

# Controlled Pressure (CP) Gun

Customer Product Manual  
Part 303788C  
Issued 4/02



NORDSON CORPORATION • AMHERST, OHIO • USA

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# Controlled Pressure (CP) Gun

## Safety

Read and follow these safety instructions. Task- and equipment-specific warnings, cautions, and instructions are included in equipment documentation where appropriate.

Make sure all equipment documentation, including these instructions, is accessible to persons operating or servicing equipment.

### ***Qualified Personnel***

Equipment owners are responsible for making sure that Nordson equipment is installed, operated, and serviced by qualified personnel. Qualified personnel are those employees or contractors who are trained to safely perform their assigned tasks. They are familiar with all relevant safety rules and regulations and are physically capable of performing their assigned tasks.

### ***Intended Use***

Use of Nordson equipment in ways other than those described in the documentation supplied with the equipment may result in injury to persons or damage to property.

Some examples of unintended use of equipment include

- using incompatible materials
- making unauthorized modifications
- removing or bypassing safety guards or interlocks
- using incompatible or damaged parts
- using unapproved auxiliary equipment
- operating equipment in excess of maximum ratings

### ***Regulations and Approvals***

Make sure all equipment is rated and approved for the environment in which it is used. Any approvals obtained for Nordson equipment will be voided if instructions for installation, operation, and service are not followed.

### ***Personal Safety***

To prevent injury follow these instructions.

- Do not operate or service equipment unless you are qualified.
- Do not operate equipment unless safety guards, doors, or covers are intact and automatic interlocks are operating properly. Do not bypass or disarm any safety devices.
- Keep clear of moving equipment. Before adjusting or servicing moving equipment, shut off the power supply and wait until the equipment comes to a complete stop. Lock out power and secure the equipment to prevent unexpected movement.
- Relieve (bleed off) hydraulic and pneumatic pressure before adjusting or servicing pressurized systems or components. Disconnect, lock out, and tag switches before servicing electrical equipment.
- While operating manual spray guns, make sure you are grounded. Wear electrically conductive gloves or a grounding strap connected to the gun handle or other true earth ground. Do not wear or carry metallic objects such as jewelry or tools.

## Personal Safety *(contd)*

- If you receive even a slight electrical shock, shut down all electrical or electrostatic equipment immediately. Do not restart the equipment until the problem has been identified and corrected.
- Obtain and read Material Safety Data Sheets (MSDS) for all materials used. Follow the manufacturer's instructions for safe handling and use of materials, and use recommended personal protection devices.
- Make sure the spray area is adequately ventilated.
- To prevent injury, be aware of less-obvious dangers in the workplace that often cannot be completely eliminated, such as hot surfaces, sharp edges, energized electrical circuits, and moving parts that cannot be enclosed or otherwise guarded for practical reasons.

## High-Pressure Fluids

High-pressure fluids, unless they are safely contained, are extremely hazardous. Always relieve fluid pressure before adjusting or servicing high pressure equipment. A jet of high-pressure fluid can cut like a knife and cause serious bodily injury, amputation, or death. Fluids penetrating the skin can also cause toxic poisoning.

If you suffer a fluid injection injury, seek medical care immediately. If possible, provide a copy of the MSDS for the injected fluid to the health care provider.

The National Spray Equipment Manufacturers Association has created a wallet card that you should carry when you are operating high-pressure spray equipment. These cards are supplied with your equipment. The following is the text of this card:



**WARNING:** Any injury caused by high pressure liquid can be serious. If you are injured or even suspect an injury:

- Go to an emergency room immediately.
- Tell the doctor that you suspect an injection injury.
- Show him this card
- Tell him what kind of material you were spraying

## MEDICAL ALERT—AIRLESS SPRAY WOUNDS: NOTE TO PHYSICIAN

Injection in the skin is a serious traumatic injury. It is important to treat the injury surgically as soon as possible. Do not delay treatment to research toxicity. Toxicity is a concern with some exotic coatings injected directly into the bloodstream.

Consultation with a plastic surgeon or a reconstructive hand surgeon may be advisable.

