive Extension At Tapered Roller Bearings At Crankpin Bearings, Diameter x Length	2.500/2.499" 3.35" 1-5/16 x 2"
Crosshead (Wrist) Pin, Case-Hardened and Ground	AISI 8620
Wrist Pin Bushing, SAE 660, Diameter x Width	1-5/16" x 2"
Main Bearings, Tapered Roller	Timken
Crankpin Bearings, Precision Automotive	Babbitt-Lined
Extension (Pony) Rod: Integral with Plungers, 2-1/4" thru 1-3/8" Separate with Plungers, 1-1/4" thru 3/4"	416 S.S. 416 S.S.
Connecting Rod, Automotive Type	Ductile Iron
Average Crosshead Speed: At 550 rpm	229 fpm
Minimum Life Expectancy, Main Bearings, L <sub>10</sub>	100,000+hr
Liquid End	
Plunger Size Range, Diameter	2-1/4" thru 3/4"
Maximum Continuous Working Pressure	3,000 psi
Hydrostatic Test	4,500 psi
Discharge Connection Size	1-1/2" NPTF
Suction Connection Size	2-1/2" NPTF
Available Liquid End Materials, ASTM: Nickel Aluminum Bronze Forged Steel Block Ductile Iron Stainless Steel Block	B148-C955 A105 A536 80-55-06 Various Grades

MA-40M ENGINEERING DATA	
Liquid End (Continued)	
Plunger Type Rokide® Stainless Steel: Chromium Oxide-Coated	416 S.S.
Stuffing Boxes, Field-Removable and Replaceable: Stainless Steel, Hardened Carbon Steel	17-4PH 1020
Packing Types Available: Gland-loaded, Nonadjustable Spring-loaded, Cup-Type Spring-loaded, Braided Teflon® & Kevlar® Spring-loaded, Garlock	Style 838 Style 120X Style 140/141 Style 8921K
Valve Cover and Cylinder Head Plugs	416 S.S. or 316 S.S.
Retainer Plates, Steel, ASTM	A536 80-55-06
Seals, Stuffing Boxes, Valve Covers, Cylinder Heads	Buna-N
Bolting, High Strength, Heat Treated	Alloy Steel
Available Valve Types: Standard, Acetal Resin Optional, Hardened and Lapped Double Stem-Guided	Delrin® 17-4PH S.S. 17-4PH S.S.
Valve Spring Material	Inconel®
Valve Seat, Liquid Passage Areas Plate (Disc) Valves, (Delrin® or S.S.) Double Stem-Guided Valve	2.3 sq. in. 1.5 sq. in.
Average Liquid Velocity with 2-1/4" Plungers, Plate Valves: At 550 Crankshaft rpm At 350 Crankshaft rpm	6.6 fps 4.2 fps
Average Liquid Velocity with 2-1/4" Plungers, Stem-Guided Valves: At 550 Crankshaft rpm At 350 Crankshaft rpm	11.2 fps 7.1 fps
Average Liquid Velocity 2-1/4" Plungers at 550 rpm: Suction Manifold Discharge Manifold	4.12 fps 12.8 fps
General	
Overall Dimensions: Length Width Height	36-1/4" 28-1/4" 14-1/4"
Approximate Weights: With Nickel Aluminum Bronze Liquid End With Ductile Iron Liquid End With Forged Steel Liquid End	750 lbs. 730 lbs. 775 lbs.



SC-30 ENGINEERING DATA	
Power End	
Model Triplex Pump	SC-30
Maximum Input HP at Speed	40 at 650 rpm
Rated Continuous Plunger Load	4,193 lbs.
Stroke	1-3/4"
Maximum Rated Continuous Speed	650 rpm
Normal Continuous Speed Range	150 to 600 rpm
Minimum Speed	100 rpm
Oil Capacity	2 U.S. Quarts
Viscosity, S.S.U. at 210°F	70 to 84
Power End Oiling System	Splash & Scoop
Power Frame, One Piece	Cast Iron
Crosshead, Full Cylindrical	Cast Iron
Crosshead, Diameter x Length	2-5/8" x 2-7/8"
Crankshaft	Ductile Iron
Crankshaft Diameters: At Drive Extension At Tapered Roller Bearings At Crankpin Bearings, Diameter x Length	1.750" 2.167" 1.750" x 1.063"
Crosshead (Wrist) Pin, Case-Hardened and Ground	AISI 8620
Main Bearings, Tapered Roller	Timken
Crankpin Bearings, Precision Automotive	Babbitt-Lined
Extension (Pony) Rod: Integral with Plungers, 1-5/8" thru 1-1/4" sizes Separate with Plungers, 3/4" and 5/8"	316 S.S. 416 S.S.
Connecting Rod, Automotive Type	Ductile Iron
Average Crosshead Speed: At 600 rpm At 450 rpm	189 fpm 416 fpm
Minimum Life Expectancy, Main Bearings, L <sub>10</sub>	10,000+hr
Liquid End	
Plunger Size Range, Diameter	1-5/8" thru 1-1/4"
Maximum Continuous Working Pressure	3,500 psi
Hydrostatic Test	5,250 psi
Discharge Connection Size	1" NPTF
Suction Connection Size	2" NPTF
Available Liquid End Materials, ASTM: Ductile Iron	A536 80-55-06

SC-30 ENGINEERING DATA	
Liquid End (Continued)	
Plunger Type Rokide® Stainless Steel: Chromium Oxide-Coated	316 S.S.
Stuffing Boxes, Field-Removable and Replaceable: Carbon Steel	1020
Packing Types Available: Gland-loaded, Nonadjustable Spring-loaded, Cup-Type Spring-loaded, Braided Teflon® & Kevlar® Spring-loaded, Garlock	Style 838 Style 120X Style 140 Style 8921K
Valve Cover and Cylinder Head Plugs	416 S.S. or 316 S.S.
Retainer Plates, Ductile Iron, ASTM	A36
Seals, Stuffing Boxes, Valve Covers, Cylinder Heads	Buna-N
Bolting, High Strength, Heat Treated	Alloy Steel
Valve Type, Double Stem-Guided	17-4PH S.S.
Valve Seat, Liquid Passage Areas	.573 sq. in.
Average Liquid Velocity with 1-5/8" Plungers, Stem-Guided Valves: At 650 Crankshaft rpm At 450 Crankshaft rpm	11.5 fps 7.9 fps
Average Liquid Velocity at 650 rpm: Suction Manifold Discharge Manifold	2.5 fps 11.6 fps
General	
Overall Dimensions: Length Width Height	26-1/8" 16-9/16" 10-3/4"
Approximate Weights: With Ductile Iron Liquid End	225 lbs.

SC-30H ENGINEERING DATA	
Power End	
Model Triplex Pump	SC-30H
Maximum Input HP at Speed	40 at 650 rpm
Rated Continuous Plunger Load	4,193 lbs.
Stroke	1-3/4"
Maximum Rated Continuous Speed	650 rpm
Normal Continuous Speed Range	150 to 600 rpm
Minimum Speed	100 rpm
Oil Capacity	2 U.S. Quarts
Viscosity, S.S.U. at 210°F	70 to 84
Power End Oiling System	Splash & Scoop
Power Frame, One Piece	Cast Iron
Crosshead, Full Cylindrical	Cast Iron
Crosshead, Diameter x Length	2-5/8" x 2-7/8"
Crankshaft	Ductile Iron
Crankshaft Diameters: At Drive Extension At Tapered Roller Bearings At Crankpin Bearings, Diameter x Length	1.750" 2.167" 1.750" x 1.063"
Crosshead (Wrist) Pin, Case-Hardened and Ground	AISI 8620
Main Bearings, Tapered Roller	Timken
Crankpin Bearings, Precision Automotive	Babbitt-Lined
Extension (Pony) Rod: Integral with Plungers, 1-1/8" thru 7/8" sizes Separate with Plungers, 3/4" only	316 S.S. 416 S.S.
Connecting Rod, Automotive Type	Ductile Iron
Average Crosshead Speed: At 600 rpm At 450 rpm	189 fpm 416 fpm
Minimum Life Expectancy, Main Bearings, L <sub>10</sub>	10,000+hr
Liquid End	
Plunger Size Range, Diameter	1-1/8" thru 7/8"
Maximum Continuous Working Pressure	5,000 psi
Hydrostatic Test	7,500 psi
Discharge Connection Size	1" NPTF
Suction Connection Size	2" NPTF
Available Liquid End Materials, ASTM: Carbon Steel Stainless Steel	4140 15-5PH

SC-30H ENGINEERING DATA	
Liquid End (Continued)	
Plunger Type Rokide® Stainless Steel: Chromium Oxide-Coated	316 S.S.
Stuffing Boxes, Field-Removable and Replaceable: Carbon Steel	1020
Packing Types Available: Gland-loaded, Nonadjustable Spring-loaded, Cup-Type Spring-loaded, Braided Teflon® & Kevlar® Spring-loaded, Garlock	Style 838 Style 120X Style 140 Style 8921K
Valve Cover and Cylinder Head Plugs	416 S.S. or 316 S.S.
Retainer Plates, Ductile Iron, ASTM	A36
Seals, Stuffing Boxes, Valve Covers, Cylinder Heads	Buna-N
Bolting, High Strength, Heat Treated	Alloy Steel
Valve Type, Double Stem-Guided	17-4PH S.S.
Valve Seat, Liquid Passage Areas	.573 sq. in.
Average Liquid Velocity with 1-1/8" Plungers, Stem-Guided Valves: At 650 Crankshaft rpm	5.49 fps
Average Liquid Velocity at 650 rpm: Suction Manifold Discharge Manifold	1.5 fps 6.0 fps
General	
Overall Dimensions: Length Width Height	26-1/8" 16-9/16" 10-3/4"
Approximate Weights: With Forged Steel Liquid End	275 lbs.

SC-45L ENGINEERING DATA	
Power End	
Model Triplex Pump	SC-45L
Maximum Input HP at Speed	60 at 600 rpm
Rated Continuous Plunger Load	5,280 lbs.
Stroke	2-1/4"
Maximum Rated Continuous Speed	600 rpm
Normal Continuous Speed Range	150 to 500 rpm
Minimum Speed	100 rpm
Oil Capacity	5 U.S. Quarts
Viscosity, S.S.U. at 210°F	70 to 84
Power End Oiling System	Splash & Scoop
Power Frame, One Piece	Cast Iron
Crosshead, Full Cylindrical	Cast Iron
Crosshead, Diameter x Length	3-1/4" x 3-5/8"
Crankshaft	Ductile Iron
Crankshaft Diameters: At Drive Extension At Tapered Roller Bearings At Crankpin Bearings, Diameter x Length	2.125/2.124" 3.15" 2.250" x 1.625"
Crosshead (Wrist) Pin, Case-Hardened and Ground	AISI 8620
Main Bearings, Tapered Roller	Timken
Crankpin Bearings, Precision Automotive	Steel Backed, Babbitt-Lined
Extension (Pony) Rod: Integral with Plungers, 1-7/8" thru 1-1/2" sizes	316 S.S.
Connecting Rod, Automotive Type	Ductile Iron
Average Crosshead Speed: At 600 rpm At 450 rpm	225 fpm 169 fpm
Minimum Life Expectancy, Main Bearings, L <sub>10</sub>	15,000+hr
Liquid End	
Plunger Size Range, Diameter	2" thru 2-1/4"
Maximum Continuous Working Pressure	1,683 psi
Hydrostatic Test	2,500 psi
Discharge Connection Size	1-1/2" NPTF
Suction Connection Size	2-1/2" NPTF
Available Liquid End Materials, ASTM: Ductile Iron Carbon Steel	A536 80-55-06 A516 Grade 70

SC-45L ENGINEERING DATA	
Liquid End (Continued)	
Plunger Type Rokide® Stainless Steel: Chromium Oxide-Coated	416 S.S.
Stuffing Boxes, Field-Removable and Replaceable: Carbon Steel	1020
Packing Types Available: Gland-loaded, Nonadjustable Spring-loaded, Cup-Type Spring-loaded, Braided Teflon® & Kevlar® Spring-loaded, Garlock	Style 838 Style 120X Style 140/141 Style 8921K
Valve Cover and Cylinder Head Plugs	416 S.S.
Retainer Plates, Steel, ASTM	A36
Seals, Stuffing Boxes, Valve Covers, Cylinder Heads	Buna-N
Bolting, High Strength, Heat Treated	Alloy Steel
Available Valve Types: Standard, Acetal Resin Optional, Hardened and Lapped Double Stem-Guided	Delrin® 17-4PH S.S. 17-4PH S.S.
Valve Seat, Liquid Passage Areas: Plate (Disc) Valves, (Delrin® or S.S.) Double Stem-Guided Valve	1.400 sq. in. .958 sq. in.
Average Liquid Velocity with 2-1/4" at 600 rpm: Thru Plate Valves Thru Dual Stem Guided Valves Thru Suction Manifold Thru Discharge Manifold	6.5 fps 9.8 fps 4.5 fps 9.7 fps
General	
Overall Dimensions: Length Width Height	30-1/2" 18-5/8" 12-3/8"
Approximate Weights: With Ductile Iron Liquid End	440 lbs.

SC-45 ENGINEERING DATA	
Power End	
Model Triplex Pump	SC-45
Maximum Input HP at Speed	60 at 600 rpm
Rated Continuous Plunger Load	5,280 lbs.
Stroke	2-1/4"
Maximum Rated Continuous Speed	600 rpm
Normal Continuous Speed Range	150 to 600 rpm
Minimum Speed	100 rpm
Oil Capacity	5 U.S. Quarts
Viscosity, S.S.U. at 210°F	70 to 84
Power End Oiling System	Splash & Scoop
Power Frame, One Piece	Cast Iron
Crosshead, Full Cylindrical	Cast Iron
Crosshead, Diameter x Length	3-1/4" x 3-5/8"
Crankshaft	Ductile Iron
Crankshaft Diameters: At Drive Extension At Tapered Roller Bearings At Crankpin Bearings, Diameter x Length	2.125/2.124" 3.15" 2.250" x 1.625"
Crosshead (Wrist) Pin, Case-Hardened and Ground	AISI 8620
Main Bearings, Tapered Roller	Timken
Crankpin Bearings, Precision Automotive	Steel Backed, Babbitt-Lined
Extension (Pony) Rod: Integral with Plungers, 1-7/8" thru 1-1/2" sizes	316 S.S.
Connecting Rod, Automotive Type	Ductile Iron
Average Crosshead Speed: At 600 rpm At 450 rpm	225 fpm 169 fpm
Minimum Life Expectancy, Main Bearings, L <sub>10</sub>	15,000+hr
Liquid End	
Plunger Size Range, Diameter	1-7/8" thru 1-1/2"
Maximum Continuous Working Pressure	3,500 psi
Hydrostatic Test	5,250 psi
Discharge Connection Size	1-1/4" NPTF
Suction Connection Size	2" NPTF
Available Liquid End Materials, ASTM: Ductile Iron	A536 80-55-06

SC-45 ENGINEERING DATA	
Liquid End (Continued)	
Plunger Type Rokide® Stainless Steel: Chromium Oxide-Coated	416 S.S.
Stuffing Boxes, Field-Removable and Replaceable: Carbon Steel	1020
Packing Types Available: Gland-loaded, Nonadjustable Spring-loaded, Cup-Type Spring-loaded, Braided Teflon® & Kevlar® Spring-loaded, Garlock	Style 838 Style 120X Style 140/141 Style 8921K
Valve Cover and Cylinder Head Plugs	416 S.S.
Retainer Plates, Steel, ASTM	A36
Seals, Stuffing Boxes, Valve Covers, Cylinder Heads	Buna-N
Bolting, High Strength, Heat Treated	Alloy Steel
Available Valve Types: Standard, Acetal Resin Optional, Hardened and Lapped Double Stem-Guided	Delrin® 17-4PH S.S. 17-4PH S.S.
Valve Seat, Liquid Passage Areas: Plate (Disc) Valves, (Delrin® or S.S.) Double Stem-Guided Valve	1.400 sq. in. .958 sq. in.
Average Liquid Velocity with 1-7/8" Plungers, Plate Valves: At 600 Crankshaft rpm At 450 Crankshaft rpm	7.40 fps 5.55 fps
Average Liquid Velocity with 1-7/8" Plungers, Stem-Guided Valves: At 600 Crankshaft rpm At 450 Crankshaft rpm	10.81 fps 8.11 fps
Average Liquid Velocity at 600 rpm: Thru Suction Manifold Thru Discharge Manifold	4.12 fps 10.75 fps
General	
Overall Dimensions: Length Width Height	31-3/4" 18-5/8" 12-3/8"
Approximate Weights: With Nickel Aluminum Bronze Liquid End	430 lbs.

SC-45H ENGINEERING DATA	
Power End	
Model Triplex Pump	SC-45H
Maximum Input HP at Speed	60 at 600 rpm
Rated Continuous Plunger Load	5,280 lbs.
Stroke	2-1/4"
Maximum Rated Continuous Speed	600 rpm
Normal Continuous Speed Range	250 to 600 rpm
Minimum Speed	50 rpm
Oil Capacity	5 U.S. Quarts
Viscosity, S.S.U. at 210°F	70 to 84
Power End Oiling System	Splash & Scoop
Power Frame, One Piece	Cast Iron
Crosshead, Full Cylindrical	Cast Iron
Crosshead, Diameter x Length	3-1/4" x 3-5/8"
Crankshaft	Ductile Iron
Crankshaft Diameters:	
At Drive Extension	2.125/2.124"
At Tapered Roller Bearings	3.15"
At Crankpin Bearings, Diameter x Length	2.250 x 1.625"
Crosshead (Wrist) Pin, Case-Hardened and Ground	AISI 8620
Main Bearings, Tapered Roller	Timken
Crankpin Bearings, Precision Automotive	Steel Backed, Babbitt-Lined
Extension (Pony) Rod: Integral with Plungers, 1-3/8" thru 1-1/8" sizes	316 S.S.
Connecting Rod, Automotive Type	Ductile Iron
Average Crosshead Speed:	
At 600 rpm	225 fpm
At 450 rpm	169 fpm
Minimum Life Expectancy, Main Bearings, L <sub>10</sub>	15,000+hr
Liquid End	
Plunger Size Range, Diameter	1-3/8" thru 1-1/8"
Maximum Continuous Working Pressure	5,000 psi
Hydrostatic Test	7,500 psi
Discharge Connection Size	1" NPTF
Suction Connection Size	1-1/2" NPTF
Available Liquid End Materials, ASTM: Ductile Iron	A536 80-55-06

SC-45H ENGINEERING DATA	
Liquid End (Continued)	
Plunger Type Rokide® Stainless Steel: Chromium Oxide-Coated	316 S.S.
Stuffing Boxes, Field-Removable and Replaceable: Carbon Steel	1040
Packing Types Available: Gland-loaded, Nonadjustable Spring-loaded, Cup-Type Spring-loaded, Braided Teflon® & Kevlar® Spring-loaded, Garlock	Style 838 Style 120X Style 140/141 Style 8921K
Valve Cover and Cylinder Head Plugs	410 S.S.
Retainer Plates, Steel, ASTM	A36
Seals, Stuffing Boxes, Valve Covers, Cylinder Heads	Buna-N
Bolting, High Strength, Heat Treated	Alloy Steel
Available Valve Types: Double Stem-Guided	17-4PH S.S.
Valve Seat, Liquid Passage Areas:	
Suction	.573 sq. in.
Discharge	.958 sq. in.
Average Liquid Velocity with 1-3/8" Plungers:	
At 600 Crankshaft rpm	9.72 fps
At 600 Crankshaft rpm	5.81 fps
Average Liquid Velocity at 600 rpm:	
Thru Suction Manifold	4.73 fps
Thru Discharge Manifold	10.64 fps
General	
Overall Dimensions:	
Length	31-3/4"
Width	18-5/8"
Height	12-3/8"
Approximate Weights:	
With Forged Steel Liquid End	475 lbs.

SC-65L ENGINEERING DATA	
Power End	
Model Triplex Pump	SC-65L
Maximum Input HP at Speed	92 at 550 rpm
Rated Continuous Plunger Load	7,216 lbs.
Stroke	2-3/4"
Maximum Rated Continuous Speed	550 rpm
Normal Continuous Speed Range	100 rpm
Minimum Speed	100 rpm
Oil Capacity	8 U.S. Quarts
Viscosity, S.S.U. at 210°F	70 to 84
Power End Oiling System	Splash & Scoop
Power Frame, One Piece	Cast Iron
Crosshead, Full Cylindrical	Cast Iron
Crosshead, Diameter x Length	4" x 4-1/2"
Crankshaft	Ductile Iron
Crankshaft Diameters: At Drive Extension At Tapered Roller Bearings At Crankpin Bearings, Diameter x Length	2.500/2.499" 3.35" 2.750" x 2"
Crosshead (Wrist) Pin, Case-Hardened and Ground	AISI 8620
Wrist Pin Bushing, SAE 660, Diameter x Width	1-5/16" x 2"
Main Bearings, Tapered Roller	Timken
Crankpin Bearings, Precision Automotive	Steel Backed, Babbitt-Lined
Extension (Pony) Rod	416 S.S.
Extension Rod Diameter	1-1/4"
Connecting Rod, Automotive Type	Ductile Iron
Average Crosshead Speed: At 550 rpm	252 fpm
Minimum Life Expectancy, Main Bearings, L <sub>10</sub>	30,000+hr
Liquid End	
Plunger Size Range, Diameter	2-3/4" thru 2-1/4"
Maximum Continuous Working Pressure	1,815 psi
Hydrostatic Test	2,725 psi
Discharge Connection Size	2" NPTF
Suction Connection Size	3" NPTF
Available Liquid End Materials, ASTM: Ductile Iron	A536 80-55-06

SC-65L ENGINEERING DATA	
Liquid End (Continued)	
Plunger Type Rokide® Stainless Steel: Chromium Oxide-Coated	416 S.S.
Stuffing Boxes, Field-Removable and Replaceable: Stainless Steel, Hardened Carbon Steel	17-4PH 1020
Packing Types Available: Gland-loaded, Nonadjustable Spring-loaded, Cup-Type Spring-loaded, Braided Teflon® & Kevlar® Spring-loaded, Garlock	Style 838 Style 120X Style 140/141 Style 8921K
Valve Cover and Cylinder Head Plugs	416 S.S. or 316 S.S.
Retainer Plates, Ductile Iron, ASTM	A536 80-55-06
Seals, Stuffing Boxes, Valve Covers, Cylinder Heads	Buna-N
Bolting, High Strength, Heat Treated	Alloy Steel
Available Valve Types: Standard, Acetal Resin Optional, Hardened and Lapped Double Stem-Guided	Delrin® 17-4PH S.S. 17-4PH S.S.
Valve Spring Material	Inconel®
Valve Seat, Liquid Passage Areas: Plate (Disc) Valves, (Delrin® or S.S.) Double Stem-Guided Valve	2.3 sq. in. 1.5 sq. in.
Average Liquid Velocity thru Seat with 2-3/4" Plungers & Plate Valves: At 550 Crankshaft rpm At 350 Crankshaft rpm	7.3 fps 4.6 fps
Average Liquid Velocity thru Seat with 2-3/4" Plungers & Double Stem Valves: At 550 Crankshaft rpm At 350 Crankshaft rpm	12.3 fps 7.8 fps
Average Liquid Velocity with 2-3/4" Plungers at 550 rpm: Thru Suction Manifold Thru Discharge Manifold	5.2 fps 14.1 fps
General	
Overall Dimensions: Length Width Height	36-1/4" 26-1/4" 14-3/4"
Approximate Weights: With Aluminum Bronze Liquid End With Ductile Iron Liquid End With Forged Steel Liquid End	750 lbs. 730 lbs. 775 lbs.

<b>SC-65 ENGINEERING DATA</b>	
<b>Power End</b>	
Model Triplex Pump	SC-65
Maximum Input HP at Speed	92 at 550 rpm
Rated Continuous Plunger Load	7,216 lbs.
Stroke	2-3/4"
Maximum Rated Continuous Speed	550 rpm
Normal Continuous Speed Range	100 rpm
Minimum Speed	100 rpm
Oil Capacity	8 U.S. Quarts
Viscosity, S.S.U. at 210°F	70 to 84
Power End Oiling System	Splash & Scoop
Power Frame, One Piece	Cast Iron
Crosshead, Full Cylindrical	Cast Iron
Crosshead, Diameter x Length	4" x 4-1/2"
Crankshaft	Ductile Iron
Crankshaft Diameters: At Drive Extension	2.500/2.499"
At Tapered Roller Bearings	3.35"
At Crankpin Bearings, Diameter x Length	2.750 x 2"
Crosshead (Wrist) Pin, Case-Hardened and Ground	AISI 8620
Wrist Pin Bushing, SAE 660, Diameter x Width	1-5/16" x 2"
Main Bearings, Tapered Roller	Timken
Crankpin Bearings, Precision Automotive	Steel Backed, Babbitt-Lined
Extension (Pony) Rod	416 S.S.
Extension Rod Diameter	1-1/4"
Connecting Rod, Automotive Type	Ductile Iron
Average Crosshead Speed: At 550 rpm	252 fpm
Minimum Life Expectancy, Main Bearings, L <sub>10</sub>	30,000+hr
<b>Liquid End</b>	
Plunger Size Range, Diameter	2-3/4" thru 2-1/4"
Maximum Continuous Working Pressure	3,000 psi
Hydrostatic Test	4,500 psi
Discharge Connection Size	1-1/2" NPTF
Suction Connection Size	2-1/2" NPTF
Available Liquid End Materials, ASTM: Ductile Iron	A536 80-55-06

<b>SC-65 ENGINEERING DATA</b>	
<b>Liquid End (Continued)</b>	
Plunger Type Rokide® Stainless Steel: Chromium Oxide-Coated	416 S.S.
Stuffing Boxes, Field-Removable and Replaceable: Stainless Steel, Hardened Carbon Steel	17-4PH 1020
Packing Types Available: Gland-loaded, Nonadjustable Spring-loaded, Cup-Type Spring-loaded, Braided Teflon® & Kevlar® Spring-loaded, Garlock	Style 838 Style 120X Style 140/141 Style 8921K
Valve Cover and Cylinder Head Plugs	416 S.S. or 316 S.S.
Retainer Plates, Ductile Iron, ASTM	A536 80-55-06
Seals, Stuffing Boxes, Valve Covers, Cylinder Heads	Buna-N
Bolting, High Strength, Heat Treated	Alloy Steel
Available Valve Types: Standard, Acetal Resin Optional, Hardened and Lapped Double Stem-Guided	Delrin® 17-4PH S.S. 17-4PH S.S.
Valve Spring Material	Inconel®
Valve Seat, Liquid Passage Areas: Plate (Disc) Valves, (Delrin® or S.S.) Double Stem-Guided Valve	2.3 sq. in. 1.5 sq. in.
Average Liquid Velocity thru Seat with 2-3/4" Plungers & Plate Valves: At 550 Crankshaft rpm At 350 Crankshaft rpm	7.3 fps 4.6 fps
Average Liquid Velocity thru Seat with 2-3/4" Plungers & Double Stem Valves: At 550 Crankshaft rpm At 350 Crankshaft rpm	12.3 fps 7.8 fps
Average Liquid Velocity with 2-3/4" Plungers at 550 rpm: Thru Suction Manifold Thru Discharge Manifold	5.2 fps 14.1 fps
<b>General</b>	
Overall Dimensions: Length Width Height	36-1/4" 26-1/4" 14-3/4"
Approximate Weights: With Aluminum Bronze Liquid End With Ductile Iron Liquid End With Forged Steel Liquid End	750 lbs. 730 lbs. 775 lbs.



