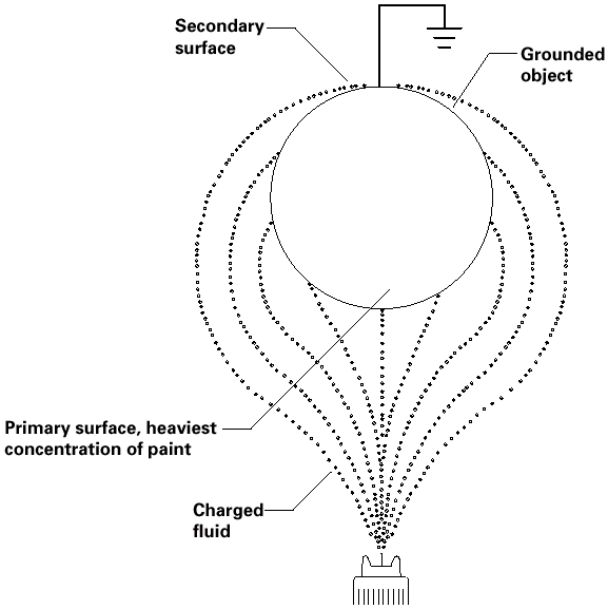
Introduction to Electrostatic Applicators



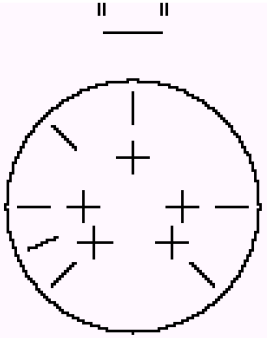
Topics

- Electrostatic Gun Theory
- Grounding
- Materials
- Setup and Cleanup

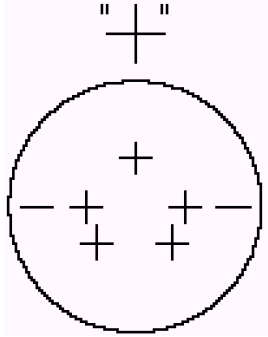
Electrostatic Gun Theory

Charged Particles

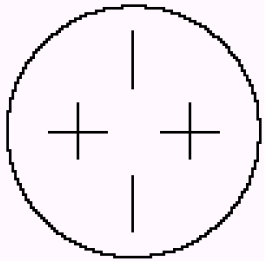
- All matter contains charged particles
  - Positively charged, (protons)
  - Negatively charged, (electrons)
  - Neutral (neutrons)
- Like charges repel
- Unlike charges attract
- Electrons move easier



