



*First choice when
quality counts.™*

Check-Mate® Supply Packages Pump/Ram Selection Guide

**Select the
Perfect
Pump/Ram
Module
for your
Sealant and
Adhesive
Package**



SEALANT ADHESIVE EQUIPMENT

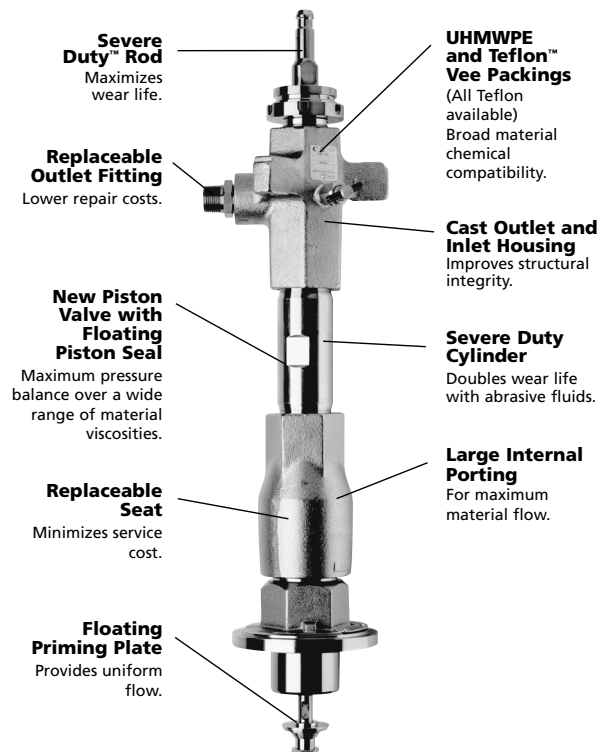
PUMP SELECTION CHART

To select the proper pump for a given sealant or adhesive material, you must know:

- 1) Material Viscosity (cps)
- 2) Material Type (urethane, epoxy, acrylic, silicone, etc.)
- 3) Flow Rate

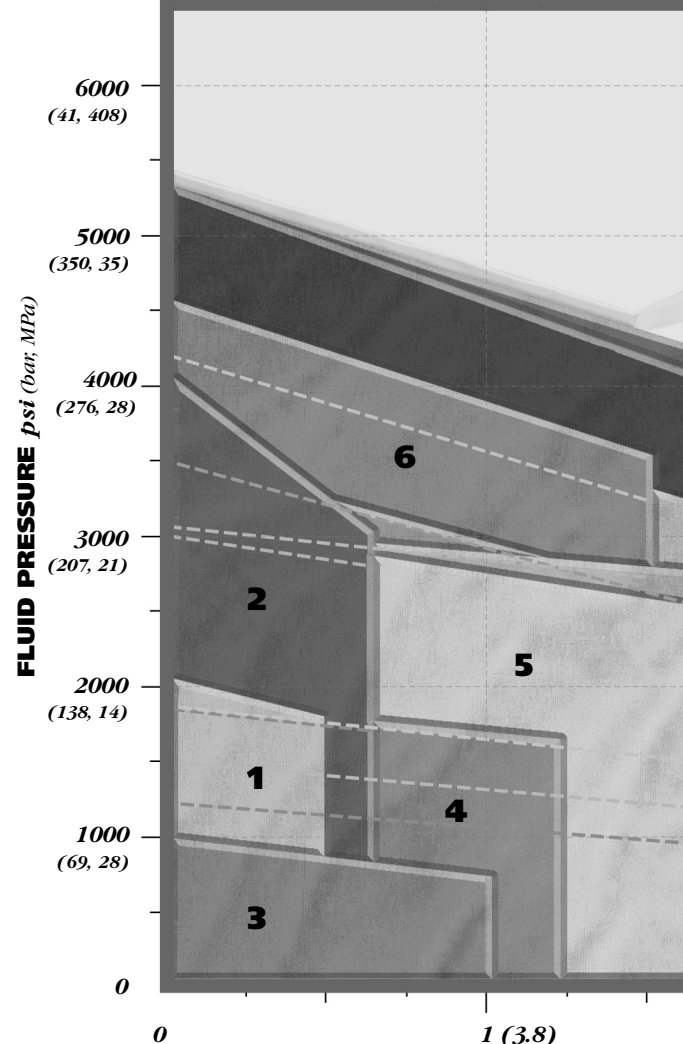
After obtaining the above information, use the pump selection chart to find the recommended pump. The chart on the right gives the air motor name, pressure ratio and lower type.

