Pro-Flo® II Hi-Flo Extrude Gun

Customer Product Manual
Part 106696A

NORDSON CORPORATION • AMHERST, OHIO • USA

Nordson Corporation welcomes requests for information, comments and inquiries about its products.

Address all correspondence to

Nordson Corporation
555 Jackson Street
Amherst, OH 44001

Notice

Trademarks

Table of Contents

1. Safety 1
   - Safety Symbols 1
   - Qualified Personnel 3
   - Intended Use 3
   - Installation 3
   - Operation 5
   - Less-Obvious Dangers 7
   - Action in the Event of a System or Component Malfunction 7
   - Maintenance and Repair 7
   - Material and Solvent Precautions 9

2. Disposal 12
3. Description 13
   - Additional Components 15
   - Theory of Operation 15

4. Installation 16
   - Robot Interface Requirements 16
   - Inspection 16
   - Installation 16
     - Gun Mounting 17
     - Cable Connections 19
     - Supply Air Connection 22
     - Material Supply Connections 22
     - Nozzles 22
     - Gun Purging 23

5. Operation 23
   - Introduction 23
   - Startup/Shutdown 23
   - Bead Size 23
   - Gun Purging 23

6. Maintenance 24
7. Troubleshooting 25
Troubleshooting Chart 26
8. Repair 28
Tools and Supplies Required 28
Clearing a Blocked Nozzle 28
Clearing a Blocked Material Supply Hose 29
Removing the Gun from the Robot 29
Removing the Trimset Valve 30
Removing the Servo Valve 32
Removing the Piston Assembly 33
Installing the Piston Assembly 35
Checking the Armature Clearance 37
Adjusting the Armature Clearance 38
Installing the Servo Valve 38
Installing the Trimset Valve 39
Checking the Continuity of the Cordset 43
Installing the Gun on the Robot 44
9. Parts 45
Using the Illustrated Parts List 45
Pro-Flo II Hi-Flo Extrude Basic and Temperature Conditioning Manifold Gun 46
Pro-Flo II Hi-Flo Extrude 120 V and 240 V Heated Guns 50
10. Specifications 52
Dimensions 52
Weight 52
Air Pressure 52
Fluid Pressure Rating, Static 52
Maximum Operating Temperature of Material 52
Material Viscosity Range 52
Flow Range 52

Pro-Flo® II Hi-Flo Extrude Gun

1. Safety

This section contains general safety instructions for using your Nordson equipment. Task- and equipment-specific warnings are included in other sections of this manual where appropriate. Note all warnings and follow all instructions carefully. Failure to do so may result in personal injury, death, or property damage.

To use this equipment safely,

- read and become familiar with the general safety instructions provided in this section of the manual before installing, operating, maintaining, or repairing this equipment.
- read and carefully follow the instructions given throughout this manual for performing specific tasks and working with specific equipment.
- store this manual within easy reach of personnel installing, operating, maintaining, or repairing this equipment.
- follow all applicable safety procedures required by your company, industry standards, and government or other regulatory agencies.
- obtain and read Material Safety Data Sheets (MSDS) for all materials used. Contact your material supplier for this information.

Safety Symbols

Become familiar with the safety symbols presented in this section. These symbols will alert you to safety hazards and conditions that may result in personal injury, death, or property and equipment damage.

WARNING: Failure to observe this warning may result in personal injury, death, or equipment damage.

***Safety Symbols** (contd)*

WARNING: Risk of electrical shock. Failure to observe this warning may result in personal injury, death, or equipment damage.

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

WARNING: Risk of explosion or fire. Fire, open flames, and smoking prohibited.

WARNING: Wear protective clothing, safety goggles, and approved respiratory protection. Failure to observe may result in serious injury.

WARNING: Hot! Risk of burns. Wear heat-protective clothing, safety goggles with side shields and/or heat-protective gloves depending on the symbol shown.

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

WARNING: Injection hazard. Do not point this device at yourself or other personnel. Failure to observe this warning may result in serious injury or death.

CAUTION: Failure to observe may result in equipment damage.

CAUTION: Hot surface. Failure to observe may result in burns.

Qualified Personnel

"Qualified personnel" is defined here as individuals who thoroughly understand the equipment and its safe operation, maintenance, and repair. Qualified personnel are physically capable of performing the required tasks, familiar with all relevant safety rules and regulations, and have been trained to safely install, operate, maintain, and repair the equipment. It is the responsibility of the company operating the equipment to see that its personnel meet these requirements.

Intended Use

WARNING: Use of this equipment in ways other than described in this manual may result in personal injury, death, or property and equipment damage. Use this equipment only as described in this manual.

Nordson Corporation cannot be responsible for injuries or damages resulting from nonstandard, unintended applications of its equipment. This equipment is designed and intended only for the purpose described in this manual. Uses not described in this manual are considered unintended uses and may result in serious personal injury, death, or property damage. Unintended uses may result from taking the following actions:

- making changes to equipment that have not been recommended or described in this manual or using parts that are not genuine Nordson replacement parts
- failing to make sure that auxiliary equipment complies with approval agency requirements, local codes, and all applicable safety standards
- using materials or auxiliary equipment that are inappropriate or incompatible with your Nordson equipment
- allowing unqualified personnel to perform any task

Installation

Read the installation section of all system component manuals before installing your equipment. A thorough understanding of system components and their requirements will help you to install the system safely and efficiently.

- Allow only qualified personnel to install Nordson and auxiliary equipment.
- Use only approved equipment. Using unapproved equipment in an approved system may void agency approvals.

Installation *(contd)*

- Make sure all equipment is rated and approved for the environment in which you are using it.
- Follow all instructions for installing components and accessories.
- Install all electrical, pneumatic, gas, and hydraulic connections to local code.
- Install locking, manual shutoff valves in the air supply lines to the system. This allows you to relieve air pressure and lock out the pneumatic system before undertaking maintenance and repairs.
- Install a locking disconnect switch or breaker in the service line ahead of any electrical equipment.
- Use only electrical wire of sufficient gauge and insulation to handle the rated current demand. All wiring must meet all applicable codes.
- Ground (and fuse, if necessary) all electrically conductive equipment within 10 feet (3 meters) of the spray area or according to its rated current consumption. (See the ID plate on your equipment.) Ungrounded conductive equipment can store a static charge which could ignite a fire or cause an explosion if a hot spark is discharged.
- Route electrical wiring, cables, hoses, and air supply tubing along a protected path. Make sure they will not be damaged. Do not bend cables or hoses around a radius of less than 6 in. (152 mm).
- Use only designated lifting points or lugs to lift and move heavy equipment. Always balance and block loads when lifting to prevent shifting. Lifting devices must be inspected, certified, and rated for a greater weight than the equipment being lifted.
- Do not use unapproved fluid hoses. Solvents may cause them to deteriorate rapidly and allow flammable liquids or pressurized material to escape.
- Protect components from damage, wear, and harsh environmental conditions.
- Allow ample room for maintenance, material supply container drop-off and loading, panel accessibility, and cover removal.
- Protect equipment with safety devices as specified by applicable safety regulations.
- If safety devices must be removed for installation, install them immediately after the work is completed and check them for proper functioning.

Operation

Only qualified personnel, physically capable of operating the equipment and with no impairments to their judgement or reaction times, are permitted to operate this equipment.

Read all component manuals before operating your Nordson equipment. A thorough understanding of components and their operation will help you operate the system safely and efficiently.

- Before starting this equipment, check all safety interlocks, fire-detection systems, and protective devices such as panels and covers. Make sure all devices are fully functional. Do not operate the system if these devices are not working properly. Do not deactivate or bypass automatic safety interlocks, locked-out electrical disconnects, or pneumatic valves.

- Never operate equipment with a known malfunction or leak.

- Do not attempt to operate electrical equipment if standing water is present.

- Know where EMERGENCY STOP buttons, safety shutoff components, and fire extinguisher are located. Make sure they work. If a component malfunctions, shut down and lock out the equipment immediately.

- Know the pinch points, temperatures, pressures, and dispense material composition for all equipment that you are working with. Recognize potential hazards associated with these and exercise appropriate caution.

- Use this equipment only in the environments for which it is rated. Do not operate this equipment in humid, flammable, or explosive environments unless it has been rated for safe operation in these environments.

- Before operating, make sure all equipment, objects being sprayed, and fluid containers are connected to a true earth ground.

- Do not remove guards while unit is in operation. Failure to observe may cause personal injury from moving mechanical parts under the guards.

Operation *(contd)*

- Never touch exposed electrical connections or equipment while the power is ON.
- If you notice electrical arcing in a spray area, shut down the system immediately. An arc can cause a fire or explosion.
- Do not operate the equipment at pressures higher than the rated maximum working pressure of any component in the system.
- Keep parts of the body or loose clothing away from moving equipment or parts. Remove jewelry and cover or tie back long hair.
- Shut off moving equipment before taking measurements or inspecting workpieces.
- Wear National Institute of Occupational Safety and Health (NIOSH) approved respirators while operating spray equipment and when performing maintenance and cleaning tasks.
- Wear gloves, eye protection, and protective clothing to protect your skin when operating equipment.
- If your skin has been exposed to dispense materials or solvents wash frequently with soap and water, especially before eating or drinking. Do not use solvents to remove coating materials from your skin.
- Do not use high-pressure compressed air to blow dust or powder off your skin or clothes. High-pressure compressed air can be injected under the skin and cause serious injury or death. Treat all high-pressure fittings and hoses as if they could leak and cause injury.
- Never point handguns or applicator nozzles at yourself or other persons.
- Do not smoke in the spray area. A lit cigarette could ignite a fire or cause an explosion.
- Keep paint pumps, pressure pots, and containers of flammable materials far enough away from spray booths to prevent their inclusion in a booth fire.
- Make sure the liquid in the heater is circulated to the external circuit when the heater is operating.
- Do not use fluids that will corrode the equipment.

Less-Obvious Dangers

Operators should also be aware of less-obvious dangers in the workplace that often cannot be completely eliminated:

- exposed surfaces on the equipment which may be hot or have sharp edges and cannot be practically safeguarded
- ungrounded conductive equipment which may continue to store an electrostatic charge after the equipment has been shut off
- vapors and materials which may cause allergic reactions or other health problems
- automatic hydraulic, pneumatic, or mechanical equipment or parts that may move without warning
- unguarded, moving mechanical assemblies

Action in the Event of a System or Component Malfunction

Do not operate a system that contains malfunctioning components. If a component malfunctions, turn the system OFF immediately.

- Disconnect and lock out electrical power. Close and lock out hydraulic and pneumatic shutoff valves and relieve pressures.
- Allow only qualified personnel to make repairs.

Maintenance and Repair

Allow only qualified personnel to perform maintenance, troubleshooting, and repair tasks.

- Always wear appropriate protective clothing and use safety devices when working on this equipment.
- Follow the recommended maintenance procedures in your equipment manuals.
- Do not service or adjust any equipment unless another person trained in first aid and CPR is present.
- Use only genuine Nordson replacement parts. Using unapproved parts or making unapproved modifications to equipment may void agency approvals and create safety hazards.

***Maintenance and Repair** (contd)*

- Refer to MSDS before using solvents to clean this equipment. The MSDS will provide use, storage, and disposal information about the solvent. Read this information carefully and follow all instructions.

WARNING: Note the flash point of the cleaning solvent used. Only use controlled methods and equipment, such as temperature-controlled or explosion-protected heaters, to heat cleaning solvent. Observe explosion-prevention regulations and follow applicable safety instructions.

- Never use an open flame to clean the unit or components of the unit.
- Do not store flammable materials in the spray area or room. Keep paint pumps, pressure pots, and containers of flammable materials far enough away from spray booths to prevent their inclusion in a booth fire. If a fire or explosion occurs, flammable materials in the area will increase the chances and the extent of personal injuries and property damage.
- Make sure that the room where you are working is sufficiently ventilated. Avoid breathing vapors over prolonged periods of time.
- Check interlock systems periodically to ensure their effectiveness.
- Check all ground connections periodically with a megohm meter. Resistance to ground must not exceed one megohm. If sparks or arcing occur, shut down the system immediately.
- Make sure the spray area floor is conductive to ground and that the operator's platform is grounded.
- Connect all disconnected equipment ground cables and wires after servicing the equipment. Ground conductive equipment.
- Disconnect, lock out, and tag electrical power at a disconnect or breaker in the service line ahead of electrical equipment before servicing.

WARNING: Service lines connected to panel disconnect switches may still be energized unless they are disconnected. Make sure the power is off before servicing. Wait five minutes for the capacitors to discharge after shutting off the electrical power.

- If a "power on" test is required, perform the test carefully and then shut off and lock out power as soon as the test is over.

- Never troubleshoot a power supply without first disconnecting all external power supplies and discharging the high-voltage capacitors with an insulated screwdriver.
- Do not attempt to service electrical equipment if there is standing water present. Do not service electrical equipment in a high-humidity environment.
- Use tools with insulated handles when working with electrical equipment.
- Keep high-voltage connection points clean and protected with dielectric grease or oil.
- Relieve air and fluid pressures before servicing equipment. Follow the specific instructions in this manual.
- Do not attempt to service a moving piece of equipment. Shut off the equipment and lock out power. Secure the equipment to prevent uncontrolled movement.
- If you must disassemble a spring-loaded component, carefully preload the spring first if it is possible to do so.