SC-65H ENGINEERING DATA	
Power End	
Model Triplex Pump	SC-65H
Maximum Input HP at Speed	92 at 550 rpm
Rated Continuous Plunger Load	7,216 lbs.
Stroke	2-3/4"
Maximum Rated Continuous Speed	550 rpm
Normal Continuous Speed Range	100 rpm
Minimum Speed	50 rpm
Oil Capacity	8 U.S. Quarts
Viscosity, S.S.U. at 210°F	70 to 84
Power End Oiling System	Splash & Scoop
Power Frame, One Piece	Cast Iron
Crosshead, Full Cylindrical	Cast Iron
Crosshead, Diameter x Length	4" x 4-1/2"
Crankshaft	Ductile Iron
Crankshaft Diameters: At Drive Extension At Tapered Roller Bearings At Crankpin Bearings, Diameter x Length	2.500/2.499" 3.35" 2.750" x 2"
Crosshead (Wrist) Pin, Case-Hardened and Ground	AISI 8620
Wrist Pin Bushing, SAE 660, Diameter x Width	1-5/16" x 2"
Main Bearings, Tapered Roller	Timken
Crankpin Bearings, Precision Automotive	Steel Backed, Babbitt-Lined
Extension (Pony) Rod	416 S.S.
Extension Rod Diameter	1-1/4"
Connecting Rod, Automotive Type	Ductile Iron
Average Crosshead Speed: At 550 rpm	252 fpm
Minimum Life Expectancy, Main Bearings, L <sub>10</sub>	30,000+hr
Liquid End	
Plunger Size Range, Diameter	1-5/8" thru 1-1/4"
Maximum Continuous Working Pressure	5,000 psi
Hydrostatic Test	6,000 psi
Discharge Connection Size	1" NPTF
Suction Connection Size	1-1/2" NPTF
Available Liquid End Materials, ASTM: Carbon Steel Stainless Steel	4140 15-15PH

SC-65H ENGINEERING DATA	
Liquid End (Continued)	
Plunger Type Rokide® Stainless Steel: Chromium Oxide-Coated	416 S.S.
Stuffing Boxes, Field-Removable and Replaceable: Carbon Steel	1040
Packing Types Available: Gland-loaded, Nonadjustable Spring-loaded, Cup-Type Spring-loaded, Braided Teflon® & Kevlar® Spring-loaded, Garlock	Style 838 Style 120X Style 140/141 Style 8921K
Valve Cover and Cylinder Head Plugs	410 S.S.
Retainer Plates, ASTM	A36
Seals, Stuffing Boxes, Valve Covers, Cylinder Heads	Buna-N
Bolting, High Strength, Heat Treated	Alloy Steel
Available Valve Types: Disc	17-4PH S.S.
Valve Spring Material	Inconel®
Valve Seat, Liquid Passage Areas	2.23 sq. in.
Average Liquid Velocity thru Seat with 1-5/8" Plungers & Plate Valves: At 550 Crankshaft rpm	3.91 fps
Average Liquid Velocity with 1-5/8" Plungers at 550 rpm: Thru Suction Manifold Thru Discharge Manifold	7.40 fps 16.65 fps
General	
Overall Dimensions: Length Width Height	36-1/4" 26-1/4" 14-3/4"
Approximate Weights: With Forged Steel Liquid End	795 lbs.

RO-23 ENGINEERING DATA	
Power End	
Model Triplex Pump	RO-23
Maximum Input HP at Speed	20 at 650 rpm
Rated Continuous Plunger Load	2,433 lbs.
Stroke	1-1/2"
Maximum Rated Continuous Speed	650 rpm
Normal Continuous Speed Range	350 to 600 rpm
Minimum Speed	100 rpm
Oil Capacity	2 U.S. Quarts
Viscosity, S.S.U. at 210°F	70 to 84
Power End Oiling System	Splash & Scoop
Power Frame, One Piece	Cast Iron
Crosshead, Full Cylindrical	Cast Iron
Crosshead, Diameter x Length	2-5/8" x 2-7/8"
Crankshaft	Ductile Iron
Crankshaft Diameters: At Drive Extension At Tapered Roller Bearings At Crankpin Bearings, Diameter x Length	1.750" 2.167" 1.750" x 1.063"
Crosshead (Wrist) Pin, Case-Hardened and Ground	AISI 8620
Main Bearings, Tapered Roller	Timken
Crankpin Bearings, Precision Automotive	Babbitt-Lined
Extension (Pony) Rod: Integral with Plungers	316 S.S.
Connecting Rod, Automotive Type	Ductile Iron
Average Crosshead Speed: At 600 rpm At 450 rpm	150 fpm 112 fpm
Minimum Life Expectancy, Main Bearings, L <sub>10</sub>	58,000+hr
Liquid End	
Plunger Size Range, Diameter	1-5/8" thru 3/4"
Maximum Continuous Working Pressure	2,448 psi
Hydrostatic Test	3,750 psi
Discharge Connection Size	1" NPTF
Suction Connection Size	2" NPTF
Available Liquid End Materials, ASTM: Nickel Aluminum Bronze Stainless Steel Block Stainless Steel Block	B148-C955 2205 Duplex S.S. 316 S.S.

RO-23 ENGINEERING DATA	
Liquid End (Continued)	
Plunger Type Rokide® Stainless Steel: Chromium Oxide-Coated	316 S.S.
Stuffing Boxes, Field-Removable and Replaceable	Stainless Steel
Gland, Stuffing Box	Nickel Aluminum Bronze
Packing Types Available: Spring-loaded, Cup-Type Spring-loaded, Garlock	Style 120X Style 8921K
Valve Cover and Cylinder Head Plugs	316 S.S.
Retainer Plates, Steel, ASTM	A36
Seals, Stuffing Boxes, Valve Covers, Cylinder Heads	Buna-N
Bolting, High Strength, Heat Treated	Alloy Steel
Valve Type, Double Stem-Guided	17-4PH S.S.
Valve Spring Material	Inconel®
Valve Seat, Liquid Passage Areas	.573 sq. in.
Average Liquid Velocity with 1-5/8" Plungers, Stem-Guided Valves: At 600 Crankshaft rpm At 450 Crankshaft rpm	9.04 fps 6.78 fps
Average Liquid Velocity at 600 rpm: Suction Manifold Discharge Manifold	2.32 fps 10.7 fps
General	
Overall Dimensions: Length Width Height	26-1/8" 16-9/16" 10-3/4"
Approximate Weights: With Nickel Aluminum Bronze Liquid End With Stainless Steel Liquid End	235 lbs. 240 lbs.

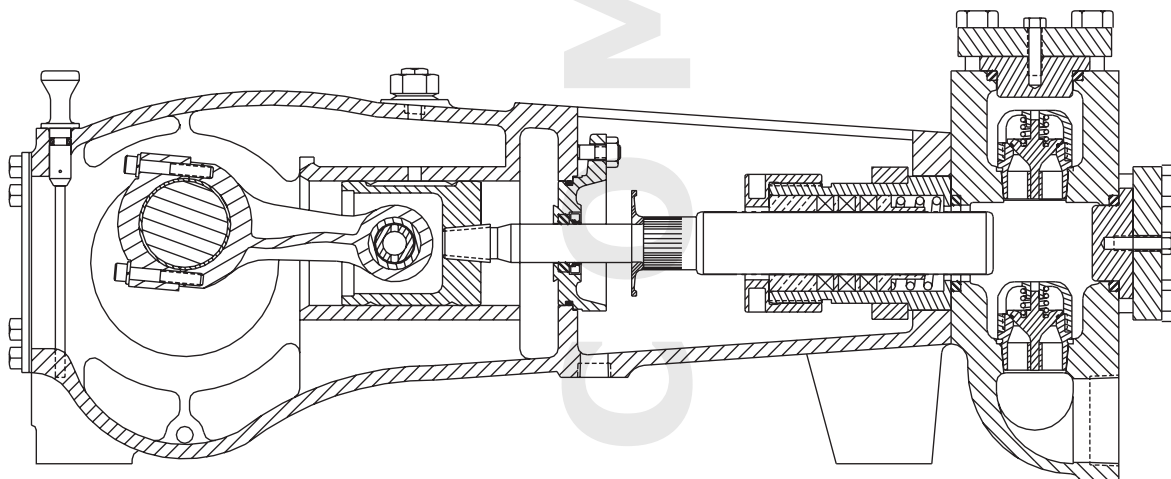
RO-38 ENGINEERING DATA	
Power End	
Model Triplex Pump	RO-38
Maximum Input HP at Speed	30 at 600 rpm
Rated Continuous Plunger Load	2,968 lbs.
Stroke	2"
Maximum Rated Continuous Speed	600 rpm
Normal Continuous Speed Range	350 to 575 rpm
Minimum Speed	100 rpm
Oil Capacity	5 U.S. Quarts
Viscosity, S.S.U. at 210°F	70 to 84
Power End Oiling System	Splash & Scoop
Power Frame, One Piece	Cast Iron
Crosshead, Full Cylindrical	Cast Iron
Crosshead, Diameter x Length	3-1/4" x 3-5/8"
Crankshaft	Ductile Iron
Crankshaft Diameters: At Drive Extension At Tapered Roller Bearings At Crankpin Bearings, Diameter x Length	2.125/2.124" 3.15" 2.250" x 1.625"
Crosshead (Wrist) Pin, Case-Hardened and Ground	AISI 8620
Main Bearings, Tapered Roller	Timken
Crankpin Bearings, Precision Automotive	Babbitt-Lined
Extension (Pony) Rod: Integral with Plungers	316 S.S.
Connecting Rod, Automotive Type	Ductile Iron
Average Crosshead Speed: At 600 rpm At 450 rpm	200 fpm 150 fpm
Minimum Life Expectancy, Main Bearings, L <sub>10</sub>	84,000+hr
Liquid End	
Plunger Size Range, Diameter	1-7/8" thru 7/8"
Maximum Continuous Working Pressure	2,418 psi
Hydrostatic Test	3,750 psi
Discharge Connection Size	1-1/4" NPTF
Suction Connection Size	2" NPTF
Available Liquid End Materials, ASTM: Nickel Aluminum Bronze Stainless Steel Block Stainless Steel Block	B148-C955 2205 Duplex S.S. 316 S.S.

RO-38 ENGINEERING DATA	
Liquid End (Continued)	
Available Plunger Type Rokide® Stainless Steel: Chromium Oxide-Coated	316 S.S.
Stuffing Boxes, Field-Removable and Replaceable: Gland, Stuffing Box	Stainless Steel Nickel Aluminum Bronze
Packing Types Available: Spring-loaded, Cup-Type Spring-loaded, Garlock	Style 120X Style 8921K
Valve Cover and Cylinder Head Plugs	316 S.S.
Retainer Plates, Steel, ASTM	A36
Seals, Stuffing Boxes, Valve Covers, Cylinder Heads	Buna-N
Bolting, High Strength, Heat Treated	Alloy Steel
Available Valve Types: Standard, Acetal Resin Optional, Hardened and Lapped	Delrin® Stainless Steel
Valve Spring Material	Inconel®
Valve Seat, Liquid Passage Areas	1.4 sq. in.
Average Liquid Velocity thru Valves with 1-7/8" Plungers: At 600 Crankshaft rpm At 450 Crankshaft rpm	6.57 fps 4.93 fps
Average Liquid Velocity at 600 rpm: Suction Manifold Discharge Manifold	4.12 fps 10.75 fps
General	
Overall Dimensions: Length Width Height	31-3/4" 20-3/8" 12-3/8"
Approximate Weights: With Nickel Aluminum Bronze Liquid End With Stainless Steel Liquid End	430 lbs. 455 lbs.

<b>RO-64 ENGINEERING DATA</b>	
<b>Power End</b>	
Model Triplex Pump	RO-64
Maximum Input HP at Speed	33 at 550 rpm
Rated Continuous Plunger Load	2,851 lbs.
Stroke	2-1/2"
Maximum Rated Continuous Speed	550 rpm
Normal Continuous Speed Range	150 to 500 rpm
Minimum Speed	100 rpm
Oil Capacity	5 U.S. Quarts
Viscosity, S.S.U. at 210°F	70 to 84
Power End Oiling System	Splash & Scoop
Power Frame, One Piece	Cast Iron
Crosshead, Full Cylindrical	Cast Iron
Crosshead, Diameter x Length	4" x 4-1/2"
Crankshaft	Ductile Iron
Crankshaft Diameters: At Drive Extension At Tapered Roller Bearings At Crankpin Bearings, Diameter x Length	2.500/2.499" 3.35" 2.750" x 2"
Crosshead (Wrist) Pin, Case-Hardened and Ground	AISI 8620
Wrist Pin Bushing, SAE 660, Diameter x Width	1-5/16" x 2"
Main Bearings, Tapered Roller	Timken
Crankpin Bearings, Precision Automotive	Babbitt-Lined
Extension (Pony) Rod: Integral with Plungers, 2-1/4" thru 1-3/8" Separate with Plungers, 1-1/4" thru 3/4"	416 S.S. 416 S.S.
Connecting Rod, Automotive Type	Ductile Iron
Average Crosshead Speed: At 550 rpm	229 fpm
Minimum Life Expectancy, Main Bearings, L <sub>10</sub>	100,000+hr
<b>Liquid End</b>	
Plunger Size Range, Diameter	2-1/4" thru 1"
Maximum Continuous Working Pressure	3,000 psi
Hydrostatic Test	4,500 psi
Discharge Connection Size	1-1/2" NPTF
Suction Connection Size	2-1/2" NPTF
Available Liquid End Materials, ASTM: Nickel Aluminum Bronze Stainless Steel Block	B148-C955 Various Grades

<b>RO-64 ENGINEERING DATA</b>	
<b>Liquid End (Continued)</b>	
Plunger Type Rokide® Stainless Steel: Chromium Oxide-Coated	416 S.S.
Stuffing Boxes, Field-Removable and Replaceable: Stainless Steel, Hardened Carbon Steel	17-4PH 1020
Packing Types Available: Gland-loaded, Nonadjustable Spring-loaded, Cup-Type Spring-loaded, Braided Teflon® & Kevlar® Spring-loaded, Garlock	Style 838 Style 120X Style 140/141 Style 8921K
Valve Cover and Cylinder Head Plugs	416 S.S. or 316 S.S.
Retainer Plates, Steel, ASTM	A536 80-55-06
Seals, Stuffing Boxes, Valve Covers, Cylinder Heads	Buna-N
Bolting, High Strength, Heat Treated	Alloy Steel
Available Valve Types: Standard, Acetal Resin Optional, Hardened and Lapped Double Stem-Guided	Delrin® 17-4PH S.S. 17-4PH S.S.
Valve Spring Material	Inconel®
Valve Seat, Liquid Passage Areas Plate (Disc) Valves, (Delrin® or S.S.) Double Stem-Guided Valve	2.3 sq. in. 1.5 sq. in.
Average Liquid Velocity with 2-1/4" Plungers, Plate Valves: At 550 Crankshaft rpm At 350 Crankshaft rpm	6.6 fps 4.2 fps
Average Liquid Velocity with 2-1/4" Plungers, Stem-Guided Valves: At 550 Crankshaft rpm At 350 Crankshaft rpm	11.2 fps 7.1 fps
Average Liquid Velocity 2-1/4" Plungers at 550 rpm: Suction Manifold Discharge Manifold	4.7 fps 12.8 fps
<b>General</b>	
Overall Dimensions: Length Width Height	36-1/4" 28-1/4" 14-3/4"
Approximate Weights: With Nickel Aluminum Bronze Liquid End With Ductile Iron Liquid End With Forged Steel Liquid End	750 lbs. 730 lbs. 775 lbs.

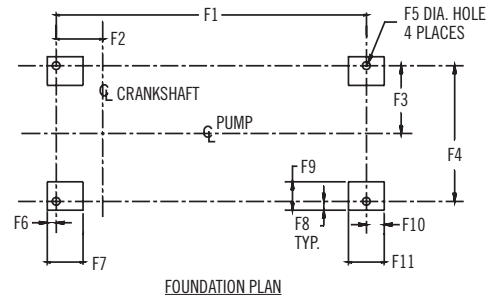
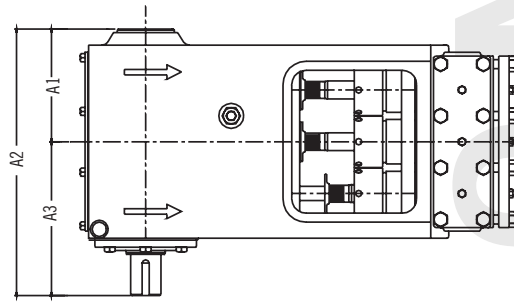
## CROSS-SECTION



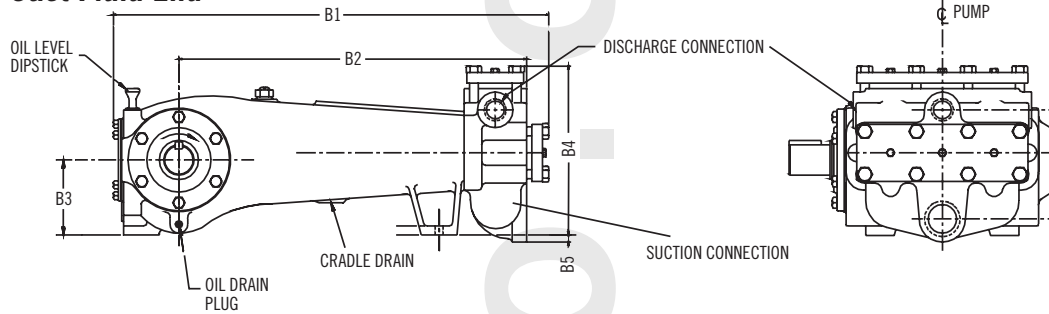
## DIMENSIONAL DATA TABLE

Ref. No.	MA-15M	MA-15H	MA-25L	MA-25M	MA-40L	MA-40M	SC-30	SC-30H	SC-45	SC-45L	SC-45H	SC-65	SC-65L	SC-65H	RO-23	RO-38	RO-64
A1	8-1/4	8-1/4	7-7/8	9-1/4	9-3/4	12	6-9/16	6-9/16	7-7/8	7-7/8	7-7/8	10	9-3/4	10	8-1/4	9-1/4	12
A2	17-1/2	17-1/2	18-5/8	20	25-3/4	28-1/4	15-1/16	15-1/16	18-5/8	18-5/8	18-5/8	26-1/4	25-3/4	26-1/4	17-1/2	20	28-1/4
A3	9-1/4	9-1/4	10-3/4	10-3/4	16	16-1/4	8-1/2	8-1/2	10-3/4	10-3/4	10-3/4	16-1/4	16	16-1/4	9-1/4	10-3/4	16-1/4
B1	25	—	—	31-3/4	—	36-3/4	25	—	30-9/16	—	—	35-1/8	—	—	25	31-3/4	36-3/4
B2	18-1/2	—	—	22-1/4	—	25-5/8	21-3/8	—	24-3/8	—	—	25-5/8	—	—	18-1/2	22-1/4	25-5/8
B3	4	—	—	5-1/4	—	6-1/2	4	—	5-1/4	—	—	—	—	—	4	5-1/4	6-1/2
B4	9-1/8	—	—	11-7/8	—	14-1/4	9-1/8	—	11-7/8	—	—	14-1/4	—	—	9-1/8	11-7/8	14-1/4
B5	1-1/2	—	—	1/2	—	1/4	1-1/2	—	1/2	—	—	1/4	—	—	1-1/2	1/2	1/4
(B) Discharge Connections	1" NPT	—	—	1-1/4" NPTF	—	1-1/2" NPTF	1" NPT	—	1-1/4" NPTF	—	—	1-1/2" NPTF	—	—	1" NPTF	1-1/4" NPTF	1-1/2" NPTF
(B) Suction Connections	2" NPT	—	—	2" NPTF	—	2-1/2" NPTF	2" NPT	—	2" NPTF	—	—	2-1/2" NPTF	—	—	2" NPTF	2" NPTF	2-1/2" NPTF
C1	25	—	30-7/16	—	35-3/4	—	25	—	30-9/16	30-7/16	—	—	35-3/4	—	—	—	—
C2	20-1/8	—	22-3/16	—	25-7/8	—	20-1/8	—	24-3/8	22-3/16	—	—	25-7/8	—	—	—	—
C3	4	—	5-1/4	—	6-1/2	—	4	—	5-1/4	5-1/4	—	—	6-1/2	—	—	—	—
C4	—	—	12-13/16	—	—	—	—	—	11-7/8	12-13/16	—	—	—	—	—	—	—
C5	1-5/8	—	1-3/8	—	2-1/8	—	—	—	5/8	1-3/8	—	—	2-1/8	—	—	—	—
(C) Discharge Connections	1" NPT	—	1-1/2" NPTF	—	2" NPTF	—	1" NPT	—	1-1/4" NPTF	1-1/2" NPTF	—	—	2" NPTF	—	—	—	—
(C) Suction Connections	2" NPT	—	2-1/2" NPTF	—	3" NPTF	—	2" NPT	—	2" NPTF	2-1/2" NPTF	—	—	3" NPTF	—	—	—	—
D1	26-1/8	24-7/8	31-3/4	31-3/4	36-7/8	36-3/4	25	24-7/8	—	31-3/4	29-1/4	35-1/8	—	33-5/8	26-1/8	31-3/4	36-3/4
D2	18-1/2	18-1/2	22-3/16	22-1/4	25-5/8	25-5/8	21-3/8	18-1/2	—	22-3/16	22	25-5/8	—	25-5/8	18-1/2	22-1/4	25-5/8
D3	4	4	5-1/4	5-1/4	6-1/2	6-1/2	4	4	—	5-1/4	5-1/4	—	—	—	4	5-1/4	6-1/2
D4	9-3/8	—	—	7-5/8	10-15/16	8-3/4	—	—	—	—	6-11/16	—	—	7-3/4	—	7-5/8	8-3/4
D5	1-3/8	1-1/2	1-1/4	—	—	—	1-3/8	1-1/2	—	1-1/4	—	1/8	—	2-7/8	1-3/8	—	—
(D) Discharge Connections	1" NPTF	1" NPTF	1-1/2" NPTF	1-1/4" NPTF	2" NPT	1-1/2" NPTF	1" NPTF	1" NPTF	—	1-1/2" NPTF	1" NPTF	1-1/2" NPTF	—	1" NPTF	1" NPTF	1-1/4" NPTF	1-1/2" NPTF
(D) Suction Connections	2" NPTF	2" NPTF	2-1/2" NPTF	2" NPTF	3" NPT	2" NPTF	2" NPTF	2" NPTF	—	2-1/2" NPTF	1-1/2" NPTF	2-1/2" NPTF	—	1-1/2" NPTF	2" NPTF	2" NPTF	2" NPTF
E1	26-1/8	—	—	32-1/4	—	36-3/4	26-1/4	—	—	—	—	—	—	—	26-1/8	32-1/4	36-3/4
E2	18-1/2	—	—	22-1/4	—	25-5/8	18-1/2	—	—	—	—	—	—	—	18-1/2	22-1/4	25-5/8
E3	4	—	—	5-1/4	—	6-1/2	4	—	—	—	—	—	—	—	4	5-1/4	6-1/2
E4	—	—	—	7-5/8	—	8-3/4	—	—	—	—	—	—	—	—	—	7-5/8	8-3/4
E5	2-3/4	—	—	1-7/8	—	1-3/8	2-3/4	—	—	—	—	—	—	—	2-3/4	1-7/8	1-3/8
(E) Discharge Connections	1" ANSI 600# RF	—	—	1-1/4" ANSI 600 RF	—	1-1/2" ANSI 600 RF	1" ANSI 600# RF	—	—	—	—	—	—	—	1" ANSI 600# RF	1-1/4" ANSI 600 RF	1-1/2" ANSI 600 RF
(E) Suction Connections	2" ANSI 150# RF	—	—	2" ANSI 150 RF	—	2-1/2" ANSI 600 RF	2" ANSI 150# RF	—	—	—	—	—	—	—	2" ANSI 150# RF	2" ANSI 150 RF	2-1/2" ANSI 150 RF
F1	17-3/4	17-3/4	21-1/2	21-1/2	24-3/4	24-3/4	17-3/4	17-3/4	21-1/2	21-1/2	21-1/2	24-3/4	24-3/4	24-3/4	17-3/4	21-1/2	24-3/4
F2	2-3/8	2-3/8	3-1/4	3-1/4	4	4	2-3/8	2-3/8	3-1/4	3-1/4	3-1/4	4	4	4	2-3/8	3-1/4	4
F3	3-3/8	3-3/8	4-3/4	4-3/4	6	6	3-3/8	3-3/8	4-3/4	4-3/4	4-3/4	6	6	6	3-3/8	4-3/4	6
F4	6-3/4	6-3/4	9-1/2	9-1/2	12	12	6-3/4	6-3/4	9-1/2	9-1/2	9-1/2	12	12	12	6-3/4	9-1/2	12
F5	9/16	9/16	9/16	9/16	11/16	11/16	9/16	9/16	9/16	9/16	9/16	11/16	11/16	11/16	9/16	9/16	11/16
F6	5/8	5/8	5/8	5/8	3/4	3/4	5/8	5/8	5/8	5/8	5/8	3/4	3/4	3/4	5/8	5/8	3/4
F7	2	2	2-1/2	2-1/2	3	3	2	2	2-1/2	2-1/2	2-1/2	3	3	3	2	2-1/2	3
F8	5/8	5/8	5/8	5/8	3/4	3/4	5/8	5/8	5/8	5/8	5/8	3/4	3/4	3/4	5/8	5/8	3/4
F9	1-3/4	1-3/4	2	2	2	2	1-3/4	1-3/4	2	2	2	2	2	2	1-3/4	2	2
F10	1	1	1-1/4	1-1/4	1-1/2	1-1/2	1	1	1-1/4	1-1/4	1-1/4	1-1/2	1-1/2	1-1/2	1	1-1/4	1-1/2
F11	2	2	2-1/2	2-1/2	3	3	2	2	2-1/2	2-1/2	2-1/2	3	3	3	2	2-1/2	3

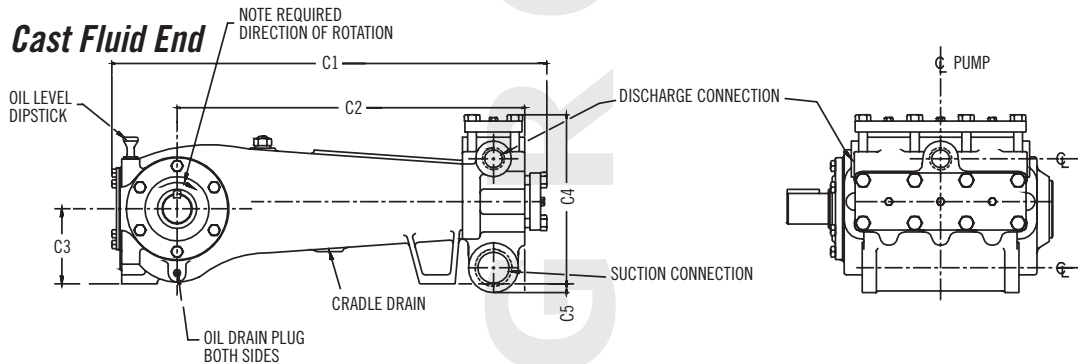
## DIMENSIONAL DRAWINGS



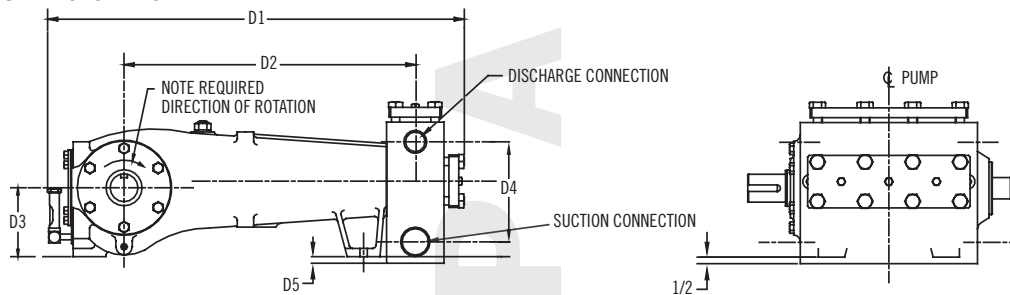
### Cast Fluid End



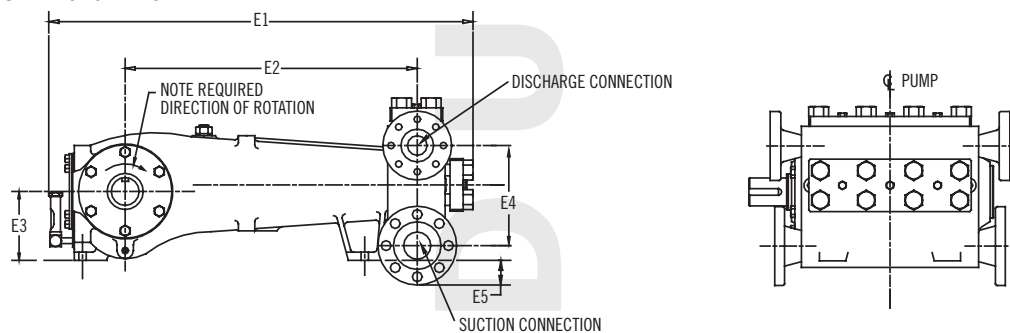
### Cast Fluid End



### Block Fluid End



### Block Fluid End





# INSTALLATION, OPERATION, LUBRICATION, MAINTENANCE AND STORAGE INSTRUCTIONS

## SAFETY

Electrical power or engine must be shut off completely before attempting service on the pump or its drive. Air surrounding the unit to be free of toxic, flammable, or explosive gases.

Tools needed should be planned for in advance (see valve seat pulling instructions), and should be clean and of adequate size. A torque-wrench will be required to tighten connecting rod cap screws.

A properly sized and set relief valve installed in the pump discharge system (ahead of any block valves) is necessary to protect personnel and to avoid dangerous overpressure. The relief valve set pressure should be not more than 25% above the design operating pressure and should discharge to tank or to the atmosphere (toward the ground), and must not be directed back to the pump suction system.