Negatively charged particle

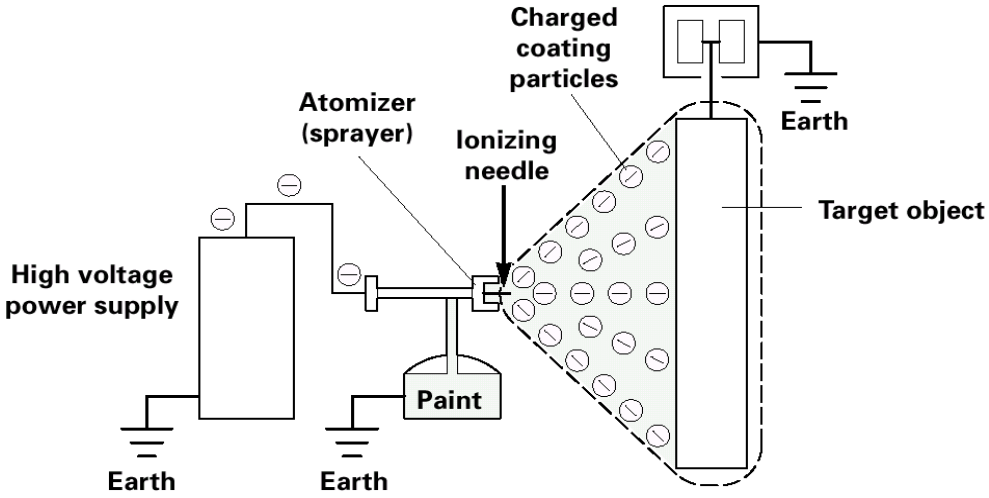


Positively charged particle



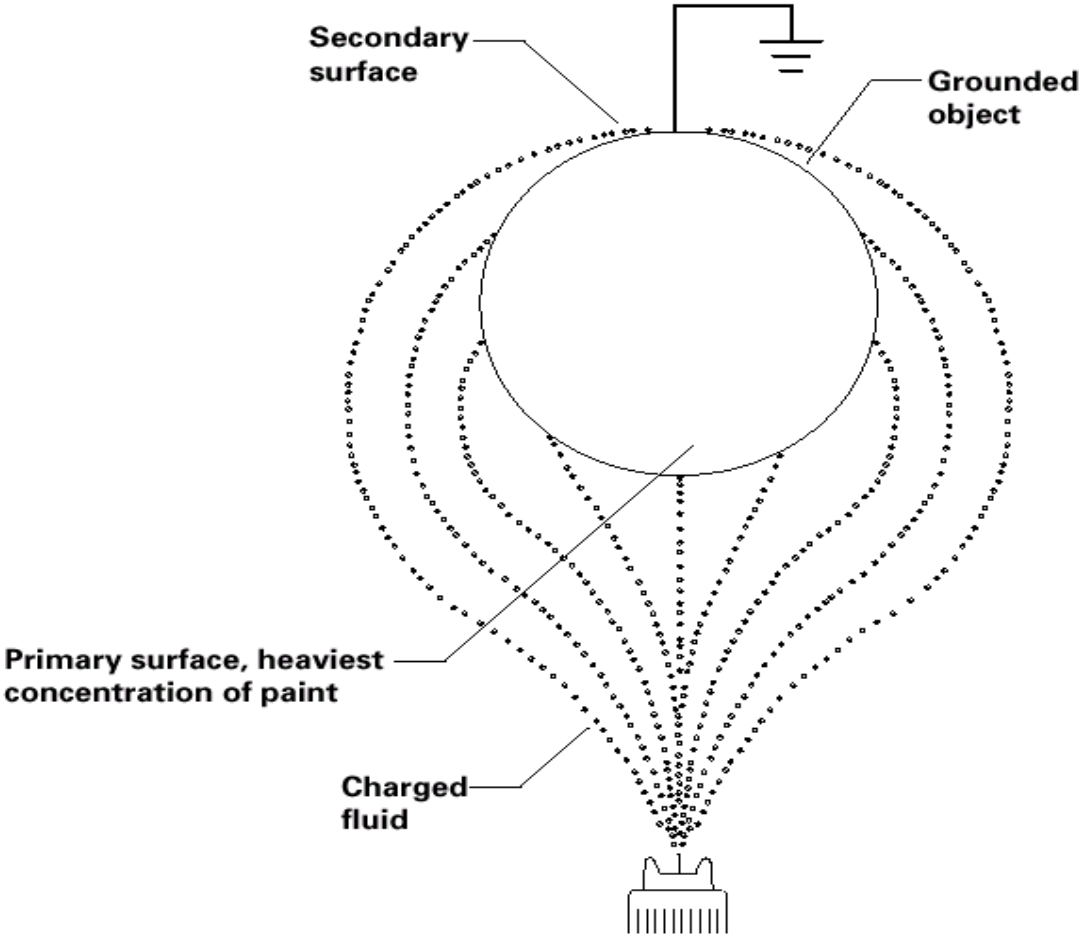
Neutral particle

Voltage and Current



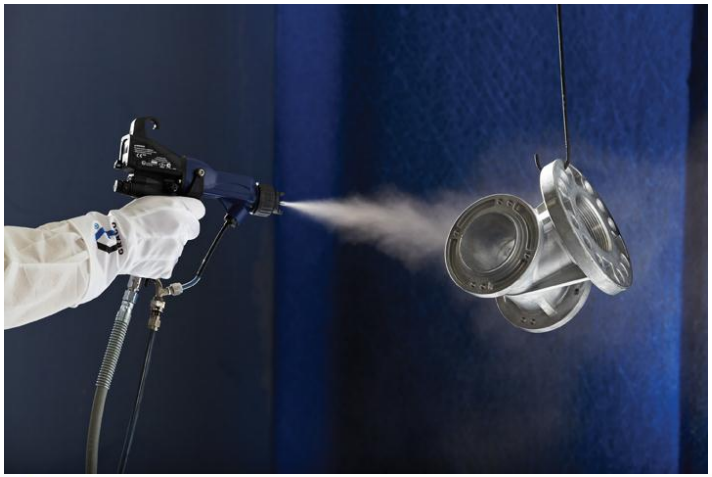
- Electrical flow can be compared to the fluid flow in a fluid system
- Power supply, like a pump creates flow and pressure
- Force, like pressure is measured voltage
  - Referred to in units of 1000 volts, Kilovolts or (kV)
- Current, like fluid flow is measured in amps
  - Referred to in units of .000001 amps or microamps (µA)
- Conductor, like a pipe allows the flow of electrons
- Insulator, prevents the flow of electrons

