

Application Guide (Air Atomised Spraying)

Conventional (Air Atomised) Spraying

A conventional spray gun is a tool which utilises compressed air to atomise (break up) paint and apply it to a surface. Air and paint enter the gun through separate channels and are mixed using an air cap to form a controlled pattern, known as a 'fan'.

Paint can be fed to a conventional spray gun via different methods. These vary from a cup which is attached to the bottom of the gun which supplies the paint by suction (suction fed), or a cup on the top of the gun which supplies the paint by gravity (gravity fed) to a supply hose which supplies the paint via pressure applied to the paint. The latter can use a pressure pot, which is a vessel containing the paint which is pressurised with compressed air, forcing out the paint, or a diaphragm pump which pumps the paint under pressure directly to the gun.



Suction and Gravity
fed guns



Pressure fed gun



Pressure Pot /
Diaphragm Pump

Conventional Spray Components

The equipment components required for conventional spray are:

- Compressed air supply
- Moisture and oil separator
- Air supply hoses and regulator
- Paint supply
- Fluid supply hoses (for pressure fed guns)
- Spray gun

This manual considers each of these components in turn with regard to what is needed to achieve the best possible results. For detailed information regarding the appropriate equipment for your facility, refer to the manufacturer or installer of the equipment.

Compressed Air Supply

A clean, dry, oil free supply of compressed air is required. This is normally taken direct from a compressor. The compressor must be capable of supplying the necessary volume and pressure; an overworked compressor can produce an excessive amount of dirt and oil. The control of volume pressure and cleanliness of the air entering the spray gun is of critical importance to the performance of the system

Moisture and Oil Separator

Most compressors are fitted with moisture and oil traps. However it is important to fit a separator between the compressor and the spray equipment, because this

air comes into direct contact with the paint. Moisture and oil can dramatically affect the paint materials being sprayed:

- Polyurethanes are moisture sensitive. Water can react with the isocyanate curing agent to produce soft films and bubbling.
- In epoxy coatings, moisture can react with the curing agent to produce contaminants which can subsequently create problems when overcoating.

The separator works by spinning the air around a chamber and collecting moisture, oil and dirt in the bottom of the chamber which can be drained periodically.

Air Regulator

An air regulator is a device for controlling the pressure of the air coming from the compressor. Once set at a particular pressure, it maintains that pressure with minimal variations, even if the pressure supplied varies.

The regulator should be installed in the area the operator will be painting so that it can be adjusted by the operator.



Air regulator

Air Supply Hoses

The air hose and fittings from the compressor to the paint pot should be in good condition and free from leaks.

The hose must have a minimum working pressure rating above the normal working pressure, and be of adequate internal diameter (ID) to deliver the required volume of air, without causing undue pressure drops. Undersized hoses will result in poor spraying characteristics which are often wrongly attributed to paint or spray guns.

Paint Supply

As mentioned previously, paint can be supplied to the spraygun in various ways. The most common types of supply are gravity feed, suction feed or pressure feed.

Gravity Feed

Gravity fed spray guns have a small (usually 0.5 litre) hopper on top of the gun from which the material flows into the gun.

Suction (Siphon) Feed

Suction fed spray guns have a cup attached to the underside of the gun from which the material is drawn up into the spray gun via suction caused by the flow of air through the gun. Because the power to draw the paint up is drawn from the air used by the spray gun, this often requires adjustment in gun set up to maintain the correct spraying characteristics.

Pressure Feed

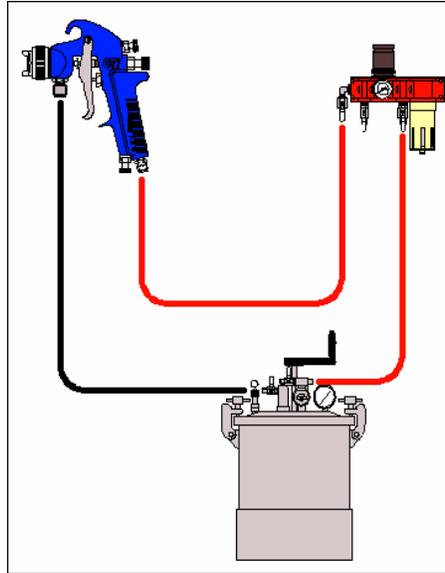
Pressure fed spray guns have the paint supplied directly into the head of the gun via a fluid hose. The paint can be supplied at pressure, allowing for larger volumes or thicker materials to be sprayed. The two main types of pressure feed equipment are pressure feed tanks or diaphragm pumps.

Pressure Feed Tanks or Pressure Pots

Pressure feed tanks are closed containers, ranging in size from about 5 litres to 200 litres. They provide a constant flow of material, under constant pressure, to the spray gun. The tank is pressurised with clean, regulated compressed air, which forces the liquid out of the tank through the fluid hose to the gun. The rate of fluid flow is controlled by increasing or decreasing the air pressure in the tank.

Due to the fact that these are pressurised vessels, pressure feed tanks are fitted with safety release valves, but care should always be taken not to use tanks at pressures higher than recommended for safe use.