**WARNING:** *Improper use of this equipment could result in loss of life.*

## STORAGE

Pumps are shipped dry from the factory. If a pump has been in storage in a humid environment for more than 6 months the crankcase cover should be removed and carefully examined for rust or water collected in the power end. Flush out any evidence of rust or damage that exists, using a light clean oil.

Pumps to be placed in extended storage should be cleaned, repaired as needed, and completely filled to the top with clean oil to prevent rusting. Rotate pump monthly 4-1/2 revolutions. Plug all openings to prevent air entry and oil leakage.

Fluid ends must be completely drained of water and suction and discharge ports blanked off. Store pump in a clean, dry location.

## PUMP LOCATION AND PIPING DESIGN

Locate pump and driver in a clean, well drained, ventilated, and brightly illuminated area, with adequate working spaces around the pump to provide ample access to fluid end, power end, and associated drive elements. Do not expect good maintenance to result if the pump is positioned on muddy terrain, or in a dirty, cramped, dimly lighted area!

The supply tank(s) should be large to allow dissolved air and other gases to escape from the liquid and allow suspended solids to settle out before entering pump. A system employing dams and settling chambers is desirable.

**CAUTION:** All pumps should be installed level. For mobile applications the maximum angle of intermittent operation pumps (SC pumps) should be no more than 5 degrees in any one direction.

Pumps are not designed to withstand piping weight, vibration, and the effects of thermal piping expansion/contraction. Piping loads may be considerable and the weight of all valving, dampeners, filters, and associated forces, moments, and couples must be completely isolated. Use flexible hoses and rigid piping supports to isolate the pump and its driver from these effects.

## SUCTION PIPING

No part of the piping system deserves more careful planning than the suction piping system. Suction piping must be **SHORT, DIRECT, and OVERSIZE**. Use one pipe size larger than the pump suction connection. The shorter it is, the better! 1 to 3 feet per second suction velocity is acceptable.

Reference the following table to size a direct suction line from a tank to a pump.

Suction Piping		
1.5" – 2"	2" – 2.5"	2.5" – 3"
MA-15H	MA-15M	MA-25L
	MA-25M	MA-40L
	SC-30	MA-40M
	SC-30H	SC-45L
	SC-45	SC-65
	SC-45H	SC-65L
	RO-23	SC-65H
	RO-38	RO-64

Use no elbows, tees, or restricted port valves in this line. Do not install orifice plates or positive displacement type fluid meters in the suction line which act as flow restrictors. Avoid the use of suction filters, if possible. Consider filtering the liquid as it enters the supply tank rather than as it leaves it. The use of an eccentric reducer with the flat side up located at the pump suction connection is recommended. The suction line should slightly rise from tank to pump, and loops in which air may collect must be avoided.

The absolute pressure in a suction line may be less than atmospheric pressure and air may be "sucked" into the line unless all flanges and connections are airtight and watertight. If you can see water leaking out of a suction line when the pump is still, that may mean air is being sucked in when the pump is running.



Suction piping should be buried beneath the frost line, or insulated to avoid freezing in the winter. If the suction line has a block valve at the supply tank, a suitable relief valve is suggested to relieve the suction piping from any possible dangerous overpressure from the discharge piping system.

Suction piping is often large, heavy (especially when filled with liquid), and tends to vibrate. Proper solid supports are recommended. A suction hose located near the pump will isolate these effects, protecting the pump from the forces and moments that piping weight creates.

New suction piping systems should be flushed free of pipe scale, welding slag, and dirt before starting the pump. Hydrostatic testing to detect air leaks is advisable. Proper choice of suction hose construction is essential to avoid collapse of the hose liner.

Install a dry type compound gauge in the suction line near the pumps which should fluctuate evenly. If violently pulsating, this gauge indicates that the pump is not fully primed, or that one or more valves are inoperative.

## ACCELERATION HEAD

A characteristic of all reciprocating pumps is the imperative need to consider the effects of acceleration head which is a **SYSTEM**-related phenomenon. Acceleration head may be considered to be the loss of available hydraulic head (energy) in the piping system occurring because the demand by the pump cylinders for liquid is not smooth and even. Because the pump's demand for liquid is cyclical, the velocity of the liquid in the entire suction system is not truly constant but varies in response to the combined demand of the reciprocating plungers. Thus, liquid in the suction system is compelled to be accelerated and decelerated several times during each crankshaft revolution, depending on the number of plungers. Called "acceleration" head, this loss of available hydraulic head is proportional to:

- (a) The speed (RPM) of the crankshaft
- (b) The average liquid velocity in the piping
- (c) The length of the suction piping
- (d) The number of pumping chambers (triplex, etc.)
- (e) The compressibility of the liquid

Thus, for a given pump, acceleration head effects may be reduced by the use of the shortest possible suction line, sized to reduce liquid velocity to a very low speed. This is often more economical than the use of charge pumps or expensive suction stabilizers.

**NOTE:** Charge pumps should be sized to 150% of rated pump volume. Charge pumps need to be centrifugals, not a positive displacement pump.

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A charging pump is usually not a good substitute for a short, direct, oversize suction line, nor is it a substitute for the computation of available **NPSH**, acceleration head, friction head, vapor pressure and submergence effects duly considered. Required **NPSHR** of Aurora Pump, Apex Series pumps depends on speed, choice of plunger size and valve spring type. Consult Aurora Pump, Apex Series Engineering for help with your particular application. A full discussion of suction system losses is given in the Standards of the Hydraulic Institute, 14th Edition.

A common design mistake is the connecting of two (or more) reciprocating pumps to a **COMMON** suction header. This is a profoundly complicated suction system, largely not amenable to mathematical analysis, and is frequently the cause of severe pump pounding, vibration and early valve failures. Each pump should be fed by its own separate, individual piping system, free from the effects of other pump cyclical demands for liquid.

## DISCHARGE PIPING

A properly designed discharge piping system usually prevents the need of a pulsation dampener. The most common mistakes made in the design of the discharge piping system are:

1. Pumping directly into a tee or header. A "standing" wave (either audible or subaudible) then often occurs. If flow must enter a header, use a 45° branch lateral (or equivalent) to avoid a reflecting surface from which sound can reflect.
2. Pumping into short radius 90° elbows. Instead, use two 45° elbows spaced 10 or more pipe diameters apart.
3. Pumping into a right angle choke valve.
4. Pumping into too small piping line size. Piping should be sized to keep fluid velocity below 15 feet per second, max.
5. Pumping through an orifice plate, small venturi, or reduced port "regular opening" valve.
6. Pumping through a quick closing valve, which can cause hydraulic shock (water-hammer).

A good discharge piping system includes:

1. A properly sized, correctly set relief valve. Discharge from relief valve returned to tank (not to pump suction).
2. A full opening discharge gate or ball valve. Avoid restricting plug valves, globe valves and angle valves.
3. A pressure gauge with gauge dampener or snubber. Consider a liquid filled gauge. (Scale range to be double the normal pump operating pressure.)

Locate the relief valve and pressure gauge ahead of any block valve and so that the pressure in the pump is always reflected at the relief valve. The relieving capacity of the relief valve must exceed the capacity of the pump to avoid excessive pressure while relieving. Use a full size relief line.

To minimize vibration (whether hydraulic or mechanical), discharge lines should be kept short, direct, well supported and solidly anchored. Avoid “dead” ends and abrupt direction changes.

## BYPASS PIPING

Some designers ignore this important aspect of proper design of pump piping systems.

A reciprocating pump, especially after maintenance of the valves or plungers, **STARTS WITH ONE OR MORE FLUID CHAMBERS FULL OF AIR**. Pumps operating on propane, butane, or other volatile liquids **START WITH VAPOR IN THE FLUID CHAMBER(S)**.

Positive displacement pumps do not automatically purge themselves of air and gas after shutdown. For example, a quintuplex plunger pump will, after servicing, expel the air in four of the five pump chambers. Thus, the pressure from four of the “active” cylinders will keep shut the discharge valve of the “inactive”, or “air bound,” cylinder. Then, the air or gas in this cylinder will be compressed and expanded by its reciprocating plunger and never leave the chamber. Similar effects occur in duplex and triplex pumps.

To overcome these difficulties, adequate provision for expelling the gas in the “air bound” cylinders must be present. Common practice is to totally relieve the pump of all discharge pressure during the start-up, after servicing.

Consider the operational advantage of a full-sized bypass line (return to tank) which substantially removes discharge pressure from all cylinders during the start. This requires a block valve on the discharge side and a full opening bypass valve on the other side.

For economy, the bypass (to tank) can be combined with the relief valve discharge line. This line must be full-sized, well supported, and sloped downward to avoid freezing in cold weather. (A frozen relief valve line provides **NO** protection to either the pump or operating personnel!)

The ability of a reciprocating pump to be “self-priming” depends on the ratio of the swept (displaced) volume in the cylinder to the unswept (clearance) volume at the end of the stroke. This depends on the design of the fluid end and on the plunger size selected.

Choice of the largest size plunger for a particular fluid end improves this compression ratio and so

leads to “self priming”, or easy priming. Choice of the minimum size plunger sometimes leads to difficulties, especially with pumps that require frequent servicing, or which handle volatile liquids, or which contain substantial amounts of dissolved air or gas. An automatic bypass and purging system for these applications may be merited.

## LUBRICATION

Aurora Pump, Apex Series pumps use S.A.E. 40 wt. nondetergent oil in the crankcase. This oil requires only a nonfoaming additive and should possess good water separation (antiemulsion) characteristics. Such oils are often labeled “industrial” or “turbine” quality lubricants. If these oils are not available, a good quality gear oil or EP oil may be substituted. See lubrication guidelines.

In temperate climates, oil viscosity selected should fall between 70 and 84 seconds Saybolt viscosimeter at 210° F. In arctic service, low pour point oils are needed.

After the first 500 hours of operation in a new pump, drain the oil. Refill with clean, fresh oil. Thereafter, change the oil every 1,500 hours or sooner if it becomes contaminated with water or dirt. Fill to the center of the sight gauge. Recheck after starting, adding oil to center of gauge while running.

The table below shows the quarts of oil needed for each pump.

Quarts of Oil		
2	5	8
MA-15M	MA-25L	MA-40L
MA-15H	MA-25M	MA-40M
SC-30	SC-45	SC-65
SC-30H	SC-45L	SC-65L
RO-23	SC-45H	SC-65H
	RO-38	RO-64

## V-BELT DRIVE

A properly designed, well-aligned V-belt will provide years of reliable, economical service if properly tensioned and kept dry, free of oil and ventilated.

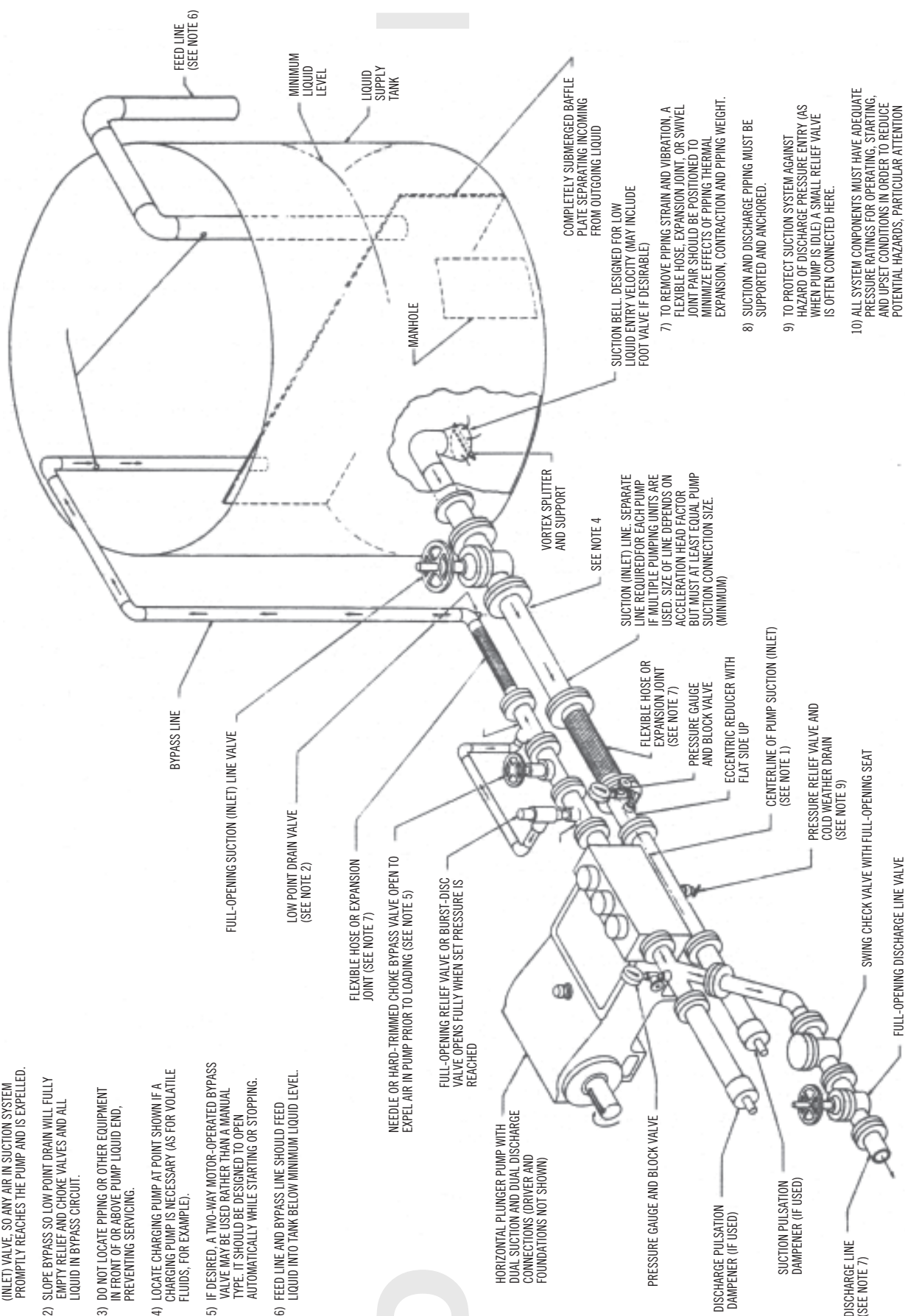
Alignment is critical for long life. If the shaft axes are not truly parallel, or if the sheave grooves are not positioned in good alignment, some belts will carry most of the load, resulting in their disproportionate load share and may actually twist or turn over in the groove. Use a straight edge across the rim of the sheaves to detect and correct for misalignment.

After about one week of operation, new V-belts will have stretched somewhat. The motor must be moved on its slide base to re-establish proper belt tensioning.

## SUGGESTED PIPING SYSTEM FOR PLUNGER PUMPS

### NOTES

- 1) CENTERLINE OF PUMP SUCTION (INLET) TO BE SLIGHTLY HIGHER THAN CENTERLINE OF SUCTION (INLET) VALVE, SO ANY AIR IN SUCTION SYSTEM PROMPTLY REACHES THE PUMP AND IS EXPELLED.
- 2) SLOPE BYPASS SO LOW POINT DRAIN WILL FULLY EMPTY RELIEF AND CHOKES VALVES AND ALL LIQUID IN BYPASS CIRCUIT.
- 3) DO NOT LOCATE PIPING OR OTHER EQUIPMENT IN FRONT OF OR ABOVE PUMP LIQUID END, PREVENTING SERVICING.
- 4) LOCATE CHARGING PUMP AT POINT SHOWN IF A CHARGING PUMP IS NECESSARY (AS FOR VOLATILE FLUIDS, FOR EXAMPLE).
- 5) IF DESIRED, A TWO-WAY MOTOR-OPERATED BYPASS VALVE MAY BE USED RATHER THAN A MANUAL TYPE. IT SHOULD BE DESIGNED TO OPEN AUTOMATICALLY WHILE STARTING OR STOPPING.
- 6) FEED LINE AND BYPASS LINE SHOULD FEED LIQUID INTO TANK BELOW MINIMUM LIQUID LEVEL.



- 7) TO REMOVE PIPING STRAIN AND VIBRATION, A FLEXIBLE HOSE, EXPANSION JOINT, OR SWIVEL JOINT PAIR SHOULD BE POSITIONED TO MINIMIZE EFFECTS OF PIPING THERMAL EXPANSION, CONTRACTION AND PIPING WEIGHT.
- 8) SUCTION AND DISCHARGE PIPING MUST BE SUPPORTED AND ANCHORED.
- 9) TO PROTECT SUCTION SYSTEM AGAINST HAZARD OF DISCHARGE PRESSURE ENTRY (AS WHEN PUMP IS IDLE) A SMALL RELIEF VALVE IS OFTEN CONNECTED HERE.
- 10) ALL SYSTEM COMPONENTS MUST HAVE ADEQUATE PRESSURE RATINGS FOR OPERATING, STARTING, AND UPSET CONDITIONS IN ORDER TO REDUCE POTENTIAL HAZARDS. PARTICULAR ATTENTION IS RECOMMENDED FOR THE SURGE CONDITION THAT WILL RESULT DOWNSTREAM OF THE RELIEF VALVE WHEN NORMAL DISCHARGE IS BLOCKED.

Insufficient tension results in slippage, burning, squealing (especially during starting) and shortened belt life. Overtightening imposes excessive loads on pump and motor bearings and can cause early shaft fatigue failure.

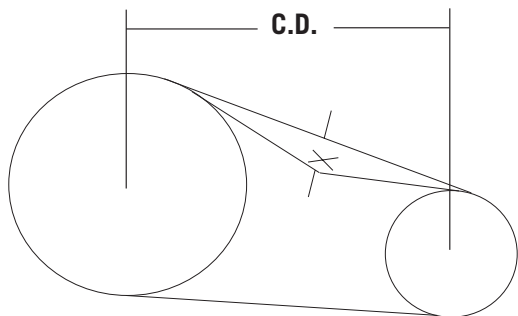
Use the following table in adjusting V-belt tension:

Belt	Tension at Mid-Span	
Cross-Section	New Belts	Used Belts
"B"	5 – 6 lb.	3-1/4 – 5 lb.
"C"	9-3/4 – 13 lb.	6-1/2 – 9-3/4 lb.
"3V"	4 – 10 lb.	3 – 7-1/2 lb.
"5V"	17 – 30 lb.	13 – 23 lb.

Applying the above forces with a small spring scale, adjust motor position to provide the following deflection at mid-span:

Approx. Center Distance (Span), inches	Deflection, inches
16	1/4
22	3/8
28	7/16
32	1/2
40	5/8
48	3/4
60	15/16

Belts must be matched in pitch length. If one or two belts are slack, when the others are correctly tensioned, investigate for possible reasons. Correct any misalignment or lack of matching so each belt will transmit its load share.



Sheaves must be balanced to prevent abnormal vibration. Balancing weights must **NOT** be removed. Type "QD" sheaves must be evenly tightened on their tapered hubs to avoid rim wobble and severe lateral vibration. V-belts that snap and jerk will produce abnormal vibration and loads on both pump and motor or engine.

Run the pump several minutes at full load with belt guard removed, observing for uneven motion on the belt slack side, especially.

When an old V-belt drive becomes unserviceable, replace **ALL** belts, not just the broken or cracked belts. Do not operate belts on sheaves having worn, rusted,

greasy or broken grooves. Shut off power to driver before servicing drive or pump.

**WARNING:** Do not operate without appropriate guards in place.

## DIRECTION OF ROTATION

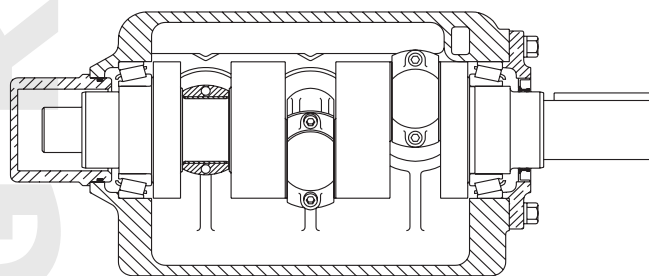
Before placing pump in operation, check that crankshaft rotation agrees with the arrows cast on top of the power frame by briefly jogging the electric motor. Crankshaft rotation must be clockwise as viewed from the right side of pump.

If pump is gear driven, remember that the pinion shaft turns opposite the crankshaft, if using a single-reduction geared drive or in the same direction as the crankshaft when using a planetary gear.

## AUTOMATIC (SAFETY) SHUTDOWNS

Carefully check all electric shutdown devices present, such as crankcase oil level, discharge pressure, vibration, lubricator oil level, motor thermostat, etc.

## CRANKSHAFT ASSEMBLY



## GENERAL

Aurora Pump, Apex Series crankshaft suspension uses two single-row tapered bearings, which are shim adjusted to provide the correct running clearance.

Thorough cleaning of all components prior to assembly is essential.

Power frame, shaft, bearings and retainer **MUST** be scrupulously scrubbed with clean solvent (such as kerosene) before starting. Remove any oil, dirt, rust and foreign matter which might prevent the correct fit up.

Crankshaft journals are critical. Remove all burrs, rust spots, and nicks, paying special attention to the ground areas on which bearings and oil seals operate.

## TAPERED ROLLER BEARINGS

Shaft and frame tolerances provide a tight (shrink) fit on the shaft and in the carrier. The best way to install the cone assembly (consists of the inner race, cage



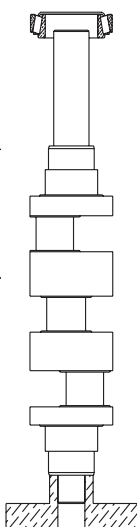
and rollers) on the shaft is to heat the cone assembly in an electric oven for 30 minutes at 300 to 400°F. No more! (**DO NOT** heat bearings with an acetylene torch. This ruins the bearings!) Using clean, insulated gloves, remove the hot cone assembly from the oven, promptly dropping it on to the shaft.

The cone assembly **MUST** contact the seat thrust face (not be cocked), and the large end of the rollers **MUST** be down. Do not hammer on the bearing. The soft steel cage is easily distorted, ruining its function as a roller separator and guide against skewing. If the cone does not contact its thrust face properly, it must be pressed into place using a specially machined sleeve (which does not touch the soft steel cage). A hydraulic press is recommended if this difficulty arises.

## INSTALLING CRANKSHAFT

### GENERAL

Stand the power frame casting on the floor or on a bench with the fluid end face down and crankshaft end up. Insert one bearing cup in the left frame cup bore and shoulder it against the bearing retainer with rubber mallet. Pass the crankshaft through the right frame bore and against the installed cup until the bearing cone seats into the left bearing cup. Insert a second bearing cup over the right-hand crankshaft journal. Install O-ring on the crankshaft extension guard. Tap the guard over the crankshaft extension if an auxiliary drive is not being used.



### SHIM ADJUSTMENT OF TAPERED ROLLER BEARINGS

To provide for crankshaft thermal expansion, sufficient shims (located beneath bearing retainer flange) must be installed to provide .005" to .015" lateral end play, when shaft is cold.

Separate the shims set (which consists of two .020", three .007", and three .005" thick shims). Select one .020" shim and the bearing retainer and position them over the bearing retainer.

Insert two of six hex head cap screws 180° apart and tighten alternately until the bearing cup is seated. Place a magnetic base indicator on the exposed end of the crankshaft with indicator spindle against the side of power frame. Move crankshaft laterally with a pry bar first left and then right observing movement indicated in each direction. The lateral end play should be only .005" to .015". Remove the bearing retainer and add shims as needed. Repeat the procedure above until

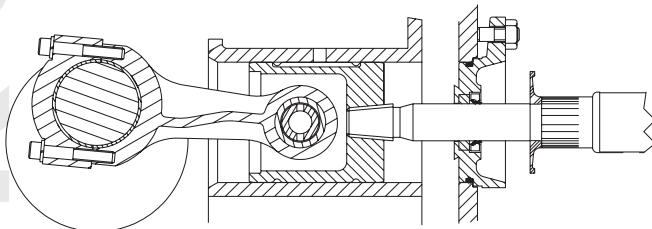
the proper end play tolerance is obtained. Install the remaining four cap screws.

Tightening Torque for Tapered Bearings		
3/8-16-24-30 Ft.-Lb.	1/2-13 59-72 Ft.-Lb.	
MA-15M	MA-25L	SC-45H
MA-15H	MA-25M	SC-65
SC-30	MA-40L	SC-65L
SC-30H	MA-40M	SC-65H
RO-23	SC-45	RO-38
	SC-45L	RO-64

### INSTALLATION OF CRANKSHAFT OIL SEAL

Insert oil seal over the end of crankshaft and position it into the oil seal bore in the power frame or bearing retainer. Using a rubber mallet, tap it into the bore until the face of the seal is flush with the power frame or bearing retainer.

## CONNECTING ROD, CROSSHEAD AND CROSSHEAD PIN ASSEMBLY:



### GENERAL

Aurora Pump, Aplex Series connecting rod assemblies employ precision automotive type steel-backed, babbitt-lined crankpin bearing halves which require no shims for clearance adjustment. This pump employs full-circle (piston type) crossheads.

Plungers are provided with a knurled wrenching area to permit tightening of the tapered thread into the crosshead, establishing accurate alignment while affording easy field installation.

Before beginning the assembly all parts must be scrupulously cleaned, removing all oil, dirt, rust, and foreign matter which prevent proper fitting, or which might tend to score the rubbing surfaces. Clean and examine the power frame bores for scoring and abnormal wear, especially wear of the lower crosshead guide way. Hone smooth, if rough.

Measure the bores of the frame using inside micrometers to determine abnormal frame wear if any.

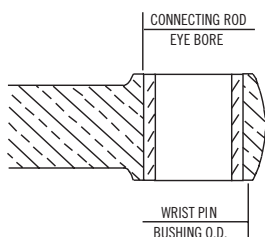
Crosshead O.D.: 2.622/2.619 New Frame Bores: 2.625/2.628	Crosshead O.D.: 3.243/3.246 New Frame Bores: 3.253/3.250	Crosshead O.D.: 3.996/3.993 New Frame Bores: 4.000/4.004
MA-15M	MA-25M	MA-40L
MA-15H	MA-25L	MA-40M
SC-30	SC-45	SC-65
SC-30H	SC-45L	SC-65H
RO-23	SC-45H	SC-65L
	RO-38	RO-64

Frame bores which have become worn more than 0.015" must be sleeved with a cast iron liner to reestablish correct geometry and alignment. Contact Aurora pump, Apex series concerning badly worn frame bores.

Smooth any rough corners and edges on the crosshead skirts, using fine emery cloth. Examine and clean the female tapered threads and wrist pin holes.

## INSTALLING WRIST PIN BUSHINGS

The wrist pin bushing is precision machined bearing bronze which is press fitted into the eye of the connecting rod.



Bushing O.D.: 1.0625/1.0645 Connecting Rod Eye Bore: 1.0625/1.0635	Bushing O.D.: 1.378/1.377 Connecting Rod Eye Bore: 1.3750/1.3760	Bushing O.D.: 1.6280/1.6270 Connecting Rod Eye Bore: 1.6250/1.6260
MA-15M	MA-25M	MA-40L
MA-15H	MA-25H	MA-40M
SC-30	SC-45	SC-65
SC-30H	SC-45L	SC-65L
RO-23	SC-45H	SC-65H
	RO-38	RO-64

Carefully align the bushing with its hole, and after applying oil to bushing O.D. use a hydraulic press to force it home. When a bronze bushing is pressed into place, the I.D. (bore) of the bushing is reduced somewhat, owing to the extent of press fit. Therefore, a clean, new wrist pin should be inserted into the bushing bore to establish that running clearance has been obtained. The running clearance between the wrist pin and installed bushing is:

New Pin O.D.: 0.8140/0.8135 Installed Bushing Bore: 0.8145/0.8150	New Pin O.D.: 1.0640/1.0635 Installed Bushing Bore: 1.0645/1.0650	New Pin O.D.: 1.3140/1.3135 Installed Bushing Bore: 1.3145/1.3155
MA-15M	MA-25L	MA-40L
MA-15H	MA-25M	MA-40M
SC-30	SC-45	SC-65
SC-30H	SC-45L	SC-65L
RO-23	SC-45H	SC-65H
	RO-38	RO-64

Oil Clearance .....0005/.0015"

Replacement bushings are furnished prebored by Aurora Pump, Apex Series which usually eliminates the need to ream the installed bushing bore. However, due to slight variations in finishes and tolerances it sometimes happens that more than predicted contraction of the I.D. occurs. This occurrence results in a slight interference which may be eliminated by lightly honing the bore of the bronze. (**NOT** by reducing the pin size!) An automotive engine repair shop usually is equipped with power honing machines capable of smoothly finishing the bushing bore. Bore of bushing must be round and free of taper.