The seriousness of the wound depends on where the injury is on the body, whether the substance hit something on its way in and deflected causing more damage, and many other variables including skin microflora residing in the paint or gun which are blasted into the wound. If the injected paint contains acrylic latex and titanium dioxide that damage the tissue's resistance to infection, bacterial growth will flourish. The treatment that doctors recommend for an injection injury to the hand includes immediate decompression of the closed vascular compartments of the hand to release the underlying tissue distended by the injected paint, judicious wound debridement, and immediate antibiotic treatment.

## Fire Safety

To avoid a fire or explosion, follow these instructions.

- Ground all conductive equipment. Use only grounded air and fluid hoses. Check equipment and workpiece grounding devices regularly. Resistance to ground must not exceed one megohm.
- Shut down all equipment immediately if you notice static sparking or arcing. Do not restart the equipment until the cause has been identified and corrected.
- Do not smoke, weld, grind, or use open flames where flammable materials are being used or stored.
- Do not heat materials to temperatures above those recommended by the manufacturer. Make sure heat monitoring and limiting devices are working properly.
- Provide adequate ventilation to prevent dangerous concentrations of volatile particles or vapors. Refer to local codes or your material MSDS for guidance.

- Do not disconnect live electrical circuits when working with flammable materials. Shut off power at a disconnect switch first to prevent sparking.
- Know where emergency stop buttons, shutoff valves, and fire extinguishers are located. If a fire starts in a spray booth, immediately shut off the spray system and exhaust fans.
- Shut off electrostatic power and ground the charging system before adjusting, cleaning, or repairing electrostatic equipment.
- Clean, maintain, test, and repair equipment according to the instructions in your equipment documentation.
- Use only replacement parts that are designed for use with original equipment. Contact your Nordson representative for parts information and advice.

## Halogenated Hydrocarbon Solvent Hazards

Do not use halogenated hydrocarbon solvents in a pressurized system that contains aluminum components. Under pressure, these solvents can react with aluminum and explode, causing injury, death, or property damage. Halogenated hydrocarbon solvents contain one or more of the following elements:

<u>Element</u>	<u>Symbol</u>	<u>Prefix</u>
Fluorine	F	“Fluoro-”
Chlorine	Cl	“Chloro-”
Bromine	Br	“Bromo-”
Iodine	I	“Iodo-”

Check your material MSDS or contact your material supplier for more information. If you must use halogenated hydrocarbon solvents, contact your Nordson representative for information about compatible Nordson components.

## Action in the Event of a Malfunction

If a system or any equipment in a system malfunctions, shut off the system immediately and perform the following steps:

- Disconnect and lock out system electrical power. Close hydraulic and pneumatic shutoff valves and relieve pressures.
- Identify the reason for the malfunction and correct it before restarting the system.

## Disposal

Dispose of equipment and materials used in operation and servicing according to local codes.

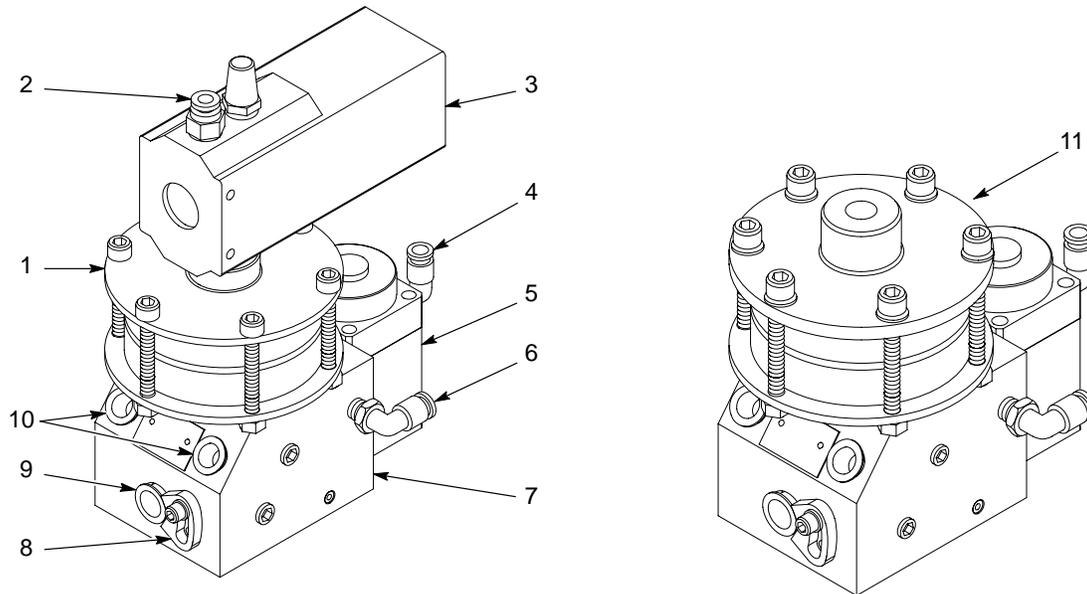
## Description

See Figure 1.