Material and Solvent Precautions

WARNING: Hot! Risk of burns. Wear heat-protective clothing, safety goggles with side shields and/or heat-protective gloves.

Heated materials may cause severe burns on contact. Remember that some materials, even solid materials, may retain heat for some time. If you are burned by a heated material, immediately cool the affected skin with lots of cool, clean water. Do not try to remove hot, melted material from the skin. Seek immediate medical attention.

High-pressure fluids, unless they are safely contained, are extremely hazardous. A jet of high-pressure fluid can act like a knife or needle, penetrate skin and muscle, and inject itself into your body. Injected fluids can cause toxic poisoning.

***Material and Solvent Precautions** (contd)*

Do not treat an injection injury as minor. Seek medical care immediately. Inform the medical staff at the hospital that you have an injection injury and identify the fluid that was injected. If possible, give the doctor copies of the MSDS for the injected fluid and for any additives, such as solvents, that are in the injected fluid.

Nordson recommends that you carry a National Safety Equipment Manufacturers Association (NSEMA) wallet card to give to emergency medical staff in the event of an injection injury. These cards are supplied with the equipment. Additional cards are available free from Nordson Corporation.

WARNING: Injection hazard. Do not go near a known leak in a hose or fitting, and stay clear of all dispensing device nozzles or orifices. Do not point a dispensing device at yourself or other personnel. The high-pressure fluid stream can penetrate skin and inject fluid into the body causing serious injury or death.

- Always handle fluid dispensing devices carefully. Do not point the nozzle of a pressurized device at yourself or other personnel.
- Never place hands, fingers, or other parts of your body directly over a nozzle or near a leak in a high-pressure system.
- Never “back-flush” the nozzles. Blocking a nozzle causes the high-pressure fluid to change direction. An injection injury may result.
- Always relieve system pressure before servicing equipment. Trigger all dispensing devices and bleed off system pressure.

Halogenated hydrocarbon solvents can cause an explosion when used with aluminum components in a pressurized fluid pumping system (pumps, heaters, filters, valves, spray guns, and tanks). The explosion could cause serious bodily injury, death, or substantial property damage. No available stabilizers will prevent this violent reaction from happening.

WARNING: Never use halogenated hydrocarbon solvents to clean aluminum parts or to flush any system. Cleaning agents, coatings and paints, or adhesives may contain halogenated hydrocarbon solvents. Obtain and read MSDS for each material and solvent being used.

- Use nonhalogenated solvents.

- Contact your solvent supplier to determine whether your existing materials and solvents contain halogenated hydrocarbons or to obtain a suitable, nonhalogenated hydrocarbon solvent for cleaning and flushing your system.

- See Table 1. Check the labels on your solvent containers. Halogenated hydrocarbon solvents can be recognized if any of the following elements are listed in the name of the product or or as an ingredient:

Element	Symbol	Prefix
Flourine	F	“Flouro-”
Chlorine	Cl	“Chloro-”
Bromine	Br	“Bromo-”
Iodine	I	“Iodo-”

- Pump the system empty, shut off the pumps, and relieve the system pressure.

- Disassemble and inspect the system components. Replace any damaged or corroded parts.

- Thoroughly clean all noncorroded parts with nonhalogenated hydrocarbon solvents before reassembling the system.

- Contact your coatings, solvent, or adhesive supplier for a nonhalogenated solvent to thoroughly flush the entire system before operating it.

- If you must use halogenated hydrocarbon solvents, consult your Nordson representative about compatible Nordson components.

Material and Solvent Precautions (contd)

Table 1 Solvents Containing Halogenated Fluids

Chlorinated Solvents	Iodinated Solvents	Brominated Solvents	Fluorocarbon Solvents
Carbon Tetrachloride	Ethyl Iodide	Ethylene Dibromide	Dichlorofluoromethane
Chloroform	Methyl Iodide	Methyl Bromide	Trichlorofluoromethane
Ethylene Dichloride	N-butyl Iodide	Methylene Chlorobromide	Freon
Methylene Chloride	Propyl Iodide		
1-1-1 Trichloroethane			
Monochlorobenzene			
Orthodichlorobenzene			
Perchloroethylene			
Trichloroethylene			

2. Disposal

Dispose of equipment and materials used in operation and cleaning according to your local regulations.

3. Description

This section provides detailed descriptions and the theory of operation for the Pro-Flo II Hi-Flo guns listed below:

- Extrude gun
- Extrude gun with 120 V heater
- Extrude gun with 240 V heater
- Extrude gun with temperature conditioning manifold

The Pro-Flo II Hi-Flo extrude guns are typically used in robotic applications for precise, proportional dispensing of ambient temperature and heated adhesives and sealants.

A gun with a heater has the added capability to heat the material supply to maintain fluidity throughout the application process. A gun with a temperature conditioning manifold has the added capabilities to heat or cool the material supply to maintain precise ambient temperature control.

These guns do not operate alone. A digital Pro-Flo controller controls the gun dispensing characteristics by using feedback from the robot controller and other sensors. By compensating for changes in robot speed and material delivery pressure, material application can be precisely controlled. Thus, if system parameters such as robot paths, bead sizes, or path lengths change, the controller will modify other parameters to maintain uniform flow.

See Figure 1 for the main components of the basic extrude guns.

3. Description *(contd.)*

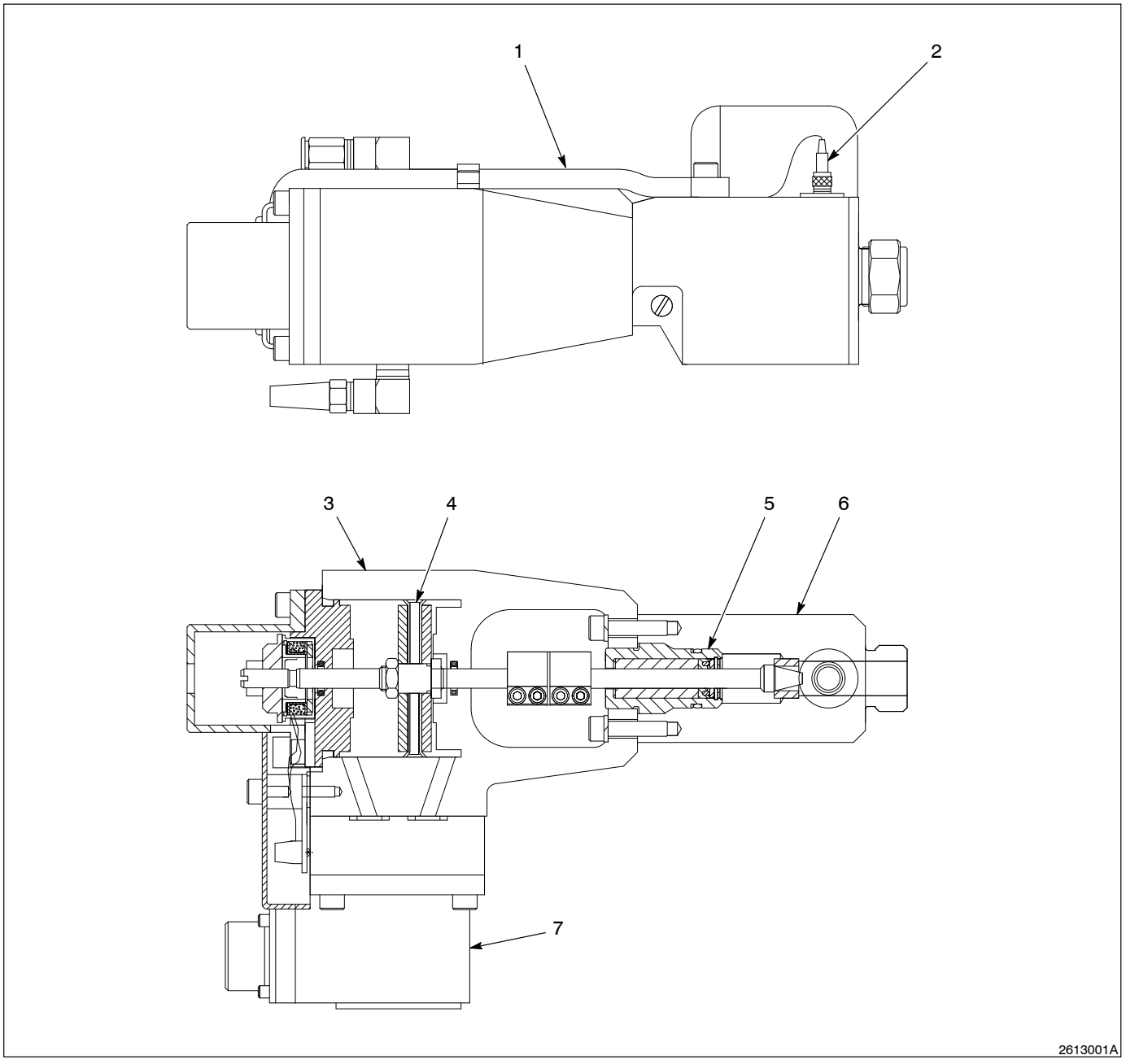


Fig. 1 Pro-Flo II Hi-Flo basic extrude gun, typical

1. Cordset
2. Pressure transducer
3. Pneumatic actuator
4. Piston
5. Bonnet assembly
6. Trimset valve
7. Servo valve

Note: See the system drawings included with unit for Pro-Flo guns used in your application.

Additional Components

In addition to the guns, Nordson offers components necessary to connect the guns to a delivery system. However, these components depend on your application requirements. Contact your Nordson sales representative for more information on the following items:

- Fittings and additional accessories
- Robot interface cables
- Gun control cables
- Material supply lines
- Nozzles

Theory of Operation

See Figure 1. Flow of material is directly proportional to an analog signal sent from the robot controller to the Pro-Flo controller. The Pro-Flo controller sends a low current output signal to the gun's servo valve (7).

Material is dispensed from the gun in relation to robot velocity. A pressure transducer (2), located just before the nozzle, provides performance feedback to the Pro-Flo controller, via the cordset (1), for adjusting gun output due to changes in robot velocity and material pressure delivery.

Variations in robot speed and/or material delivery pressure are compensated for by the automatic adjustment of the gun's trimset valve (6). The automatic adjustment is accomplished through the use of the Pro-Flo controller. The microprocessor controller features volume compensation based on changes in material velocity.

The pneumatic actuator (3) on the gun receives the signal from the controller, via the servo valve (7), and directs a flow of air from the air inlet above the piston (4) to lower (close) the bonnet assembly (5) valve stem against the seat in the trimset valve (6). When the pneumatic actuator receives a signal to open the trimset valve, it directs a flow of air below the piston, which lifts the valve stem from the seat. When this occurs, the material enters the material inlet stream of the trimset valve and dispenses from the material outlet.

If your gun is equipped with a heater, the temperature required by the material is entered into the temperature controller by the operator. The temperature controller sends an electrical signal to the heater. The heater heats up to the required temperature and transfers that heat to the trimset valve.

If your gun is equipped with a temperature conditioning manifold, the temperature required by the material is entered into the temperature controller. Coolant temperature is changed to the required material temperature. The unit processing the coolant routes the temperature-specific coolant to and from the gun through the inlet and outlet lines to the manifold to maintain precise, ambient conditions.

4. Installation

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

This section provides robot interface requirements. It also provides inspection and installation procedures for the Pro-Flo II Hi-Flo extrude guns.

Robot Interface Requirements

Refer to the Pro-Flo Controller manual for the proper input signals for your application.

Inspection

Inspect the following:

1. Inspect the gun for dents, scratches, corrosion, and other physical damage.
2. Inspect all fasteners and mechanical connections for tightness.
3. If there is damage to any component, contact a Nordson representative immediately.

Installation

WARNING: To prevent serious injury to personnel and/or damage to equipment, ensure all power to the controller has been shut off and locked out and that all pneumatic and material pressures have been relieved or bled off.

WARNING: The system or material is pressurized. Relieve pressure. Failure to observe this warning may result in serious injury or death.

The following paragraphs provide the procedures to install a gun to a robot arm.

Gun Mounting

Most applications require precise mounting of the gun on the robot. See Figures 2 and 3 for the clearance and mounting dimensions of the various gun styles. Consider the clearances necessary for cables, air lines, and material supply hoses and their fittings when calculating the robot and gun path.

NOTE: Route the cables, air line, and material supply hose to avoid contact with workpieces and damage from robot movement.