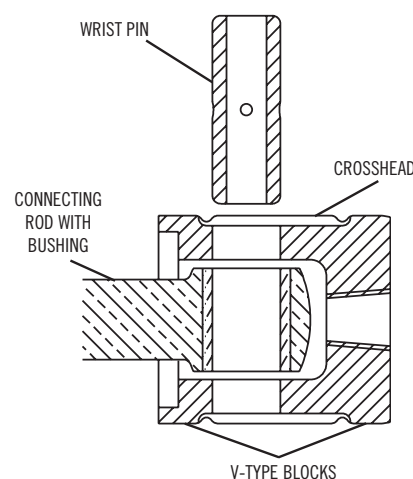
## PINNING THE CROSSHEAD

A pressfit is employed between the crosshead pin and crosshead to secure the pin against any motion. A hydraulic press is employed to force the pin through the bosses of the crosshead.

A mishap during insertion can occur causing the ruin of the pin or the crosshead, if during application of pressure:

- Pin is not aligned absolutely square with the crosshead.
- Crosshead is not supported on v-blocks so it can roll while under load.
- Connecting rod is not fully supported so pin cannot enter the bushing without damage to it. This will damage the bushing.
- Failure to oil pin O.D. and crosshead bores, to prevent galling. Use clean motor oil.

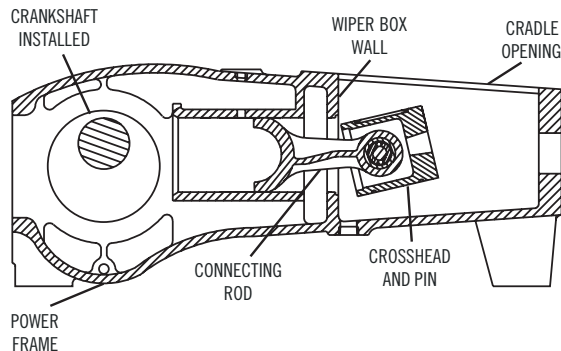
After installing the pin, carefully check the crosshead O.D. to see if it is out-of-round. If so, a smart blow with



a rubber mallet will restore the crosshead O.D. into its original roundness.

## ORDER OF ASSEMBLY

The connecting rod/crosshead assembly is installed **AFTER** the assembly of the crankshaft. The rod and crosshead will pass through the wiper box wall bore. With the frame in the horizontal position, load the rods through the cradle.

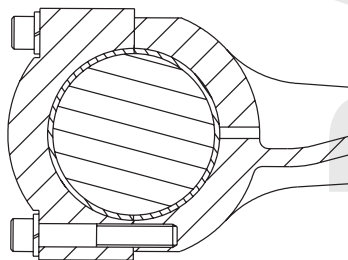


## PRECISION CRANKPIN (CRANKTHROW) BEARINGS

Aurora Pump, Aplex Series pump crankpin bearings require no shimming to establish correct running clearance. Precise machining of the connecting rod, caps and crankpin journals is necessary to achieve this convenience.

New Crankpin O.D.: 1.750/1.749	New Crankpin O.D.: 2.250/2.249	New Crankpin O.D.: 2.749/2.748
New Connecting Rod Bore: 1.8944/1.8954	New Connecting Rod Bore: 2.3944/2.3955	New Connecting Rod Bore: 2.941/2.942
MA-15M	MA-25L	MA-40L
MA-15H	MA-25M	MA-40M
SC-30	SC-45	SC-115
SC-30H	SC-45L	SC-115L
RO-23	SC-45h	SC-115H
	RO-38	RO-64

Crankpins that are worn out-of-round, tapered, or badly scored should either be discarded or perhaps salvaged by grinding undersize, hard chrome-plated, and finish ground to above diameter.



Connecting rod/cap bore must be perfectly round and within above sizes and free of taper. Discard if elliptical or tapered as the result of abnormal heating. Each cap and rod is match-marked for correct identification. Take care that each cap is reinstalled properly with its companion rod. Bearing halves are identical and are prevented from rotating by tongues which fit into slots in the cap.

Check that all oil holes are clean and fully open. **GRIT** is the greatest enemy of bearings, however precisely manufactured. Hence, all surfaces must be perfectly clean and lightly oiled prior to assembly. Remove any burrs or sharp corners which prevent the perfect fitting of these precision bearings. Using a torque wrench, tighten cap bolts as follows:

Thread Size: 1/4" – 20UNC Tightening Torque: 11 Ft. Lb.	Thread Size: 5/16" – 18 UNC Tightening Torque: 19 Ft. Lb.	Thread Size: 3/8" – 16UNC Tightening Torque: 26 Ft. Lb.
SC-30	SC-45	SC-65
SC-30H	SC-45H	SC-65H
RO-23	SC-45L	SC-65L
MA-15M	RO-38	RO-64
MA-15H	MA-25M	MA-40M
	MA-25L	MA-40L

Specified torque, applied to clean, well oiled threads and bearing faces, will create tensile stresses in the cap bolts from 90,000 to 110,000 psi, approx. and will provide correct initial tension. Aurora Pump, Aplex Series pumps use high strength cap bolts suitable for these initial loadings, maintained by hardened spring lockwashers.

After all rods and caps are secured, slowly turn the crankshaft to be sure no bearing is in a bind.

Using a flashlight, examine the location of each connecting rod (eye end) within its crosshead. Rods must not touch any crosshead boss or skirt.

## WIPER BOX ASSEMBLY

### GENERAL

Extension rod wiper boxes (sometimes referred to as the diaphragm stuffing box, or stripper housing assembly) serve two important functions: retention of crankcase oil in the power end and exclusion of dirt and water.

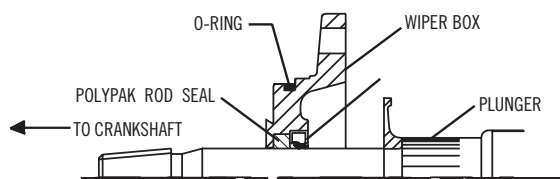
Aurora Pump, Aplex Series has developed a unique sealing set which operates on a hardened and ground stainless steel extension rod (often called "pony" rod), and a rubber baffle disc affording protection against leaking plunger packing. The seals require no adjustment, only correct and careful assembly.

### "POLY PAK" SEAL

This seal keeps oil from leaking out of the power frame. Developed by the Parker Seal Group, this patented rod seal employs a soft nitrile rubber O-ring to energize a special hard polyurethane Molythane® shell by forcing the inner lip against the rod and the outer lip against the housing bore, as shown.

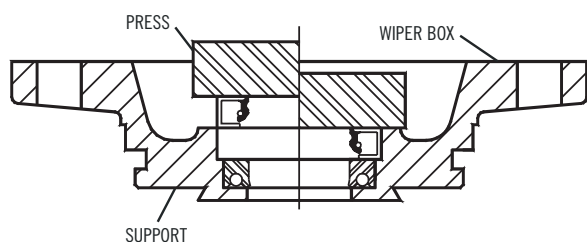


The Poly Pak seal is inserted into its counter bore with its lips directed toward the oil in the crankcase. (Will **NOT** work if installed backward!)



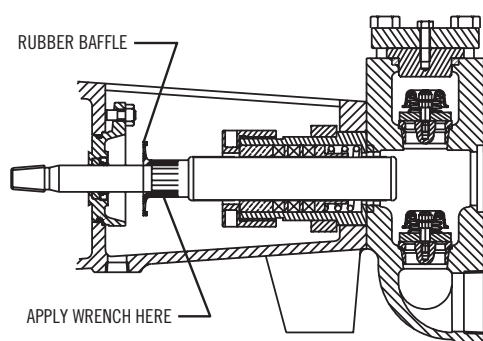
## MECHANICAL OIL SEAL

The oil seal is to keep contamination out of the power frame. With the box positioned in a hydraulic press, install the backup seal against the Poly Pak seal, with the lips of both seals facing downward.



The mechanical seal contains a garter spring. Check to see that this spring is still properly located and in its position. The mechanical seal has a metal case which serves to force the Poly Pak seal into its cavity, energizing its lips. Apply oil lightly to the bore of the box before pressing each seal into its counterbore.

## INSERTING THE PLUNGER



Insert the integral extension rod plunger through the fluid end and through the stuffing box. Insert the extension rod through the wiper seals with the tapered thread and entering **FIRST**. Next, install rubber baffle plate by oiling the extension rod portion of the plunger. This baffle plate seats into a reduced diameter next to the knurled shoulder. Care should be used in moving the male tapered thread through wiper seals to prevent dislocating the garter spring or damaging seal lips.

Fasten the wiper box to the power frame by evenly tightening the two nuts on the wiper box studs. Oil leakage between frame face and wiper box is prevented by an O-ring on the O.D. of the wiper box.

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[www.dupagro.com](http://www.dupagro.com)

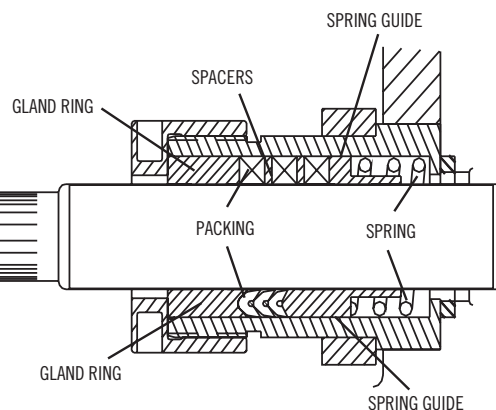
With extension rod inserted through the wiper box seals, thread the tapered threads (must be clean!) into the tapered crosshead female threads. Firmly tighten, applying wrench to the knurled area only. Never damage the extension rod ground surfaces!

## STUFFING BOX, PACKING AND PLUNGER ASSEMBLIES

### GENERAL

Aurora Pump, Apex Series pumps all feature field removable and replaceable stuffing boxes. The SC-45 has integral extension rods. The plungers may be removed separately (without box removal) to facilitate repacking. The integral extension rod type plunger may be removed by removing the cylinder head plug and retainer plate allowing the plunger to be removed through the fluid end, after unscrewing it from the crosshead. It is not necessary to disturb the fluid end or piping.

### SPRING LOADED PACKING



Note that the gland is screwed tightly onto the box and contacts its face. The spring is providing all of the initial compression and adjustment. No adjustment is provided by the gland.

Since the force exerted by the spring is contingent on the space provided for it, the correct lengths of all rings are essential for good tensioning.

#### Spring:

A stiff Inconel® spring, which closely fits the bore of the stuffing box, is used in this assembly. This spring is compressed in a vise to the operating length required plus 0.25" and tied with waxed nylon spot tie cord. The cord is looped over the ends of the spring through the coils and tied to maintain the length mentioned above. Each spring is assembled into the stuffing box. Note that the spring does not contact the plunger.

### **Spring-Guide Ring:**

Plungers are heavy and the importance of a well-fitted guide ring that carries this weight is often overlooked. Discard any guide ring that becomes worn or scored, as it will then not serve its purpose. It should fit snugly in the box. Apply oil generously to this ring.

### **Spring Loaded Packing:**

Three (3) rings of chevron or compression packing are installed next. For compression packing, install them with the skive intersections 180° apart to discourage leaking.

### **Gland Ring:**

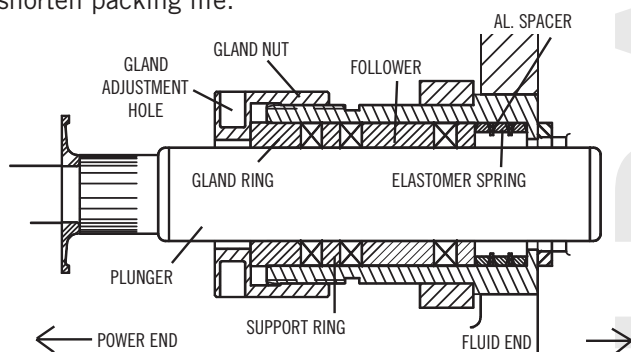
This ring also fits the plunger and helps support the plunger weight. Discard it if bore is worn, rough or out-of-round. Lightly oil the ring before insertion.

## ***HI/LO GLAND ADJUSTABLE PACKING***

The Aurora Pump, Aplex Series Hi/Lo adjustable packing was designed to provide sealing of the plunger in either high or low pressure operation. The packing is nonlubricated and user adjustable.

If packing begins to wear and leak (liquid running out of the cradle drain hole), the gland can be tightened. Tightening will increase packing preload and will control leakage. Adjustments (with the pump running) should be in 1/2 to 1/6 of a turn of the gland nut. There are 6 gland adjustment holes on the nut so 1/2 to 1 hole rotation will be desirable.

When a bentonite slurry is being pumped, it is normal for a putty like material to collect at the packing plunger interface. This is nothing more than bentonite with most of the water evaporated. As this material begins to collect this is the first sign that the packing could be adjusted. Overtightening will unnecessarily shorten packing life.



The Hi/Lo packing is totally retrofitable to existing Aurora Pump, Aplex Series pump. Use the drawing for proper reassembly order.

Initial gland tightening should be 2 to 2-1/4 turns past hand tight. If there is a grease fitting in the stuffing box, remove it. Use a 1/8" pipe plug and plug the hole.

**CAUTION:** Make sure the plug does not protrude down into the I.D. of the stuffing box. If the plug is too long, grind off the end and try again.

## ***INSERTING THE PLUNGER***

Apply oil liberally to plunger O.D. and lightly tap it through the packing. When introducing the plunger through the SC-45 stuffing boxes, also apply oil liberally to the O.D. of each integral extension rod to allow easy passage through the wiper box seals.

A soft rubber mallet is recommended to avoid any damage to the plunger face or its threads. Remember: The fragile nature of packing rings and plunger surfaces deserves your respect and avoidance of careless damage to these key elements!

## ***INSTALLING THE GLAND***

Considerable downward pressure on the gland is required to compress the spring, to move the packing into location, and to start the threads of the box.

Once the gland threads are started, screw it down completely until it makes up tightly against the face of the box, for spring loaded packing. For Hi/Lo, J-Style or Gland adjusted packing, tighten the gland until it is seated firmly against the packing.

## ***INSTALLING THE STUFFING BOX***

Aurora Pump, Aplex Series stuffing boxes derive their alignment from the bores of the power frame and the faces of the fluid end. So these surfaces **MUST** be cleaned of rust, scale, and dirt before assembly is begun. Wash all contacting surfaces with clean solvent and dry with a **CLEAN** shop towel.

A nitrile rubber seal is used to seal between the face of the fluid end (must be flat, clean and smooth) and the face of the box. Replace if damaged.

The fluid end is retained on the power end by two socket head cap screws. No dowel pins or other alignment techniques are needed since the power frame provides alignment to the stuffing boxes individually. These two screws should be tightened before the stuffing boxes.

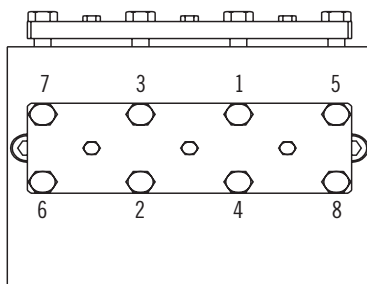
The torque value for each pump should be as follows:

Stud Threads			
5/8" – 11UNC at 100 Ft. Lb.	3/4" – 11UNC at 100 Ft. Lb.	7/8" – 9UNC at 250 Ft. Lb.	3/4" – 11UNC at 160 Ft. Lb.
SC-30	SC-45	SC-65	MA-25M
SC-30H	SC-45H	SC-65H	MA-25L
RO-23	SC-45L	SC-65L	
MA-15M		RO-38	
MA-15H		RO-64	
		MA-40M	
		MA-40L	

All stuffing boxes are retained by large bolts which extend through the liquid end, serving to clamp the box tightly against the fluid end face.

Using a socket extension and torque wrench, tighten clean, well-oiled threads and nut faces as follows:

Long Screws Stuffing Box			
5/8" – 11UNC at 100 Ft. Lb.	1/2" – 11UNC at 50 Ft. Lb.	3/4" – 10UNC at 175 Ft. Lb.	3/4" – 10UNC at 160 Ft. Lb.
MA-25L	RO-23	MA-40M	MA-40L
MA-25M	MA-15M	RO-38	
	MA-15H	RO-64	



Failure to fully and evenly tighten these studs (or cap screws) can lead to early failure, plunger misalignment and failure, and short packing life. Retighten after 500 hours of operation.

## CONNECTING THE PLUNGER

Install the rubber baffle on to the integral extension rod, sliding it against the knurled shoulder of the plunger. Roll the pump crankshaft slowly until the plunger male threads touch the mating female threads in the crosshead.

Applying a pipe wrench to plunger knurled area, thoroughly tighten the connection. Do **NOT** use a “cheater” when connecting plunger to extension rod. (Serves no useful purpose, and may damage the connection!)

## PACKING

Packing life for aramid fiber packing may be improved in some applications by regular, systematic lubrication. An optional force feed lubricator assembly is often recommended especially for pumps on continuous

duty. This provides regular, controlled supply of lubricant lowering friction and heat.

Additionally, the regular application of the correct lubricant aids dissolving of salt and gyp tending to build up on the plungers in produced water applications. For this service, Rock Drill Lubricant is a popular and effective packing lubricant.

Plungers in CO<sub>2</sub>, ethane, or other very cold liquid services may use brake fluid. This fluid does not congeal into a solid which cannot enter the packing. Consider the use of an air-sealed cradle into which dry (instrument) air may be directed, excluding the moisture which causes plunger icing especially in very humid conditions.

Packing lubricant for pumps on light hydrocarbons, hot water, lean oil, naphtha, or gasoline often requires experimentation.

A good start is to use steam cylinder oil. Castor oil is sometimes successful as a packing lubrication for liquid propane and butane services, at ambient temperature.

In pumps placed in arctic service, a special low pour point oil is indicated.

Packing lubrication is not permitted on some services, such as amine, foodstuffs, etc., and other packing styles and materials may be required.

## PLUNGERS

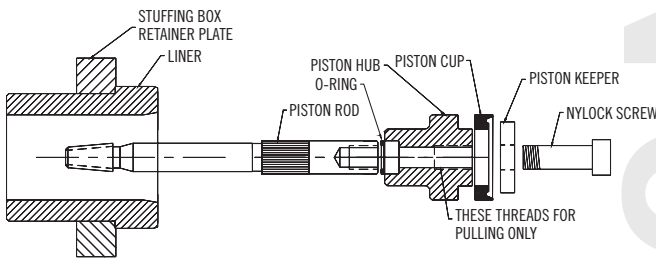
Aurora Pump, Apex Series offers its own unique product: the Aurora Pump, Apex Series Rokide® plunger. This premier quality plunger consists of a chromium-oxide deposition on a solid stainless steel body.

Ordinary handling will not damage this fine product. Avoid striking the coated surface (black) during installation. Apply light forces only on the ends of the plunger. Do not hammer or pry.

All threads on Aurora Pump, Apex Series plungers must be **CLEAN** and oiled before assembly. Stainless steel (although very corrosion resistant) has a tendency to gall and seize. To avoid this, an anti-seizing lubricant is well worth its use. Apply oil to the threads.

Aurora Pump, Apex Series can supply solid ceramic plungers on order. This plunger is very fragile, vulnerable to thermal and mechanical shock, and must be handled with the greatest care. Use only a rubber mallet to insert it into the packing. Other plunger types are available upon request.

## CONVERTING PLUNGER TO PISTON



### DISASSEMBLY:

1. Remove the 8 cap screws and the cylinder head retaining plate from the front of the liquid end.
2. Unscrew the 3 glands from the stuffing boxes and remove. Unscrew the 3 plungers from the crossheads and work them gently through the wiper box seals and plunger packing. Pull them out the front of the pump.
3. Pull the stuffing box retainer plate to the back of the cradle, and remove the 3 stuffing boxes.

### REASSEMBLY:

1. Install the 3 liners in place of the stuffing boxes.
2. Pull the stuffing box retainer plate over the 3 liners.
3. Snap the piston cup over the piston hub. Assemble the piston rod, O-ring, piston assembly, piston keeper and nylock socket head cap screw (12mm hex) together.
4. Insert the entire piston assembly through the liquid end, liner and wiper box and screw into the crosshead. Once it is assembled you can tighten the nylock screw into the piston rod.
5. Reinstall the cylinder head retainer plate and 8 cap screws. Torque in an even manner as shown in the service manual.

## CHANGING PISTON CUPS

1. Remove the 8 cap screws and the cylinder head retaining plate from the front of the liquid end.
2. Unscrew the nylock socket head cap screw (12mm hex) and remove with piston keeper.
3. Screw a 5/8"-11UNC all thread stud into the piston hub and remove from liner. Make sure the O-ring comes out also.
4. Change piston cup and reinstall with a new O-ring and nylock screw. Inspect the piston hub for wear. It should be changed periodically.
5. Reinstall the cylinder head retainer plate and 8 cap screws. Torque in an even manner as shown on previous page.

## DISC VALVE SYSTEMS AND ABRASION RESISTANT

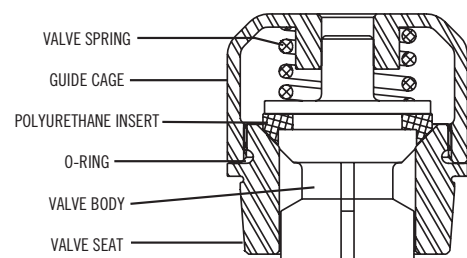
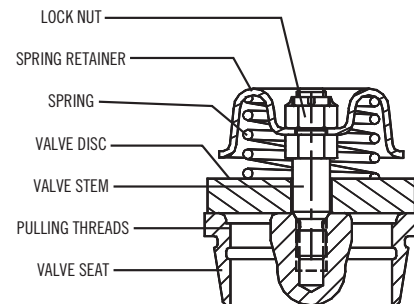
### GENERAL

Aurora Pump, Aplex Series has developed a unique setting/puller system permitting quick, easy and safe methods of installing and removing tapered seat valves.

The system allows servicing without distortion of the seat, with minimum effort and **NO** damage to fluid end tapers or seat.

Tapered seats notoriously drive solidly down into mating deck tapers, so firmly that extraction heretofore has always posed severe problems. Old style valves may be pulled only with the greatest effort, using "J" puller heads (prone to failure), CO<sub>2</sub> – dry ice, and other improvisations.

### DISC VALVE AND ABRASION RESISTANT VALVE CONSTRUCTION

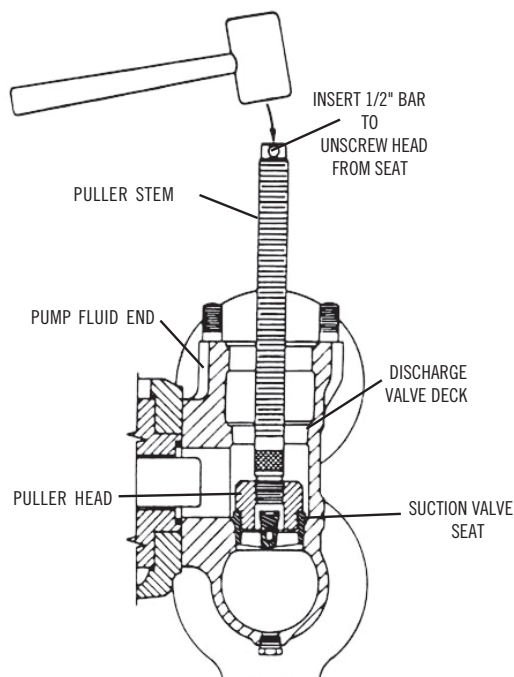


The Aurora Pump, Aplex Series valve is a precision made subassembly using threads cut into the rim of seat for use with Aurora Pump, Aplex Series setting/pulling tool. These threads do **NOT** deteriorate as proved by field experience. By locating these on the rim, setting/pulling forces are now applied only to the rim of the seat, never to the webs (or "spokes"), or to the center section. Distortion of the seat is eliminated.

Access to these seat threads is provided by the removal of the valve cage on abrasion resistant valve or the spring retainer on disc valves which is screwed onto the seat. An anti-seizing lubricant applied to all threads is good insurance against future difficulty.



## SETTING THE VALVE SEAT



Effective pressure-sealing between tapered (male) seat and tapered (female) fluid end deck is possible **ONLY** if the tapers are absolutely clean and dry just prior to installation. Thoroughly clean surfaces using a clean solvent. Dry with a **CLEAN** shop towel.

Examine the cleaned fluid end deck tapers, using a flashlight, and remove all deposits of gyp, salt, or other incrustation. Lightly rub with emery cloth any minor imperfections found in the deck taper.

## INSTALLING THE VALVE SEAT

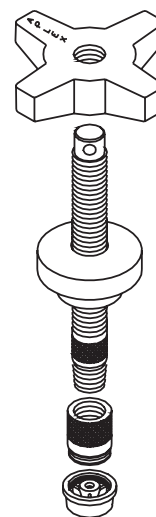
The puller stem and puller head are provided with tapered (locking) threads. Screw them together using two pipe wrenches applied to the knurled areas provided. Then screw the valve seat onto the puller head by hand until it shoulders against the puller shoulder. Do not tighten.

Lower the seat and puller assembly into the fluid end, squarely setting the seat into the deck. Then pound the top of the stem with a 6 pound hammer until a sharp metallic sound is heard.

Unscrew the head and stem from the seat using a 1/2" bar (or screwdriver) into the hole provided at the top end of the stem.

## INSTALLING O-RINGS, ABRASION RESISTANT SPRING AND CAGE

Install nitrile O-ring over the threaded section of the seat and position it at the bottom of the threads. Install the polyurethane insert into the valve. The insert may be heated in hot water to make it flexible enough to stretch over the valve. Position the valve into the seat. Install the valve spring. Apply anti-seizing lubricant to the threads of the valve cage and screw the cage on to the threaded valve seat with cage setting tool.



## INSTALLING DISC, SPRING, DISC VALVES AND STEM:

Aurora Pump, Apex Series offers discs of Delrin® acetal resin, of 17-4PH S.S. hardened and ground, and of titanium alloy.

Position the disc and Inconel® spring on the seat, aligning the hole in the disc with the stem threads in the seat center.

The stem, spring retainer, and locknut are shipped from Aurora Pump, Apex Series already assembled and tightened with a torque wrench with Loctite® sealant added to the top stem threads only.

Torque ..... 16 ft. lb.

Use an anti-seizing lubricant in these threads. This is very necessary when seats and stems of Type 316 stainless steel are selected (optional) to prevent galling. CLEANLINESS of threads and other contacting surfaces is of paramount importance in the assembly of all valve elements.

## VALVE SPRING OPTIONS:

All Aurora Pump, Apex Series valve springs are made of Inconel® material, precisely designed and fabricated. Unless otherwise specified, the standard spring is furnished. It provides excellent results in the great majority of applications.

Pumps employed in marginally available NPSH conditions may require a softer spring, to reduce the required NPSH. For these special conditions, Aurora Pump, Apex Series can supply light valve springs which exert lower pressure on the valve disc. The use of light valve springs may be limited by the choice of plunger size and/or limited by the chosen speed of the pump. Light valve springs may be impractical for pump models fitted with their maximum plunger size, or which operate near top speed rating, as disc bouncing and erratic seating may occur.

## VALVE DISC OPTIONS

Aurora Pump, Aplex Series acetal resin discs made of DuPont Delrin® are machined flat and smooth to produce perfect sealing on the lapped-flat face of the seat. Used successfully in thousands of applications, these discs are light, slightly flexible under load, and seal well, even at high pump speeds, providing smooth pump action.

Acetal resins are very resistant to most corrodents, but are not usually suitable in fluid temperatures above 120 degrees. Nor do they afford long life at extreme pressures. Pressure limitations depend on valve size. But continuous valve operation at pressures above 2,500 psi usually indicates the need of metal valve discs.

For higher temperatures or pressures, Aurora Pump, Aplex Series offers lapped flat, hardened Type 17-4PH stainless discs, or titanium alloy discs. These metal discs are less tolerant of any fine grit in the liquid and are noisier than the acetal resin disc.

## PULLING THE VALVE SEAT

First drain the fluid end entirely. For abrasion resistant valves, use the cage wrench to unscrew the cage from the seat. For disc valves unscrew the stem from the seat. Remove the cage, spring and valve from the fluid end. Attach the Aurora Pump, Aplex Series puller head to the puller stem, tighten their tapered threads with a pipe wrench applied to the knurled areas of the puller stem and head. Lower the stem and head into the fluid end and engage the threads of the head onto the seat threads.

Using a 1/2" bar (or screwdriver), rotate the head clockwise and thread it fully onto the seat. But do **NOT** tighten.

Slide the bridge over the stem. Clean and oil the stem threads. Oil the face of the wing nut. Thread wing nut down onto the stem, seating it on the bridge top firmly. Extract the seat from the pump by striking the wing nut with a heavy hammer. A hydraulic ram may also be used. Stand clear of the pump when applying heavy tonnage, as the entire assembly will jump violently upward when the pulling energy is suddenly released!

The Aurora Pump, Aplex Series puller/setting tool and gauge tool are custom designed and built for each specific Aurora Pump, Aplex Series pump model. The same puller head is used on both suction and discharge seats. The bridge is made to fit each model, and its proper use will not damage the valve cover gasket machined counterbore on the top of the fluid end.