Ionization

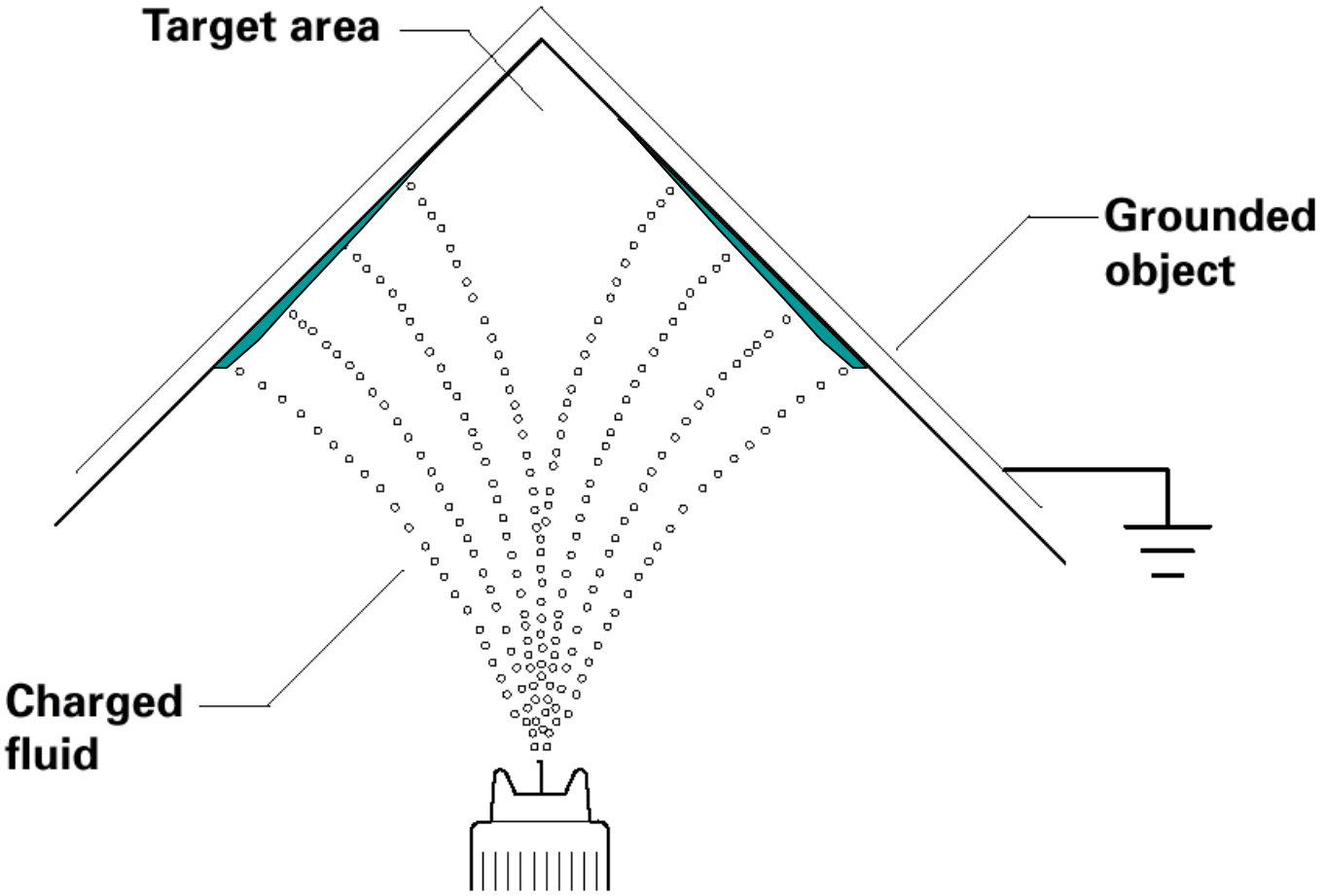

Secondary surface
Grounded object
Primary surface, heaviest concentration of paint
Charged fluid

Electrostatics & Transfer Efficiency

- Factors that effect electrostatic transfer efficiency
  - Distance from gun to grounded part
    - Gun distance should be 10 to 12 inches (250 - 300 mm) from the target
  - Material conductivity
    - Highly conductive (low resistivity) materials
  - Shape of the target
    - Corners or enclosed area cause a Faraday Cage Effect