Check-Mate™ Features

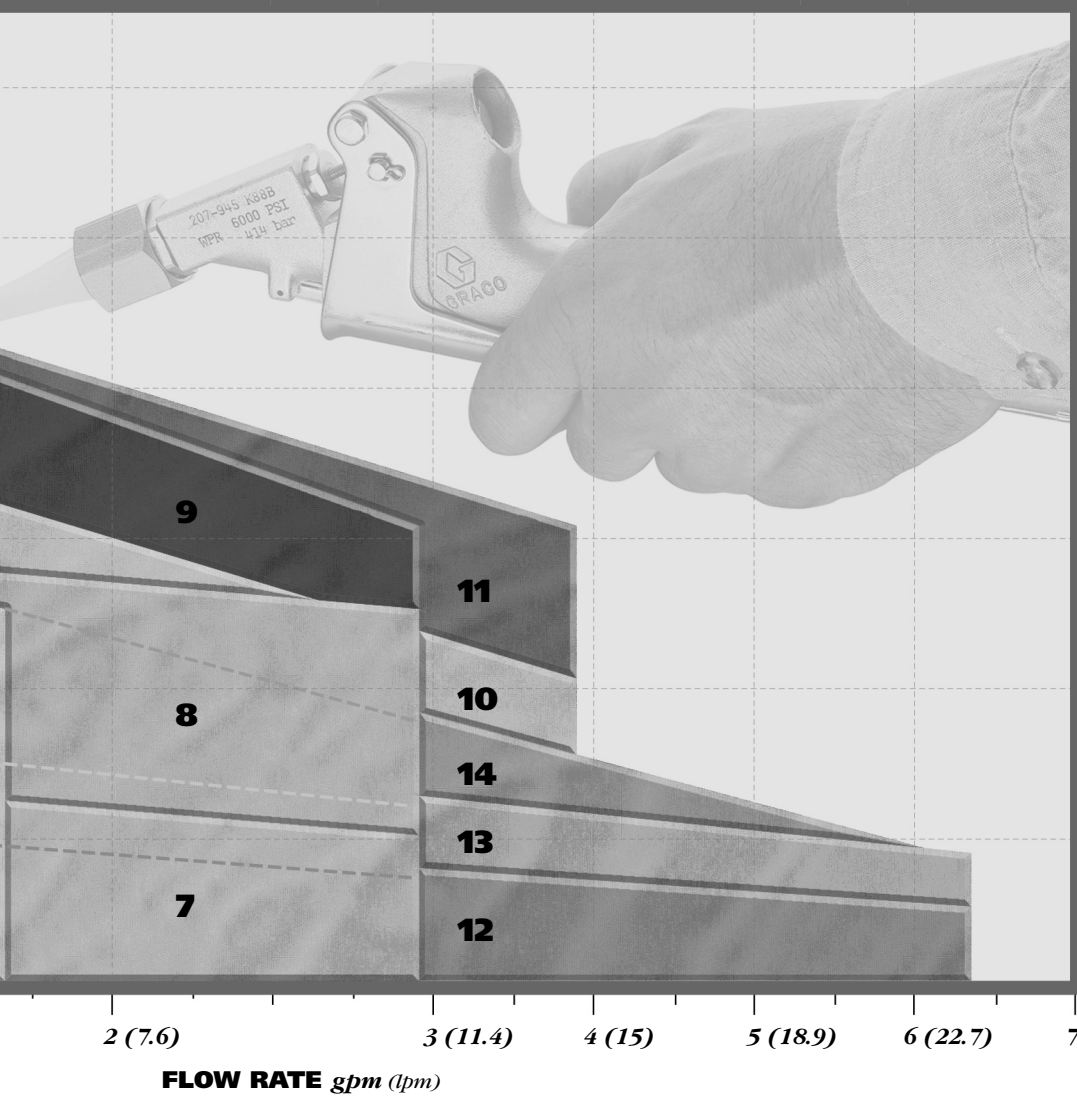


Use this chart as a guide only. Contact your local Graco representative for further details.
 * Teflon is a registered trademark of Du Pont.