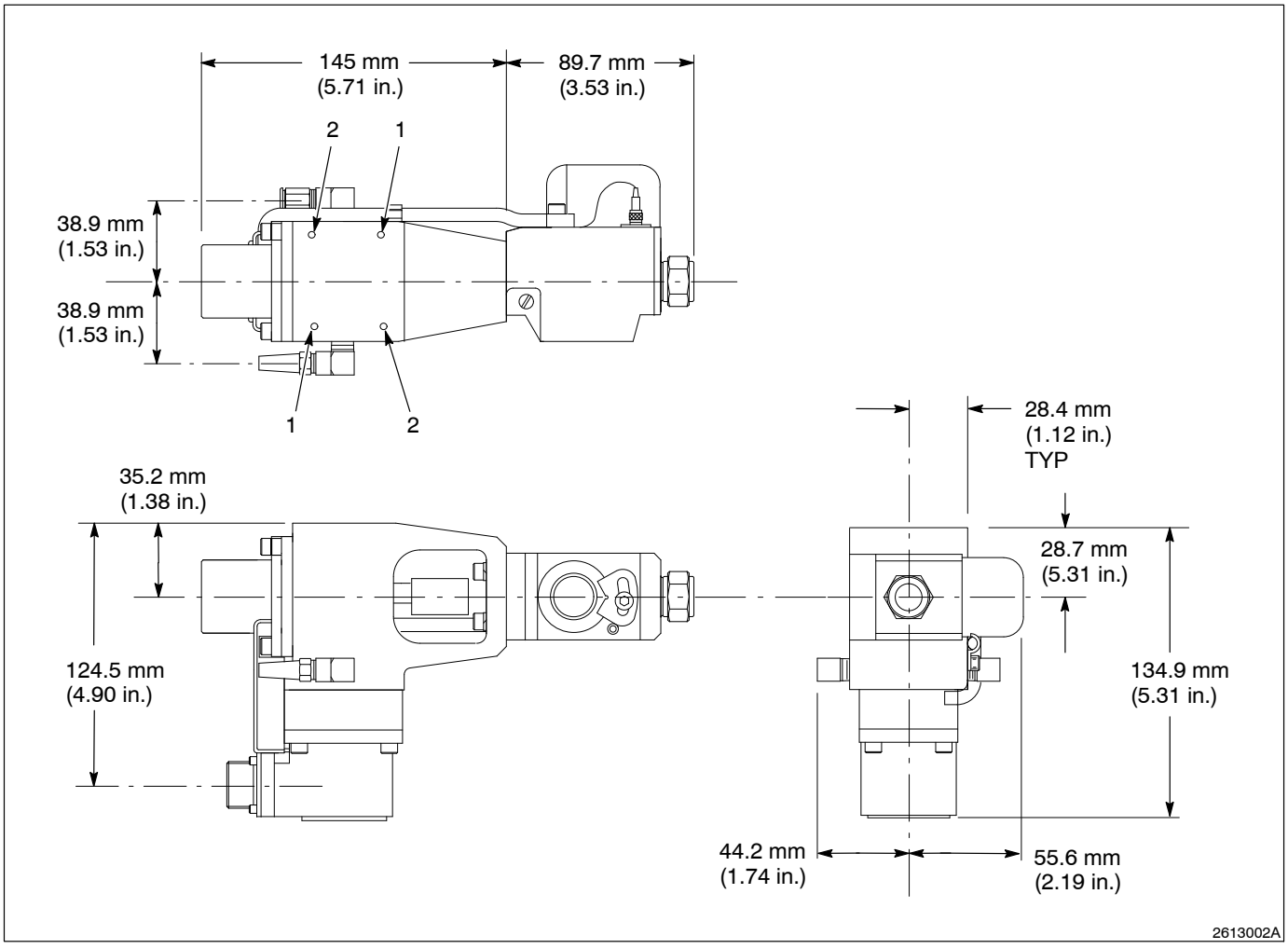


Fig. 2 Extrude gun mounting dimensions, typical

1. Dowel pin ($^1/_4$-in.)
2. Mounting bolt ($^1/_4$-20)

Note: See the system drawings included with unit for Pro-Flo guns used in your application.

Gun Mounting *(contd.)*

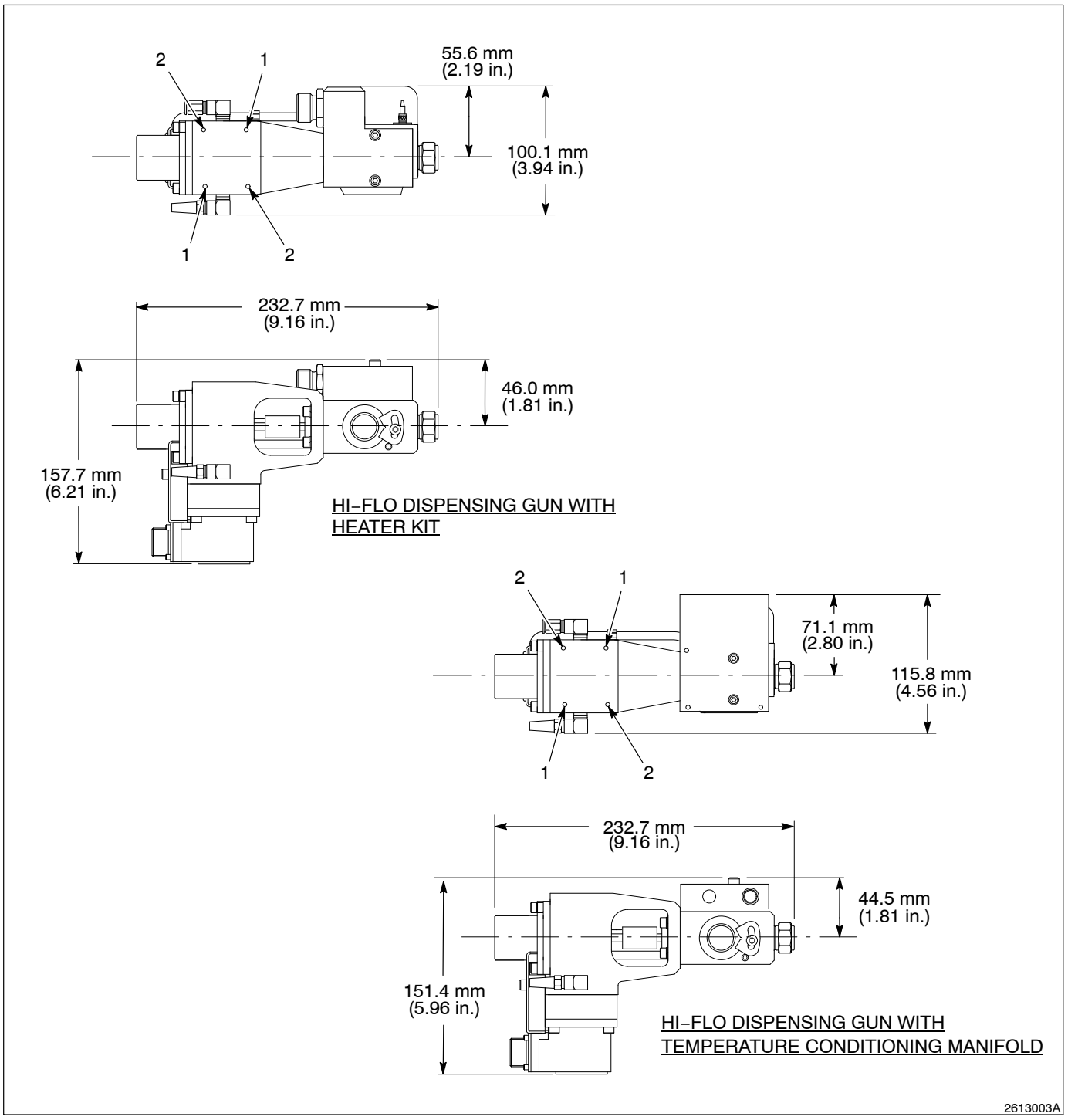


Fig. 3 Extrude gun with heater or with temperature conditioning manifold mounting dimensions, typical

1. Dowel pin ($^1/_4$-in.)
2. Mounting bolt ($^1/_4$-20)

Note: See the system drawings included with unit for Pro-Flo guns used in your application.

See Figures 2 and 3. Mounting the gun to a robot arm requires the use of a customer-supplied end of arm tooling that has been specifically designed for the application. The design of the end of arm tooling must include provisions for accepting two $^1/_4$-20 threaded mounting bolts (2) and two $^1/_4$-in. dowel pins (1).

See Figures 2 and 3 for the mounting hole locations and mount the gun using the following procedure.

1. Mount the gun to the adapter using two customer-supplied $^1/_4$-20 threaded mounting bolts (2).

2. Two $^1/_4$-in. nominal dowel pins (1) are shipped with the gun to prevent any movement of the gun, with respect to the adapter and robot head. Ensure the gun and adapter are properly aligned; then, insert the dowel pins.

Cable Connections

NOTE: To ensure proper connection, the gun control cable connector is keyed.

1. See Figure 4. Make the gun control cable connection (1) to the servo valve.

CAUTION: To prevent damage to the gun and/or robot, ensure that enough cable slack is maintained to clear the movement of the robot wrist and part fixture.

2. Route the gun control cable along the robot arm to the controller.

3. See Figure 5. If installing an extrude gun with a heater, connect the heater cable (1) to the heater connector.

Cable Connections *(contd.)*

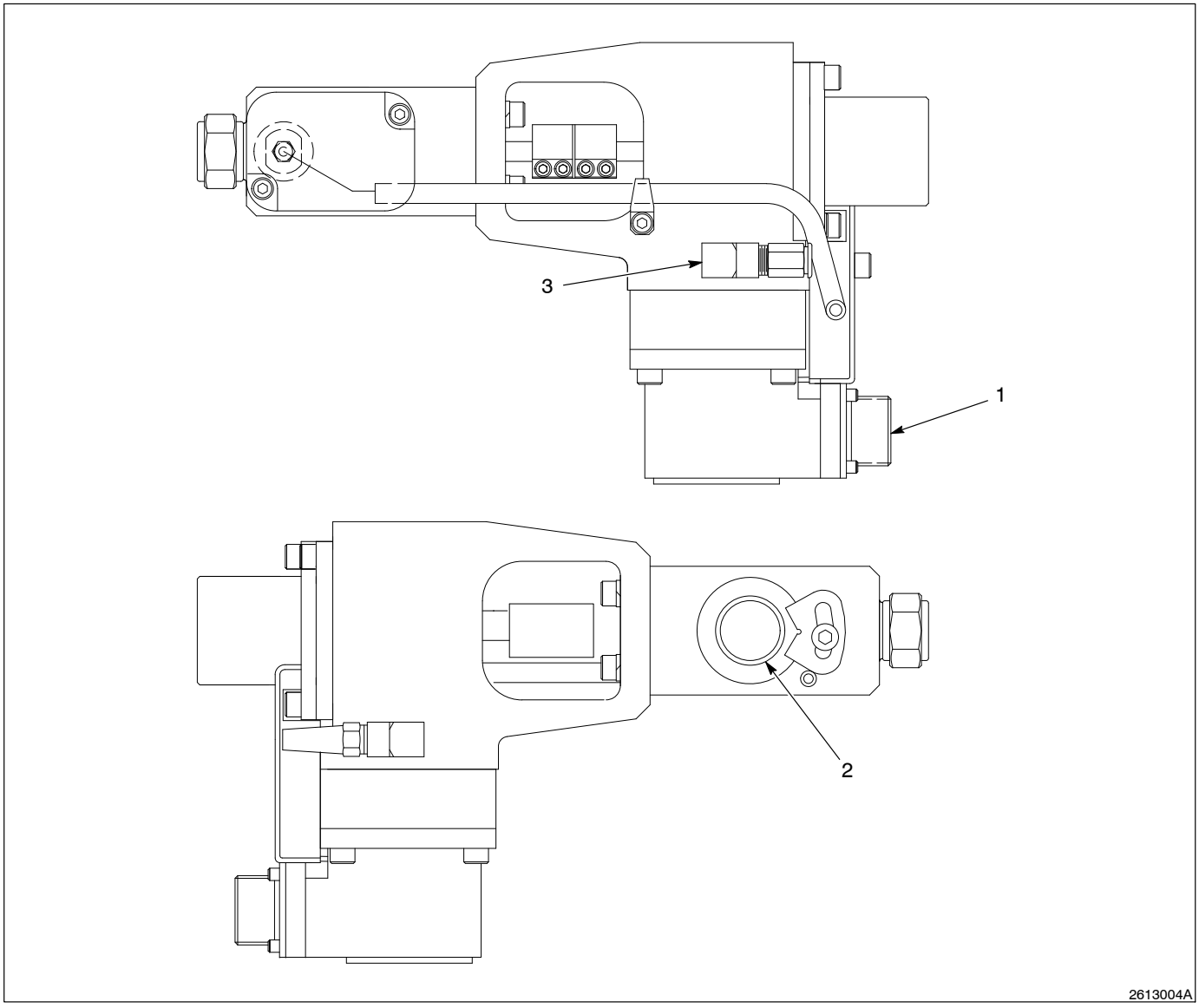
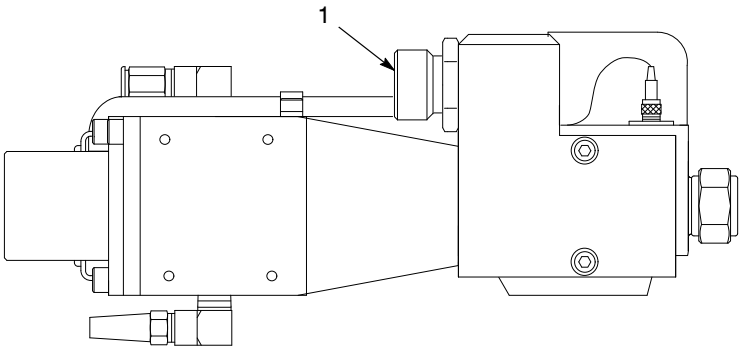


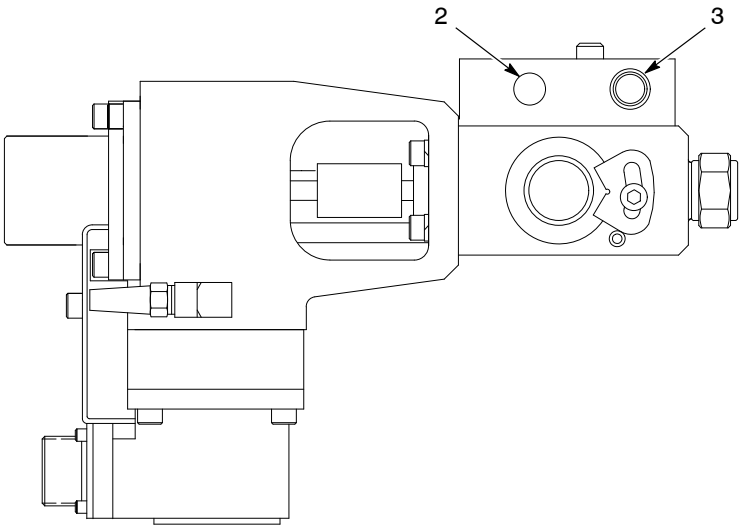
Fig. 4 Cable, air line, and material supply connections, typical

1. Gun control cable connection
2. Material supply inlet
3. Control air supply inlet

Note: See the system drawings included with unit for Pro-Flo guns used in your application.