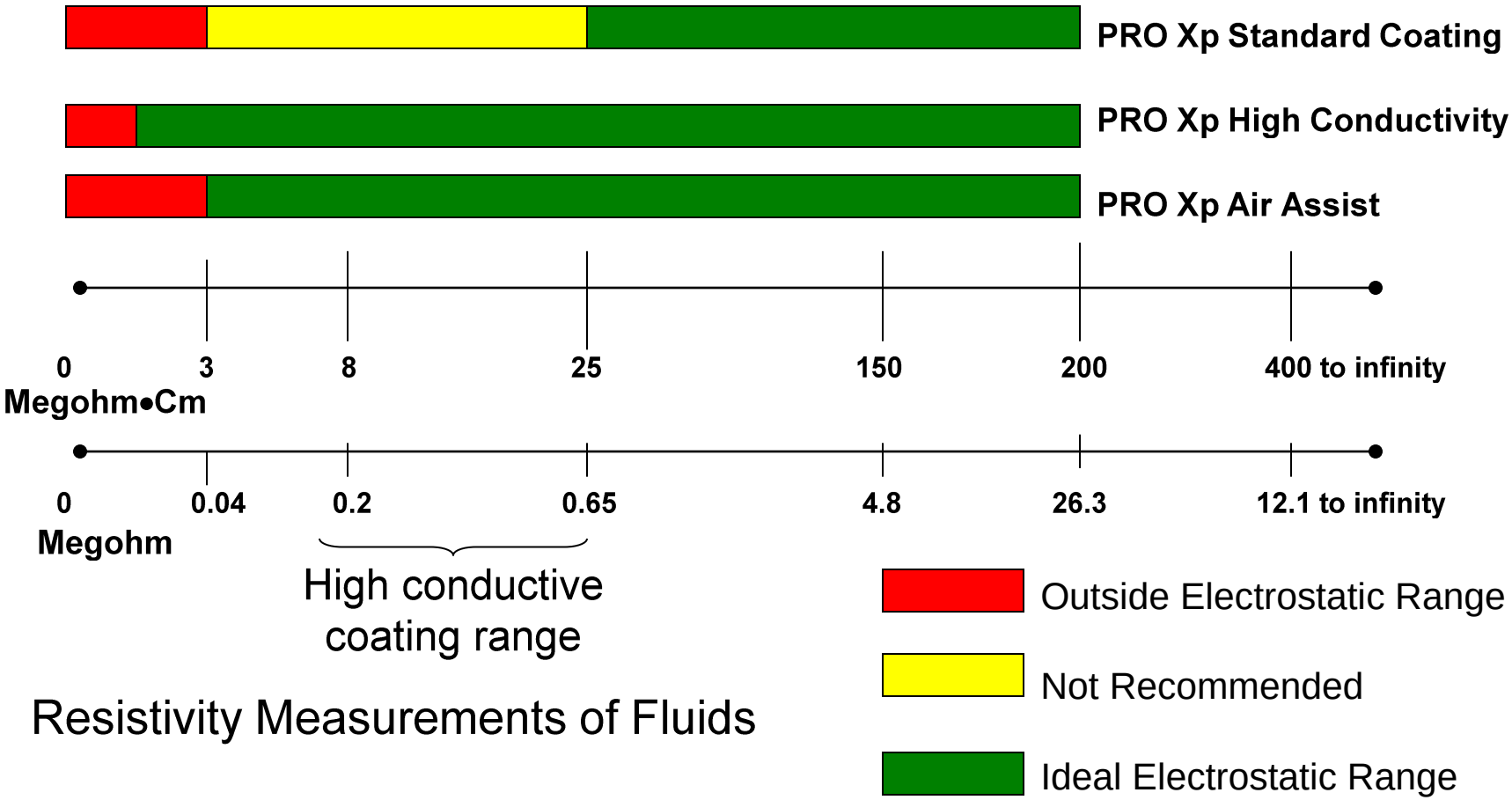
Faraday Cage Effect



Resistivity Measurement

- Graco measures resistivity units = megohm centimeters (megohm cm)
- Resistivity reading of 25 megohm cm or above sprays best electrostatically
- Materials as low as 2 megohm cm successfully sprayed electrostatically
- Materials between 1 to 25 megohm cm will require a high conductivity fluid tube

Preparation - Paint Resistivity



Resistivity Measurements of Fluids

Grounding

Electrostatic Safety

- Grounding is the most important aspect of electrostatic safety

- All conductive items need to be grounded including:
  - operator
  - gun handle
  - object being sprayed
  - fluid handling equipment (no plastic pail liners)
  - all conductive objects within the spray zone
  - conductive floors (properly cleaned)
  - flammable liquids
  - air hose

NOTE: If gloves are worn, they must be conductive or modified as shown so as not to interfere with operator grounding through the gun.