## SALVAGE OF WORN SEATS

Rough valve seat faces may often be renewed by lapping or grinding, if not deeply fluid-cut.

Perfect flatness is required. A surface grind, followed by lapping on a lapping plate, provides excellent smoothness and the flatness needed for good sealing and smooth running. Metal valve discs may sometimes be salvaged by grinding or lapping, if not deeply cut or cracked.

Delrin® discs are relatively inexpensive and salvage is seldom worthwhile. Replace the stem, if severely worn. Inconel® valve springs rarely require replacement.

## OTHER PUMP BRANDS

Aurora Pump, Aplex Series Industries can provide its unique (patented) valve to fit nearly all brands and models of multiplex pumps. An Aurora Pump, Aplex Series seat setting/puller tool is available, too.

## TROUBLE LOCATION AND REMEDY

Trouble	Possible Cause	Remedy
Excessive heat in power end. (Above 180°F)	Pump operating backward.	Correct rotation.
	Insufficient oil in power end.	Fill to proper level.
	Excessive oil in power end.	Drain to proper level.
	Incorrect oil viscosity.	Fill with correct oil.
	Overloading.	Reduce load.
	Tight main bearings.	Correct clearance.
	Drive misaligned.	Realign.
	Belts too tight.	Reduce tension.
	Discharge valve of a cylinder(s) stuck open.	Fix valve(s).
	Insufficient cooling.	Provide adequate cooling for oil or reduce ambient temperature.
	Pump speed too low.	Increase speed.

## TROUBLE LOCATION AND REMEDY

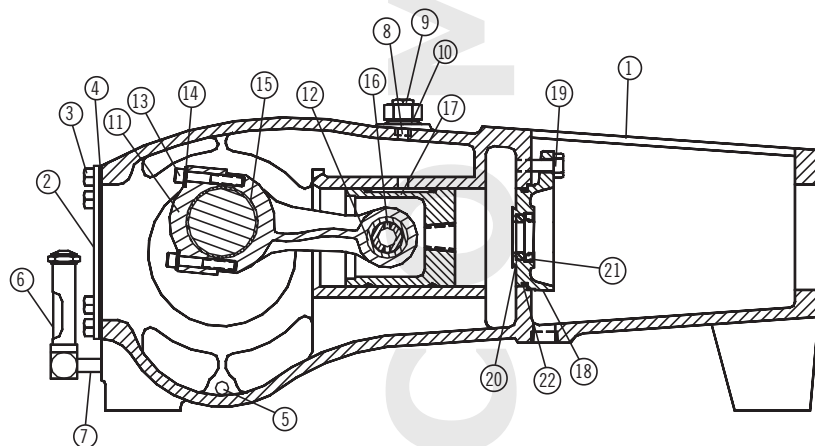
Trouble	Possible Cause	Remedy
Pump fails to deliver required capacity.	Speed incorrect. Belts slipping.	Change drive ratio or tighten belts (if loose). Correct motor speed.
	Air leaking into pump.	Seal with compounds.
	Liquid cylinder valves, seats or plungers worn.	Reface or lap valves and seats; replace packing or plungers.
	Insufficient NPSHA.	Increase suction pressure.
	Pump not filling.	Prime pump.
	Makeup in suction tank less than displacement of pump.	Increase makeup flow. Reduce pump speed.
	Vortex in supply tank.	Increased liquid level in supply tank. Install vortex breaker.
	One or more cylinders not pumping.	Prime all cylinders. Allow pump to operate at low pressure through bypass valve to eliminate vapor.
	Suction lift too great.	Decrease lift. Raise tank level.
	Broken valve springs.	Replace.
	Stuck foot valve.	Clean.
	Pump valve stuck open.	Remove debris beneath valve.
	Clogged suction strainer.	Clean or remove.
	Relief, bypass, pressure valves leaking.	Repair.
Suction and/or discharge piping vibrates or pounds.	Piping too small and/or too long.	Increase size and decrease length. Use booster pump. Use suction and/or discharge pulsation dampeners.
	Worn valves or seats.	Replace or reface.
	Piping inadequately supported.	Improve support at proper locations.
Pump vibrates or pounds.	Gas in liquid.	Submerge return, supply or makeup lines in suction supply tank. If operating under a suction lift, check joints for air leaks.
	Pump valve stuck open.	Remove debris beneath valve.
	Pump not filling.	Increase suction pressure.
	One or more cylinders not pumping.	Prime all cylinders. Allow pump to operate a low pressure through bypass valve to eliminate vapor.
	Excessive pump speed.	Reduce. Check drive ratio.
	Worn valves or seats.	Replace or reface.
	Broken valve spring.	Replace.
	Loose plunger.	Tighten.
	Loose or worn bearings.	Adjust or replace.
	Worn crossheads or guides.	Replace.
	Loose crosshead pin. Loose connecting rod cap bolts.	Adjust or replace.
	Pump running backward.	Correct rotation.



## TROUBLE LOCATION AND REMEDY

Trouble	Possible Cause	Remedy
Consistent knock.	Water in power end, crankcase.	Drain. Refill with clean oil.
	Worn or noisy gear.	Replace.
	Worn or loose main bearing, crank pin bearing, wrist pin bushing, plunger, valve seat, low oil level.	Adjust or replace. Add oil to proper level.
	<b>NOTE:</b> High speed power pumps are not quiet. Checking is necessary only when the sound is erratic.	
Packing failure (excessive).	Improper installation.	Install per instructions.
	Improper or inadequate lubrication.	Lubricate per instructions.
	Improper packing selection.	Change to correct packing.
	Scored plungers.	Replace.
	Worn or oversized stuffing box bushings.	Repair or replace. Check bore and outside diameter of bushings frequently. (Many times plungers are replaced and bushings ignored.)
	Plunger misalignment.	Realign. Plungers must operate concentrically in stuffing box.
Wear of liquid end parts.	Abrasive or corrosive action of liquid.	Check valves and seats frequently at start-up to determine schedule for replacing, etc. Eliminate sand, abrasive, air entering pump.
	Incorrect material.	Install correct materials.
Liquid end cylinder failure.	Air entering suction system.	Eliminate air. <b>NOTE:</b> Pitting often leads to hairline cracks which ends in cylinder failure.
Wear of power end parts (excessive).	Poor lubrication.	Replace oil as recommended in instructions. Keep oil clean and at correct temperature. Be sure oil is reaching all bearings.
	Overloading.	Modify pump or system to eliminate overload.
	Liquid in power end.	Drain power end. Eliminate cause or source of liquid entering power end. Relubricate.

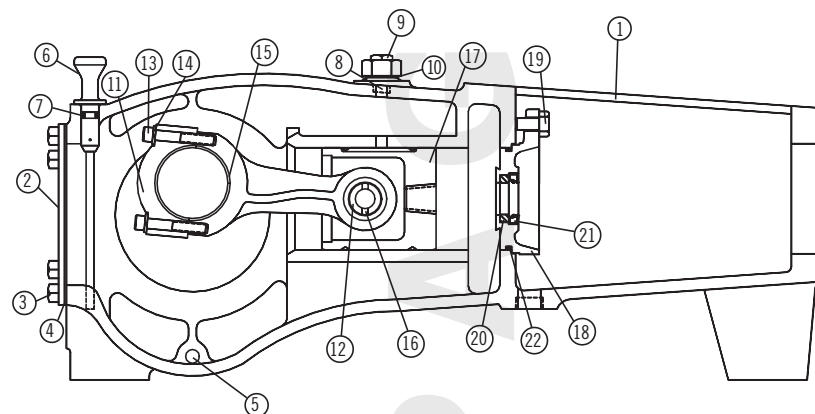
## Power Frame Assembly; Connecting Rod, Crosshead & Wiper Box Assembly



MA-15M, MA-15H, RO-23			
Item	Quantity	Description	Part Number
1	1	Power Frame	7207-0025-01E
2	1	Crankcase Cover	7207-0028-00B
3	8	5/16" NC Hex Head Cap Screw x 1/2" Long	100-516012-273
4	1	Gasket, Crankcase Cover	7207-0023-00A
5	2	Plug, 1/4" Pipe; Hex Head	170-014002-405
6	1	Oil Level Sight Gauge	7602-3015-00A
7	1	Nipple, Pipe; Std. 1/4" NPT x 1-1/2"	157-014112-235
8	3	Plug, Pipe; 1/8" Socket Head S.S.	170-018003-405
9	1	3/4" NPTM, Crankcase Breather	7602-3002-10A
10	1	Plug, Pipe; 1/4" Socket Head SST	170-014003-405
11	3	Connecting Rod subassembly, which includes:	7207-0017-00C
12	1	Wrist Pin Bushing	7207-0018-00A
13	2	1/4" NC x 2-1/2" Long, Socket Head Cap Screw	105-014112-454
14	2	1/4" Reg. Spring Lockwasher	154-014049-244

MA-15M, MA-15H, RO-23			
Item	Quantity	Description	Part Number
15	6	Crankpin Bearing Half	7207-0024-00K
16	3	Wrist Pin	7207-0019-00A
17	3	Crosshead	7207-0010-00C
18	3	Wiper Box	7207-0012-00B
19	6	1/4" x 1-1/4" Long, Hex Head Cap Screw	100-014114-273
20	3	Poly Pak Ring	145-034114-999
21	3	Oil Seal	145-034138-999
22	3	O-Ring	110-000229-201

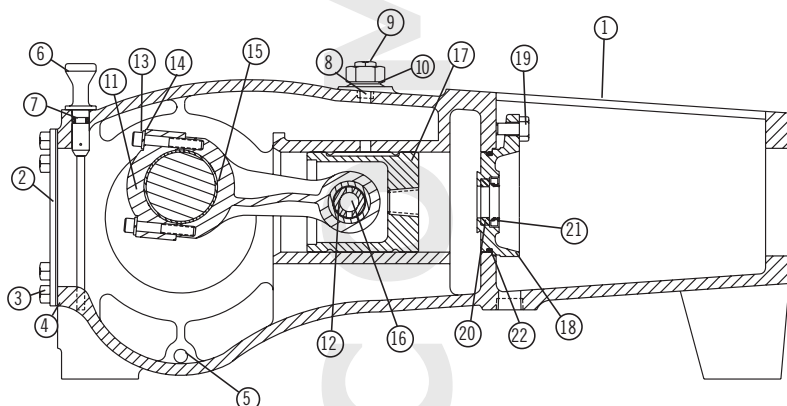
## Power Frame Assembly; Connecting Rod, Crosshead & Wiper Box Assembly



SC-30, SC-30H			
Item	Quantity	Description	Part Number
1	1	Power Frame	7207-0025-01K
2	1	Crankcase Cover	7207-0220-00B
3	8	5/16" NC Hex Head Cap Screw x 1/2" Long	100-516012-273
4	1	Gasket, Crankcase Cover	7207-0023-00A
5	2	Plug, 1/4" Pipe; Hex Head	170-014002-405
6	1	Oil Level Dipstick	7207-0050-00A
7	1	O-Ring	110-000110-201
8	3	1/8" Pipe Plug, Socket Head	170-018003-405
9	1	3/4" NPTM, Crankcase Breather	7602-3002-10A
10	1	1/4" Pipe Plug, Socket Head, Steel	170-014003-405
11	3	Connecting Rod subassembly, which includes:	7207-0017-00C
12	1	Wrist Pin Bushing	7207-0018-01A
13	2	Connecting Rod Bolts	105-14112-454
14	2	1/2" Spring Lockwasher	154-014049-244

SC-30, SC-30H			
Item	Quantity	Description	Part Number
15	3	Crankpin Bearing Pair	7207-0024-00K
16	3	Wrist Pin	7207-0019-00A
17	3	Crosshead	7207-0010-00C
18	3	Wiper Box	7207-0012-00B
19	6	1/4" x 1-1/4" Long, Hex Head Cap Screw	100-014114-273
20	3	Poly Pak Ring	145-034114-999
21	3	Oil Seal	145-034138-999
22	3	O-Ring	110-000229-201

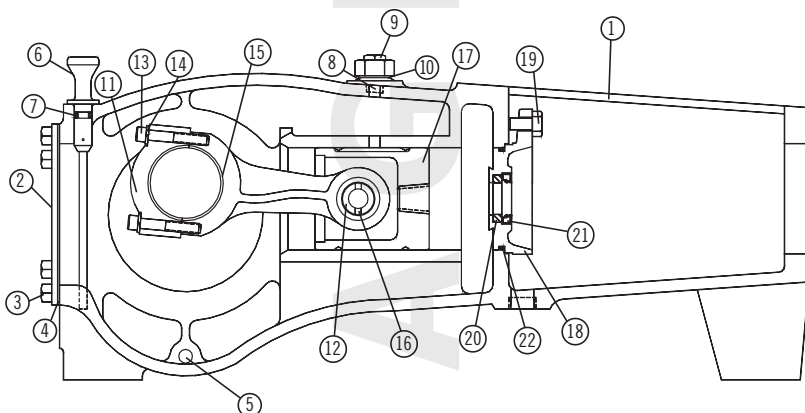
## Power Frame Assembly; Connecting Rod, Crosshead & Wiper Box Assembly



MA-25L, SC-45L			
Item	Quantity	Description	Part Number
1	1	Power Frame	7206-0276-00K
2	1	Crankcase Cover	7206-0021-00B
3	8	3/8" NC Hex Head Cap Screw x 5/8" Long	100-038058-273
4	1	Gasket, Crankcase Cover	7206-0022-00A
5	2	3/8" Pipe Plug, Square Head	170-038001-237
6	1	Oil Level Dipstick	7206-0094-00A
7	1	O-Ring, Size #2-203	110-000110-201
8	3	1/8" Pipe Plug, Socket Head	170-018003-405
9	1	Breather, Crankcase, 3/4" NPTM	7602-3002-10A
10	1	1/2" Pipe Plug, Square Head, Steel	170-012003-237
11	3	Connecting Rod subassembly, which includes:	7206-0003-00C
12	1	Wrist Pin Bushing	7206-0004-00A
13	2	Socket Head Cap Screw – 5/16" NC x 2" Long	105-516200-454
14	2	5/16" Reg. Spring Lockwasher	154-516059-244

MA-25L, SC-45L			
Item	Quantity	Description	Part Number
15	3	Crankpin Bearing Pair	7206-0006-00K
16	3	Wrist Pin	7206-0005-00A
17	3	Crosshead	7206-0010-00C
18	3	Wiper Box	7206-0009-00B
19	6	Hex Head Cap Screw – 3/8" x 1-1/4" Long	100-038114-273
20	3	Poly Pak Ring	145-100112-999
21	3	Oil Seal	145-100158-999
22	3	O-Ring	001500331

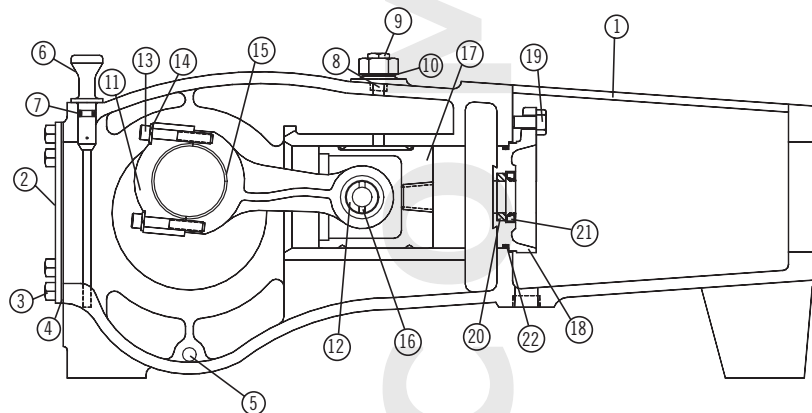
## Power Frame Assembly; Connecting Rod, Crosshead & Wiper Box Assembly



MA-25M, SC-45, SC-45H, RO-38			
Item	Quantity	Description	Part Number
1	1	Power Frame	7206-0029-51K
2	1	Crankcase Cover	7206-0021-00B
3	8	3/8" NC Hex Head Cap Screw x 5/8" Long	100-038058-273
4	1	Gasket, Crankcase Cover	7206-0022-00A
5	2	3/8" Pipe Plug, Square Head	170-038001-237
6	1	Oil Level Dipstick	7206-0094-00A
7	1	O-Ring, Size #2-110	110-000110-201
8	3	1/8" Pipe Plug, Socket Head	170-018003-405
9	1	Breather, Crankcase, 3/4" NPTM	7602-3002-10A
10	1	1/2" Pipe Plug, Square Head, Steel	170-012003-237
11	3	Connecting Rod subassembly, which includes:	7206-0003-00C
12	1	Wrist Pin Bushing	7206-0004-01A
13	2	Socket Head Cap Screw – 5/16" NC x 2" Long	105-516200-454
14	2	5/16" Reg. Spring Lockwasher	154-516059-244

MA-25M, SC-45, SC-45H, RO-38			
Item	Quantity	Description	Part Number
15	3	Crankpin Bearing Pair	7206-0006-00K
16	3	Wrist Pin	7206-0005-00A
17	3	Crosshead	7206-0010-00C
18	3	Wiper Box	7206-0009-00B
19	6	Hex Head Cap Screw – 3/8" x 1-1/4" Long	100-038114-273
20	3	Poly Pak Ring	145-100112-999
21	3	Oil Seal	145-100158-999
22	3	O-Ring	01500331

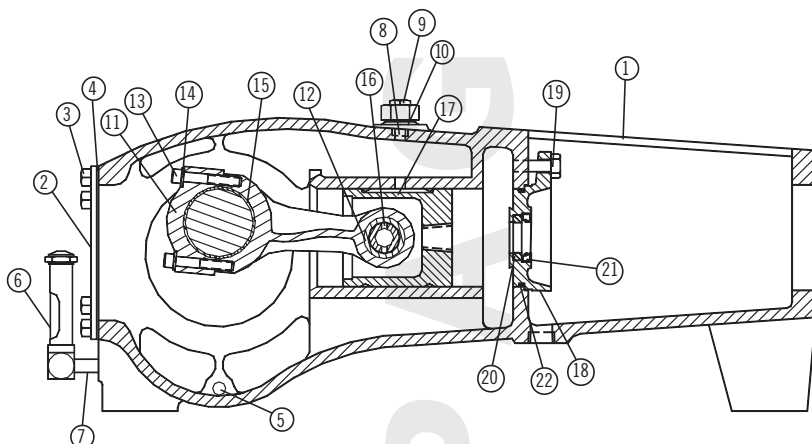
## Power Frame Assembly; Connecting Rod, Crosshead & Wiper Box Assembly



MA-40L, SC-65L			
Item	Quantity	Description	Part Number
1	1	Power Frame	7203-0414-00K
	1	For Left-Hand Hyd. or Gear Adaption	7203-0515-00K
2	1	Crankcase Cover	7203-0139-00B
3	8	3/8" NC Hex Head Cap Screw x 5/8" Long	100-038058-273
4	1	Gasket, Crankcase Cover	7203-0140-00B
5	2	3/8" Pipe Plug, Square Head	170-038001-237
6	1	Oil Level Dipstick	7203-0342-00A
7	1	O-Ring #2-110	110-000110-201
8	3	1/4" Pipe Plug, Socket Head	170-014003-405
9	1	3/4" NPTM, Crankcase Breather	7602-3002-10A
10	1	3/4" Pipe Plug, Socket Head, Steel	170-034003-237
11	3	Connecting Rod subassembly, which includes	7203-0104-00D
12	1	Wrist Pin Bushing	7203-0115-00A
13	2	3/8" NC x 2-1/2" Long, Socket Head Cap Screw	100-038212-454
14	2	3/8" Reg. Spring Lockwasher	05454A007

MA-40L, SC-65L			
Item	Quantity	Description	Part Number
15	3	Crankpin Bearing Pair	7203-0160-00K
16	3	Wrist Pin	7203-0116-00A
17	3	Crosshead	7203-0105-00C
18	3	Wiper Box	7203-0108-00C
19	6	1/2" x 1-1/2" Long, Hex Head Cap Screw	100-012112-273
20	3	Poly Pak Ring	145-114178-999
21	3	Oil Seal	145-114206-999
22	3	O-Ring	001500121

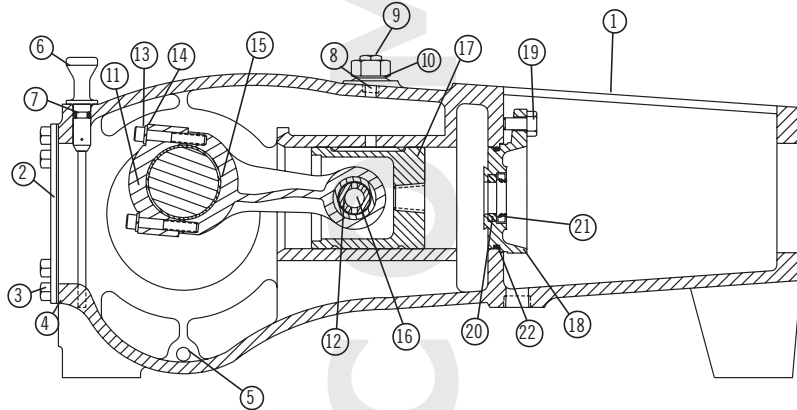
## Power Frame Assembly; Connecting Rod, Crosshead & Wiper Box Assembly



MA-40M, R0-64			
Item	Quantity	Description	Part Number
1	1	Power Frame	7203-0103-50K
2	1	Crankcase Cover	7203-0139-00B
3	8	3/8" NC Hex Head Cap Screw x 5/8" Long	100-038058-273
4	1	Gasket, Crankcase Cover	7203-0140-00B
5	2	3/8" Pipe Plug, Square Head	170-038001-237
6	1	Oil Level Sight Gauge	7602-3000-00A
7	1	1/4" Pipe Nipple, Std. Wt. - 2" Long	157-014112-235
8	3	1/4" Pipe Plug, Socket Head	170-014003-405
9	1	3/4" NPTM, Crankcase Breather	7602-3002-10A
10	1	3/4" Pipe Plug, Socket Head, Steel	170-034003-237
11	3	Connecting Rod subassembly, which includes:	7203-0104-00D
12	1	Wrist Pin Bushing	7203-0115-00A
13	2	3/8" NC x 2-1/2" Long, Socket Head Cap Screw	100-038212-454
14	2	3/8" Reg. Spring Lockwasher	05454A007

MA-40M, R0-64			
Item	Quantity	Description	Part Number
15	3	Crankpin Bearing Pair	7203-0160-00K
16	3	Wrist Pin	7203-0116-00A
17	3	Crosshead	7203-0105-00C
18	3	Wiper Box	7203-0108-00C
19	6	1/2" x 1-1/2" Long, Hex Head Cap Screw	100-012112-273
20	3	Poly Pak Ring	145-114178-999
21	3	Oil Seal	145-114206-999
22	3	O-Ring	001500121

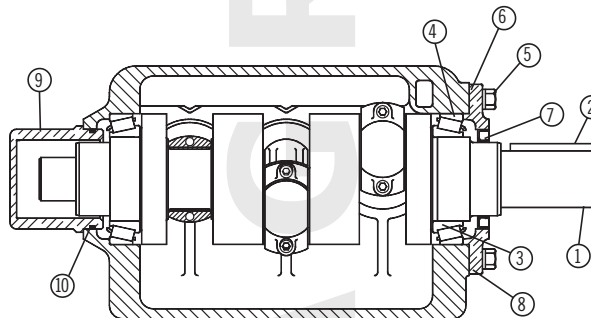
## Power Frame Assembly; Connecting Rod, Crosshead & Wiper Box Assembly



SC-65			
Item	Quantity	Description	Part Number
1	1	Power Frame (Right-Hand Drive)	7203-0103-50K
1	1	Power Frame (Left-Hand Drive)	7203-0596-00K
2	1	Crankcase Cover	7203-0139-00B
3	8	3/8" NC Hex Head Cap Screw x 5/8" Long	100-038058-273
4	1	Gasket, Crankcase Cover	7203-0140-00B
5	2	3/8" Pipe Plug, Square Head	170-038001-237
6	1	Oil Level Dipstick	7203-0342-00A
7	1	O-Ring #2-110	110-000110-201
8	3	1/4" Pipe Plug, Socket Head	170-014003-405
9	1	3/4" NPTM, Crankcase Breather	7602-3002-10A
10	1	3/4" Pipe Plug, Socket Head, Steel	170-034003-237

SC-65			
Item	Quantity	Description	Part Number
11	3	Connecting Rod subassembly, which includes	7203-0104-00D
12	1	Wrist Pin Bushing	7203-0115-00A
13	2	3/8" NC x 2-1/2" Long, Socket Head Cap Screw	100-038212-454
14	2	3/8" Reg. Spring Lockwasher	05454A007
15	3	Crankpin Bearing Pair	7203-0160-00K
16	3	Wrist Pin	7203-0116-00A
17	3	Crosshead	7203-0105-00C
18	3	Wiper Box	7203-0108-00C
19	6	1/2" x 1-1/2" Long, Hex Head Cap Screw	100-012112-273
20	3	Poly Pak Ring	145-114178-999
21	3	Oil Seal	145-114206-999
22	3	O-Ring	001500121

## Crankshaft Assembly 1-1/2" Stroke; Right-Hand and Left-Hand Drive; Right-Hand Shown

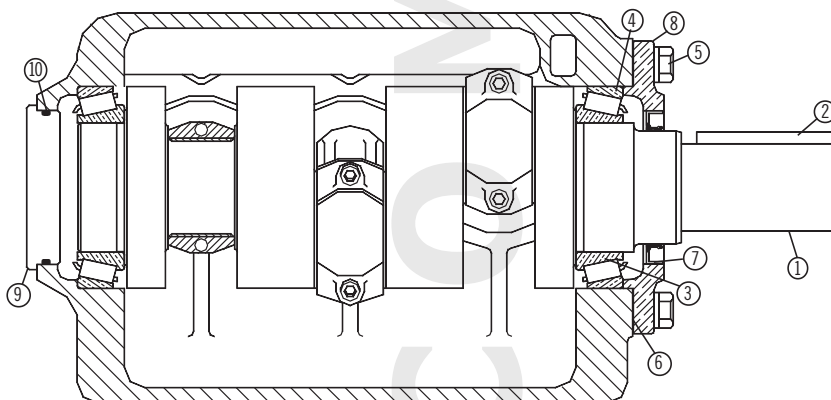


MA-15M, MA-15H, RO-23			
Item	Quantity	Description	Part Number
1	1	Crankshaft	7207-0021-00C
2	1	Drive Key	146-038134-236
3	2	Bearing Cone, Tapered Roller	
4		Bearing Cup – Included with item above	203-11223-999
5	6	3/8" NC Hex Head Cap Screw 7/8" Long	100-038078-273

MA-15M, MA-15H, RO-23			
Item	Quantity	Description	Part Number
6	1	Shim Set	7207-0006-00A
7	1	*Oil Seal	145-055072-08
8	1	Bearing Retainer	7207-0005-00B
9	1	*Extension Guard	7207-0016-00B
10	1	*O-Ring	110-000230-200

\*Note – If crankshaft accessory drive extension is to be used (for example: to drive a packing lubricator), then omit item 9, Extension Guard, and also increase the quantity of item 7 from one required to two. Omit item 10, O-Ring.