HI–FLO DISPENSING GUN WITH
HEATER KIT



HI–FLO DISPENSING GUN WITH
TEMPERATURE CONDITIONING MANIFOLD

2613005A

Fig. 5 Heater and temperature conditioning manifold connections, typical

1. Heater cable connection
2. Coolant outlet
3. Coolant inlet

Note: See the system drawings included with unit for Pro-Flo guns used in your application.

Supply Air Connection

Supply air must be taken from an oil-free shop air outlet that will maintain a pressure of at least 4.83 bar (70 psi). The gun will not operate properly without the required amount of air pressure (4.83–8.38 bar [70–120 psi]). Gun performance will increase at higher pneumatic pressures.

NOTE: The gun supply air lines must be routed in a manner that ensures they are free and clear of any movement around the wrist and arm of the robot and any workpiece tooling.

The air line connections are provided in the following steps:

1. Connect an air line from the shop air outlet to the filter/regulator input.

2. See Figure 4. Connect an air line from the filter/regulator output to the control air supply inlet fitting (3)on the gun.

Material Supply Connections

Connecting the material supply hose from the pump/header system to the gun requires the use of adapters and reducers specified for your particular application.

Connect the material supply line using the following procedure:

1. Apply O-ring lubricant to the O-ring on the material inlet fitting or swivel. Install the fitting onto the trimset valve of the gun body.

2. Secure inlet fitting with a swivel lock.

3. See Figure 4. Connect the material supply hose from the pump/header system to the gun's material supply inlet fitting (2).

4. See Figure 5. If installing the extrude gun with temperature conditioning manifold, connect the inlet and outlet coolant lines to the inlet fitting (3) and outlet fitting (2) of the temperature conditioning manifold.

Nozzles

Your Nordson sales representative can help you select the correct nozzles for your application. Nozzle selection depends on the type of material being dispensed, the desired bead size, and your production rate requirements.

Gun Purging

After the gun is installed, the gun body must be purged to remove any trapped air. Trapped air in the system may result in inaccurate pressure transducer readings.

5. Operation

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

Introduction

The Pro-Flo II Hi-Flo guns have no operating controls of their own. Gun operation is controlled by a Pro-Flo Controller along with a robot controller.

Operating instructions for the gun consist of startup/shutdown, bead size information, and gun purging procedures. Before operating the gun, the operator should read all related component manuals and be familiar with the operating characteristics of each component in the system. A thorough understanding of the system operation will help obtain desired results.

Startup/Shutdown

The startup/shutdown procedures are dependent upon the applicable controller operating instructions. For specific operating instructions, refer to the applicable controller manual.

Bead Size

The operator sets the bead size. The controller multiplies this relative value by the incoming variable voltage from the robot, which forms the basis for the proportional control of the bead size.

Gun Purging

After the gun has been installed, the nozzle and pressure transducer must be removed and the gun purged to remove trapped air from the transducer and outlet ports. After the nozzle and transducer are installed, the gun should be purged again to remove any remaining air.

6. Maintenance

The Pro-Flo II Hi-Flo guns are designed to provide efficient operation when a basic maintenance schedule is followed. Perform the following checks and procedures at the specified intervals to prevent inefficient system operation and unnecessary downtime.

WARNING: Do not loosen any hydraulic/pneumatic fittings or connections without first relieving system hydraulic/pneumatic pressure. Failure to observe this warning may result in serious injury or death.

WARNING: Wear safety glasses, safety gloves, and protective clothing to prevent injury from material under pressure. Failure to observe this warning may result in serious injury or death.

System Component	Frequency of Maintenance			
	Daily	Weekly	Monthly	Quarterly
Nozzle — Check the nozzle for wear and deformities. Replace the nozzle if necessary.	X			
Cable Connections — Make sure that the cable connections are secure. Tighten if necessary.	X			
Cable Connections — Check the cable connectors for damage. Replace the cables if necessary.		X		
Air Line Connections — Make sure that the air line connections are secure. Tighten if necessary.		X		
Air Line Connections — Check the air line connectors for wear. Replace the air lines if necessary.		X		
Fluid Connections — Make sure the fluid connections are tight. Tighten if necessary.			X	
Fluid Connections — Check the fluid connectors for wear. Replace the fluid hoses if necessary.			X	
Gun — Check the gun for leaks. Tighten any loose fittings. Replace any O-rings if necessary.		X		
Gun — Check the gun mounting. Tighten any loose hardware.			X	
Cables — Check the cables for wear. Replace the cables if necessary.			X	
Pneumatic filter/regulator — Clean the pneumatic filter/regulator. Change the filter/regulator if necessary.			X	
Material — Check the shelf life of the material. Ensure the material is useable.		X		
Pressure Transducer — Clean the pressure transducer.				X

7. Troubleshooting

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

WARNING: Ensure all power, air pressure, and fluid pressure is removed from the gun before performing any troubleshooting procedures. Troubleshooting procedures are to be performed by qualified personnel observing standard safety practices.

WARNING: Remove input air supply to the material pump. Refer to the pump manual for the procedures. To avoid injury, do not troubleshoot with the pump on unless it is required.

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.

	Problem	Page
1.	Gun does not dispense material	26
2.	Gun does not dispense material and does not open	26
3.	Gun does not dispense material but opens fully	26
4.	Gun does not change dispensing rate to control bead size	27
5.	Gun does not change dispensing rate to control bead size but opens fully	27
6.	Gun continues to dispense after cycle; Controller indicates that gun is closed	27
7.	Dispensing starts late	27
8.	Bead deposition wiggles	27
9.	Bead size changes unexpectedly	27
10.	Material leaks from bonnet	27

Troubleshooting Chart

Problem	Possible Cause	Corrective Action
1. Gun does not dispense material	Material supply pressure low	Increase the material supply pressure.
	Nozzle blocked	Remove and clean the nozzle.
	Material supply hose blocked	Check and unblock the material supply hose.
	Spring closures not retracted	Verify power to controller and controller is on. Verify solenoid supply air to gun is on. Verify air is present at gun and at correct pressure. Replace spring closure assembly if defective.
2. Gun does not dispense material and does not open	Control air pressure absent or low	Check the supply air pressure. Increase the air pressure if necessary.
	Stem binding	Remove the trimset valve. Check and replace the stem and bonnet, if necessary.
	Actuator malfunctioning	Replace the actuator.
	Spring closures not retracted	Verify power to controller and controller is on. Verify solenoid supply air to gun is on. Verify air is present at gun and at correct pressure. Replace spring closure assembly if defective.
3. Gun does not dispense material but opens fully	Trimset valve blocked	Remove and clean the trimset valve.

Problem	Possible Cause	Corrective Action
4. Gun does not change dispensing rate to control bead size	Cordset damaged	Check the continuity of the cordset. Replace the cordset, if necessary.
	Gun control, Y-, or extension cable damaged	Check the continuity and replace the cables, if necessary.
5. Gun does not change dispensing rate to control bead size but opens fully	Pressure transducer in controller malfunctioning	Check the pressure output voltage of the controller board.
6. Gun continues to dispense after cycle; Controller indicates that gun is closed	Control air pressure low	Check the supply air pressure and increase it, if necessary.
	Needle not seating	Purge the gun.
	Stem and trimset valve seats worn	Replace the trimset valve.
7. Dispensing starts late	Gun On signal from robot controller to Nordson controller timed improperly (digital controller only)	Set the proper timing sequence.
	Stem binding (packing bonnet only)	Loosen the bonnet screw.
8. Bead deposition wiggles	Nozzle too high above workpiece	Lower the nozzle.
	Material velocity through nozzle too high	Decrease the bead size or install a larger nozzle.
9. Bead size changes unexpectedly	Nozzle partially blocked	Clean the nozzle.
	Material has exceeded shelf life	Use new material.
10. Material leaks from bonnet	Bonnet worn	Replace the bonnet.
	Packing bonnet screw loose	Tighten the bonnet screw.

8. Repair

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

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

WARNING: Disconnect, lock out, and tag electrical power at a disconnect or breaker in the service line ahead of the electrical equipment before servicing.

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

Tools and Supplies Required

The following tools are required for servicing the extrude guns.

- Adjustment wrench (2)
- Allen wrench
- O-ring removal tool
- Socket head screwdriver
- Torque wrench

The following supplies are recommended for use during the repair procedures:

- Anti-seize compound
- PTFE grease

Clearing a Blocked Nozzle

To clear a blocked nozzle, perform the following procedure:

1. Shut off the air pressure to the material supply pump.
2. Bleed off the residual pressure through the in-line pressure relief valve in the material supply line. This valve should be located near the material supply pump.
3. Shut off and lock out all power to the system.
4. Remove the nozzle retaining nut and nozzle. Clean the nozzle thoroughly with an appropriate solvent.
5. Reinstall the nozzle.

Clearing a Blocked Material Supply Hose

NOTE: For this procedure, start at the material supply pump and work toward the gun. Repeat this procedure at each connection in the material supply hose.

To clear a blocked material supply hose, perform the following procedure:

1. Shut off the air pressure to the material supply pump.
2. Bleed off the residual pressure through the in-line pressure relief valve in the material supply line. This valve should be located near the material supply pump.
3. Disconnect the hose.
4. Turn on the material supply pump and check the flow.
5. Turn off the material supply pump and relieve the system pressure if necessary.
6. If no flow was seen, replace this section of the hose.
7. If no blockage was found, reconnect the hose and repeat this procedure at the next connection.

Removing the Gun from the Robot

WARNING: To prevent injury to personnel and/or damage to equipment, ensure all power to the controller and gun has been shut off and locked out and that all pneumatic and material pressures have been relieved or bled off.

WARNING: If a heated gun is being used, allow the system to cool down before disconnecting or removing any components from the gun. Failure to observe this warning may result in serious injury to personnel and/or damage to equipment.

1. Shut off the material supply pump and relieve the pressure from the gun and hose. Disconnect the material supply hose from the material supply inlet of the gun.
2. See Figure 4. Disconnect the air line from the supply line fitting (3) located on the actuator of the gun.
3. Disconnect the gun control cable from the gun cable connection (1).
4. See Figure 5. For heated gun control applications, disconnect the heater cable from the heater connection (1).

Removing the Gun from the Robot (contd)

5. For temperature conditioning applications, disconnect the inlet (3) and outlet (2) coolant hoses from the temperature conditioning manifold.

6. See Figures 2 and 3. Remove the two mounting bolts (2) and two dowel pins (1) securing the gun to the robot arm. Remove the gun from the robot and move to a clean workbench.

Removing the Trimset Valve

Perform the following procedure to remove the trimset valve:

1. Remove the gun from robot according to the procedure *Removing the Gun from the Robot*.

2. See Figure 6. Loosen the two lower coupling set screws (3) to separate the bonnet assembly (4) valve stem from the coupling (13). Do not remove the set screws.

3. Remove the two screws (10) securing the pressure transducer cover (9) to the trimset valve (6).

4. Unplug the pressure transducer cordset (11) from the pressure transducer (8).

5. Remove the pressure transducer and O-ring (7) from the trimset valve.

6. Remove the retaining nut (12) and nozzle from the trimset valve.

7. For guns with heaters, remove the heater and its attaching hardware from the trimset valve.

8. For guns with temperature conditioning manifolds, remove the temperature conditioning manifold and its attaching hardware from the trimset valve.