The controlled pressure (CP) gun combines a precision mastic regulator and an on/off dispense gun into a single package. This package is compact and intended to be mounted at the point of dispensing.

There are four versions of the CP gun:

- twin piston (30:1) with a proportional valve
- twin piston (30:1) without a proportional valve
- triple piston (45:1) with a proportional valve
- triple piston (45:1) without a proportional valve



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Figure 1 CP Gun System Configurations (with Proportional Valve; without Proportional Valve)

- |                             |                                   |   |
|-----------------------------|-----------------------------------|---|
| 1. Air cylinder assembly    | 5. Dispensing gun (Auto-Flo)      | 9. Material (fluid) connection                              |
| 2. Supply air connection    | 6. Dispensing gun air open        | 10. Temperature conditioning water supply in/out connection |
| 3. Proportional valve       | 7. Regulator body                 | 11. CP Gun without proportional valve                       |
| 4. Dispensing gun air close | 8. Locking key for swivel fitting |   |

## Theory of Operation

The CP gun is pilot operated. The pilot pressure on the top of the air cylinder controls the output pressure of the CP gun.

Supply pressure is regulated by the inlet side of the voltage pressure regulator. Variations in supply pressure have little effect on the output pressure. The opposing forces from the output pressure and the air cylinder open and close the control orifice to create an equilibrium. If more pressure is needed, the pilot pressure is raised. This causes the control orifice to open more, raising the output pressure until it is in equilibrium with the new higher pilot pressure.

The CP gun can be controlled by a manually adjusted air pressure regulator or electrically adjusted voltage pressure regulator (guns with proportional valve only).

The regulator body is ported for temperature conditioning water. The water surrounds the voltage/ air pressure regulator and flows through the lower portion of the on/off gun.

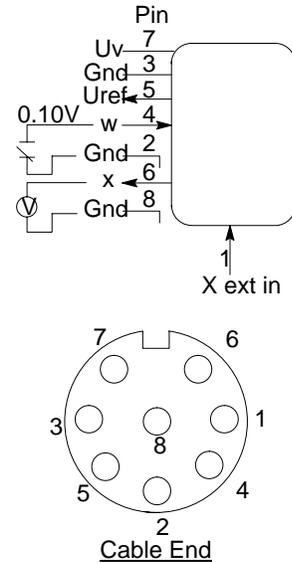
## Specifications

The specifications for the CP gun are as follows:

Specifications	30:1 Ratio, Twin Piston bar (psi)	45:1 Ratio, Triple Piston bar (psi)
Maximum inlet pressure	345 (5000)	345 (5000)
Maximum outlet pressure	180 (2700)	280 (4050)
Supply air pressure to proportional valve	8 (116)	8 (116)
Control air pressure @ 10 V (versions with voltage to pressure regulator)	6 (90)	6 (90)

## Proportional Air Pressure Regulator

Figure 2 illustrates the regulator connector diagram and Table 1 lists each signal description.



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Figure 2 Proportional Air Pressure Regulator Circuit and Connector

Table 1 Proportional Air Pressure Regulator Electrical Description

Pin No.	Signal	Description
1	X ext in	External pressure sensor in (0–10 V).
2	Gnd common	Input. Common for 0–10 V analog signal. Internally connected.
3	Gnd common	Common for 24 Vdc supply. Internally connected.
4	w	Input (0–10 Vdc analog signal).
5	Uref	Reference output (10 V).
6	X	Actual output value (0–10 V).
7	Uv	Supply voltage (24 Vdc).
8	Gnd common	Common actual value. Internally connected.

## Installation



**WARNING:** Allow only qualified personnel to perform the following tasks. Follow the safety instructions in this document and all other related documentation.