Ground Paths

- Grounded gun handle, to ground the operator
- Object being sprayed to earth ground
- Pump grounding
- Electrons can pass through overspray collected on the gun to the grounded handle
- Floor should be clean and conductive
- Proper shoes and personal grounding straps
- All liquids must be stored in grounded containers

Materials

Solvent Based Materials

- Resistivity - measurement of a material's conductivity
- Highly resistive solvent based fluids resist current flow, resulting in higher voltage, increasing transfer efficiency
- Low resistive solvent based fluids support current flow, resulting in lower voltage, decreasing transfer efficiency
- Polar solvents like acetone and methyl cellosolve, are low resistivity solvents
- A material supplier can adjust the material resistivity by using different solvents in electrostatic applications

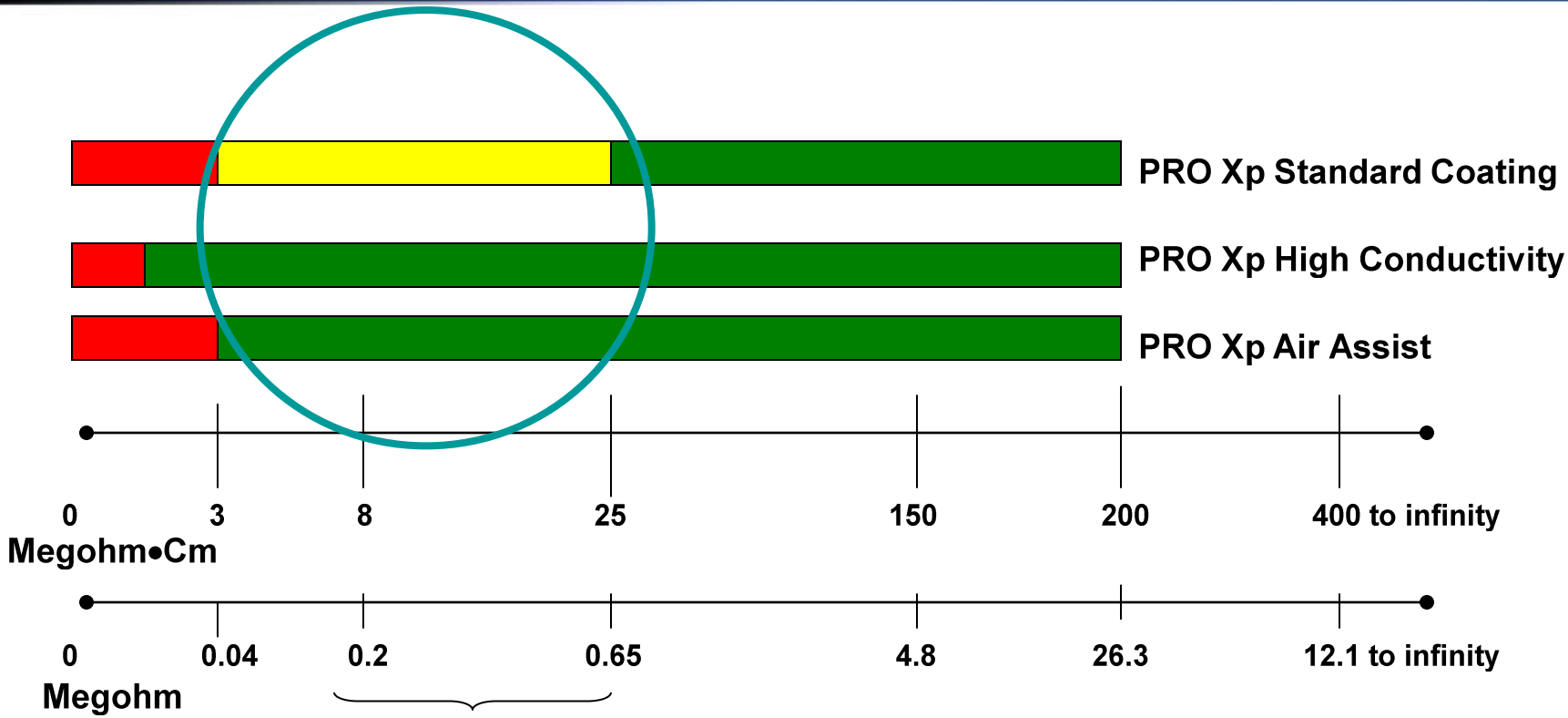
Metallic Finish

- Metallics contain flakes which may be conductive.
  - As high voltage is applied, some elements of the coating may allow current to flow to ground.
  - Not all metallics are subject to this high conductivity condition.
  - The lower applied voltage of the Graco Paint Resistivity Meter (500 volts), can mask this high conductivity condition

High Conductive Materials

- Guns with High Conductivity fluid tube and High Conductive Hose
- Fluids from 1 to 25 megohm/cm^2 perform well with the high conductivity (HC) gun kit.
- Fluids below 5 megohm/cm^2 or high viscosity materials should use the high conductive hose.