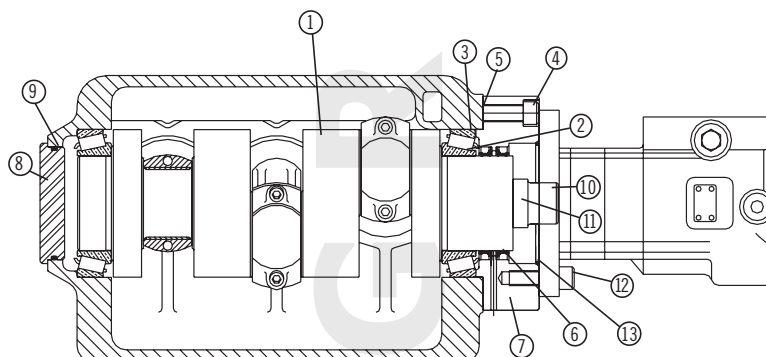
### Crankshaft Assembly 1-3/4" Stroke; Right-Hand Drive



SC-30, SC-30H			
Item	Quantity	Description	Part Number
1	1	Crankshaft	7207-0043-00B
2	1	Drive Key	146-038134-236
3	2	Crankshaft Kit (includes items 1, 2, 3 & 4)	PE196KB
4		Bearing Cone, Tapered Roller*	203-11223-999
5	6	Bearing Cup *Included with item above	100-038078-273

SC-30, SC-30H			
Item	Quantity	Description	Part Number
6	1	Shim Set	7207-0006-00A
7	1	Oil Seal	145-055072-08
8	1	Bearing Retainer	7207-0005-00B
8A	1	(also available with External Pilot Diameter)	
9	1	Frame Plug	7207-0027-00A
10	1	O-Ring	110-000230-200

### Crankshaft Assembly 1-3/4" Stroke; Bearingless Hydraulic Motor



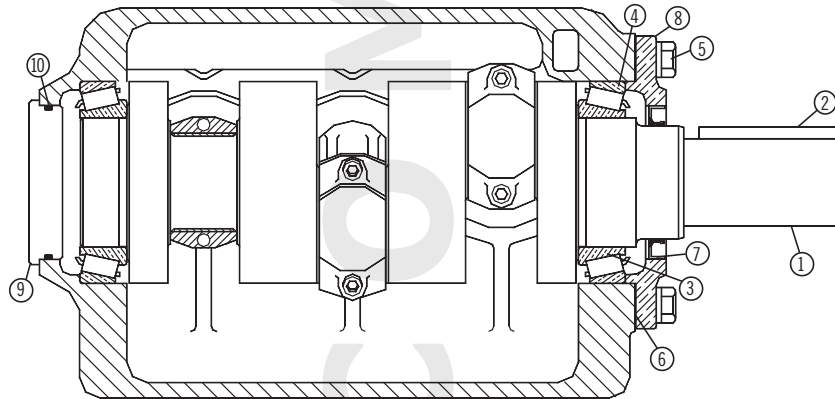
SC-30, SC-30H			
Item	Quantity	Description	Part Number
1	1	Crankshaft	7207-0054-00B
10	1	Spline Adapter	7206-0121-00A
2	2	Crankshaft Kit (includes items 1, 2, 3, & 10)	PE201KB
3		Bearing Cone, Tapered Roller*	203-11223-999
4	6	Bearing Cup *Included with item above	105-038214-273
5	1	3/8" NC Hex Head Cap Screw 2-1/4" Long	
6	1	Shim Set	7207-0006-00A
7	2	Oil Seal	145-055072-08
8	1	Bearing Retainer	7207-0053-00B

SC-30, SC-30H			
Item	Quantity	Description	Part Number
8	1	Frame Plug	7207-0027-00A
9	1	O-Ring	110-000230-200
10	1	(listed above with crankshaft assembly)	
11	1	Hardened Spacer	7206-0363-00A

Optional			
Item	Quantity	Description	Part Number
12	4	1/2" NC Socket Head Cap Screws 1-1/2" Long	100-012112-273
13	1	O-Ring	110-000237-200



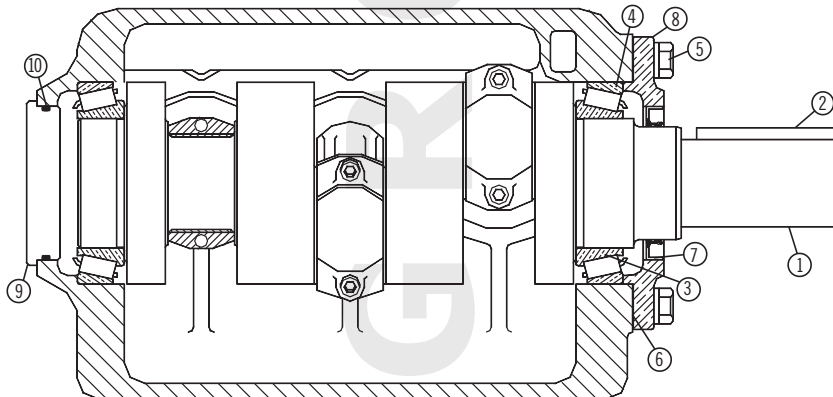
### ***Crankshaft Assembly 2" Stroke; Right and Left-Hand Drive; Right-Hand Shown***



<b>MA-25L, MA-25M, RO-38</b>			
Item	Quantity	Description	Part Number
1	1	Crankshaft Assembly (includes items 1 & 2)	PE244K
2	1	Crankshaft, 2-1/4" Stroke	7206-0017-50C
		Drive Key	146-012214-236
3	2	Crankshaft Kit (includes items 1, 2, 3, & 4)	PE244KB
4	2	Bearing Cone, Tapered Roller	203-09624-999
5	6	Bearing Cup	202-02624-999
		1/2" NC Hex Head Cap Screw 1-1/4" Long	100-012114-273

<b>MA-25L, MA-25M, RO-38</b>			
Item	Quantity	Description	Part Number
6	1	Shim Set	7509-0014-50A
7	1	Oil Seal	145-234334-999
8	1	Bearing Retainer	7206-0007-50B
8A	1	(also available with External Pilot Diameter)	7206-0206-50A
9	1	Frame Plug	7206-0064-00A
10	1	O-Ring	110-000238-200

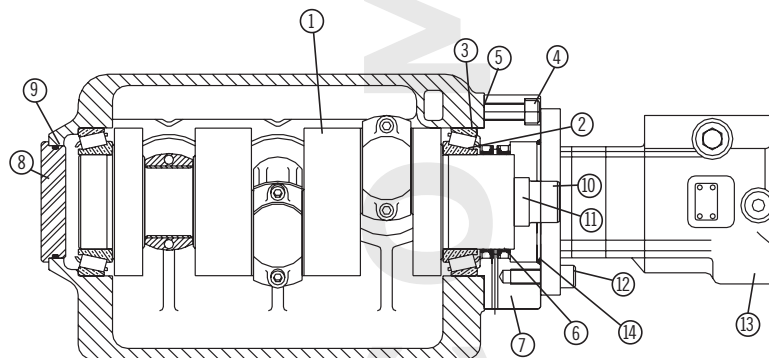
### ***Crankshaft Assembly 2-1/4" Stroke; Right and Left-Hand Drive; Right-Hand Shown***



<b>SC-45L, SC-45, SC-45H</b>			
Item	Quantity	Description	Part Number
1	1	Crankshaft Assembly (includes items 1 & 2)	PE233K
2	1	Crankshaft, 2-1/4" Stroke	7206-0040-50D
		Drive Key	146-012341-236
3	2	Crankshaft Kit (includes items 1, 2, 3, & 4)	PE233KB
4	2	Bearing Cone, Tapered Roller	203-09624-999
5	6	Bearing Cup	202-02624-999
		1/2" NC Hex Head Cap Screw 1-1/4" Long	100-012114-273

<b>SC-45L, SC-45, SC-45H</b>			
Item	Quantity	Description	Part Number
6	1	Shim Set	7509-0014-50A
7	1	Oil Seal	145-234334-999
8	1	Bearing Retainer	7206-0007-50B
8A	1	(also available with External Pilot Diameter)	7206-0206-50A
9	1	Frame Plug	7206-0064-00A
10	1	O-Ring	110-000238-200

## Crankshaft Assembly 1-3/4" Stroke; Right-Hand Drive

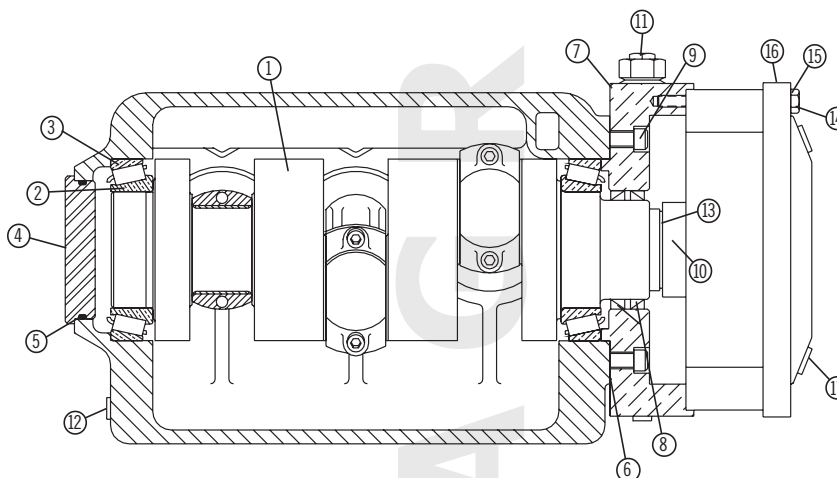


SC-45L, SC-45			
Item	Quantity	Description	Part Number
1	1	Crankshaft Assembly (includes items 1 & 10)	PE237K
10	1	Crankshaft, for Bearingless Hyd. Motor	7206-0122-50B
		Spline Adapter (Coupling)	7206-0121-00A
2	2	Crankshaft Kit (includes items 1, 2, 3, & 10)	PE237KB
3	2	Bearing Cone, Tapered Roller	203-09624-999
4	6	Bearing Cup	202-02624-999
5	1	1/2" NC Hex Head Cap Screw 2" Long	105-012200-273
6	1	Shim Set	7509-0014-50A
7	2	Oil Seal	145-234334-999
8	1	Bearing Retainer and Motor Adapter	7206-0120-50A

SC-45L, SC-45			
Item	Quantity	Description	Part Number
8	1	Frame Plug	7206-0064-00A
9	1	O-Ring #2-238	110-000238-200
10	1	(listed above with the Crankshaft Assembly)	
11	1	Spacer, Hardened	7206-0363-00A

Optional			
Item	Quantity	Description	Part Number
12	4	1/2"-13 NC Socket Head Cap Screws x 1-1/4"	105-012114-273
13	1	Eaton 2000 Series Two-Speed Bearingless Hyd. Motor	7206-0403-00A
14	1	O-Ring	110-000155-200

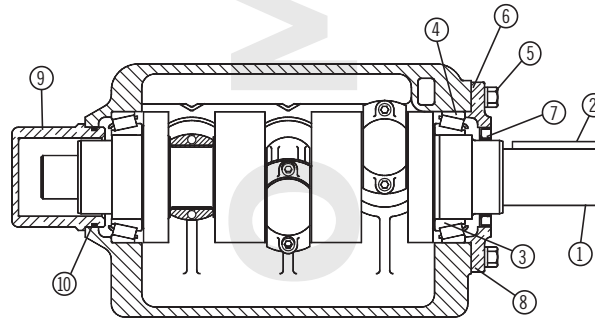
## Crankshaft Assembly 2-1/4" Stroke; Auburn Gear #6 Kit



SC-45, SC-45H			
Item	Quantity	Description	Part Number
1	1	Crankshaft Assembly (includes items 1, 10 & 13)	PE310K
10	1	Crankshaft, 2-1/4" Stroke	7206-0122-50B
13	1	Planetary Output Shaft	7206-0321-00A
		Snap Ring	226-000225-999
2	2	Crankshaft Kit (includes items 1, 2, 3, 10 & 13)	PE310KB
3	2	Bearing Cone, Tapered Roller	203-09624-999
4	2	Bearing Cup	202-02624-999
5	1	Frame Plug	7206-0064-00A
6	1	O-Ring	110-000238-201
7	1	Shim Set	7509-0014-50A

SC-45, SC-45H			
Item	Quantity	Description	Part Number
7	1	Bearing Retainer	7206-0320-00A
8	2	Oil Seal	145-234334-999
9	6	1/2" NC Socket Head Cap Screw x 1-1/2" Long	105-012134-273
10	1	(listed above with Crankshaft Assembly)	
11	1	Breather Filter	7602-3002-10A
12	2	1/4" NPT Pipe Plug	170-014002-405
13	1	(listed above with Crankshaft Assembly)	
14	8	5/16" NC Hex Hd. Cap Screw x 3-1/4" Long	100-516314-454
15	8	Washer Stat-O-Seal 5/16"	156-516062-999
16	1	Auburn Gear #6 Kit 3.75:1 Ratio	7203-0505-00A

## Crankshaft Assembly 2-1/2" Stroke; Right-Hand and Left-Hand Drive; Right-Hand Shown

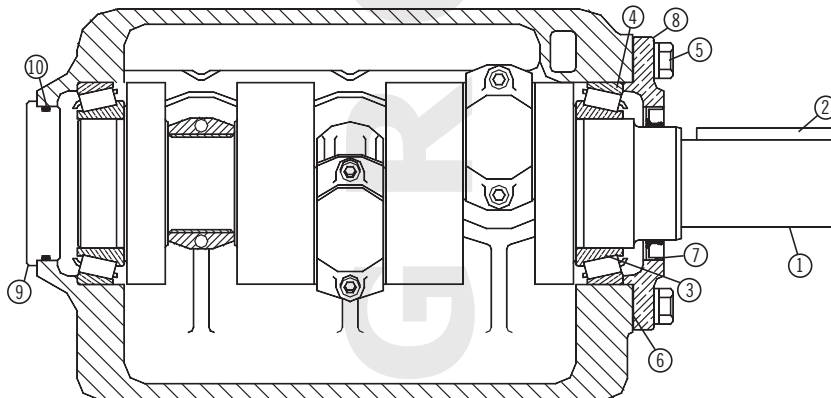


MA-40L, MA-40M, RO-64			
Item	Quantity	Description	Part Number
1	1	Crankshaft Assembly (includes items 1 & 2)	PE136K
2	1	Crankshaft, 2-1/4" Stroke	7203-0106-00C
3	2	Drive Key	146-058512-236
4	2	Crankshaft Kit (includes items 1, 2, 3, & 4)	PE136KB
5	2	Bearing Cone, Tapered Roller	203-947000-999
6	2	Bearing Cup	202-247000-999
7	6	1/2" NC Hex Head Cap Screw 1-1/2" Long	100-012112-273

MA-40L, MA-40M, RO-64			
Item	Quantity	Description	Part Number
6	1	Shim Set	7509-0013-00A
7	1	*Oil Seal	145-234334-999
8	1	Bearing Retainer	7203-0109-00B
9	1	*Extension Guard	7203-0176-00A
10	1	*O-Ring	110-000238-200

\*Note – If crankshaft accessory drive extension is to be used (for example: to drive a packing lubricator) then omit item 9, Extension Guard, and also increase the quantity of item 7 from one required to two. Omit item 10, O-Ring.

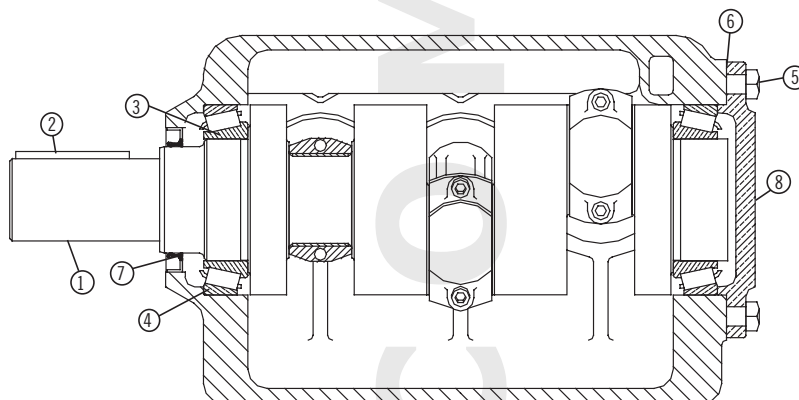
## Crankshaft Assembly 2-3/4" Stroke; Right-Hand Drive



SC-65L, SC-65, SC-65H			
Item	Quantity	Description	Part Number
1	1	Crankshaft Assembly (includes items 1 & 2)	PE152K
2	1	Crankshaft, 2-3/4" Stroke	7203-0156-00C
3	1	Drive Key	146-058512-236
4	2	Crankshaft Kit (includes items 1, 2, 3, & 4)	PE152KB
5	2	Bearing Cone, Tapered Roller	203-947000-999
6	2	Bearing Cup	202-247000-999
7	6	1/2" NC Hex Head Cap Screw 1-1/2" Long	100-012112-273

SC-65L, SC-65, SC-65H			
Item	Quantity	Description	Part Number
6	1	Shim Set	7509-0013-00A
7	1	Oil Seal	145-234334-999
8	1	Bearing Retainer, Drive Side	7203-0109-00B
9	1	Frame Plug	7203-0064-00A
10	1	O-Ring	110-000238-201

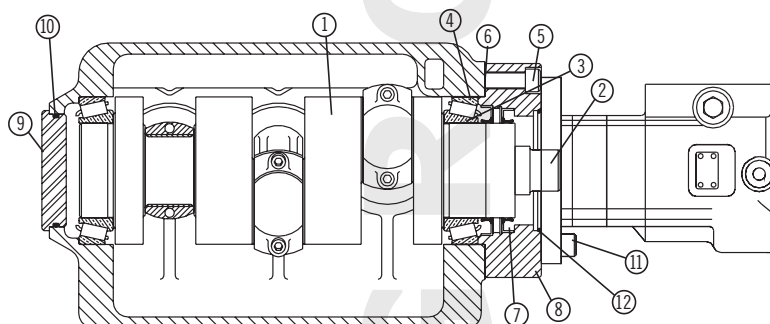
### ***Crankshaft Assembly 2-3/4" Stroke; Left-Hand Drive***



SC-65L, SC-65, SC-65H			
Item	Quantity	Description	Part Number
1	1	Crankshaft Assembly (includes items 1 & 2)	PE152K
2	1	Crankshaft, 2-3/4" Stroke Drive Key	7203-0156-00C 146-058512-236
3	2	Crankshaft Kit (includes items 1, 2, 3, & 4)	PE150KB
4	2	Bearing Cone, Tapered Roller Bearing Cup	203-947000-999 202-247000-999

SC-65L, SC-65, SC-65H			
Item	Quantity	Description	Part Number
5	6	1/2" NC Hex Head Cap Screw 1-1/2" Long	100-012112-273
6	1	Shim Set	7509-0013-00A
7	1	Oil Seal	145-234334-999
8	1	Bearing Retainer (Blind)	7203-0155-01C

### ***Crankshaft Assembly 2-3/4" Stroke; Bearingless Hyd. Motor; Right-Hand Drive Shown***

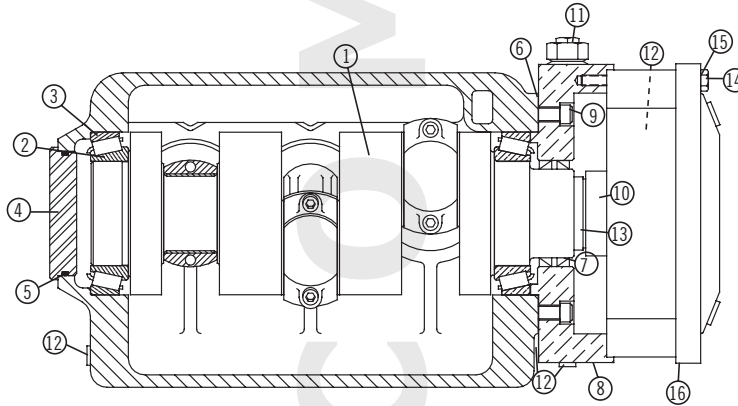


SC-65				
Item	Quantity	Description	R.H. Drive Part Number	L.H. Drive Part Number
1	1	Crankshaft, Bearingless Hyd. Motor	7203-0365-00B	7203-0432-00B
2	1	Spline Adapter	7203-0364-00A	7203-0431-00A
3	2	Crankshaft Kit (includes items 1, 2, 3, & 4)	PE343KB	
4	2	Bearing Cone, Tapered Roller Bearing Cup	203-947000-999 202-247000-999	203-947000-999 202-247000-999
5	6	1/2" NC Hex Head Cap Screw 2-3/4" Long	100-012234-273	100-012234-273
6	1	Shim Set	7509-0013-00A	7509-0013-50A
7	2	Oil Seal	145-281400-999	145-238312-999

SC-65				
Item	Quantity	Description	R.H. Drive Part Number	L.H. Drive Part Number
8	1	Bearing Retainer and Motor Adapter	7203-0363-00A	7203-0430-00A
9	1	Frame Plug	7206-0064-00A	
9	1	Bearing Retainer (Blind)		7203-0155-01C
10	1	O-Ring	110-000238-200	
10	6	1/2"-13UNC Hex Hd. Cap Screw x 1-1/2" Lg.		100-012112-273

Optional				
Item	Quantity	Description	R.H. Drive Part Number	L.H. Drive Part Number
11	4	3/4"-10NC Socket Head Cap Screw x 1-3/4"	100-034134-273	100-034134-273
12	1	O-Ring	110-000256-200	100-000256-200

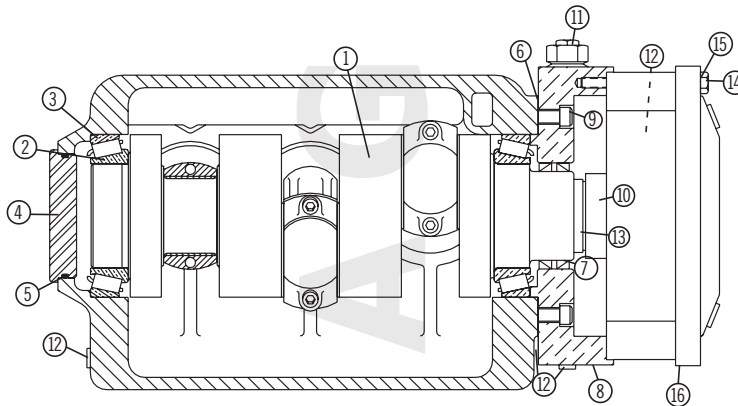
### *Crankshaft Assembly 2-3/4" Stroke; Auburn Planetary; Right-Hand Drive Shown*



SC-65L, SC-65, SC-65H				
Item	Quantity	Description	R.H. Drive Part Number	L.H. Drive Part Number
1	1	Crankshaft Assembly (includes items 1, 10, & 13)	PE218K	PE255K
10	1	Crankshaft	7203-0384-00A	7203-0502-00A
13	1	Planetary Output Shaft Snap Ring	7203-0453-00A	7203-0504-00A
		Crankshaft Kit (includes items 1, 2, 3, 10 & 13)	PE218KB	PE255KB
2	2	Bearing Cone	203-947000-999	203-947000-999
3	2	Bearing Cup	202-247000-999	202-247000-999
4	1	Frame Plug	7206-0064-00A	
4	1	Bearing Retainer (Blind)		7203-0155-01C
5	1	O-Ring	110-00238-201	
5	6	1/2" NC Hex Hd. Cap Screw x 1-1/2" Lg.		100-012112-273
6	1	Shim Set	7509-0013-00A	7509-0013-00A

SC-65L, SC-65, SC-65H				
Item	Quantity	Description	R.H. Drive Part Number	L.H. Drive Part Number
7	2	Oil Seal	145-318418-999	145-234334-999
8	1	Bearing Retainer	7203-0454-00A	7203-0454-00A
9	6	1/2" NC Socket Hd. Cap Screw x 1-3/4" Lg. (for R.H. Drive)		
10	1	1/2" NC Socket Hd. Cap Screw x 2" Lg. (for L.H. Drive) (listed above with Crankshaft Assembly)	105-012134-273	105-012200-273
11	1	Breather Filter	7602-3002-10A	7602-3002-10A
12	2	1/4" NPT Pipe Plug	170-014001-220	170-014001-220
13	1	(listed above with Crankshaft Assembly)		
14	6	5/16" NC Hex Head Cap Screw x 3-1/4" Long	100-516314-454	100-516314-454
15	6	5/16" Washer Stat-O-Seal	156-516062-999	156-516062-999
16	1	Auburn Gear #6 Kit 3.75:1	Optional Ratios	Optional Ratios

### *Crankshaft Assembly 2-3/4" Stroke; Auburn Planetary; Right-Hand Drive Shown*



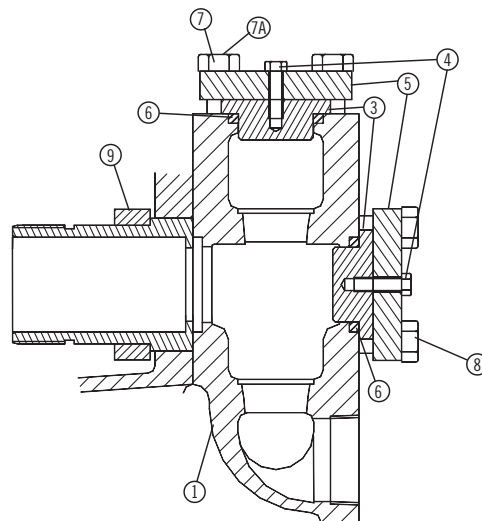
SC-65L, SC-65				
Item	Quantity	Description	R.H. Drive Part Number	L.H. Drive Part Number
1	1	Crankshaft	7203-0384-00A	7203-0502-00A
10	1	Planetary Output Shaft	7203-0453-00A	7203-0504-00A
13	1	Snap Ring	226-000225-999	226-000225-999
		Crankshaft Kit (includes items 1, 2, 3, 10 & 13)	PE265KB	PE254KB
2	2	Bearing Cone	203-947000-999	203-947000-999
3	2	Bearing Cup	202-247000-999	202-247000-999
4	1	Frame Plug	7206-0064-00A	
4	1	Bearing Retainer (Blind)		7203-0155-01C
5	1	O-Ring	110-000238-201	
5	6	1/2" NC Hex Hd. Cap Screw x 1-1/2" Lg.		100-012112-273
6	1	Shim Set	7509-0013-00A	7509-0013-00A

SC-65L, SC-65				
Item	Quantity	Description	R.H. Drive Part Number	L.H. Drive Part Number
7	2	Oil Seal	145-318418-999	145-234334-999
8	1	Bearing Retainer	7203-0454-00B	7203-0454-00B
9	6	1/2" NC Socket Hd. Cap Screw x 1-3/4" Lg. (for R.H. Drive)		
10	1	1/2" NC Socket Hd. Cap Screw x 2" Lg. (for L.H. Drive) (listed above with Crankshaft Assembly)	105-012200-273	105-012200-273
11	1	Breather Filter	7602-3002-10A	7602-3002-10A
12	2	1/4" NPT Pipe Plug	170-014001-405	170-014001-237
13	1	(listed above with Crankshaft Assembly)		
14	6	5/16" NC Hex Head Cap Screw x 3-1/4" Long	100-516314-454	100-516314-454
15	6	5/16" Washer Stat-O-Seal	156-516062-999	156-516062-999
16	1	Auburn Gear #6 Kit 3.75:1	Optional Ratios	Optional Ratios



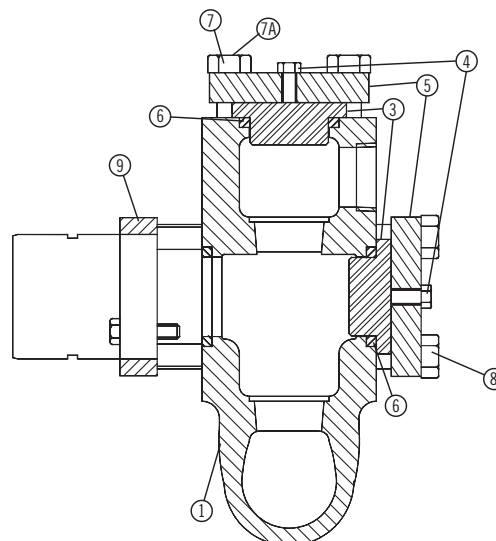
## Front Suction Fluid End Assembly

MA-15M, SC-30, RO-23			
Item	Quantity	Description	Part Number
1	1	Fluid End, Ductile Iron	7207-0007-00B
1	1	Fluid End, Nickel Aluminum Bronze	7207-0008-00B
2	2	5/8" NC Socket Head Cap Screw x 1-1/2" Long	271-058112-271
3	6	Valve Cover & Cylinder Head Plugs	7207-0014-00A
4	6	5/16" NC Hex Head Cap Screw x 7/8" Long	100-516078-273
5	2	Retainer Plate, Valve Cover & Cylinder Head	7207-0013-00B
6	6	Fluid Seal, Nitrile Rubber	7207-0022-00A
7	4	1/2" NC Hex Head Cap Screw x 1-3/4" Long	100-012134-273
7A	4	1/2" NC Hex Head Cap Screw x 2-3/4" Long	100-012234-273
8	8	1/2" NC Hex Head Cap Screw x 6" Long	100-012600-273
9	1	Retainer Plate, Stuffing Box	7207-0011-00B



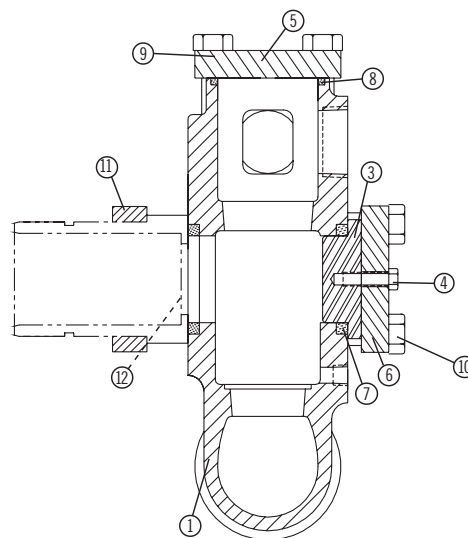
## Side Suction Fluid End Assembly

MA-15M, SC-30			
Item	Quantity	Description	Part Number
1	1	Side Suction Fluid, Ductile Iron	7207-0047-00B
2	2	5/8" NC Socket Head Cap Screw x 1-1/2" Long	271-058112-271
3	6	Valve Cover & Cylinder Head Plug	7207-0014-00A
4	6	5/16" NC Hex Head Cap Screw x 7/8" Long	100-516078-273
5	2	Retainer Plate, Valve Cover & Cylinder Head	7207-0013-00B
6	6	Fluid Seal, Nitrile Rubber	7207-0022-00A
7	4	1/2" NC Hex Head Cap Screw x 1-3/4" Long	100-012134-273
7A	4	1/2" NC Hex Head Cap Screw x 2-3/4" Long	100-012234-273
8	8	1/2" NC Hex Head Cap Screw x 6" Long	100-012600-273
9	1	Retainer Plate, Stuffing Box	7207-0011-00B