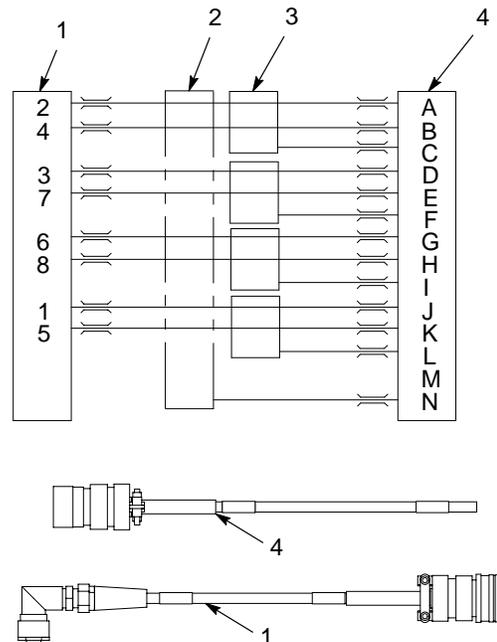
**WARNING:** System or material pressurized. Relieve pressure. Failure to observe this warning may result in serious injury or death.

See Figure 1.

1. Make sure the dispensing gun (5) is attached to the back of the regulator body (7). A manifold mount Auto-Flo gun is used as a dispensing gun.
2. Mount the CP gun per specifications. Mounting configurations vary. The CP gun can be mounted to fixed, mobile, and robotic fixtures. Consult your Nordson representative for specific information on mounting configurations.
3. Make the following connections:
  - supply air (2)
  - material (fluid) (9) and locking key (8)
  - if used, temperature conditioning water supply in/out (10)
  - dispensing gun air open (6) and air close (4)

## Cabling

Connect the cable assembly to the sacrificial cable assembly. Figure 3 illustrates the cable and sacrificial cable assemblies and the wiring diagram. Table 2 lists the wiring chart for the sacrificial cable assembly to the cable assembly.



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Figure 3 Cable and Sacrificial Cable Assembly and Wiring Diagram

- |                               |                        |
|-------------------------------|------------------------|
| 1. Sacrificial cable assembly | 3. Twisted pair shield |
| 2. Cable shield               | 4. Cable assembly      |

Table 2 Wiring Chart

From Connector (Sacrificial Cable)		Cable		To Connector (Cable)
Pin No.	Signal	Color	Jacket Color	Pin No.
2	common	green	red	A
4	0–10 V	black		B
—	—	shield		C
3	common	red	black	D
7	+ 24 V	black		E
—	—	shield		F
6	V out 0–10 V	blue	green	G
8	common	black		H
—	—	shield		I
1	common	white	white	J
5	V ref 10 V	black		K
—	—	shield		L
—	—	—	—	M
—	—	shield	—	N

## Operation



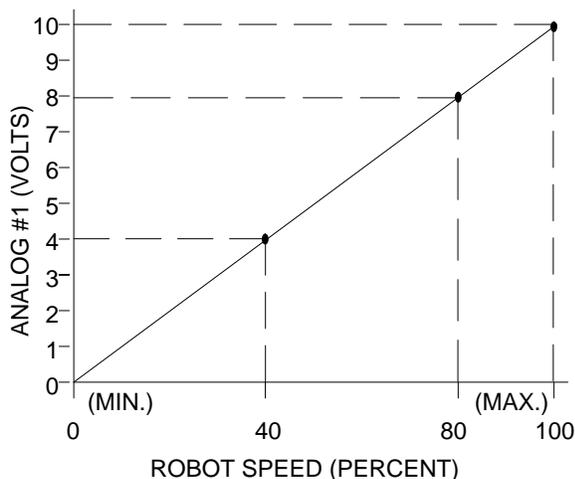
**WARNING:** Allow only qualified personnel to perform the following tasks. Follow the safety instructions in this document and all other related documentation.

1. Make sure that the gun is properly installed. Refer to the *Installation* section.
2. Turn on the temperature conditioning if connected.

**NOTE:** See Figure 4. Configure the robot controller to vary the analog (or tool speed) signal from 0–10 Vdc over the full range of robot speed.