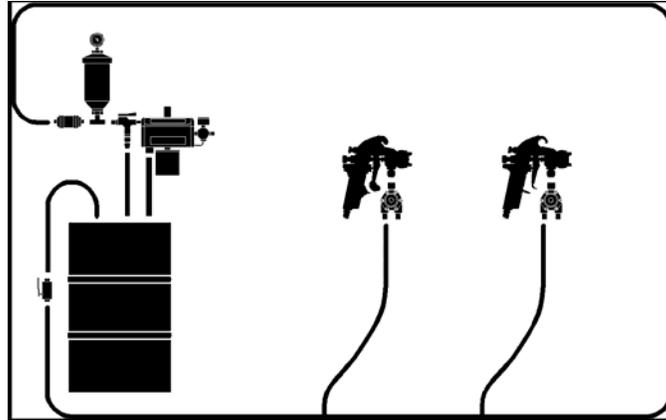
Pressure feed tanks are used in situations where continuous production is needed because the fluid flow is positive and constant. Pressure feed tanks are a practical and economic method of feeding material to the spray gun for extended periods of time. Tanks can be fitted with agitators to keep the paint mixed and in suspension.



Pressure Feed Tank System

Diaphragm Pumps

Diaphragm pumps are an alternative to pressure feed tanks; they are small pumps which can deliver material directly from almost any container to the spraygun under constant pressure. Diaphragm pumps are driven by compressed air and the pressure of the supplied paint is controlled by the pressure of air supplied to the pump. The advantage of these pumps over a pressure feed tank is that the material can be pumped from an open container, which means that it can be frequently topped up without disassembling. Another advantage is that the equipment is smaller and more portable than a large pressure feed tank.



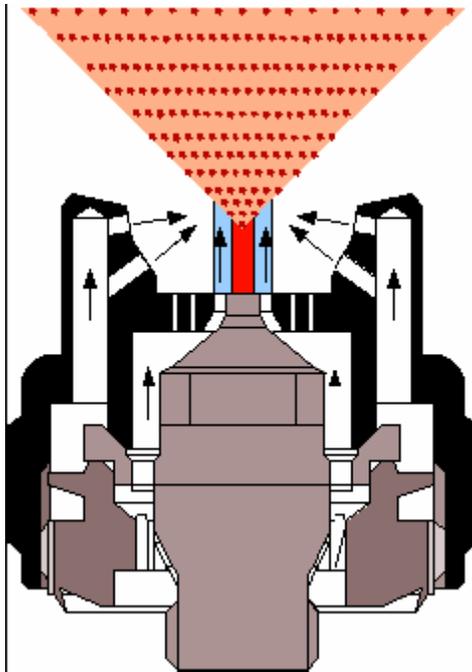
Diaphragm Pump System

Fluid Supply Hoses

The correct type of hose should be used for fluid supply to a spray gun. Never use an air supply hose to transport pressurised paint. The solvents in most paints will attack ordinary rubber compounds, therefore fluid hoses are lined with solvent resistant nylon. Most manufacturers have a colour coded system for identifying fluid and air lines; please refer to the manufacturer of your equipment if in doubt.

Air Atomising Spray Guns

Air atomising spray guns work by utilising compressed air to break up paint into droplets, whilst shaping the droplets into a regular pattern or fan. This process of breaking up the material is done by using an air cap. As the paint leaves the gun, air is forced past the paint at high speed, thereby breaking up the paint into droplets. Immediately after being atomised, the droplets are squeezed into a fan shape by air which is pushed out of the horns on the air cap.



Operation of a fluid tip and aircap on a modern spraygun

The modern air atomising spray gun is a very flexible tool as the settings of fluid flow, air pressure for atomising and air pressure for shaping the fan can all be adjusted quickly, easily and independently. This allows the user to adapt the spray gun set up to different materials, substrates, environmental conditions and many other variables which can affect a paint job.

Air Atomised Spraying Setup

Before spraying, the spraygun needs to be set up and adjusted so that the material being used can be sprayed optimally. Paint should always be mixed according to the instructions on the appropriate product technical datasheet. This will give the correct viscosity for spraying. The technical datasheet will also give recommendations for tip size and general gun set-up to give the best results for that product.

With the spraygun assembled, connected to the compressed air supply and the paint supplied to the gun, perform the following checks:

Fan shape check

Vertical fan check – with the air cap horns in the horizontal position, spray the paint onto a piece of white paper or card. You should see a vertical fan shape with no distortions or bends as per the picture below.



Normal fan shape

If the fan has areas which are wider than others or is banana shaped, there is likely to be a problem with the aircap, which is the part of the spraygun which forms the shape of the fan. Remove the air cap and thoroughly clean all of the holes. The length of this fan can be altered by the fan adjustment knob on the rear of the spraygun.

Horizontal fan check - Turn the air cap through 90° so that the horns are in the vertical position. Spray the paint onto the white paper or card and hold the trigger open until the paint begins to run. The runs which emerge from the fan should be evenly distributed. This indicates that the paint is evenly distributed in the fan. If the runs are unevenly distributed, there may be a problem with the fluid tip. Remove the tip and clean it thoroughly, also check that the shape of the hole in the tip has not been distorted.