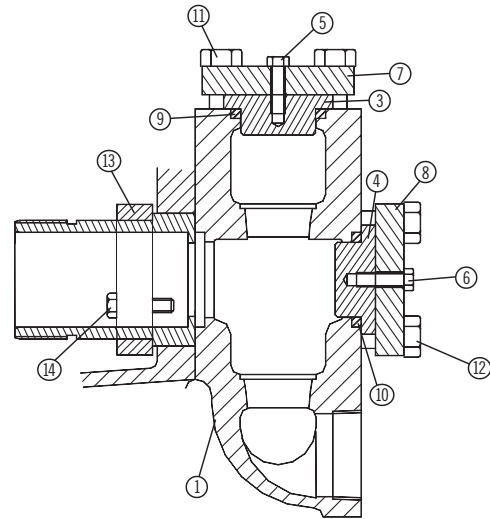
## Fluid End Assembly

MA-25L, SC-45L			
Item	Quantity	Description	Part Number
1	1	Fluid End, Steel	7206-0277-00B
2	2	3/4" NC Socket Head Cap Screw x 4-1/2" Long	271-034200-271
3	3	Cylinder Head Plug	7203-0119-00A
4	3	3/8" NC Hex Head Cap Screw x 1-1/4" Long	100-038114-273
5	1	Valve Cover	7206-0284-00B
6	2	Retainer Plate, Cylinder Head	7206-0309-00B
7	3	Fluid Seal, Nitrile Rubber	7203-0118-00A
8	3	O-Ring #335	110-000335-320
9	8	5/8" NC Hex Head Cap Screw x 1-3/4" Long	100-058134-273
10	8	5/8" NC Hex Head Cap Screw x 7-1/2" Long	100-058712-273
11	1	Retainer Plate, Stuffing Boxes	7206-0275-00B
12	2	3/8" NC Hex Head Cap Screw x 1-1/2" Long	100-038112-273



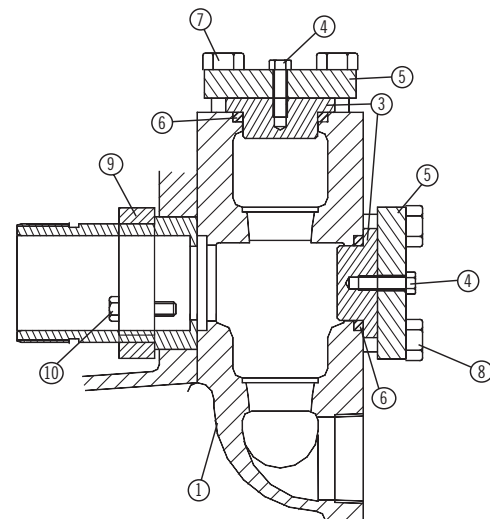
### Fluid End Assembly (Front Suction S/N 3000+)

MA-25M, SC-45			
Item	Quantity	Description	Part Number
1	1	Fluid End, Ductile Iron	7206-0317-00B
2	2	3/4" NC Socket Head Cap Screw x 2" Long	271-034200-271
3	3	Valve Cover Plug	7203-0119-00A
4	3	Cylinder Head Plug	7206-0018-00A
5	3	3/8" NC Hex Head Cap Screw x 1-1/4" Long	100-038114-273
6	3	1/2" NC Hex Head Cap Screw x 1-1/4" Long	100-012114-273
7	1	Retainer Plate, Valve Cover	7206-0309-00B
8	1	Retainer Plate, Cylinder Head	7206-0019-00B
9	3	Fluid Seal, Nitrile Rubber	7203-0118-00A
10	3	Fluid Seal, Nitrile Rubber	7206-0016-00A
11	8	5/8" NC Hex Head Cap Screw x 3" Long	100-058300-273
12	8	5/8" NC Hex Head Cap Screw x 7-1/2" Long	100-058712-273
13	1	Retainer Plate, Stuffing Boxes	7206-0020-00B
14	2	3/8" NC Hex Head Cap Screw x 1-3/4" Long	100-038134-273



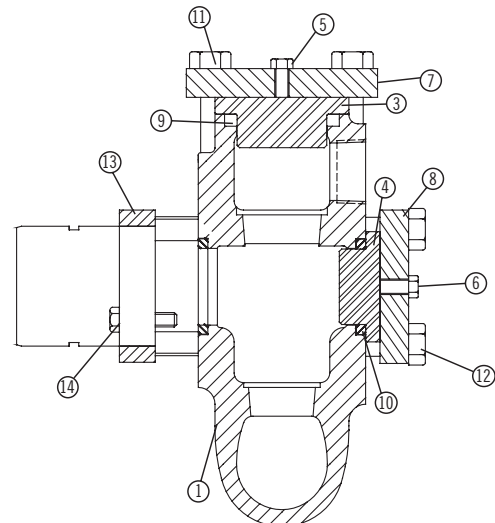
### Fluid End Assembly (Nickel Aluminum Bronze S/N 3000+)

MA-25M, RO-38			
Item	Quantity	Description	Part Number
1	1	Fluid End, Nickel Aluminum Bronze	7206-0002-00D
2	2	3/4" NC Socket Head Cap Screw x 2" Long	271-034200-271
3	6	Valve Cover Plug, S.S.	
		Cylinder Head Plug, S.S.	7206-0018-10A
4	6	3/8" NC Hex Head Cap Screw x 1-1/4" Long	100-038114-273
5	2	Retainer Plate, Valve Cover	
		Retainer Plate, Cylinder Head	7206-0019-00B
6	6	Fluid Seal, Nitrile Rubber	7206-0016-00A
7	8	5/8" NC Hex Head Cap Screw x 3-1/2" Long	100-058300-273
8	8	5/8" NC Hex Head Cap Screw x 7-1/2" Long	100-058712-273
9	1	Retainer Plate, Stuffing Boxes	7206-0020-00B
10	2	3/8" NC Hex Head Cap Screw x 1-1/2" Long	100-038112-273



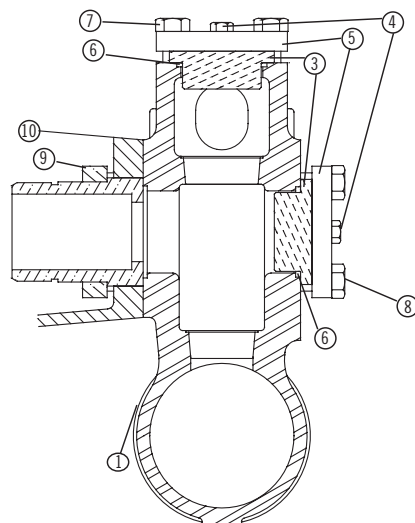
### Side Suction Fluid End Assembly (S/N 3000+)

MA-25M, SC-45			
Item	Quantity	Description	Part Number
1	1	Side Suction Fluid End, Ductile Iron	7206-0267-00B
2	2	3/4" NC Socket Head Cap Screw x 2" Long	271-034200-271
3	3	Valve Cover Plug	7203-0119-00A
4	3	Cylinder Head Plug	7206-0018-00A
5	3	3/8" NC Hex Head Cap Screw x 1-1/4" Long	100-038114-273
6	3	1/2" NC Hex Head Cap Screw x 1-1/4" Long	100-012114-273
7	1	Retainer Plate, Valve Cover	7206-0309-00B
8	1	Retainer Plate, Cylinder Head	7206-0019-00B
9	3	Fluid Seal, Nitrile Rubber	7203-0118-00A
10	3	Fluid Seal, Nitrile Rubber	7206-0016-00A
11	8	5/8" NC Hex Head Cap Screw x 3-1/2" Long	100-058312-273
12	8	5/8" NC Hex Head Cap Screw x 7-1/2" Long	100-058712-273
13	1	Retainer Plate, Stuffing Boxes	7206-0020-00B
14	2	3/8" NC Hex Head Cap Screw x 1-1/2" Long	100-038112-273



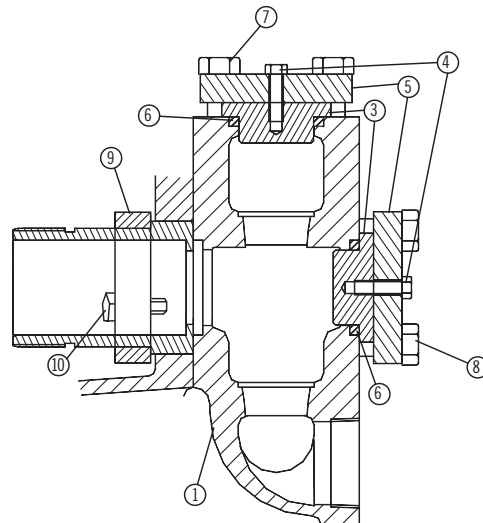
## Side Suction Fluid End Assembly

MA-40L, SC-65L			
Item	Quantity	Description	Part Number
1	1	Fluid End, Ductile Iron	7203-0521-00B
2	2	7/8" NC Socket Head Cap Screw x 2-3/4" Long	271-078234-271
3	6	Valve Cover & Cylinder Head Plug	7203-0565-00B
4	6	1/2" NC Hex Head Cap Screw x 1-1/4" Long	100-012114-273
5	2	Retainer Plate, Valve Cover & Cylinder Head	7203-0110-00B
6	6	Fluid Seal, Nitrile	7202-0041-00A
7	8	Bolt; Hex Head 3/4"-10 UNC x 3-3/4" Long Gr. 5	100-034334-273
8	8	3/4" NC Hex Head Cap Screw x 9-1/2" Long	100-034912-273
9	1	Retainer Plate, Stuffing Box	7203-0415-00B
10	2	Screw, 12 Point; 5/8" NC x 2" Long 12 Point Cap Screw	310-058200-454



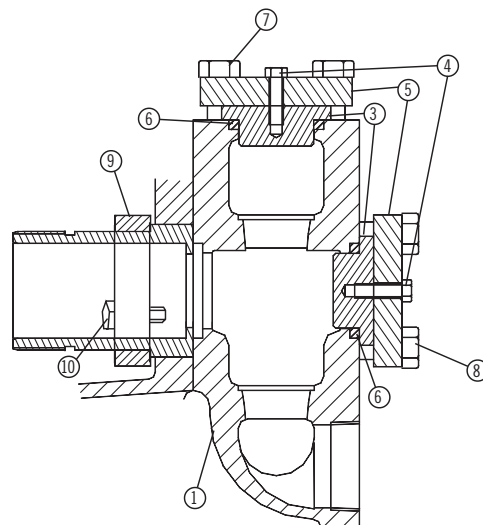
## Fluid End Assembly

MA-40M, SC-65			
Item	Quantity	Description	Part Number
1	1	Fluid End, Ductile Iron	7203-0102-00E
2	2	7/8" NC Socket Head Cap Screw x 2-3/4" Long	271-078234-271
3	6	Valve Cover & Cylinder Head Plug	7203-0119-00A
4	6	1/2" NC Hex Head Cap Screw x 1-1/4" Long	100-012114-273
5	2	Retainer Plate, Valve Cover & Cylinder Head	7203-0110-00B
6	6	Fluid Seal, Nitrile Rubber	7203-0118-00A
7	8	3/4" NC Hex Head Cap Screw x 3" Long	100-034300-273
8	8	3/4" NC Hex Head Cap Screw x 9" Long	100-034900-273
9	1	Retainer Plate, Stuffing Box	7203-0107-00C
10	2	Screw, Cap, Hex Head, 5/8" NC x 2" Long	100-058200-273
9	1	Retainer Plate, Stuffing Boxes	7206-0020-00B
10	2	3/8" NC Hex Head Cap Screw x 1-1/2" Long	100-012112-273



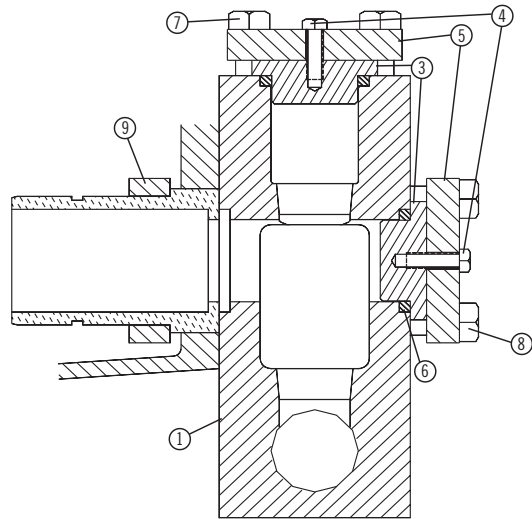
## Front Suction Fluid End Assembly

MA-40M, R0-64			
Item	Quantity	Description	Part Number
1	1	Fluid End, Nickel Aluminum Bronze	7203-0101-00E
2	2	7/8" NC Socket Head Cap Screw x 2-3/4" Long	271-078234-271
3	6	Valve Cover & Cylinder Head Plug	7203-0119-20A
4	6	1/2" NC Hex Head Cap Screw x 1-1/4" Long	100-012114-273
5	2	Retainer Plate, Valve Cover & Cylinder Head	7203-0110-00B
6	6	Fluid Seal, Nitrile Rubber	7203-0118-00A
7	8	3/4" NC Hex Head Cap Screw x 4-1/2" Long	100-034414-273
8	8	3/4" NC Hex Head Cap Screw x 9" Long	100-034900-273
9	1	Retainer Plate, Stuffing Box	7203-0107-00C
10	2	5/8" NC Hex Head Cap Screw x 2-1/4" Long	100-058214-273



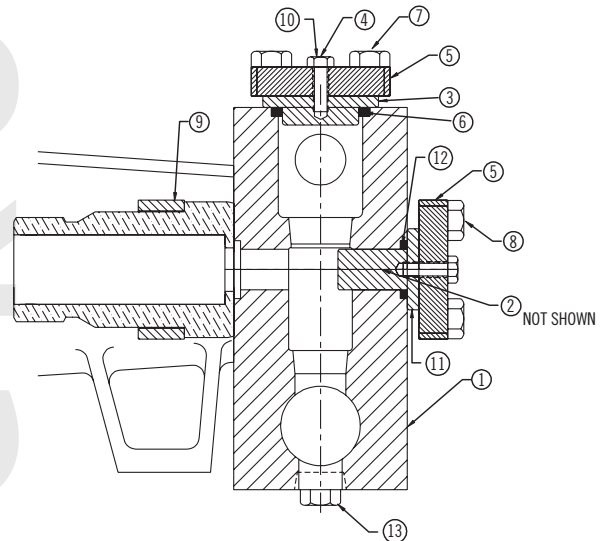
### Front Suction Fluid End Assembly

MA-15M, RO-23			
Item	Quantity	Description	Part Number
1	1	Fluid End	Consult Factory
2	2	5/8" NC Socket Head Cap Screw x 3-3/4" Long	271-058334-271
3	6	Valve Cover & Cylinder Head Plug	7207-0014-10A
4	6	5/16" NC Hex Head Cap Screw x 7/8" Long	100-516078-273
5	2	Retainer Plate, Valve Cover & Cylinder Head	7207-0013-00B
6	6	Fluid Seal	7207-0022-00A
7	8	1/2" NC Hex Head Cap Screw x 1-3/4" Long	100-012134-273
8	8	1/2" NC Hex Head Cap Screw x 6" Long	100-012600-273
9	1	Retainer Plate, Stuffing Box	7207-0011-00B



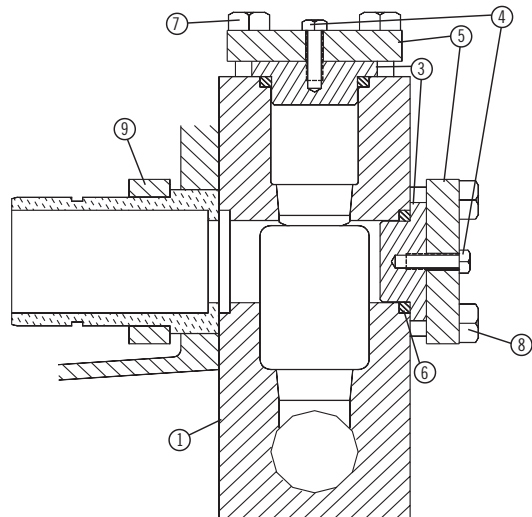
### Liquid End Assembly

MA-15H			
Item	Quantity	Description	Part Number
1	1	Fluid End	Consult Factory
2	2	5/8" NC Socket Head Cap Screw x 4-1/4" Long	271-058414-271
3	3	Valve Cover Plug	7207-0014-10A
4	5	5/16" NC Hex Head Cap Screw x 7/8" Long	100-516078-273
5	2	Retainer Plate, Valve Cover & Cylinder Head	7207-0013-00B
6	3	Fluid Seal	7207-0022-00A
7	8	1/2" NC Hex Head Cap Screw x 1-3/4" Long	100-012134-273
8	8	1/2" NC Hex Head Cap Screw x 5-3/4" Long	100-012534-273
9	1	Retainer Plate, Stuffing Box	7207-0127-00B
10	1	5/16" Screw, Cap Hex Head x 1-1/8" Long	100-516118-273
11	3	Cylinder Head Plug	7207-0243-10A
12	6	Seal, Fluid	7207-0252-00A
13	3	Plug, Pipe, 3/4" NPT S.S.	170-034002-263



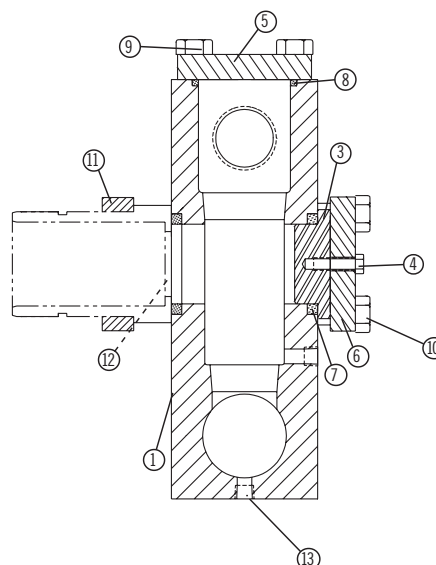
### Fluid End Assembly

SC-30H			
Item	Quantity	Description	Part Number
1	1	Fluid End	Consult Factory
2	2	5/8" NC Socket Head Cap Screw x 4-1/4" Long	271-058414-271
3	6	Valve Cover & Cylinder Head Plug	7207-0014-00A
4	6	5/16" NC Hex Head Cap Screw x 7/8" Long	100-516078-273
5	2	Retainer Plate, Valve Cover & Cylinder Head	7207-0127-00B
6	6	Fluid Seal, Nitrile Rubber	7207-0022-00A
7	4	1/2" NC Hex Head Cap Screw x 1-3/4" Long	100-012134-273
8	8	1/2" NC Hex Head Cap Screw x 6" Long	100-012600-273
9	1	Retainer Plate, Stuffing Boxes	7207-0011-00B



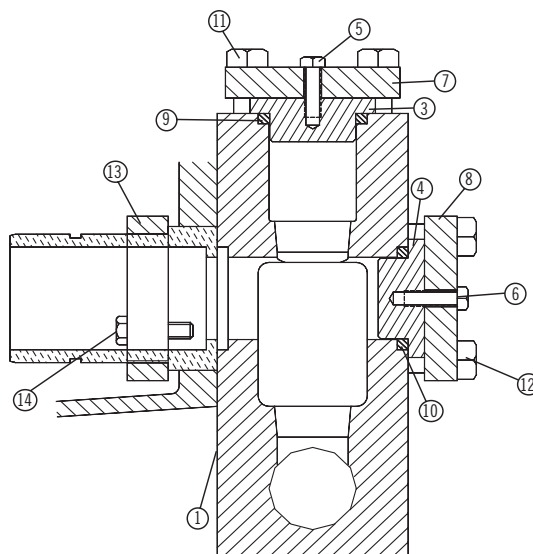
## Fluid End Assembly

MA-25L, SC-45L			
Item	Quantity	Description	Part Number
1	1	Fluid End	Consult Factory
2	2	3/4" NC Socket Head Cap Screw x 4-1/2" Long	271-034412-271
3	3	Cylinder Head Plug	7203-0119-00A
4	3	3/8" NC Hex Head Cap Screw x 1-1/4" Long	100-038114-273
5	1	Valve Cover	7206-0284-00B
6	1	Retainer Plate, Cylinder Head	7206-0019-00B
7	3	Fluid Seal, Nitrile Rubber	7203-0118-00A
8	3	O-Ring #335	110-000335-201
9	8	5/8" NC Hex Head Cap Screw x 1-3/4" Long	100-058134-273
10	8	5/8" NC Hex Head Cap Screw x 7-1/2" Long	100-058712-273
11	1	Retainer Plate, Stuffing Boxes	7206-0020-00B
12	2	3/8" NC Hex Head Cap Screw x 1-1/2" Long	100-038112-273
13	4	1/4" Pipe Plug, S.S.	170-014002-263



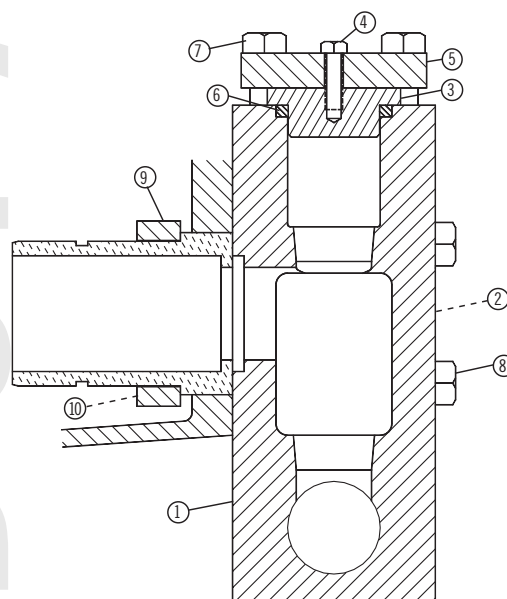
## Fluid End Assembly, S/N 3000+

MA-25M, RO-38			
Item	Quantity	Description	Part Number
1	1	Fluid End	Consult Factory
2	2	3/4" NC Socket Head Cap Screw x 2" Long	271-034412-273
3	3	Valve Cover Plug	7203-0119-00A
4	3	Cylinder Head Plug	7206-0018-00A
5	3	3/8" NC Hex Head Cap Screw x 1-1/4" Long	100-038114-273
6	3	1/2" NC Hex Head Cap Screw x 1-1/4" Long	100-012114-273
7	1	Retainer Plate, Valve Cover	7206-0309-00B
8	1	Retainer Plate, Cylinder Head	7206-0019-00B
9	3	Fluid Seal, Nitrile Rubber	7203-0118-00A
10	3	Fluid Seal, Nitrile Rubber	7206-0016-00A
11	8	5/8" NC Hex Head Cap Screw x 2" Long	100-058200-273
12	8	5/8" NC Hex Head Cap Screw x 7-1/2" Long	100-058712-273
13	1	Retainer Plate, Stuffing Boxes	7206-0020-00B
14	2	3/8" NC Hex Head Cap Screw x 1-1/2" Long	100-038112-273



## Fluid End Assembly

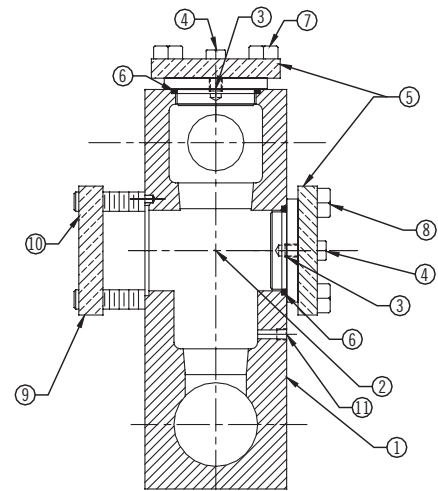
SC-45H			
Item	Quantity	Description	Part Number
1	1	Fluid End	Consult Factory
2	2	3/4" NC Socket Head Cap Screw x 5" Long	100-034500-273
3	3	Valve Cover & Cylinder Head Plug	7206-0018-00A
4	3	3/8" NC Hex Head Cap Screw x 1-1/4" Long	100-038114-273
5	2	Retainer Plate, Valve Cover	7206-0091-00B
6	3	Fluid Seal, Nitrile Rubber	7206-0016-00A
7	8	5/8" NC Hex Head Cap Screw x 2-1/2" Long	100-078225-273
8	8	5/8" NC Hex Head Cap Screw x 6-1/2" Long	100-058612-273
9	1	Retainer Plate, Stuffing Box	7206-0020-00B
10	2	3/8" NC Hex Head Cap Screw x 1-1/2" Long	100-038112-273





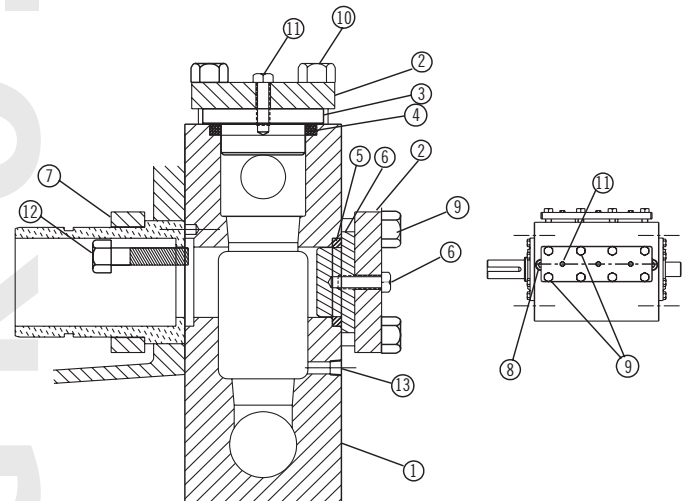
## Block Fluid End Assembly

MA-40L			
Item	Quantity	Description	Part Number
1	1	Fluid End	Consult Factory
2	2	7/8" NC Socket Head Cap Screw x 5-3/4" Long	271-078534-271
3	6	Valve Cover & Cylinder Head Plug	7203-0565-00B
4	6	1/2" NC Hex Head Cap Screw x 1-1/4" Long	100-012114-273
5	2	Retainer Plate, Valve Cover & Cylinder Head	7203-0110-00B
6	6	Fluid Seal, Nitrile	7202-0041-00A
7	8	3/4" NC Hex Head Cap Screw x 3-1/2" Long	100-034212-273
8	8	3/4" NC Hex Head Cap Screw x 9-1/2" Long	100-034912-273
9	1	Retainer Plate, Stuffing Box	7203-0415-00B
10	2	5/8" NC Hex Head Cap Screw x 2-1/4" Long	310-058200-454
11	3	Plug, Pipe, 1/8"	170-018002-405



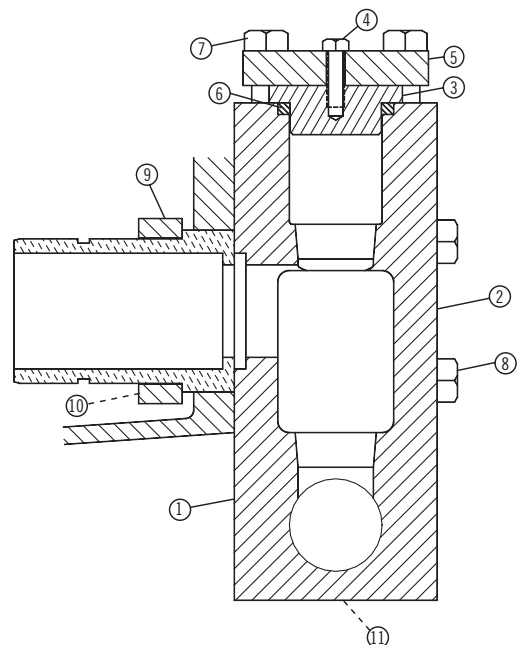
## Fluid End Assembly

MA-40M, RO-64			
Item	Quantity	Description	Part Number
1	1	Fluid End	Consult Factory
2	2	Retainer Plate, Valve Cover & Cylinder Head	7203-0110-00B
3	3	Plug, Valve Cover	7203-0636-10A
4	3	Seal, Valve Cover, Nitrile	7202-0012-00A
5	3	Seal, Cylinder Head, Nitrile	7203-0118-00A
6	3	Plug, Cylinder Head	7203-0119-20A
7	1	Retainer Plate, Stuffing Box	7203-0107-00C
8	2	Screw, Socket Head Cap 7/8" NC x 5-3/4"	271-078534-271
9	8	Screw, Hex Head Cap 3/4" NC x 9"	100-034900-273
10	8	Screw, Hex Head Cap 3/4" NC x 2"	100-034200-273
11	6	Screw, Hex Head Cap 1/2" NC x 1-1/4"	100-012114-273
12	2	Screw, Hex Head Cap 5/8" NC x 2-1/4"	100-058214-273
13	3	Plug, Pipe 1/8" NPT (Optional)	170-018003-405

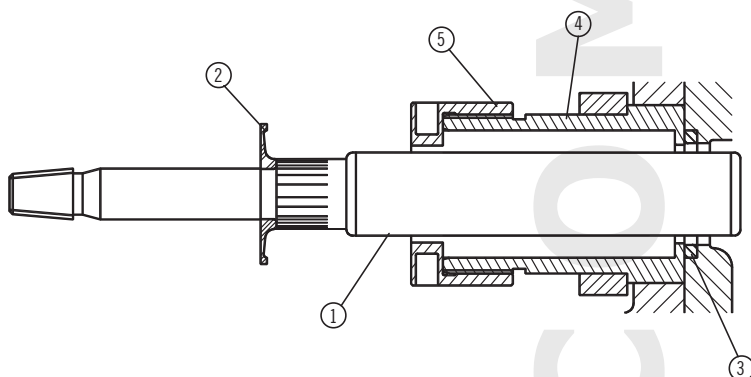


## Fluid End Assembly

SC-65H			
Item	Quantity	Description	Part Number
1	1	Fluid End	Consult Factory
2	2	7/8" NC Socket Head Cap Screw x 7" Long	100-078700-273
3	3	Valve Cover & Cylinder Head Plug	7203-0119-00A
4	6	1/2" NC Hex Head Cap Screw x 1-1/2" Long	100-012112-273
5	1	Retainer Plate, Valve Cover & Cylinder Head	7203-0187-00B
6	3	Fluid Seal, Nitrile Rubber	7203-0118-00A
7	8	1" NC Hex Head Cap Screw x 3" Long	100-100300-273
8	8	3/4" NC Hex Head Cap Screw x 8" Long	100-034800-00
9	1	Retainer Plate, Stuffing Box	7203-0107-00C
10	2	5/8" NC Hex Head Cap Screw x 2-1/4" Long	100-058114-273
11	1	1/4" Hex Head Pipe Plug	170-014002-273



## Stuffing Box Assembly



\*RO pumps do not use steel.