9. Remove the four screws (5) securing the trimset valve to the actuator (2).

   NOTE: Note the trimset valve mounting orientation to the actuator to ensure the correct positioning upon installation.

10. Separate the trimset valve and the actuator.

11. Carefully pull the bonnet assembly from the trimset valve.

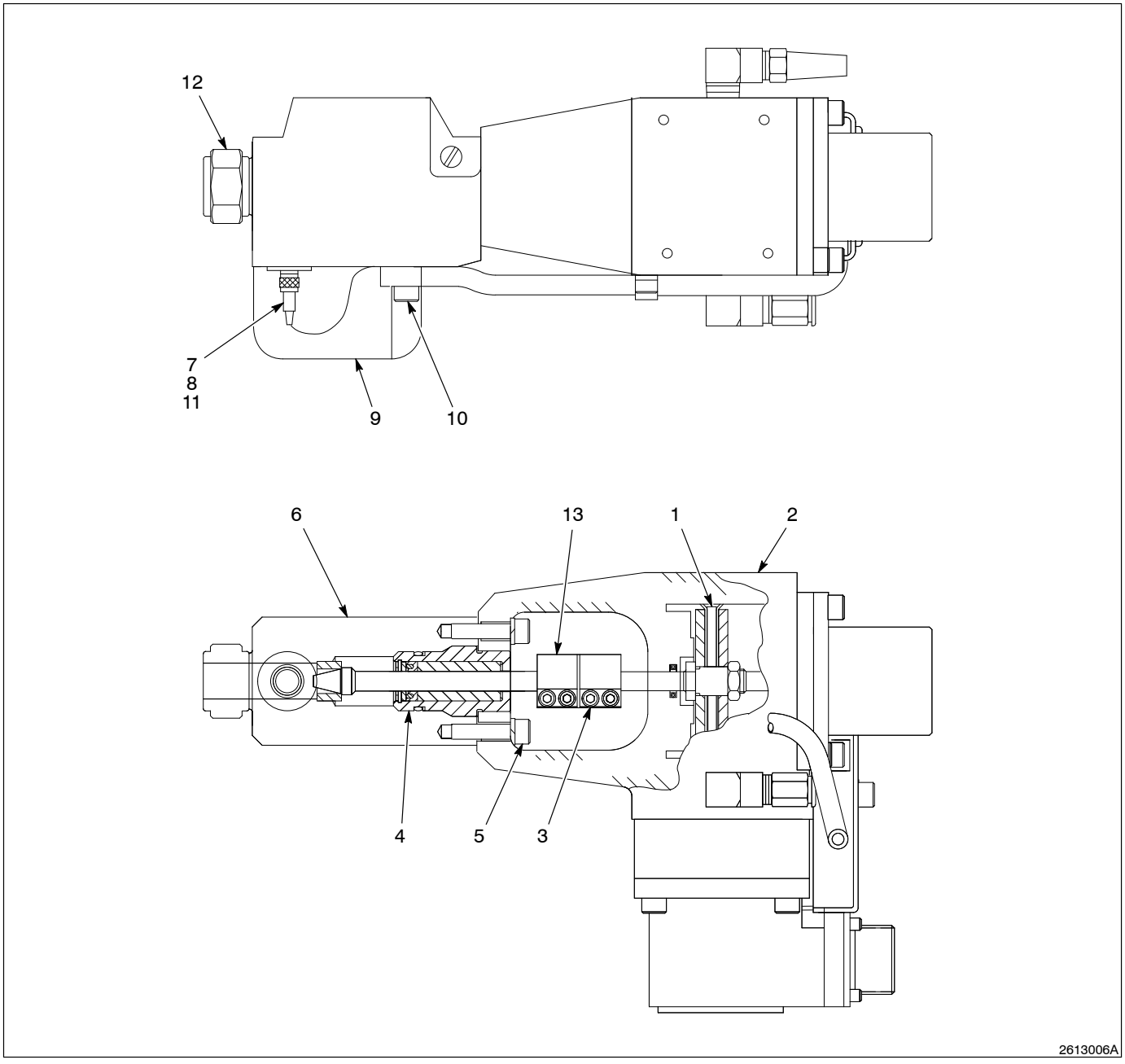


Fig. 6 Removing the trimset valve, typical

1. Piston assembly rod
2. Actuator
3. Lower coupling set screw (2)
4. Bonnet assembly
5. Screw (4)
6. Trimset valve
7. O-ring
8. Pressure transducer
9. Pressure transducer cover
10. Screw (2)
11. Pressure transducer cordset
12. Retaining nut
13. Coupling

Note: See the system drawings included with unit for Pro-Flo guns used in your application.

Removing the Servo Valve

Use the following procedure to remove the servo valve:

1. Remove the gun from the robot according to the procedure *Removing the Gun from the Robot*.
2. See Figure 7. Remove the two screws (4), actuator lead cover (1), two standoffs (3), and terminal block (2).
3. Loosen the terminal block screws that secure the servo valve wires to the terminal block.
4. Remove the four screws (7) securing the servo valve (8) to the actuator (5).
5. Separate the servo valve from the actuator and remove the O-rings (6).

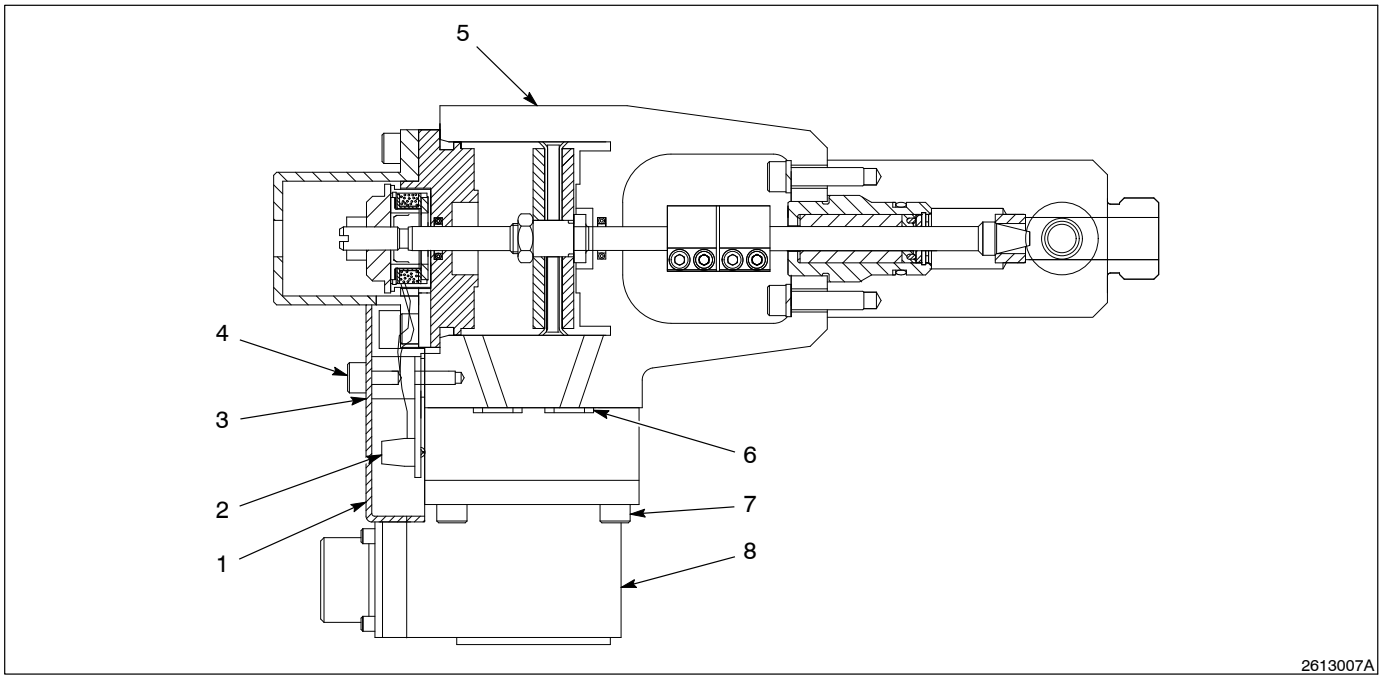


Fig. 7 Removing the servo valve, typical

1. Actuator lead cover
2. Terminal block
3. Standoff (2)
4. Screw (2)
5. Actuator
6. O-ring (4)
7. Screw (4)
8. Servo valve

Note: See the system drawings included with unit for Pro-Flo guns used in your application.

Removing the Piston Assembly

Use the following procedure to remove the piston assembly:

1. Remove the gun from the robot according to the procedure *Removing the Gun from the Robot*.
2. See Figure 8. Remove the four screws (6) and bobbin cover (1) from the actuator (12).
3. Hold the piston assembly (2) rod with an adjustment wrench to prevent it from turning. Use a second wrench to loosen and remove the jam nut (3).
4. Remove the armature (4) by unthreading it from the piston assembly rod.
5. Refer to the *Removing the Servo Valve* procedure to remove the actuator lead cover.
6. Loosen the terminal block screws that attach the coil assembly wires to the terminal block.
7. Remove the coil assembly (5), tolerance ring (7), and cylinder head (8) from the piston assembly rod.
8. Remove the O-rings (9 and 10) and glide ring (11) from the cylinder head.
9. Loosen the two upper coupling set screws (15) to separate the piston assembly rod from the coupling (16). Do not remove the set screws.
10. Carefully pull the piston assembly from the actuator.
11. Remove the O-ring (13) and glide ring (14) from the actuator.

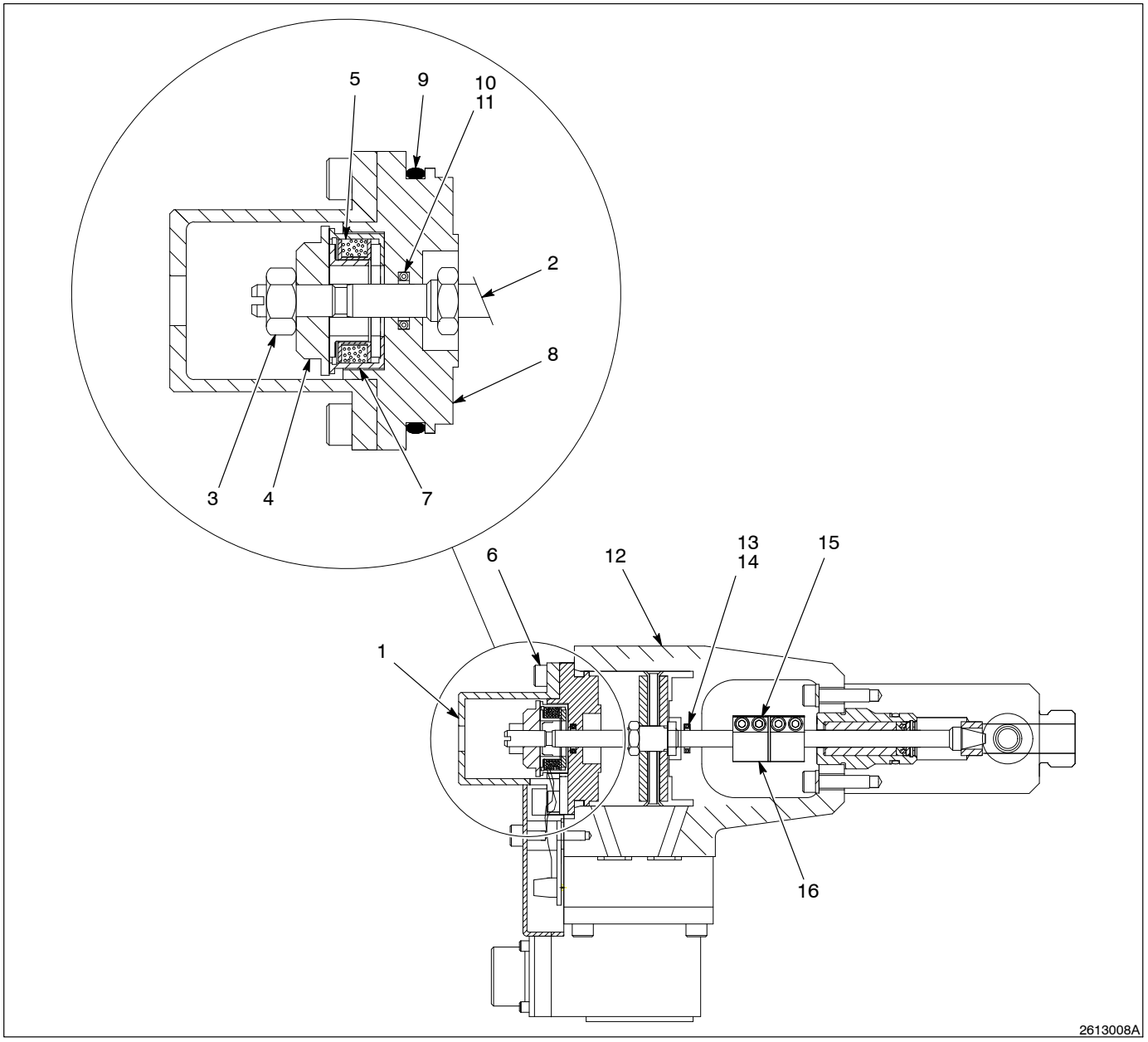


Fig. 8 Removing the piston assembly, typical

1. Bobbin cover
2. Piston assembly
3. Jam nut
4. Armature
5. Coil assembly
6. Screw (4)
7. Tolerance ring
8. Cylinder head
9. O-ring
10. O-ring
11. Glide ring
12. Actuator
13. O-ring
14. Glide ring
15. Upper coupling set screw (2)
16. Coupling

Note: See the system drawings included with unit for Pro-Flo guns used in your application.