3. Determine the highest and lowest robot speeds to be used in production.
4. Configure the robot controller to output an analog signal of +10 Vdc when the robot is moving at, or slightly higher than, maximum speed.
5. Configure the robot controller to output an analog signal of 0 Vdc when the robot is stationary.

**NOTE:** Figure 4 presents an example of the relationship between robot speed and analog voltage. A robot speed of 80% corresponds to a voltage of 8 Vdc. A robot speed of 40% corresponds to a voltage of 4 Vdc. This relationship is approximate and is provided only as a guide.



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Figure 4 Relationship between Analog Signal and Robot Speed

6. Set the material pressure to the recommended operating level per the Nordson representative.
7. Check for leaks at the air, material, and water connections.
8. See Figure 1. Check for leaks at the connection of the cylinder assembly (1) to the regulator body (7).

## Maintenance



**WARNING:** Allow only qualified personnel to perform the following tasks. Follow the safety instructions in this document and all other related documentation.



**WARNING:** System or material pressurized. Relieve pressure. Failure to observe this warning may result in serious injury or death.

Periodically, perform the following maintenance tasks:

- Check the air lines and the material supply hose for leaks, kinks, or damage. Replace lines and hoses when necessary.
- Make sure the CP gun is mounted securely.
- Make sure the air supply filters are clean and dry.
- Check for leaks at the connection of the cylinder assembly to the regulator body.

# Troubleshooting



**WARNING:** Allow only qualified personnel to perform the following tasks. Follow the safety instructions in this document and all other related documentation.

This section contains troubleshooting procedures. These procedures cover only the most common problems that you may encounter.

If you cannot solve the problem with the information given here, contact your local Nordson representative for help.

Some problems presented in this section may originate with components in the system and not with the CP gun. If the corrective actions described do not solve the problem, refer to the appropriate system manuals for further suggestions.

Problem	Possible Cause	Corrective Action
1. <b>Material leaking at the connection of the cylinder assembly to the regulator body or at packing cartridge</b>	Worn packing cartridge	Replace the packing cartridge.
2. <b>CP gun responds slowly</b>	Voltages incorrect Improper ground Air supply pressure insufficient Pressure control not responding Material supply pressure insufficient Bad proportional valve	Verify supply voltage is 24 Vdc $\pm 25\%$ . Make sure the analog supply is grounded to the proportional valve. Verify air pressure to proportional valve and/or the Auto-Flo gun meets the minimum requirements. 1. Bleed the dispensing mechanism. 2. Remove the cartridge assembly. 3. Clean out the connection hole of the cartridge assembly. 4. Replace the cartridge assembly. Verify material pressure meets the minimum requirements. 1. Remove the proportional valve from the CP gun. 2. Place a pressure gauge on the outlet port. Vary the analog signal as follows and observe the respective output pressure on the gage. [10 V = 90 psi; 5 V = 45 psi; 1 V = 9 psi] If the pressure values are substantially different than those listed, replace the proportional valve.
3. <b>Material or water leaking at fittings</b>	Dirty or damaged connections	Check for leaks at the connection points for material, and water. Replace tubing if damaged. Clean connection if dirty.
4. <b>Air leaking from cylinder</b>	Worn cylinder seals	Replace all O-rings in the cylinder using the rebuild installation kit. If problem persists, replace the cylinder.

## Repair



**WARNING:** Allow only qualified personnel to perform the following tasks. Follow the safety instructions in this document and all other related documentation.



**WARNING:** Disconnect equipment from line voltage. Failure to observe this warning may result in personal injury, death, or equipment damage.



**WARNING:** System or material pressurized. Relieve pressure. Failure to observe this warning may result in serious injury or death.

Repair activities include changing the packing cartridge, replacing the air cylinder seals, and replacing the air cylinder.

### Replacing the Packing Cartridge

Replace the packing cartridge when it leaks fluid. You can replace the packing cartridge while the CP gun is still on-line. If you choose to remove the gun from operation for repair, be sure to place the gun in a soft-jawed vise when working with it. To replace the packing cartridge, perform the following procedure:

See Figures 5 and 6.

1. Disconnect the air and fluid connections from the CP gun.
2. If your gun has a proportional valve (1), disconnect the electrical connections to the valve.
3. Relieve material pressure by purging the Auto-Flo dispensing gun.
4. Using an adjustable wrench, grasp the flats on the packing cartridge (11) assembly and remove it. Dispose of the used packing cartridge assembly properly.
5. Clean the inside of the CP gun body (12) with a compatible solvent or wipe it clean with a rag.