High Conductive Materials



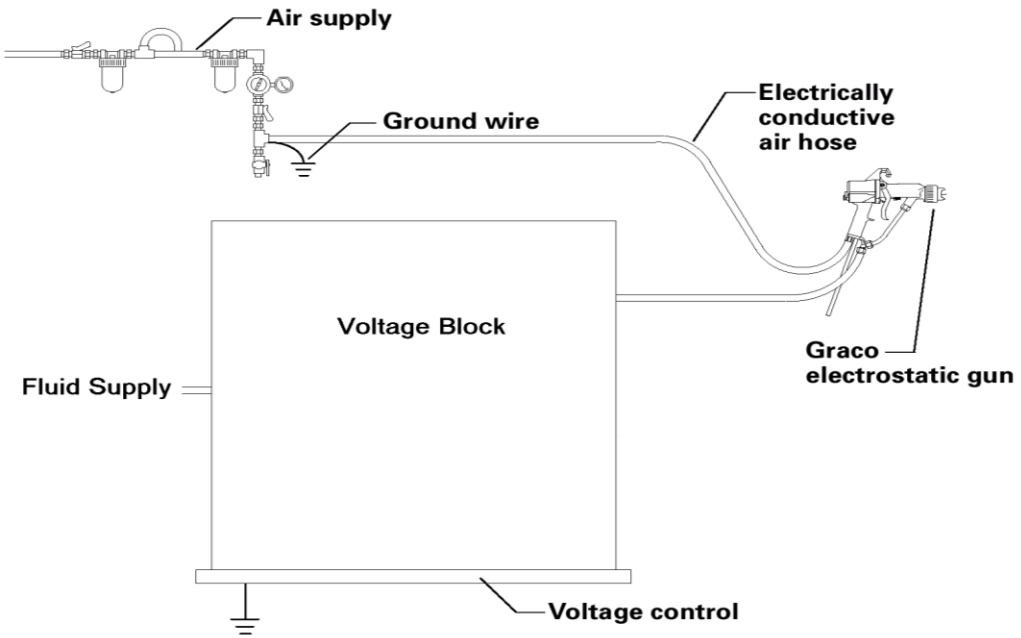
Resistivity Measurements of Fluids

Outside Electrostatic Range

Not Recommended

Ideal Electrostatic Range

Waterborne & Electrostatics

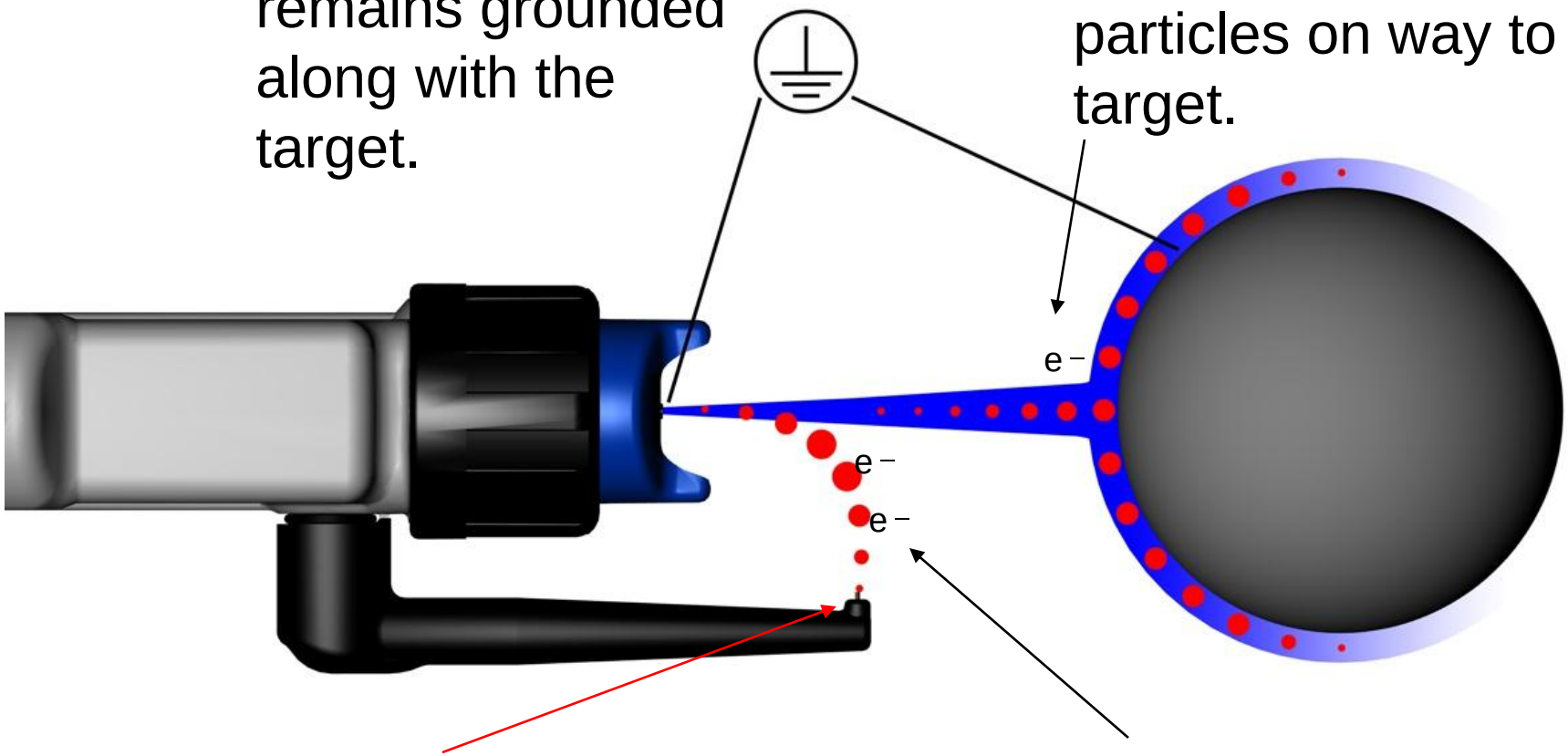


- Waterborne materials easily support the flow of electrons
  - As the electron flow increases, tip voltage will decrease causing transfer efficiency to drop