	AIR MOTOR	RATIO	LOWER
1	Monark®	23:1	CM 200
2	President®	46:1	CM 200
3	Monark	10:1	CM 450
4	President	20:1	CM 450
5	Senator®	34:1	CM 450



AIR MOTOR	RATIO	LOWER	AIR MOTOR	RATIO	LOWER		
6	Bulldog®	55:1	CM 450	11	Premier	80:1	CM 1000
7	Senator	19:1	CM 800	12	Bulldog	12:1	CM 2100
8	Bulldog	31:1	CM 800	13	King	24:1	CM 2100
9	King®	65:1	CM 800	14	Premier	39:1	CM 2100
10	King	50:1	CM 1000				



- Specialty Resins
- Autobody Sealer
- 300,000 Centipoise
- Grease
- Silicones
- 200,000 Centipoise
- Polysulfides
- 50,000 Centipoise
- Lithographic Inks
- Automotive Epoxy
- 20,000 Centipoise
- Acrylic Caulks
- 5,000 Centipoise

FLOW RATE gpm (lpm)

CHECK-MATE™ PUMPS

Pump/Ram Module Selection

Use the following Pump/Ram module chart to select the desired pump package for your specific needs. You must decide:

- 1) Pressure and flow requirements.
- 2) Will you be using 5 or 55 gallon (20.1 or 200 liter) drums of material?
- 3) What is the material viscosity in cps at the application temperature?
This determines the Ram type.
- 4) Do you require carbon steel (CS) or stainless steel (SST) wetted parts?
To assist with this critical decision, refer to the following guide:

Which Pump to Select

Carbon steel	Butyls, epoxies, PVC, silicones, urethanes
Stainless steel	Acrylics, waterbornes

- 5) All Check-Mate pumps have Ultra High Molecular Weight Polyethylene (UHMWPE) and Teflon (TFE) packings. For urethanes and some silicones, an optional all-Teflon packing kit is available. Contact your local Graco distributor for assistance, if required.
- 6) Available wiper materials include: nitrile, EPDM rubber and PVC. Nitrile wipers are the most common for sealant and adhesive materials; however, some end-users prefer PVC for silicone materials.

With the above information, appropriately select the pump/Ram module from the following chart.