6. Place a thin layer of O-ring lubricant on the threads of the gun body and on the three external O-rings on the packing cartridge.
7. Install the new packing cartridge assembly finger tight. Tighten the assembly to 67.8 N•m (50 ft-lb) using an adjustable wrench.
8. Return the CP gun to operation. Reinstall all air, fluid, and electrical connections.

### Replacing the Air Cylinder Seals

Replace the seals and O-rings in the air cylinder assembly when there is an audible leak, excessive drag, or a degradation of control. To replace the air cylinder seals, perform the following procedure:

See Figures 5 and 6.

1. Disconnect the air and fluid connections from the CP gun.
2. If your gun has a proportional valve (11), disconnect the electrical connections to the valve.
3. Relieve material pressure by purging the Auto-Flo dispensing gun.
4. If your gun has a proportional valve, unscrew the valve from the air cylinder (5).
5. Unscrew the air cylinder assembly from the CP gun body (12).

See Figure 7.

6. Unscrew the six screws (1) connecting the top and bottom plates of the air cylinder assembly.
7. Replace the seals and O-rings in the manner shown.
8. Reassemble the top and bottom air cylinder plates. Loosely install the screws and hex nuts (9).
9. Tighten the screws in a star pattern to 7.3 N•m (65 in.-lb).

See Figures 5 and 6.

10. Install the air cylinder assembly (5) into the gun body as tight as possible by hand.
11. If your gun has a proportional valve: Apply pipe thread compound to the nipple (4) threads and reinstall the proportional valve into the air cylinder assembly. Tighten it to hand tight.
12. Return the CP gun to operation. Reinstall all air, fluid, and electrical connections.

## ***Replacing the Air Cylinder Assembly***

Replace the air cylinder assembly when it is damaged or you do not wish to replace the seals only. To replace the entire air cylinder assembly, perform the following procedure:

See Figures 5 and 6.

1. Disconnect the air and fluid connections from the CP gun.
2. If your gun has a proportional valve (1), disconnect the electrical connections to the valve.
3. Relieve material pressure by purging the Auto-Flo dispensing gun.
4. If your gun has a proportional valve, unscrew the valve from the air cylinder (5).
5. Unscrew the old air cylinder assembly and dispose of it properly.
6. Install the new air cylinder assembly into the gun body (12) as tight as possible by hand.
7. If your gun has a proportional valve: Apply pipe thread compound to the threads of the nipple (4) and reinstall the proportional valve into the air cylinder assembly. Tighten it to hand tight.
8. Return the CP gun to operation. Reinststate all air, fluid, and electrical connections.

## Parts

To order parts, call the Nordson Customer Service Center or your local Nordson representative. Use this five-column parts list, and the accompanying illustration, to describe and locate parts correctly.

### *Using the Illustrated Parts List*

Numbers in the Item column correspond to numbers that identify parts in illustrations following each parts list. The code NS (not shown) indicates that a listed part is not illustrated. A dash (—) is used when the part number applies to all parts in the illustration.

Item	Part	Description	Quantity	Note
—	0000000	Assembly	1	
1	000000	• Subassembly	2	A
2	000000	• • Part	1	

- If you order the assembly, items 1 and 2 will be included.
- If you order item 1, item 2 will be included.
- If you order item 2, you will receive item 2 only.

The number in the Quantity column is the quantity required per unit, assembly, or subassembly. The code AR (As Required) is used if the part number is a bulk item ordered in quantities or if the quantity per assembly depends on the product version or model.