Installing the Piston Assembly

Use the following procedure to install the piston assembly:

NOTE: Always use new O-rings and packings when reassembling the gun.

1. See Figure 9. Lubricate a new O-ring (13) and glide ring (14) with PTFE grease.

2. Install the new O-ring into the actuator (12) groove. Install the glide ring in the inside diameter of the O-ring.

3. Install a new piston assembly (2) using the piston assembly fixture (18) that comes with each new piston assembly.

4. Hold the piston assembly fixture against the opening of the piston assembly bore and push the piston assembly until it enters the bore.

5. Push the piston assembly until it fully seats against the bonnet assembly valve stem (17) in the coupling (16).

6. Tighten the two upper coupling set screws (15).

NOTE: Always use new O-rings and packings when reassembling the gun.

7. Lubricate two new O-rings (9 and 10) and glide ring (11) with PTFE grease. Install the O-ring in the O-ring groove on the outside of the cylinder head. Install the O-ring in the O-ring groove inside the cylinder head and install the glide ring in the inside diameter of the O-ring.

8. Install the cylinder head (8) onto the piston assembly rod.

9. Install the tolerance ring (7) and the coil assembly (5) onto the piston assembly rod.

10. Attach the coil assembly wires to the terminal block. See Figure 12 for the correct wiring diagram.

11. Install the actuator lead cover according to the *Installing the Servo Valve* procedure.

12. Hold the piston assembly rod with an adjustment wrench to prevent it from turning and loosely install the armature (4) and jam nut (3) onto the piston assembly rod. Refer to the *Adjusting the Armature Clearance* procedure to provide the necessary clearance.

13. Apply anti-seize compound to the four screws (6). Install the bobbin cover (1) and secure it and the cylinder head (8) with the screws. Tighten the screws to 0.45–0.68 N•m (4–6 in.-lb).

14. Attach the gun to the robot using the *Installing the Gun on the Robot* procedure.

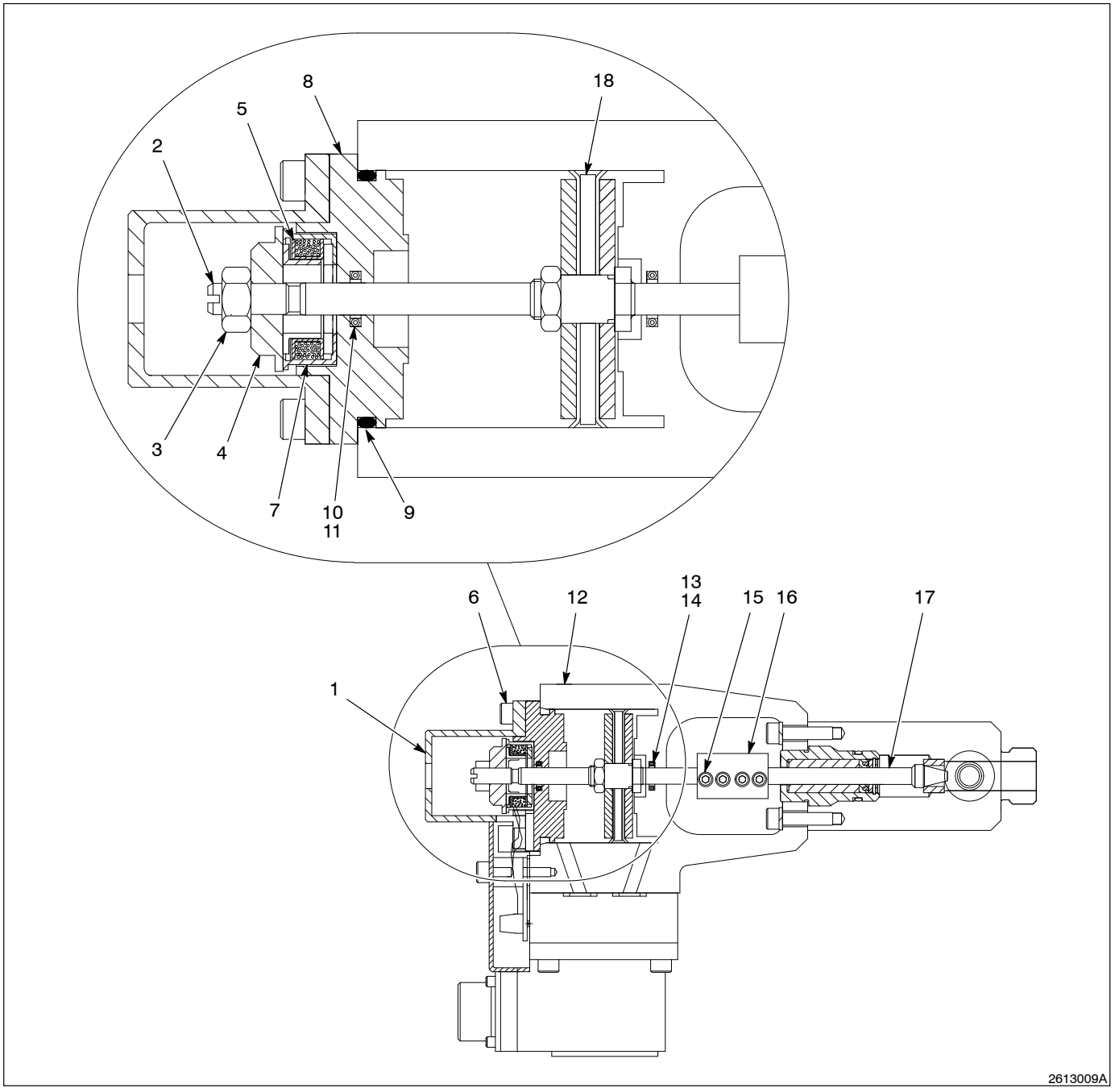


Fig. 9 Installing the piston assembly, typical

1. Bobbin cover
2. Piston assembly
3. Jam nut
4. Armature
5. Coil assembly
6. Screw (4)
7. Tolerance ring
8. Cylinder head
9. O-ring
10. O-ring
11. Glide ring
12. Actuator
13. O-ring
14. Backup ring
15. Upper coupling set screw (2)
16. Coupling
17. Bonnet assembly valve stem
18. Piston assembly fixture

Note: See the system drawings included with unit for Pro-Flo guns used in your application.

Checking the Armature Clearance

To check the armature clearance, perform the following procedure:

1. See Figure 9. Remove the four screws (6) and bobbin cover (1).
2. Push down on the top of the armature (4).
3. See Figure 10. There should be a gap of 0.43–0.88 mm (0.017–0.035 in.) between the armature (3) and the cylinder head (4). If the gap is more or less, refer to the *Adjusting the Armature Clearance* procedure.
4. See Figure 10. Replace the bobbin cover and the four screws. Tighten the screws to 0.45–0.68 N•m (4–6 in.-lb).

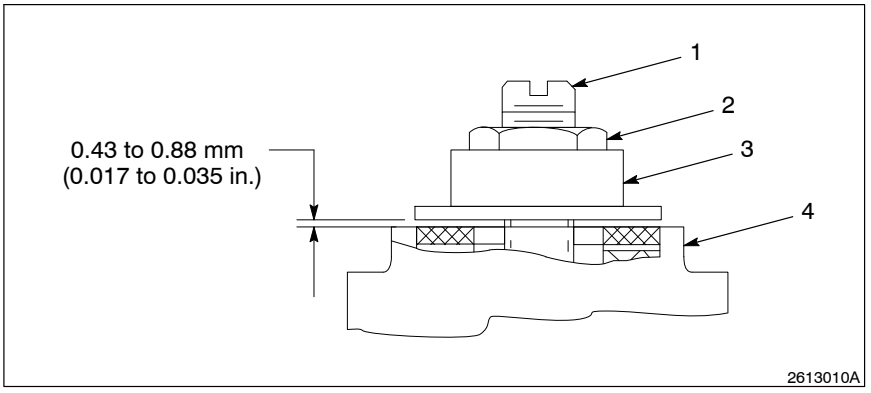


Fig. 10 Armature clearance

1. Top of piston assembly rod
2. Jam nut
3. Armature
4. Cylinder head

Adjusting the Armature Clearance

Use the following procedure to adjust the armature clearance:

1. See Figure 9. Remove the four screws (6) and bobbin cover (1).
2. See Figure 10. Hold the piston assembly rod (1) with an adjustment wrench to prevent it from turning. Use a second wrench to loosen the jam nut (2).
3. Loosen the armature (3) by turning it counterclockwise. Move it to the end of the piston assembly rod.
4. Push down on the top of the piston assembly until the stem is seated.
5. Turn the armature clockwise until it comes into light contact with the cylinder head (4).
6. Turn the armature counterclockwise by $^1/_2$–1 turn and tighten the jam nut (2) to produce a gap of approximately 0.43–0.88 mm (0.017–0.035 in.) between the armature (3) and cylinder head (4).
7. Check the gap for the proper clearance.
8. See Figure 9. Install the bobbin cover (1) and four screws (6). Tighten the screws to 0.45–0.68 N•m (4–6 in.-lb).

Installing the Servo Valve

NOTE: Always use new O-rings and packings when reassembling the gun.

1. See Figure 7. Lubricate four new O-rings (6) with PTFE grease. Install the O-rings in the servo valve (8).
2. Apply anti-seize compound to the four screws (7). Install the servo valve using the screws. Tighten the screws to 0.45–0.68 N•m (4–6 in.-lb).
3. Install the servo valve wires on the terminal block (2). See Figure 12 for proper wire installation.
4. Apply anti-seize compound to the two screws (4). Install the terminal block, two standoffs (3), actuator lead cover (1), and screws. Tighten the screws to 0.45–0.68 N•m (4–6 in.-lb).
5. Attach the gun to the robot using the *Installing the Gun on the Robot* procedure.

Installing the Trimset Valve

Use the following procedure to install the trimset valve.

NOTE: Always use new O-rings and packings when reassembling the gun.

1. See Figure 11. Loosen the two upper coupling set screws (16) and firmly seat the coupling (14) against the piston assembly (1) rod. Tighten the two upper coupling set screws that hold the piston assembly rod in place.

2. If installing the same bonnet assembly (4), replace the O-ring (12) and backup ring (13).

3. Lubricate the bonnet assembly O-ring and backup ring with PTFE grease.

4. Lubricate the inside of the trimset valve (6) with PTFE grease before installing the bonnet assembly. Install the bonnet assembly in the trimset valve.

5. Align the actuator (2) and the trimset valve (6) in the same orientation as noted in the *Removing the Trimset Valve* procedure.

6. Apply anti-seize compound to the four screws (5). Install the screws and tighten to 47.5 N•m (35 ft-lb).

7. Fully seat the bonnet assembly valve stem against the piston assembly rod in the coupling.

Installing the Trimset Valve
(contd)

8. Tighten the two lower coupling set screws (3) that hold the bonnet assembly valve stem in place.
9. If installing the same pressure transducer (8), replace the O-ring (7).
10. Lubricate the O-ring with PTFE grease.
11. Install the pressure transducer.
12. Connect the pressure transducer cordset (11) to the pressure transducer.
13. Apply anti-seize compound to the two screws (10). Install the pressure transducer cover (9) using the screws. Tighten the screws to 0.45–0.68 N•m (4–6 in.-lb).
14. Install the retaining nut (15) and nozzle.
15. If using a gun with a heater, install the heater using its attaching hardware.
16. If using a gun with a temperature conditioning manifold, install the manifold using its attaching hardware.
17. Attach the gun to the robot using the *Installing the Gun on the Robot* procedure.
18. Purge the gun before using.