Cart-Mounted



Single Post Ram



3 in. Dual Post Ram



6 1/2 in. Dual Post Ram

CHECK-MATE PUMPS

(INCLUDES RAM AND PLATE)				CART, INDUCTOR			3 IN.		6 1/2 IN.	
				PLATE & LIFT	SINGLE POST	DUAL POST	DUAL POST	DUAL POST	DUAL POST	HYDRAULIC
ATMOSPHERE BOOST				0 PSI (0 BAR, 0 MPA)	5.5 PSI (0.3 BAR, 3 MPA)	11 PSI (0. BAR, 0 MPA)	2.8 PSI (0.2 BAR, 2 MPA)	16 PSI (1.1 BAR, 11 MPA)	36 PSI (2.4 BAR, 24 MPA)	
VISCOSITY (CPS)				20K TO 300K	50K TO 1M	500K TO 2M	50K TO 500K	300K TO 2.5M	1.5M TO 5M	
Air Motor & Displacement		Fluid Outlet	Wetted Parts	5 GALLON (20 LITER) PAIL SIZE			55 GALLON (200 LITER) DRUM SIZE			
1	MONARK 23:1 up to 0.5 gpm (1.9 lpm)	1/2 npt(m)	CS	231-134	231-117	----	----	----	----	
			SST	231-170	231-168	----	----	----	----	
2	PRESIDENT 46:1 up to 0.6 gpm (2.3 lpm)	1/2 npt(m)	CS	231-136	231-118	----	----	----	----	
			SST	231-172	231-169	----	----	----	----	
3	MONARK 10:1 up to 1.0 gpm (3.8 lpm)	3/4 npt(m)	CS	231-144	231-113	----	223-816	----	----	
			SST	----	----	----	----	----	----	
4	PRESIDENT 20:1 up to 1.2 gpm (4.5 lpm)	3/4 npt(m)	CS	231-146	231-111	----	223-817	----	----	
			SST	----	----	----	----	----	----	
5	SENATOR 34:1 up to 1.7 gpm (6.4 lpm)	3/4 npt(m)	CS	----	231-112	----	223-818	----	----	
			SST	----	231-166*	----	224-661*	----	----	
6	BULLDOG 55:1 up to 1.7 gpm (6.4 lpm)	3/4 npt(m)	CS	----	231-115	918-386	223-819	----	----	
			SST	----	231-167*	----	224-662*	----	----	
7	SENATOR 19:1 up to 2.8 gpm (10.6 lpm)	1 npt(f)	CS	----	----	918-370 (PVC wiper)	----	----	----	
			SST	----	----	----	----	----	----	
8	BULLDOG 31:1 up to 2.8 gpm (10.6 lpm)	1 npt(f)	CS	----	237-263*	918-371 (PVC wiper)	686-537	918-552 (PVC wiper)	----	
			SST	----	----	----	----	----	----	
9	KING 65:1 up to 2.8 gpm (10.6 lpm)	1 npt(f)	CS	----	----	918-372 (PVC wiper)	236-472	918-597	918-313 (PVC wiper)	
			SST	----	----	----	----	918-314 (EPDM wiper)	----	
10	KING 50:1 up to 3.8 gpm (14.4 lpm)	1 npt(f)	CS	----	----	918-378 918-379 (PVC wiper)	686-965	918-315 (EPDM wiper)	----	
			SST	----	----	918-380	----	----	----	
11	PREMIER 80:1 up to 3.8 gpm (14.4 lpm)	1 npt(f)	CS	----	----	----	----	918-316 (EPDM wiper)	----	
			SST	----	----	----	----	----	----	
12	BULLDOG 12:1 up to 7.5 gpm (28.4 lpm)	1 1/2 npt(m)	CS	----	----	----	235-835	----	----	
			SST	----	----	----	----	----	----	
13	KING 24:1 up to 7.5 gpm (28.4 lpm)	1 1/2 npt(m)	CS	----	----	----	235-836	----	686-978	
			SST	----	----	----	----	----	----	
14	PREMIER 39:1 up to 7.5 gpm (28.4 lpm)	1 1/2 npt(m)	CS	----	----	----	----	918-303 (PVC wiper)	----	
			SST	----	----	----	----	----	----	