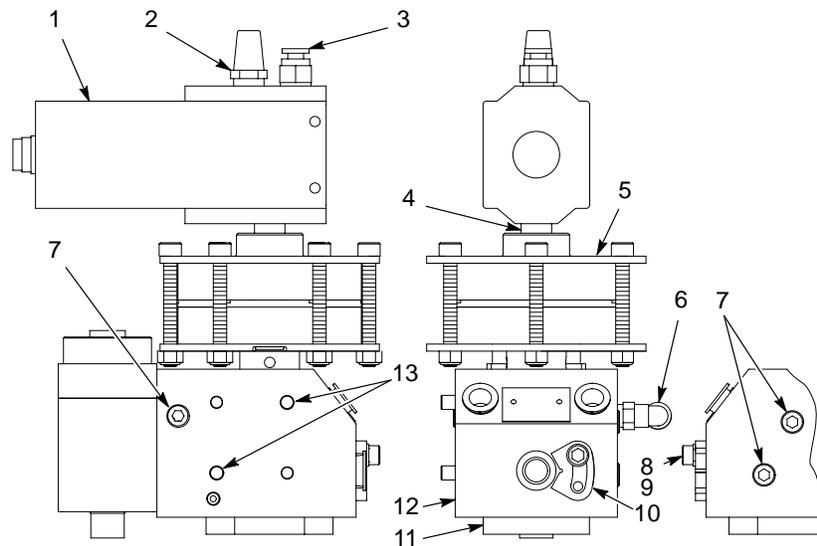
The number in the Part column is the Nordson Corporation part number. A series of dashes in this column (-----) means the part cannot be ordered separately.

The Description column gives the part name, as well as its dimensions and other characteristics when appropriate. Indentions show the relationships between assemblies, subassemblies, and parts.

Letters in the Note column refer to notes at the end of each parts list. Notes contain important information about usage and ordering. Special attention should be given to notes.

## CP Guns with Proportional Valve

See Figure 5.



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Figure 5 CP Gun with Proportional Valve

Item	Part	Description	Quantity	Note
—	304005	Regulator, CP $\frac{9}{16}$ -18, 5000 psi (twin piston)	1	
—	331463	Regulator, CP $\frac{9}{16}$ -18, 5000 psi (triple piston)	1	
1	304160	• Valve, proportional, 6 bar, $\frac{1}{4}$	1	
2	972903	• Muffler, exhaust, $\frac{1}{4}$ NPTF	1	
3	971265	• Connector, male, $\frac{1}{4}$ tube x $\frac{1}{4}$ NPT	1	
4	973085	• Nipple, steel, $\frac{1}{4}$ NPT x 0.87 large	1	
5	306536	• Kit, cylinder assembly, 3 inch, twin piston	1	A
5	331459	• Kit, cylinder assembly, 3 inch, triple piston	1	A
6	972119	• Fitting, elbow, 90, $\frac{1}{8}$ P x $\frac{1}{4}$ T	1	
7	973402	• Plug, pipe, socket, flush, $\frac{1}{8}$ , zinc	3	
8	983035	• Washer, flat, M, regular, 5, steel, zinc	1	
9	982372	• Screw, socket head, M5 x 12 mm, black	1	
10	156208	• Key, locking swivel	1	
11	306535	• Kit, cartridge assembly, regulator, CP	1	
12	303999	• Body, regulator, CP	1	
13	331475	• Pin, dowel, 0.25 x 0.6250, H and G	2	
NS	178450	• Insulator, spacer, 2.25 x 2.00 x 0.06	1	B

NOTE A: This kit includes an entire air cylinder assembly. To replace the seals only, refer to [Cylinder Rebuild Kits](#) section.