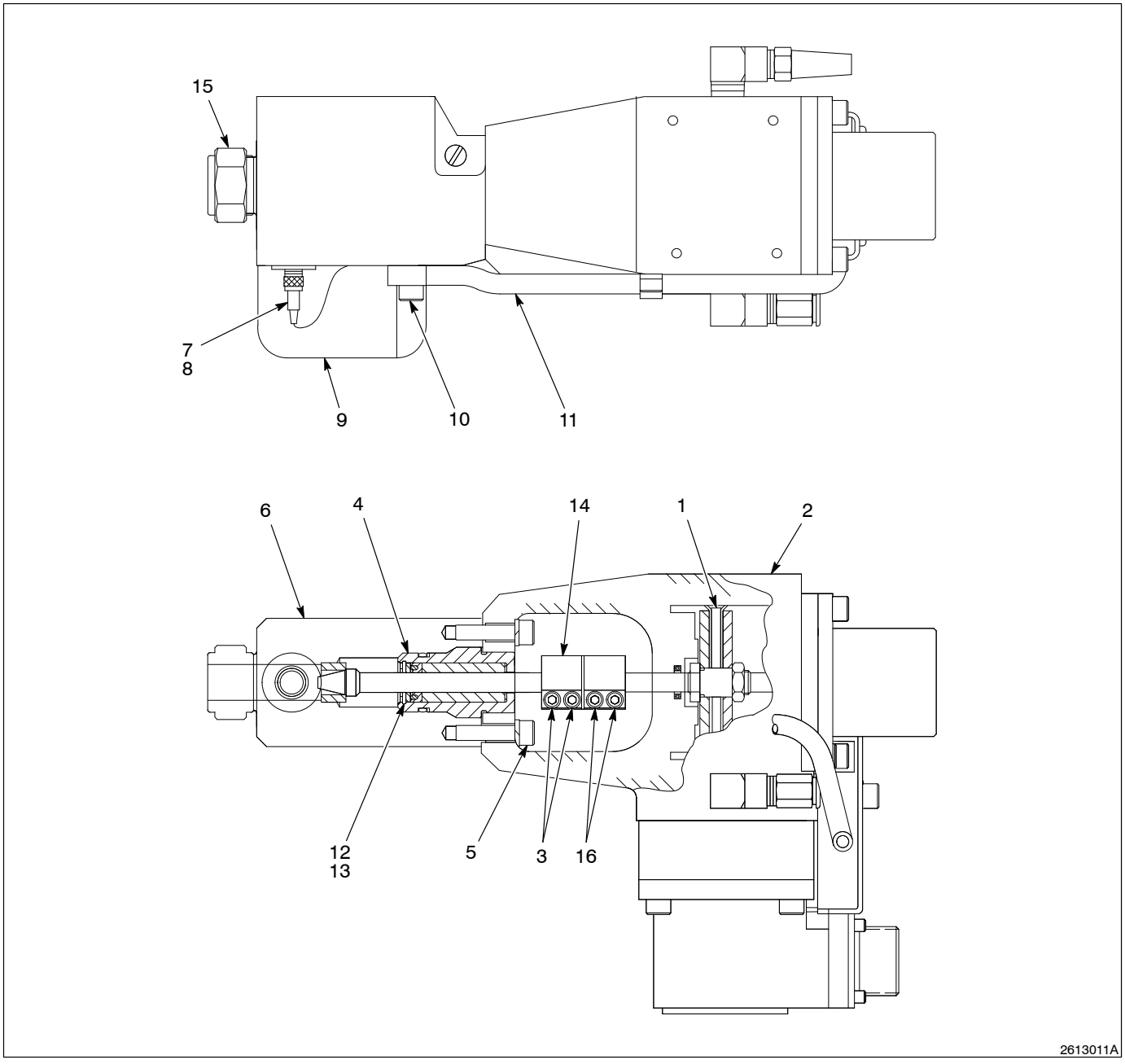


Fig. 11 Installing the trimset valve, typical

1. Piston assembly
2. Actuator
3. Lower coupling set screw (2)
4. Bonnet assembly
5. Screw (4)
6. Trimset valve

Note: See the system drawings included with unit for Pro-Flo guns used in your application.

7. O-ring
8. Pressure transducer
9. Pressure transducer cover
10. Screw (4)
11. Pressure transducer cordset
12. O-ring
13. Backup ring
14. Coupling
15. Retaining nut
16. Upper coupling set screw (2)

Installing the Trimset Valve

(contd)

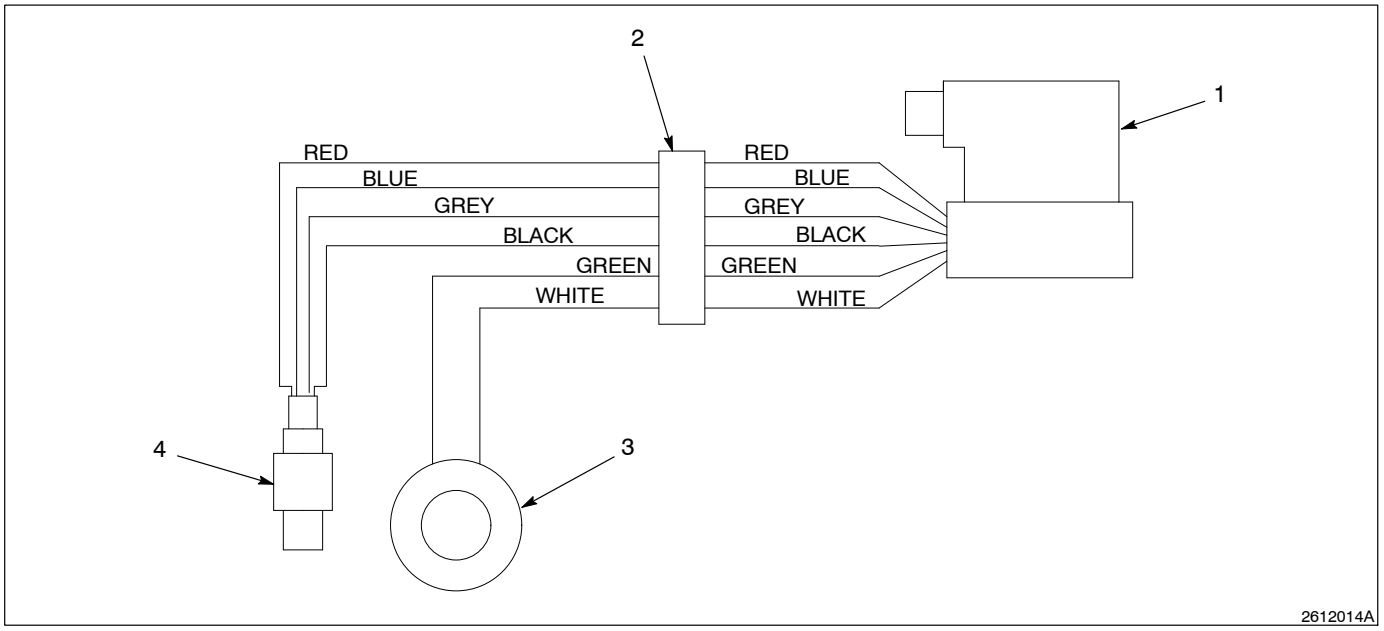


Fig. 12 Pressure transducer cordset wiring

1. Servo valve
2. Terminal block
3. Coil assembly
4. Pressure transducer

Checking the Continuity of the Cordset

See Figure 13. Perform the following procedure to check the continuity of the pressure transducer cordset.

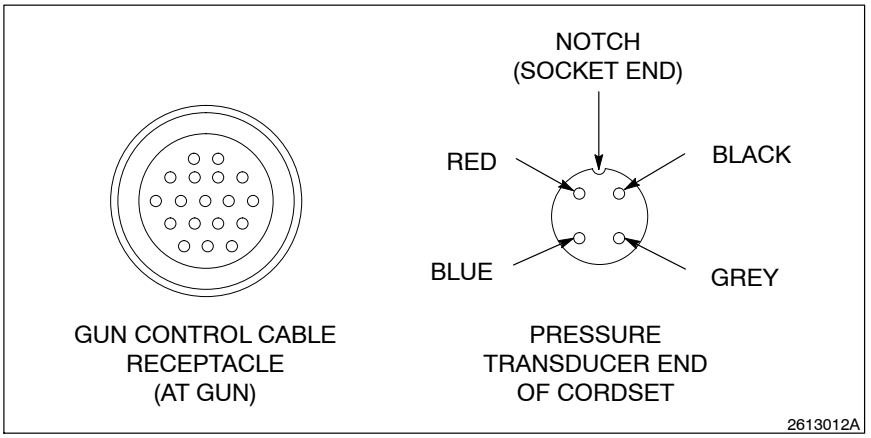


Fig. 13 Pin locations of the cordset

1. Remove the pressure transducer cover and unplug the cordset. Disconnect the gun control cable from the gun.
2. Check the continuity of each wire with an ohmmeter. The wires are connected as shown in Table 2.
3. Replace the cordset if the wiring is not continuous.

Table 2 Wire Connections on the Cordset

Gun Connector End Pin	Transducer End Pin	Wire Color
K	45° counterclockwise from notch	Red
M	135° counterclockwise from notch	Blue
L	135° clockwise from notch	Grey
J	45° clockwise from notch	Black

Installing the Gun on the Robot

Perform the following procedure to install the gun on the robot:

1. See Figures 2 and 3. Install the gun on the robot arm adapter. Secure with the two mounting bolts (2) and two dowel pins (1).

2. See Figure 4. Connect the material supply hose to the material inlet fitting (2). If you are using high pressure fluid swivels, remove the swivel lock, tighten the fluid swivel, and tighten the swivel lock.

3. Connect the gun control cable to the gun (1).

4. Connect the air supply line to the actuator fitting (3)

5. See Figure 5. For heated gun applications, install the heater cable to the heater connection (1).

6. For temperature conditioning applications, install the inlet (3) and outlet (2) coolant hoses to the temperature conditioning manifold.

7. Turn on the material supply pump and check for leaks in the hoses and fittings.

8. Purge the gun to remove trapped air from the hoses and gun.

9. 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.

The six-digit 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.

Item	Part	Description	Quantity	Note
—	000 000	Assembly	1	
1	000 000	• Subassembly	2	A
2	000 000	• • 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.

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.

Pro-Flo II Hi-Flo Extrude Basic and Temperature Conditioning Manifold Gun

See Figures 14 and 15.

Item	Part	Part	Description	Quantity	Note
—	163494		Gun, extrude, basic, Hi-Flo, Pro-Flo II, 2000 psi		
—		220363	Gun, with temperature conditioning manifold, Hi-Flo, Pro-Flo II, 2000 psi	1	
1	982372	982372	• Screw, socket head, M5 x 12, bl	6	A
2	- - - - - -	- - - - - -	• Cover, bobbin	1	
3	984222	984222	• Nut, hex, jam, $^1/_4$-28, steel, zinc	1	
4	163464	163464	• Armature	1	
5	- - - - - -	- - - - - -	• Coil assembly, Pro-Flo II	1	
6	- - - - - -	- - - - - -	• Ring, tolerance, 0.89 x 0.86 x 0.28	1	
7	940 111	940 111	• O-ring, Viton, 0.301 ID x 0.070 w, br	2	B
8	- - - - - -	- - - - - -	• Ring, glide	2	B
9	- - - - - -	- - - - - -	• Head, cylinder, Hi-Flo	1	
10	941332	941332	• O-ring, Viton, blk, 1.812 x 2.00	1	B
11	163468	163468	• Piston assembly, Pro-Flo, Hi-Flo	1	
12	220354	220354	• Coupling, shaft, Hi-Flo	1	
13	982023	982023	• Screw, socket, M3 x 8, bl	4	D
14	- - - - - -	- - - - - -	• Frame, actuator	1	
NS	985409	985409	• • Pin, dowel	2	
15	241040	241040	• Muffler, air, $^1/_8$ NPT	1	C
16	973098	973098	• Elbow, pipe, auto, 90, $^1/_8$, brass	2	C
17	982028	982028	• Screw, socket head, M5 x 20	6 or 8	A, F
18	163490	163490	• Cordset, transducer, Hi-Flo	1	
19	220360	220360	• Bonnet, Hi-Flo, 20/200, polymyte	1	

NOTE A: Apply Never-Seez anti-seize compound, part 900348, to these parts.

B: Lubricate these parts with PTFE grease, part 900349.

C: Attach with PTFE paste sealant, part 900236.

D: Apply threadlocking compound, part 900424, to these parts.

F: The Pro-Flo II Hi-Flo basic extrude gun, part 163494, uses 6 of these screws. The Pro-Flo II Hi-Flo extrude gun with temperature conditioning manifold, part 220363, uses 8 of these screws.