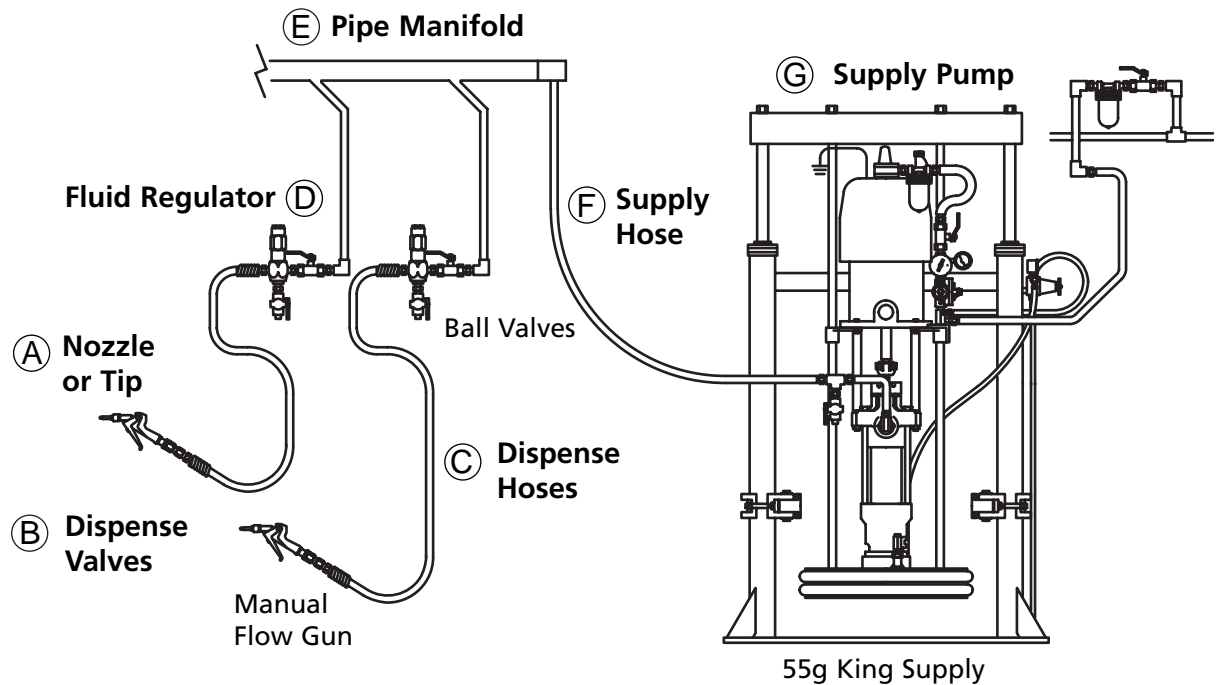
* Quiet Air Motor

Ram plates have nitrile (Buna-N) wipers unless otherwise noted.
CS - zinc-plated carbon steel
SST - 303 stainless steel

SEALANT ADHESIVE EQUIPMENT

SYSTEM EXAMPLE

Major Components	A	B	C	D	E	F	G
	Nozzle or Tip	Dispense Valves	Dispense Hoses	Fluid Regulators	Pipe Manifold	Supply Hoses	Supply Pumps
Selection Factors	<ul style="list-style-type: none"> • Size, Shape and type of fluid flow pattern 	<ul style="list-style-type: none"> • Usage <ul style="list-style-type: none"> - Manual - Automatic - Robotic - Shot • Pressure • Volume 	<ul style="list-style-type: none"> • Viscosity • Volume • Length • Pressure • Flexibility • Chemical compatibility 	<ul style="list-style-type: none"> • Viscosity • Pressure • Volume • Chemical compatibility 	<ul style="list-style-type: none"> • Volume • Pressure • Location • Drops • Chemical compatibility 	<ul style="list-style-type: none"> • Viscosity • Volume • Length • Pressure • Chemical compatibility 	<ul style="list-style-type: none"> • Container size • Volume • Viscosity • Pump location • Chemical compatibility
Equipment Options	<ul style="list-style-type: none"> • Nozzles • Tips • Extensions • Brushes 	<ul style="list-style-type: none"> • Mechanical gun • Pneumatic gun • Nozzle <ul style="list-style-type: none"> - Extrusion - Spray - Length - Orifice 	<ul style="list-style-type: none"> • Steel, SST • Pipe JIC • Flexible hoses <ul style="list-style-type: none"> - Teflon - Buna - Nylon - Moisture-Lok 	<ul style="list-style-type: none"> • Mastic regulator • Pressure compensating valve 	<ul style="list-style-type: none"> • Steel • SST • Pipe • Tubing • Sizes 	<ul style="list-style-type: none"> • Steel, SST • Pipe, JIC • Flexible hoses <ul style="list-style-type: none"> - Teflon - Buna - Nylon - Moisture-Lok 	<ul style="list-style-type: none"> • Priming Piston • Double ball • Ram mount • 5 g, 55 g wiper plates • Drum empty options • Auto crossover



CALCULATIONS

Calculations

Bead Size diameter in.	Gal. per 1000 lineal ft	Lineal ft/gal.
1/16	0.16	6000
3/32	0.36	2700
1/8	0.64	1500
3/16	1.44	675
1/4	2.55	375
5/16	3.98	240
3/8	5.74	165
1/2	10.20	95
5/8	15.92	50
3/4	22.95	35
1	40.80	19