Atomisation check

If the fan checks are normal, return the air cap to the horizontal position and check that the paint is being atomised adequately.

Open the fluid adjusting knob until the first thread is showing, set the air pressure at the gun to about 2 bar (30PSI) and make a test pass across the paper or card. Examine the result, if there are any variations in particle size, specks or large globs, the paint is not atomising properly. If this is the case, increase the air pressure slightly and repeat the test. Continue this process until the particle size is relatively uniform.



Normal particle size distribution

When the fan shape and atomisation are adjusted correctly, start the spray job.

Further Spray Setup Recommendations for Pressure Feed Systems

Typically a technical datasheet for a polyurethane finish might recommend a setup as below:

- Thin to 18 seconds DIN4
- Use a 1.1mm tip
- 1 Bar fluid pressure (pressure applied to the tank)
- 2-3 Bar atomising air pressure.

This would be a valid way to spray such a product, but it does not take into account several important variables:

- Applicators may prefer to thin to different viscosities to match their spray technique.
- The correct tip size may not be available.
- The set up may have extremely long or short fluid hoses – causing loss of fluid pressure at the gun.

The question of pressure drops due to length of fluid hoses is a subject of high importance which causes huge variations in pressure settings. To achieve the same pressure at the gun with different length of hoses requires different pressures on the tank.

Flow Rate Recommendations

The solution to these variables is to make recommendations based entirely on measurements made at the tip of the gun.

By measuring fluid flow from the tip of the gun it is possible to significantly reduce the effect of the variables discussed above.

Example

For the same product described above, it is feasible that the following recommendation could be made:

- Apply settings to the pressure feed equipment which result in a fluid flow of 200-250 cc/min.

- Adjust atomising air until uniform atomisation is achieved. (Approximately 2-3 Bar)

This means the applicator can use several sizes of tip and varying fluid pressures as long as the correct fluid flow rate is achieved.

Note. – Viscosity or thinning recommendations are usually still given, and should be broadly adhered to as this can affect the ability of the equipment to atomise the material.

Measuring Flow Rates

1. To measure flow rate, set up the equipment with preferred size of tip.
(Note – a rough guide would be to use one size lower than recommended for gravity or suction fed equipment)
2. Load the paint into the supply vessel and apply pressure to the fluid. A pressure of 5-10 Bar is a good place to start.
3. Without applying any atomising air to the spray gun, dispense the paint into a measuring cup or jug whilst timing with a stopwatch.
4. After 1 minute, note how much fluid has flowed into the cup. This is your flow rate per minute.

To increase the flow rate, either increase the fluid pressure or change the tip for a larger size. To reduce the flow rate, either decrease the fluid pressure or change the tip for a smaller size.

When the correct flow rate has been achieved, apply atomising air in increments to achieve optimum atomisation. Please refer to the International “Air Atomised Spraying Guide” for full guidance on this step.

Before starting the spray job, make a note of the settings you have used to achieve the correct flow rate. A record of the settings required for each product used will ease the setting up process next time. The important information to record is:

- Product name or number
- Viscosity
- Fluid pressure – Read from the pressure gauge on the pressure pot or diaphragm pump
- Tip size used
- Atomising air pressure – Read from a pressure gauge fitted to handle of gun (If available)

Warning!

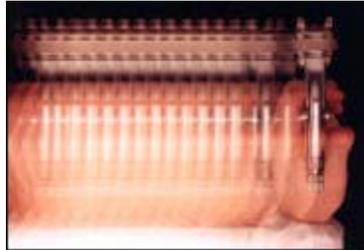
Do not attempt to use this technique when using airless or other high pressure equipment. The pressures used in these systems are dangerously high and injury could occur.

Spraying Techniques

The spraying stroke should be made with a relaxed arm motion, keeping the gun at a right angle to the surface at all points of the stroke. Triggering should begin just before the edge of the surface to be sprayed. The trigger should be fully depressed and the gun should be moved in one continuous motion until the other edge of the surface is reached. The trigger should then be released just after the edge of the surface, but the motion should be continued for a few centimetres until it is reversed for the return stroke.

Each time a pass is made, the fan should overlap the last pass by 50%. Overlapping by less than 50% will result in an uneven build up of material. As the material flows at a constant rate, it is essential to keep the speed of the gun and

the distance from the surface constant. This will help prevent areas of heavy build up which will be prone to runs and sags, colour difference and opacity problems.



Keep the spraygun perpendicular to the surface



Arcing the gun causes uneven paint distribution

Difficult areas such as edges or corners should be sprayed first. Adjust the fan size by turning the fan adjustment knob in or by only partially triggering, spray a little closer and faster in order to get into internal angles. When the difficult areas are painted, move onto the easier, flatter surfaces. Always remember to overlap by 50% with each pass.

Curved surfaces should be sprayed by keeping the gun at a right angle to the surface and following the shape of the object. This is often difficult to achieve but is the optimum technique to achieve the best finish.

Further information

The information in this manual is intended as a guide to the ideal solutions to standard paint jobs. If further assistance or troubleshooting is required please

contact your local International Paint representative or your spray equipment supplier.