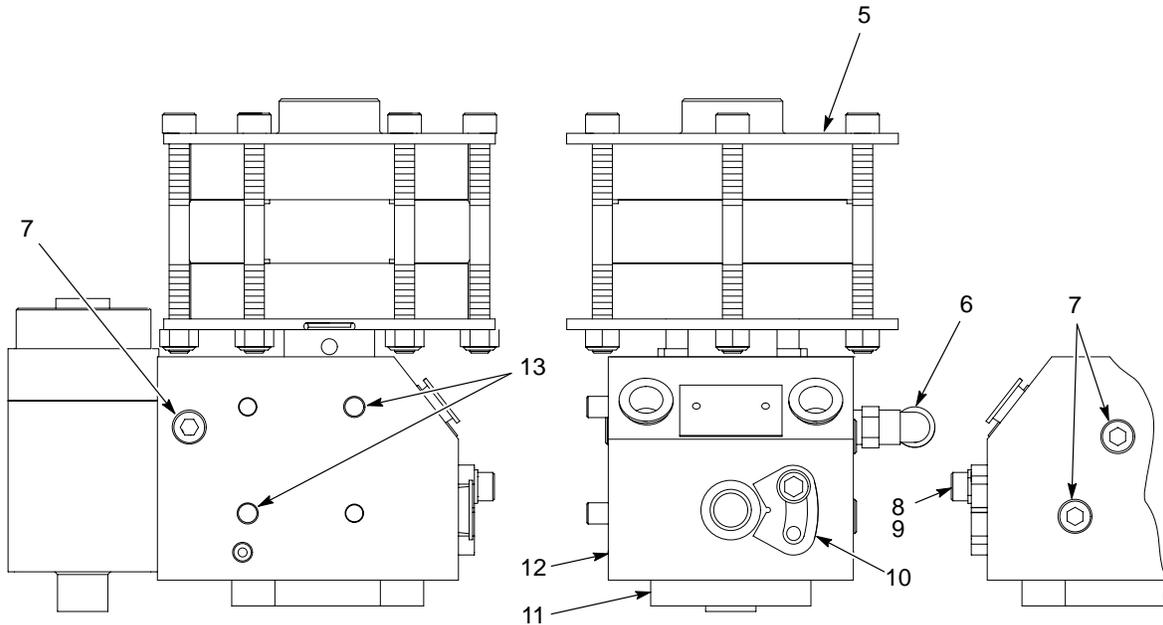
B: Install the insulator between the gun and the gun bracket in heated gun applications only.

AR: As Required

NS: Not Shown

## CP Guns without Proportioning Valve

See Figure 6.



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Figure 6 CP Gun without Proportional Valve

Item	Part	Description	Quantity	Note
—	308528	Regulator, CP $\frac{9}{16}$ -18, twin piston	1	
—	331649	Regulator, CP $\frac{9}{16}$ -18, triple piston	1	
5	306536	• Kit, cylinder assembly, 3 inch, twin piston	1	A
5	331459	• Kit, cylinder assembly, 3 inch, triple piston	1	A
6	972119	• Fitting, elbow, 90, $\frac{1}{8}$ P x $\frac{1}{4}$ T	1	
7	973402	• Plug, pipe, socket, flush, $\frac{1}{8}$ , zinc	3	
8	983035	• Washer, flat, M, regular, 5, stainless steel, zinc	1	
9	982372	• Screw, socket head, M5 x 12 mm, black	1	
10	156208	• Key, locking swivel	1	
11	306535	• Kit, cartridge assembly, regulator, CP	1	
12	303999	• Body, regulator, CP	1	
13	331475	• Pin, dowel, 0.25 x 0.6250, H and G	2	
NS	178450	• Insulator, spacer, 2.25 x 2.00 x 0.06	1	B

NOTE A: This kit includes an entire air cylinder assembly. To replace the seals only, refer to [Cylinder Rebuild Kits](#) section.

B: Install the insulator between the gun and the gun bracket in heated gun applications only.

AR: As Required

NS: Not Shown

## Cylinder Rebuild Kits

See Figure 7.

**NOTE:** Quantities are the same for both the 30:1 and 45:1 rebuild kits unless otherwise noted.

Item	Part	Part	Description	Quantity	Note
—	306503		Cylinder, rebuild kit, 30:1	1	
—		331473	Cylinder, rebuild kit, 45:1	1	
2	940410	940410	• O-ring, Viton, 3.00 x 3.125 x 0.063	2/3	
3	940144	940144	• O-ring, 0.500 x 0.625 x 0.063	2/4	
4	942310	942310	• O-ring, hot paint, -146	2/3	
5	304119	304119	• Ring, glyd, piston, -232	2/3	
6	304120	304120	• Ring, glyd, rod, -016	1/2	
7	940172	940172	• O-ring, Viton, 0.676 ID x 0.07 w, br	1/2	
8	940128	940128	• O-ring, Viton, black, 0.375 x 0.50	1	
NS	900223	900223	• Lubricant, O-ring, Parker, 4-oz	AR	
NS	900424	900424	• Compound, threadlock, VC-3	AR	
1	982292		Screw, socket, M6 x 55, black	6	A
1		982184	Screw, socket, M6 x 75, black	6	A
9	984092	984092	Nut, hex, lock, torque, M6, class10	6	A
<p>NOTE A: This part is not included in the cylinder rebuild kits. Order it only if you need to replace it.            AR: As Required            NS: Not Shown</p>					