- Required isolation
  - primary elements: electrostatic gun, fluid hose, fluid source which is isolated from ground
  - Voltage discharge control
- Corona charge gun for water based material in a circulation system

Corona Charging

Fluid Needle remains grounded along with the target.

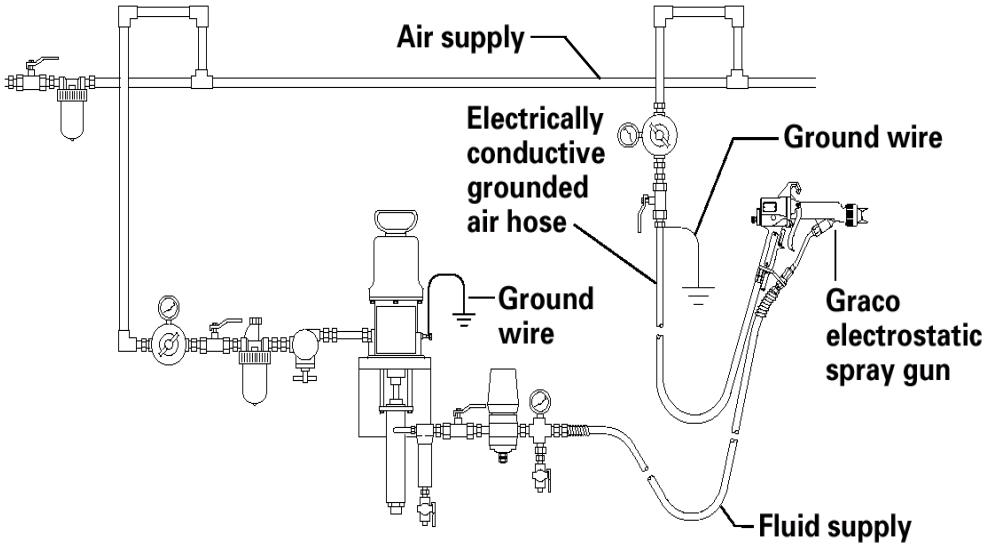
Electrons charge atomized paint particles on way to target.