Pressure drop or ΔP

$$\Delta P = \frac{.0273 Q V L}{D^4}$$

Where:

P = Pressure drop in PSI
 V = Viscosity in POISE (CPS)
 D = Diameter in INCHES
 Q = Flow rate in GPM
 L = Length in FT

Other ΔP Considerations:

- * 0.094 diameter nozzle = 300 PSI
- * Gun drop ΔP
 Ultra-Lite® 6000 = 400 PSI
 Ultra-Lite 4000 = 400 PSI
- * Mastic Regulator ΔP = 400 PSI
- * Straight Swivel 1/2 in. = 200 PSI
- * Z Swivel 1/2 in. = 200 PSI
- * Filters = 100-400 PSI

Example 1

Material is 2000 poise (200,000 cps) non-thixotropic acrylic latex sealant. 5 gallon pails, one manual gun, 25 ft x 3/8 in. I.D. hose, 1/4 in. bead. The part is 6 in. diameter. Need to do 3 parts per minute. Need swivel at the gun.

- 6 in. diameter to circumference - πD or $3.14 \times 6 \text{ in.} = 18.84 \text{ in.}$ (total) per part.
- $18.84 \text{ in.} \times 3$ (3 parts) = 57 in. of bead per minute
- Flow rate (gpm) = Area_{bead} x Length_{bead} = $0.049 \text{ in}^2 (\pi r^2) \times 57 \text{ in} = 2.77 \text{ in}^3 = 0.01 \text{ gpm}$ (231 in³ = 1 gal)

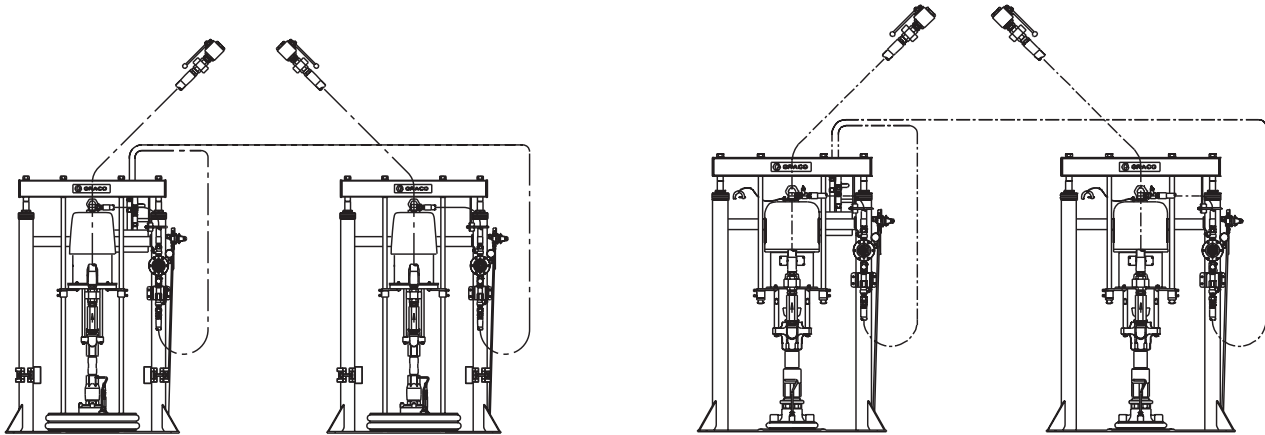
$$\Delta P = \frac{(.0273) (.01) (2000) (25)}{(.375)^4} = \frac{13.65}{.0198} = 689 \text{ PSI}$$

Nozzle $\Delta P = 300$
 Ultra-Lite 6000 Flow Gun $\Delta P = 400$
 Fittings & Swivel $\Delta P = 400$

$$\Delta P_{\text{Total}} = \Delta P_{\text{Nozzle}} + \Delta P_{\text{Gun}} + \Delta P_{\text{Swivel}} + \Delta P_{\text{Hose}} = (300 + 400 + 400 + 689) = 1789 \text{ PSI (123.4 BAR, 12.34 MPa)}$$

From the chart, we selected a 46:1 President with a 3 in. single post Ram. Since the material is an acrylic, use SST wetted parts or part no. 231-169. A 46:1 pump at 90 psi of air will produce 4140 PSI (46 x 90 psi) of pressure. Calculated pressure loss is only 1789 PSI, so this selection will be fine for the application.