NS: Not Shown

Continued on next page

Item	Part	Part	Description	Quantity	Note
NS	954045	954045	• • Backup ring, single, $^5/_8$ x $^1/_4$	1	B
NS	940166	940166	• • O-ring, Viton, blk, 0.625 x 0.750	1	B
20	163478	163478	• Valve, trimset	1	
21		- - - - - -	• Manifold, Pro-Flo II, analog	1	
22	156208	156208	• Key, locking swivel	1	
23	325104	325104	• Nut, nozzle, $^1/_2$ NPSM	1	
24	- - - - - -	- - - - - -	• Transducer, pressure 2000 psi, $^3/_8$-24	1	B
25	152403	152403	• Cover, transducer, Pro-Flo	1	
26	940121	940121	• O-ring, Viton, 0.364 ID x 0.070, br	4	B
27	163460	163460	• Valve, servo, 18 p, Pro-Flo	1	
28	982386	982386	• Screw, socket head, M5 x 35, bl	4	A
29	- - - - - -	- - - - - -	• Board, with junction block, 8-pin	1	
30	972716	972716	• Connector, male, $^1/_4$ tube x $^1/_8$ NPT	1	
31	- - - - - -	- - - - - -	• Cover, actuator, leads	1	
32	- - - - - -	- - - - - -	• Standoff, Hi-Flo	2	
33	982201	982201	• Screw, socket head, M5 x 8, bl	2	A
NS	900424	900424	• Compound, thread lock, VC-3	AR	
NS	900236	900236	• Sealant, paste, PTFE	AR	
NS	900348	900348	• Lubricant, Never-Seez, tube, 1 oz	AR	
NS	900349	900349	• Lubricant, TFE grease, 0.75 oz tube	AR	
35	152444	152444	Clamp, tube	1	E

NOTE A: Apply Never-Seez anti-seize compound, part 900348, to these parts.
B: Lubricate these parts with PTFE grease, part 900349.
E: This part must be ordered separately.
AR: As Required
NS: Not Shown

Pro-Flo II Hi-Flo Extrude Basic and Temperature Conditioning Manifold Gun

(contd)

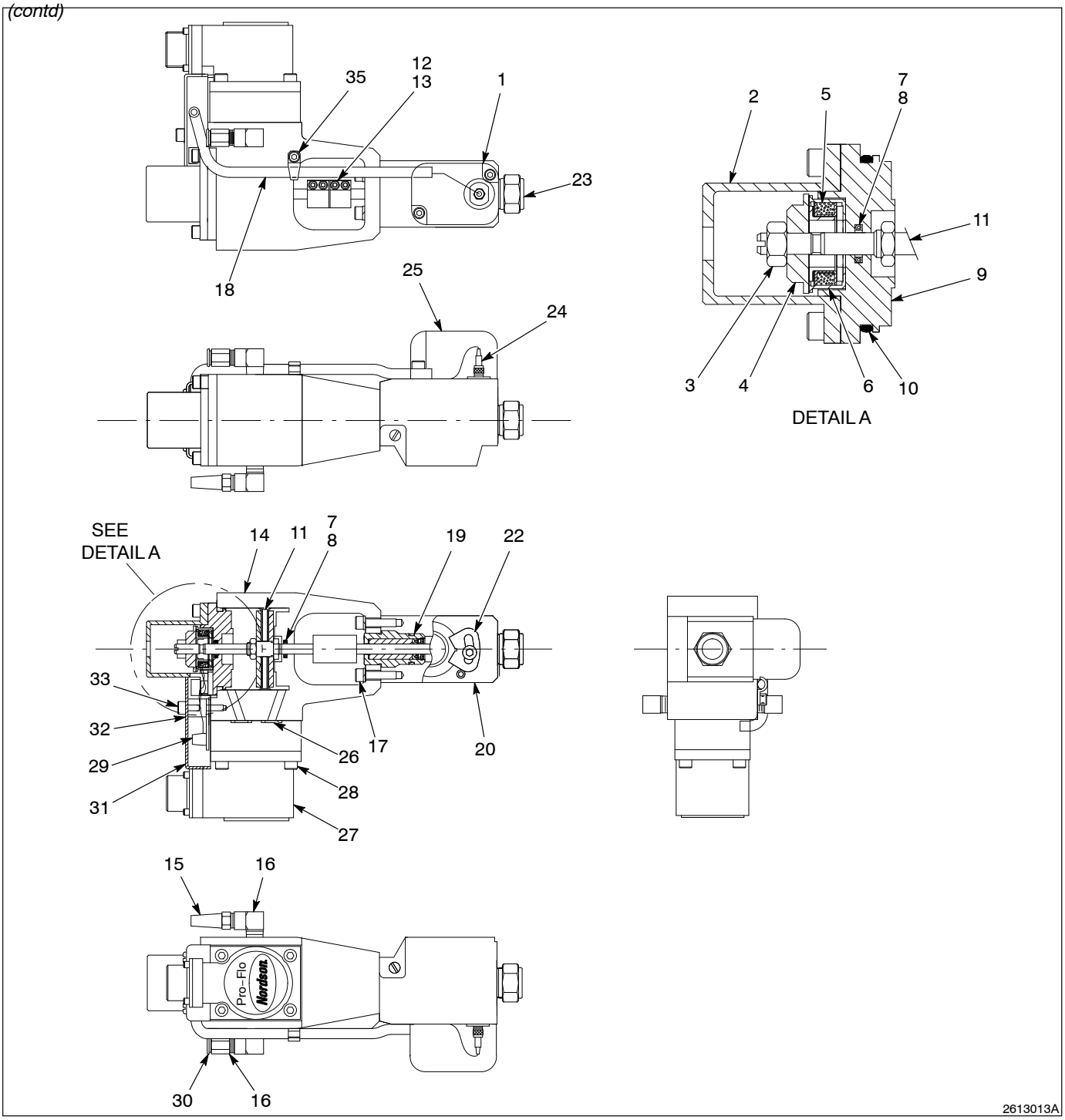


Fig. 14 Pro-Flo II Hi-Flo guns, typical

Note: See the system drawings included with unit for Pro-Flo guns used in your application.

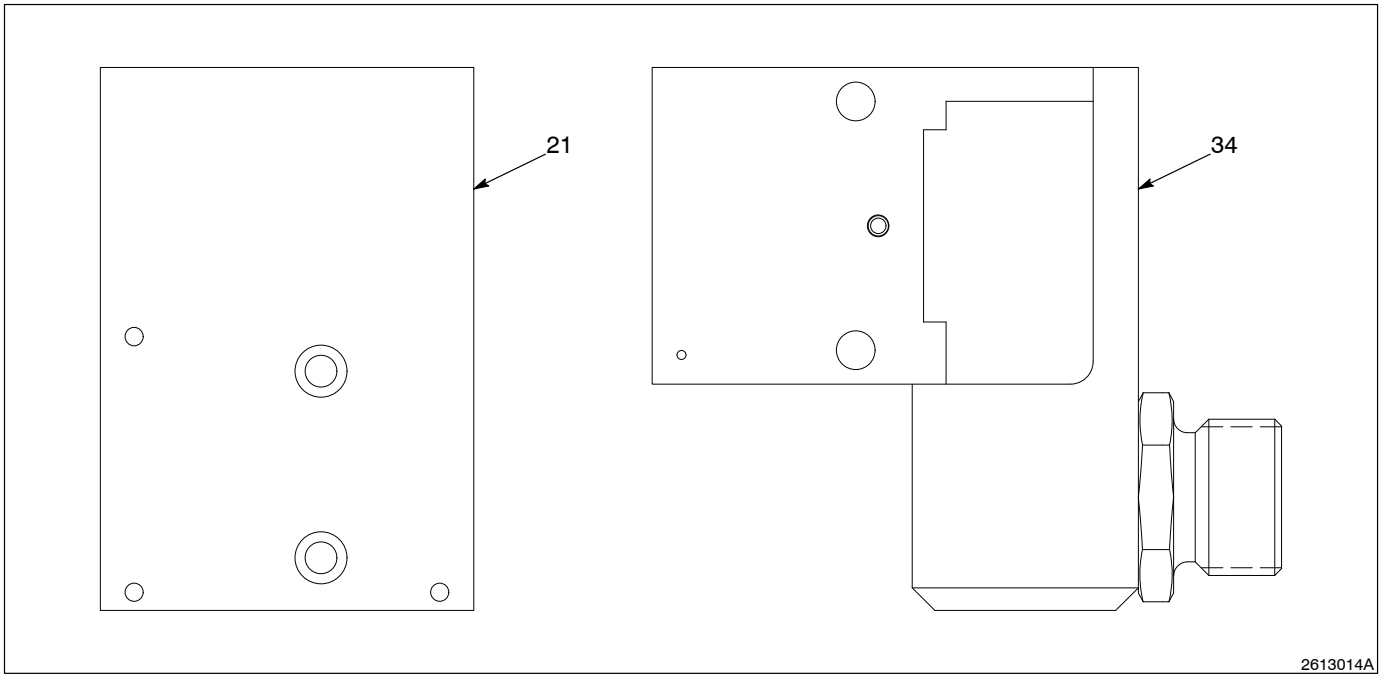


Fig. 15 Pro-Flo II Hi-Flo guns, temperature conditioning manifold and heaters, typical

Note: See the system drawings included with unit for Pro-Flo guns used in your application.

Pro-Flo II Hi-Flo Extrude 120 V and 240 V Heated Guns

See Figures 14 and 15.

Item	Part	Part	Description	Quantity	Note
—	220361		Gun, with 120 V heater, extrude, Hi-Flo, Pro-Flo II	1	
—		220358	Gun, with 240 V heater, extrude, Hi-Flo, Pro-Flo II	1	
1	982372	982372	• Screw, socket head, M5 x 12, bl	6	A
2	- - - - - -	- - - - - -	• Cover, bobbin	1	
3	984222	984222	• Nut, hex, jam, $^1/_4$-28, steel, zinc	1	
4	163464	163464	• Armature	1	
5	- - - - - -	- - - - - -	• Coil assembly, Pro-Flo II	1	
6	- - - - - -	- - - - - -	• Ring, tolerance, 0.89 x 0.86 x 0.28	1	
7	940 111	940 111	• O-ring, Viton, 0.301 ID x 0.070 w, br	2	B
8	- - - - - -	- - - - - -	• Ring, glide	2	B
9	- - - - - -	- - - - - -	• Head, cylinder, Hi-Flo	1	
10	941332	941332	• O-ring, Viton, blk, 1.812 x 2.00	1	B
11	163468	163468	• Piston assembly, Pro-Flo, Hi-Flo	1	
12	220354	220354	• Coupling, shaft, Hi-Flo	1	
13	982023	982023	• Screw, socket, M3 x 8, bl	4	D
14	- - - - - -	- - - - - -	• Frame, actuator	1	
NS	985409	985409	• • Pin, dowel	2	
15	241040	241040	• Muffler, air, $^1/_8$ NPT	1	C
16	973098	973098	• Elbow, pipe, auto, 90, $^1/_8$, brass	2	C
17	982028	982028	• Screw, socket head, M5 x 20	6	A
18	163490	163490	• Cordset, transducer, Hi-Flo	1	
19	304055	304055	• Bonnet, Hi-Flo, ls, 20/200, peek	1	

NOTE A: Apply Never-Seez anti-seize compound, part 900348, to these parts.
B: Lubricate these parts with PTFE grease, part 900349.
C: Attach with PTFE paste sealant, part 900236.
D: Apply threadlocking compound, part 900424, to these parts.
NS: Not Shown

Continued on next page

Item	Part	Part	Description	Quantity	Note
NS	954045	954045	• • Backup ring, single, $^5/_8$ x $^1/_4$	1	B
NS	940166	940166	• • O-ring, Viton, blk, 0.625 x 0.750	1	B
20	163478	163478	• Valve, trimset	1	
21	156208	156208	• Key, locking swivel	1	
23	325104	325104	• Nut, nozzle, $^1/_2$ NPSM	1	
24	- - - - - -	- - - - - -	• Transducer, pressure 2000 psi, $^3/_8$-24	1	B
25	152403	152403	• Cover, transducer, Pro-Flo	1	
26	940121	940121	• O-ring, Viton, 0.364 ID x 0.070, br	4	B
27	163460	163460	• Valve, servo, 18 p, Pro-Flo	1	
28	982386	982386	• Screw, socket head, M5 x 35, bl	4	A
29	- - - - - -	- - - - - -	• Board, with junction block, 8-pin	1	
30	972716	972716	• Connector, male,tube $^1/_4$ x $^1/_8$ NPT	1	
31	- - - - - -	- - - - - -	• Cover, actuator, leads	1	
32	- - - - - -	- - - - - -	• Standoff, Hi-Flo	2	
33	982201	982201	• Screw, socket head, M5 x 8, bl	2	A
34		282819	• Heater kit, 240 V, Pro-Flo, Hi-Flo	1	
34	282619		• Heater kit, 120 V, Pro-Flo, Hi-Flo	1	
NS	900424	900424	• Compound, thread lock, VC-3	AR	
NS	900236	900236	• Sealant, paste, PTFE	AR	
NS	900348	900348	• Lubricant, Never-Seez, tube, 1 oz	AR	
NS	900349	900349	• Lubricant, TFE grease, 0.75 oz tube	AR	
35	152444	152444	Clamp, tube	1	E

NOTE A: Apply Never-Seez anti-seize compound, part 900348, to these parts.
B: Lubricate these parts with PTFE grease, part 900349.
E: This part must be ordered separately.
AR: As Required
NS: Not Shown

10. Specifications

The following section details the specifications pertinent to the Pro-Flo II Hi-Flo guns.

Dimensions

See Figures 2 and 3.

Weight

Extrude gun:	2.3 kg (5.0 lb)
Extrude gun with 120 V heater:	2.5 kg (5.5 lb)
Extrude gun with 240 V heater:	2.5 kg (5.5 lb)
Extrude gun with temperature conditioning manifold:	2.7 kg (6.0 lb)

Air Pressure

Operating:	4.83–8.28 bar (70–120 psi)
Maximum air flow:	0.023 m3/min (0.8 scfm)
Ambient air temperature:	4–71 °C (40–160 °F)

Fluid Pressure Rating, Static

206.90 bar (3000 psi)

Maximum Operating Temperature of Material

Extrude gun:	48 °C (120 °F)
Extrude gun with 120 V or 240 V heater:	121 °C (250 °F)
Extrude gun with temperature conditioning manifold:	67 °C (150 °F)

Material Viscosity Range

10,000–3,000,000 cps

Flow Range

0–158 kg/hr (0–350 lb/hr)