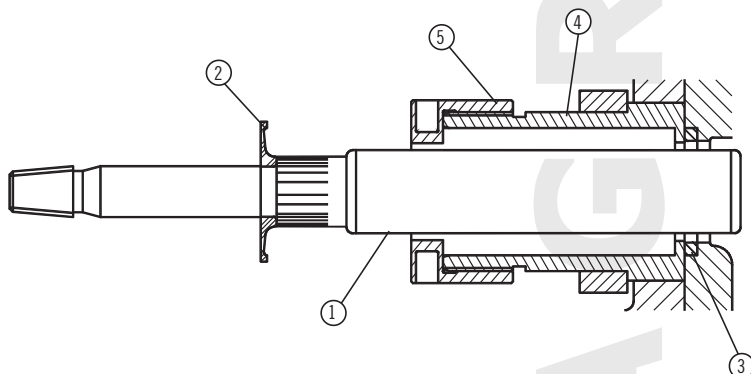
For both Stuffing Box and Gland use the following:  
Nickel Aluminum Bronze:  
xxxx-xxxx-01A.  
316 Stainless Steel:  
xxxx-xxxx-03A.  
2205 Duplex Stainless Steel:  
xxxx-xxxx-04A.

GLAND NUT WRENCH  
7206-0086-00B

Qty. 3 per pump ea.

MA-15M, MA-15H, SC-30, SC-30H, RO-23					
Plunger Diameter	Plunger, Chrome-Oxide (#1)	Baffle (#2)	Stuffing Box Seal, Nitrile Rubber (#3)	Stuffing Box, *Steel (#4)	Gland *Steel (#5)
1-5/8"	7207-0042-13B	7207-0015-00A	7207-0022-00A	7207-0039-00A	7207-0038-00A
1-1/2"	7207-0042-12B	7207-0015-00A	7207-0022-00A	7207-0039-00A	7207-0038-00A
1-3/8"	7207-0042-11B	7207-0015-00A	7207-0022-00A	7207-0039-00A	7207-0038-00A
1-1/4"	7207-0042-10B	7207-0015-00A	7207-0022-00A	7207-0039-00A	7207-0038-00A
1-1/8"	7207-0042-09B	7207-0015-00A	7207-0022-00A	7207-0040-00A	7207-0026-00A
1"	7207-0042-08B	7207-0015-00A	7207-0022-00A	7207-0040-00A	7207-0026-00A
7/8"	7207-0042-07B	7207-0015-00A	7207-0022-00A	7207-0041-00A	7207-0026-00A
3/4"	7207-0042-06B	7207-0015-00A	7207-0022-00A	7207-0041-00A	7207-0026-00A

## Stuffing Box Assembly



\* RO pumps do not use steel.

For TX plunger use 7206-0278-xxB (for abrasive service).

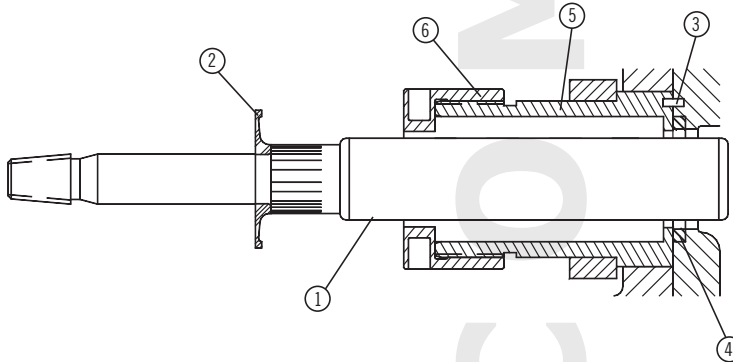
For both Stuffing Box and Gland use the following:  
Nickel Aluminum Bronze:  
xxxx-xxxx-01A.  
316 Stainless Steel:  
xxxx-xxxx-03A.  
2205 Duplex Stainless Steel:  
xxxx-xxxx-04A.

GLAND NUT WRENCH  
7206-0086-00B

Qty. 3 per pump ea.

MA-25L, SC-45L					
Plunger Diameter	Plunger, Chrome-Oxide (#1)	Baffle (#2)	Stuffing Box Seal, Nitrile Rubber (#3)	Stuffing Box, *Steel (#4)	Gland Nut *Steel (#5)
2-1/4"	7206-0023-18B	7207-0015-00A	7203-0118-00A	7206-0271-00A	7206-0272-00A
2-1/8"	7206-0023-17B	7207-0015-00A	7203-0118-00A	7206-0271-00A	7206-0272-00A
2"	7206-0023-16B	7207-0015-00A	7203-0118-00A	7206-0271-00A	7206-0272-00A

### Stuffing Box Assembly



\*RO pumps do not use steel.  
 \*\* **NOTE:** 1" and 7/8" require a separate extension rod – 7206-0024-00A.

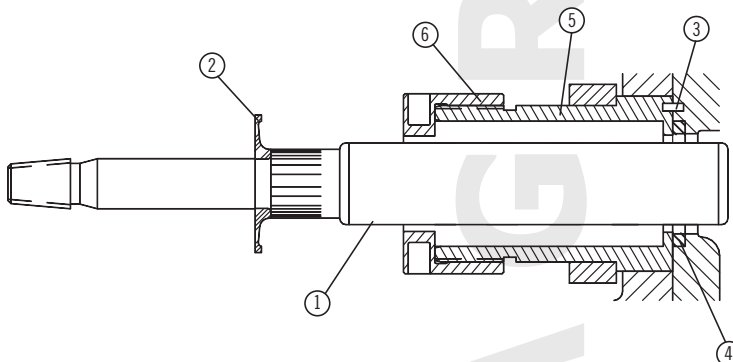
For both Stuffing Box and Gland use the following:  
 Nickel Aluminum Bronze:  
 xxxx-xxxx-01A.  
 316 Stainless Steel:  
 xxxx-xxxx-03A.  
 2205 Duplex Stainless Steel:  
 xxxx-xxxx-04A.

GLAND NUT WRENCH  
 7206-0086-00B

Qty. 3 per pump ea.

MA-25M, SC-45, SC-45H, RO-38							
Plunger Diameter	Plunger, Chrome-Oxide (#1)	Baffle (#2)	Roll Pin (#3)	Stuffing Box Seal, Nitrile Rubber (#4)	Stuffing Box, *Steel (#5)		Gland Nut, Steel (#6)
1-7/8"	7206-0023-15B	7206-0015-00A	149-014058-999	7206-0016-00A	7206-0025-01A	7206-0025-00A	7206-0012-00A
1-3/4"	7206-0023-14B	7206-0015-00A	149-014058-999	7206-0016-00A	7206-0025-01A	7206-0025-00A	7206-0012-00A
1-5/8"	7206-0023-13B	7206-0015-00A	149-014058-999	7206-0016-00A	7206-0025-01A	7206-0025-00A	7206-0012-00A
1-1/2"	7206-0023-12B	7206-0015-00A	149-014058-999	7206-0016-00A	7206-0025-01A	7206-0025-00A	7206-0012-00A
1-3/8"	7206-0023-11B	7206-0015-00A	149-014058-999	7206-0016-00A	7206-0026-01A	7206-0026-00A	7206-0013-00A
1-1/4"	7206-0023-10B	7206-0015-00A	149-014058-999	7206-0016-00A	7206-0026-01A	7206-0026-00A	7206-0013-00A
1-1/8"	7206-0023-09B	7206-0015-00A	149-014058-999	7206-0016-00A	7206-0027-01A	7206-0027-00A	7206-0011-00A
** 1"	7206-0023-08B	7206-0015-00A	149-014058-999	7206-0016-00A	7206-0027-01A	7206-0027-00A	7206-0011-00A
** 7/8"	7206-0023-07B	7206-0015-00A	149-014058-999	110-000320-201	7206-0028-01A	7206-0028-00A	7206-0014-00A

### Stuffing Box Assembly



\*For both Stuffing Box and Gland use the following:  
 Aluminum Bronze:  
 xxxx-xxxx-01A.  
 316 Stainless Steel:  
 xxxx-xxxx-03A.  
 2205 Stainless Steel:  
 xxxx-xxxx-04A.

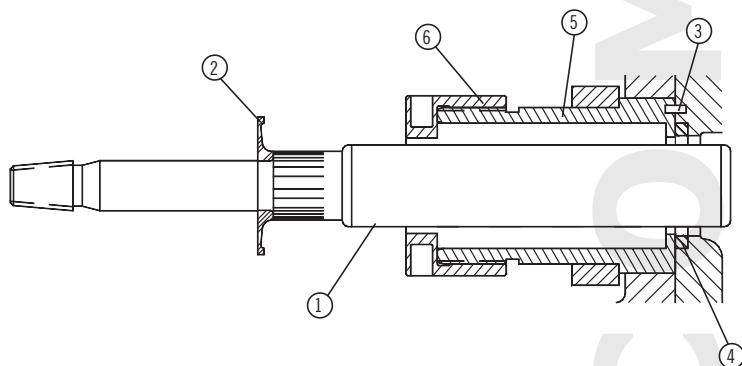
\*\* For TX use 7203-0530-xxB (for abrasive service).

GLAND NUT WRENCH  
 7202-0399-00B

Qty. 3 per pump ea.

MA-40L, SC-65L						
Plunger Diameter	**Plunger, Chrome-Oxide (#1)	Baffle (#2)	Roll Pin (#3)	Stuffing Box Seal, Nitrile Rubber (#4)	Stuffing Box, *Steel (#5)	Gland Nut *Steel (#6)
2-3/4"	7203-0113-22B	7203-0117-00A	149-014058-999	7202-0041-00A	7203-0289-02B	7203-0290-02B
2-5/8"	7203-0113-21B	7203-0117-00A	149-014058-999	7202-0041-00A	7203-0289-02B	7203-0290-02B
2-1/2"	7203-0113-20B	7203-0117-00A	149-014058-999	7202-0041-00A	7203-0552-02B	7203-0534-02B
2-3/8"	7203-0113-19B	7203-0117-00A	149-014058-999	7202-0041-00A	7203-0552-02B	7203-0534-02B
2-1/4"	7203-0113-18B	7203-0117-00A	149-014058-999	7202-0041-00A	7203-0755-02B	7202-0180-02B

## Stuffing Box Assembly



Qty. 3 per pump ea.

MA-40M, SC-65, RO-64						
Plunger Diameter	**Plunger, Chrome-Oxide (#1)	Baffle (#2)	Roll Pin (#3)	Stuffing Box Seal, Nitrile Rubber (#4)	Stuffing Box, *Ductile (#5)	Gland Nut *Ductile (#6)
2-1/4"	7203-0113-18B	7203-0117-00A	149-014058-999	7203-0118-00A	7203-0111-00B	7202-0180-00B
2-1/8"	7203-0113-17B	7203-0117-00A	149-014058-999	7203-0118-00A	7203-0111-00B	7202-0180-00B
2"	7203-0113-16B	7203-0117-00A	149-014058-999	7203-0118-00A	7203-0111-00B	7202-0180-00B
1-7/8"	7203-0113-15B	7203-0117-00A	149-014058-999	7203-0118-00A	7203-0111-00B	7202-0180-00B
1-3/4"	7203-0113-14B	7203-0117-00A	149-014058-999	7203-0118-00A	7203-0111-00B	7202-0180-00B

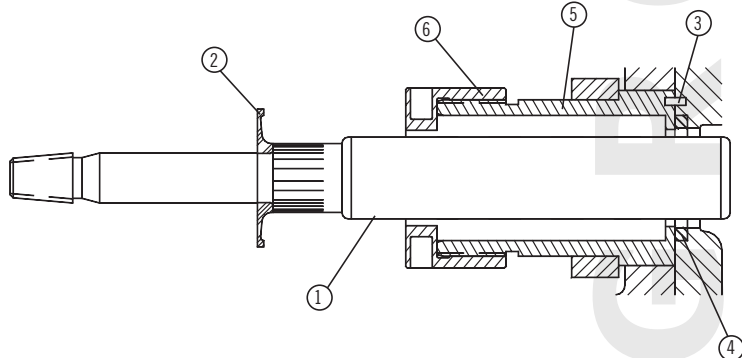
\*RO pumps do not use steel.

\*For both Stuffing Box and Gland use the following:  
Nickel Aluminum Bronze:  
xxxx-xxxx-01A.  
316 Stainless Steel:  
xxxx-xxxx-03A.  
2205 Duplex Stainless Steel:  
xxxx-xxxx-04A.

\*\* For TX plunger use 7203-0530-xxB (for abrasive service).

GLAND NUT WRENCH  
7202-0399-00B

## Stuffing Box Assembly



Qty. 3 per pump ea.

SC-65H						
Plunger Diameter	**Plunger, Chrome-Oxide (#1)	Baffle (#2)	Roll Pin (#3)	Stuffing Box Seal, Nitrile Rubber (#4)	Stuffing Box, *Steel (#5)	Gland Nut *Steel (#6)
1-5/8"	7203-0113-13A	7203-0117-00A	149-014058-999	7203-0118-00A	7203-0133-00A	7202-0179-00B
1-1/2"	7203-0113-12B	7203-0117-00A	149-014058-999	7203-0118-00A	7203-0133-00B	7202-0179-00B
1-3/8"	7203-0113-11B	7203-0117-00A	149-014058-999	7203-0118-00A	7203-0134-03A	7202-0178-00B
1-1/4"	7203-0113-10B	7203-0117-00A	149-014058-999	7203-0118-00A	7203-0134-03A	7202-0178-00B

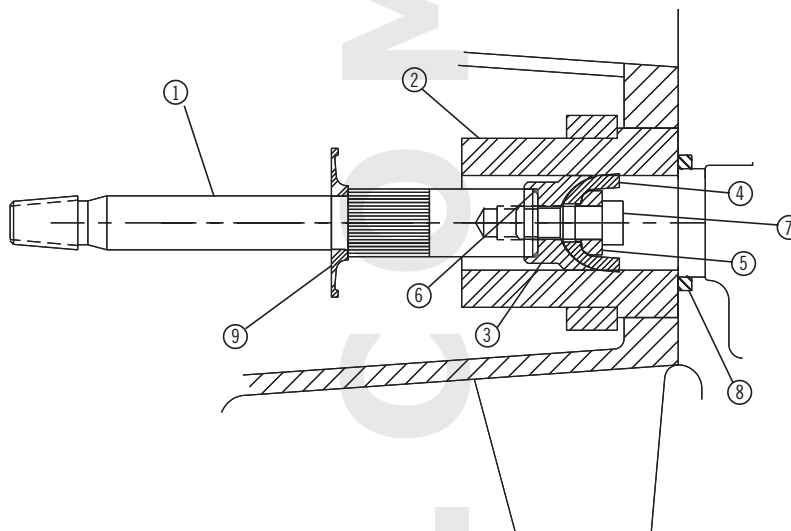
\*For TX plunger use 7203-0530-xxB (for abrasive service).

1-1/4" plungers need a separate extension rod (7203-0114-00A).

For both Stuffing Box and Gland use the following:  
Nickel Aluminum Bronze:  
xxxx-xxxx-01A.  
316 Stainless Steel:  
xxxx-xxxx-03A.  
2205 Duplex Stainless Steel:  
xxxx-xxxx-04A.

GLAND NUT WRENCH  
7202-0399-00B

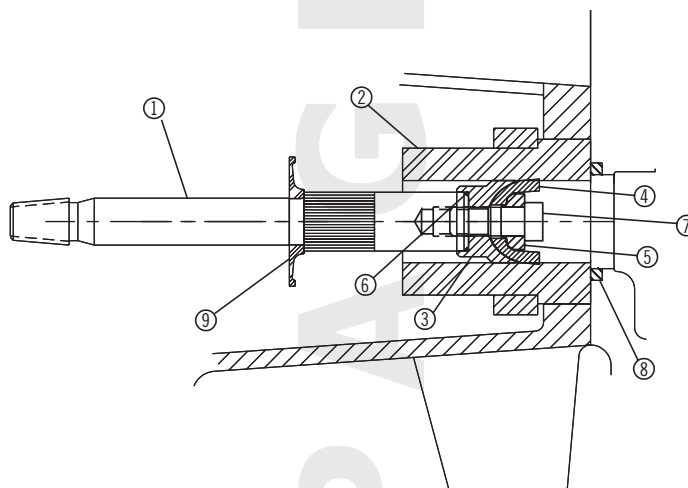
### *Piston Assembly; 1-3/4" Kevlar® and Chrome Oxide*



Qty. 3 per pump ea.

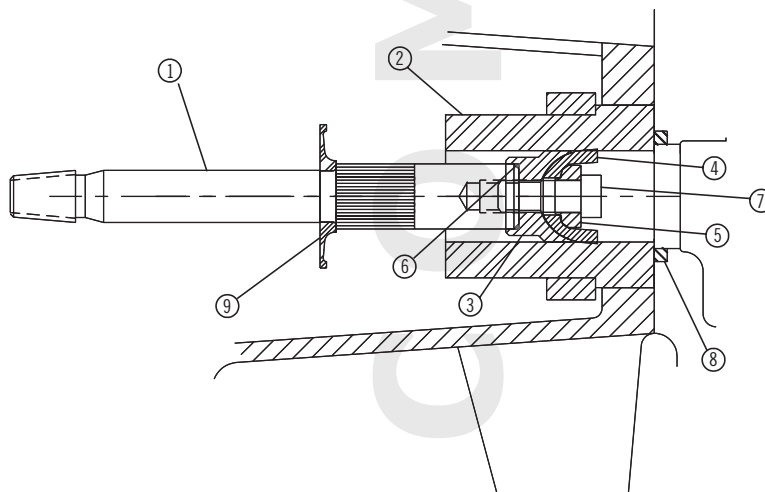
SC-30				SC-30			
Item	Quantity	Description	Part Number	Item	Quantity	Description	Part Number
1	1	Piston Rod	7207-0198-00B	5	1	Piston Keeper	7206-0391-00A
2	1	Piston Liner 1-3/4" White Ceramic	7207-0214-00A	6	1	O-Ring	110-000024-218
	1	Piston Liner 1-3/4" Chrome Oxide	7207-0197-00A	7	1	Socket Head Cap Screw	16654A009
3	1	Piston Hub	7206-0390-00A	8	1	Fluid Seal	7207-0022-00A
4	1	Piston Cup HSN and Kevlar®	7206-0389-00A	9	1	Baffle Plate	7207-0015-00A

### *Piston Assembly; 2-1/4" Kevlar® and Chrome Oxide*



SC-45L				SC-45L			
Item	Quantity	Description	Part Number	Item	Quantity	Description	Part Number
1	1	Piston Rod	7206-0365-00B	5	1	Piston Keeper	7206-0384-00A
2	1	Piston Liner 2-1/4" White Ceramic	7206-0364-00A	6	1	O-Ring	110-000024-218
	1	Piston Liner 2-1/4" Chrome Oxide	7206-0406-00A	7	1	Socket Head Cap Screw	16654A006
3	1	Piston Hub	7206-0383-00A	8	1	Fluid Seal	7203-0118-00A
4	1	Piston Cup HSN and Kevlar®	7206-0380-00A	9	1	Baffle Plate	7206-0015-00A

### *Piston Assembly; 1-3/4" Kevlar® and Chrome Oxide*

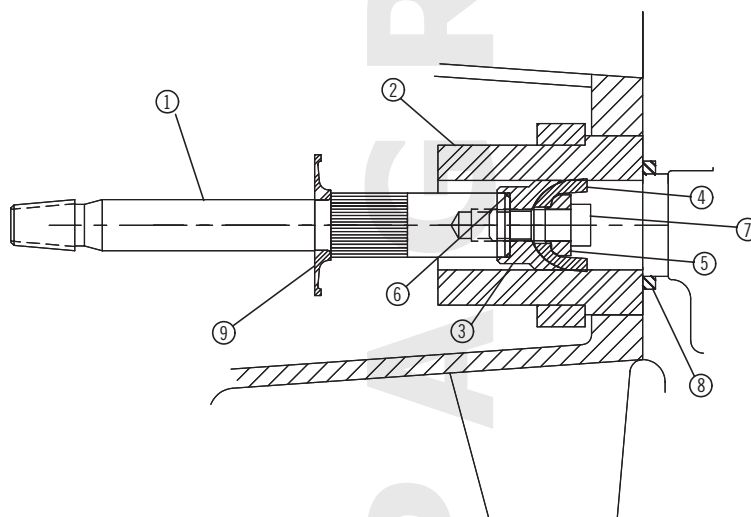


Qty. 3 per pump ea.

SC-45			
Item	Quantity	Description	Part Number
1	1	Piston Rod	7206-0365-00B
2	1	Piston Liner 1-3/4" Chrome Oxide	7206-0360-00A
	1	Piston Liner 1-3/4" White Ceramic	7206-0405-00A
3	1	Piston Hub	7206-0390-00A
4	1	Piston Cup HSN and Kevlar®	7206-0389-00A

SC-45			
Item	Quantity	Description	Part Number
5	1	Piston Keeper	7206-0391-00A
6	1	O-Ring	110-000024-218
7	1	Socket Head Cap Screw	16654A009
8	1	Fluid Seal	7206-0016-00A
9	1	Baffle Plate	7206-0015-00A

### *Piston Assembly; 2-1/4" Kevlar® and White Ceramic or Chrome Oxide*

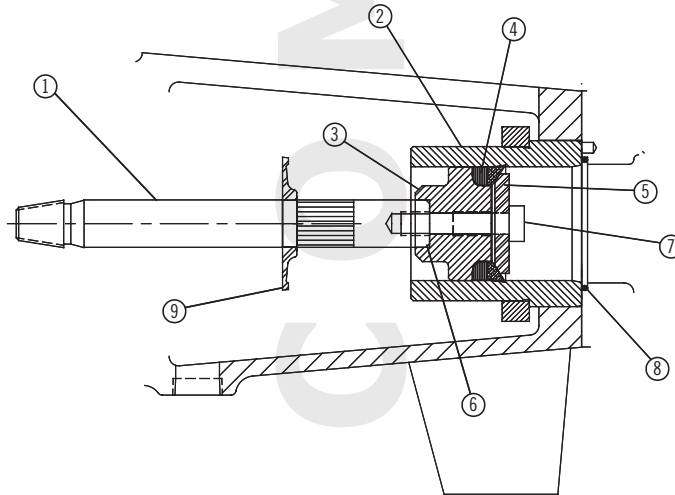


SC-65			
Item	Quantity	Description	Part Number
1	1	Piston Rod	7203-0624-00B
2	1	Piston Liner 2-1/4" White Ceramic	7203-0702-00A
	1	Piston Liner 2-1/4" Chrome Oxide	7206-0627-00A
3	1	Piston Hub	7206-0383-00A
4	1	Piston Cup HSN and Kevlar®	7206-0380-00A

SC-65			
Item	Quantity	Description	Part Number
5	1	Piston Keeper	7206-0384-00A
6	1	O-Ring	110-000024-218
7	1	Socket Head Cap Screw	16654A006
8	1	Fluid Sead	7203-0118-00A
9	1	Baffle Plate	7203-0117-00A



### *Piston Assembly; 3" Black Rubber and White Ceramic*



Qty. 3 per pump ea.

SC-65L			
Item	Quantity	Description	Part Number
1	1	Piston Rod	7203-0624-00B
2	1	Piston Liner 3"	7203-0658-00A
3	1	Piston Hub	7203-0661-00A
4	1	Piston Cup Black Rubber	7203-0666-00A
5	1	Piston Keeper	7203-0662-00A

SC-65L			
Item	Quantity	Description	Part Number
6	1	O-Ring	110-000024-218
7	1	Socket Head Cap Screw	16654A006
8	1	Fluid Seal	7202-0041-00A
9	1	Baffle Plate	7203-0117-00A

### *Piston Assembly; 3" Kevlar® and White Ceramic*

SC-65L			
Item	Quantity	Description	Part Number
1	1	Piston Rod	7203-0624-00B
2	1	Piston Liner 3" White Ceramic	7203-0658-00A
3	1	Piston Hub	7203-0729-00A
4	1	Piston Cup HSN and Kevlar®	7203-0727-00A
5	1	Piston Keeper	7203-0730-00A

SC-65L			
Item	Quantity	Description	Part Number
6	1	O-Ring	110-000024-218
7	1	Socket Head Cap Screw	16654A006
8	1	Fluid Seal	7202-0041-00A
9	1	Baffle Plate	7203-0117-00A

## **STANDARD LIMITED WARRANTY CENTRIFUGAL & RECIPROCATING PUMPS**

Aplex warrants its products against defects in material and workmanship for a period of 12 months from the date of shipment from Aplex or 18 months from the manufacturing date, whichever occurs first - provided that such products are used in compliance with the requirements of the Aplex catalog and technical manuals.

During the warranty period and subject to the conditions set forth, Aplex, at its discretion, will repair or replace to the original user, the parts which prove defective in materials and workmanship. Aplex reserves the right to change or improve its products or any portions thereof without being obligated to provide such a change or improvement for prior sold and/or shipped units.

Seals, piston cups, packing, plungers, liners and valves used for handling clear, fresh, nonaerated water at a temperature not exceeding 120°F are warranted for ninety days from date of shipment. All other applications are subject to a thirty day warranty. Accessories such as motors, engines and auxiliary equipment are warranted by the respective manufacturer and are excluded in this standard warranty. Under no circumstance will Aplex be responsible for the cost of field labor, travel expenses, rented equipment, removal/reinstallation costs or freight expenses to and from the factory or an authorized Aplex service facility.

This limited warranty will not apply: (a) to defects or malfunctions resulting from failure to properly install, operate or maintain the unit in accordance with the printed instructions provided; (b) to failures resulting from abuse, accident or negligence; (c) to normal maintenance services and parts used in connection with such service; (d) to units which are not installed in accordance with applicable local codes, ordinances and good trade practices; (e) if the unit is moved from its original installation location; (f) if unit is used for purposes other than for what it is designed and manufactured; (g) to any unit which has been repaired or altered by anyone other than Aplex or an authorized Aplex service provider; (h) to any unit which has been repaired using non factory specified/OEM parts.

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Some states do not permit some or all of the above warranty limitations or the exclusion or limitation of incidental or consequential damages and therefore such limitations may not apply to you. No warranties or representations at any time made by any representatives of Aplex shall vary or expand the provision hereof.



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