CHECK-MATE 450 PUMP/RAM PACKAGES

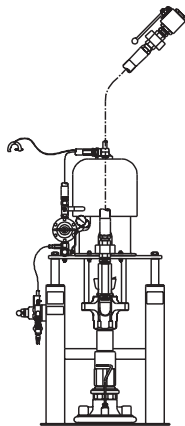


55 Gallon (200 liter) Packages

- 970-022 Tandem 55:1 Bulldog 55 Gal. Ram Pumps with Pneumatic Crossover
- 970-023 Tandem 55:1 Bulldog 55 Gal. Ram Pumps with Electric Crossover
- 970-024 Single 55:1 Bulldog 55 Gal. Ram Pump with Pneumatic Low-Level Shutoff

55 Gallon (200 liter) Packages

- 970-028 Tandem 55:1 Bulldog 55/5 Gal. Ram Pumps with Pneumatic Crossover
- 970-029 Tandem 55:1 Bulldog Ram Pumps with Electric Crossover
- 970-030 Single 55:1 Bulldog Ram Pump with Pneumatic Low-Level Shutoff

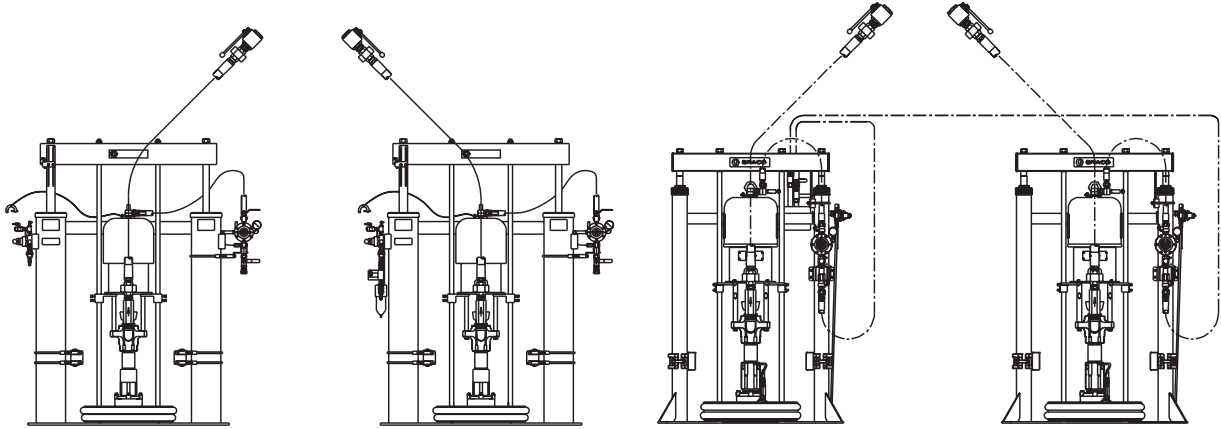


5 Gallon (20 liter) Packages

- 970-032 Single 55:1 Bulldog 5 Gal. Ram Pump

For Check-Mate 450 technical information, see data sheet 305-546.

CHECK-MATE 800 PUMP/RAM PACKAGES



55 Gallon (200 liter) with 6.5 in. Dual Post Ram

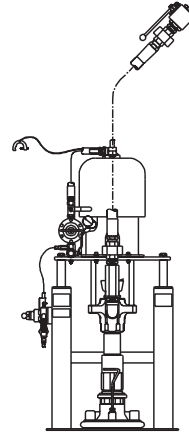
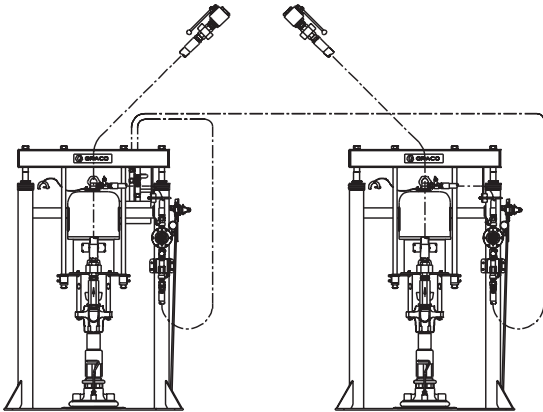
- 970-086 Tandem 65:1 King Ram Pumps (PVC) with Pneumatic Crossover
- 970-087 Tandem 65:1 King Ram Pumps (PVC) with Electric Crossover
- 970-088 Single 65:1 King Ram Pump (PVC) with Pneumatic Low-Level Shutoff
- 970-204 Tandem 65:1 King Ram Pumps (EPDM) with Pneumatic Crossover
- 970-205 Tandem 65:1 King Ram Pumps (EPDM) with Electric Crossover
- 970-206 Single 65:1 King Ram Pumps (EPDM) with Pneumatic Low-Level Shutoff
- 918-313 King 65:1 Ram Pump
- 91-314 King 65:1 Ram Pump

55 Gallon (200 liter) with 3 in. Dual Post Ram

- 970-019 Tandem 65:1 King Ram Pumps (EPDM) with Pneumatic Crossover
- 970-020 Tandem 65:1 King Ram Pumps (EPDM) with Electric Crossover
- 970-021 Single 65:1 King Ram Pump (EPDM) with Pneumatic Low-Level Shutoff
- 970-074 Single 65:1 King Ram Pump/Hose/Gun
- 236-472 King 65:1 Ram Pump
- C59-521 King 65:1 Ram Pump
- 918-552 Bulldog 31:1 Ram Pump

For Check-Mate 800 technical information, see data sheet 305-725.

CHECK-MATE 800 PUMP/RAM PACKAGES



55/5 Gallon (200/20 liter) with 55 Gal. (200 liter) 3 in. Dual Post Ram

- 970-025 Tandem 65:1 King Ram Pumps with
Pneumatic Crossover

- 970-026 Tandem 65:1 King Ram Pumps with
Electric Crossover

- 970-027 Single 65:1 King Ram Pumps with
Pneumatic Low-Level Shutoff

5 Gallon (20 liter) with 3 in. Dual Post Ram

- 970-018 Single 65:1 King Ramp/Pump/Hose/Gun

- 970-031 Single 65:1 King Ram Pump

- 918-372 King 65:1 Ram Pump

- 918-371 Bulldog 31:1 Ram Pump

- 918-370 Senator 19:1 Ram Pump

For Check-Mate 800 technical information, see data sheet 305-725.

CHECK-MATE 1000 PUMP/RAM PACKAGES

Pump Package Ordering Information

55 Gallon (200 liter) with 6.5 in. Dual Post Ram

- 918-315 King 50:1 EPDM plate, air controls
- 918-316 Premier 80:1 EPDM plate, air controls
- 970-187 Single Premier 80:1 Pneumatic Low-Level Shutoff
- 970-185 Tandem Premier 80:1 Pneumatic Crossover
- 970-186 Tandem Premier 80:1 Electric Crossover

55 Gallon (200 liter) with 3 in. Dual Post Ram

- 686-965 King 50:1

5 Gallon (20 liter) with 3 in. Dual Post Ram

- 918-378 King 50:1 Wiper plate, air controls
- 918-379 King 50:1 PVC tire plate, air controls
- 918-380 King 50:1 SST SST wiper plate, air controls

For Check-Mate 1000 technical information,
see data sheet 305-726.

CHECK-MATE 2100 PUMP/RAM PACKAGES

- 918-303 Premier 39:1 Pump Ram Assembly

For Check-Mate 2100 technical information, see data sheet 305-727.