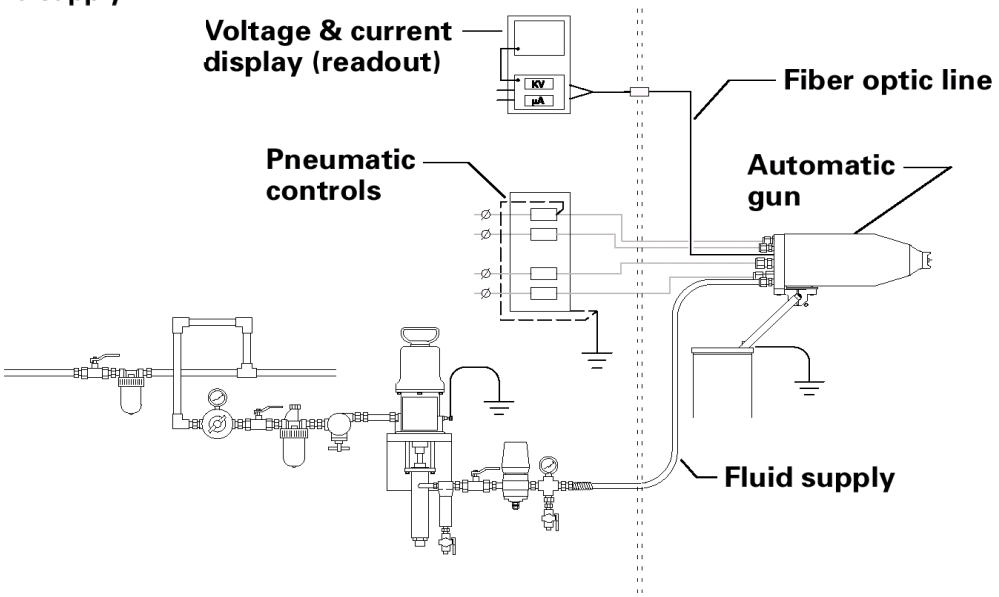
Charging electrode at high voltage.

A stream of electrons flow towards grounded fluid needle.

Electrostatic Systems



MANUAL ELECTROSTATIC SYSTEM

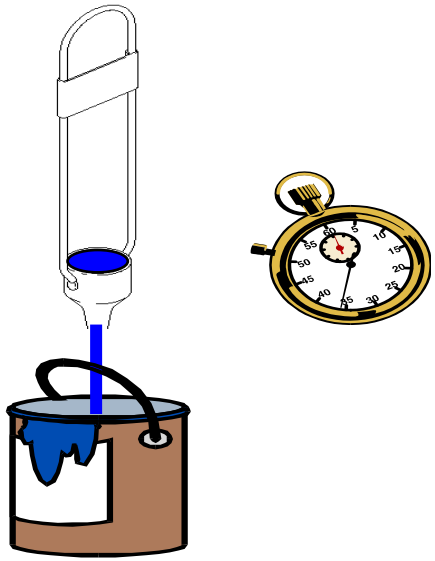


AUTOMATIC ELECTROSTATIC SYSTEM

Setup and Cleanup

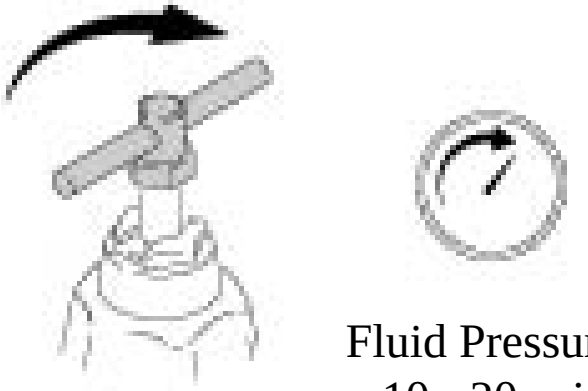
Preparation - Paint Viscosity

- Viscosity test
  - Viscosity cup
  - Stop watch
  - Tip selection
    - refer to instruction manual

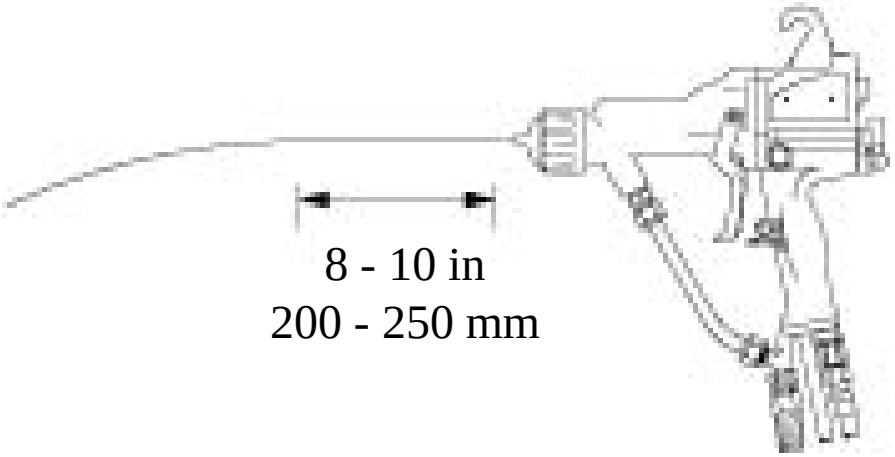


Setting Airspray Fluid Pressure

- Adjust pressure to yield 8 - 10” straight fluid stream
- Different materials - different fluid pressures
- Distance from the part matters, not fluid pressure
- Informer™ for best accuracy



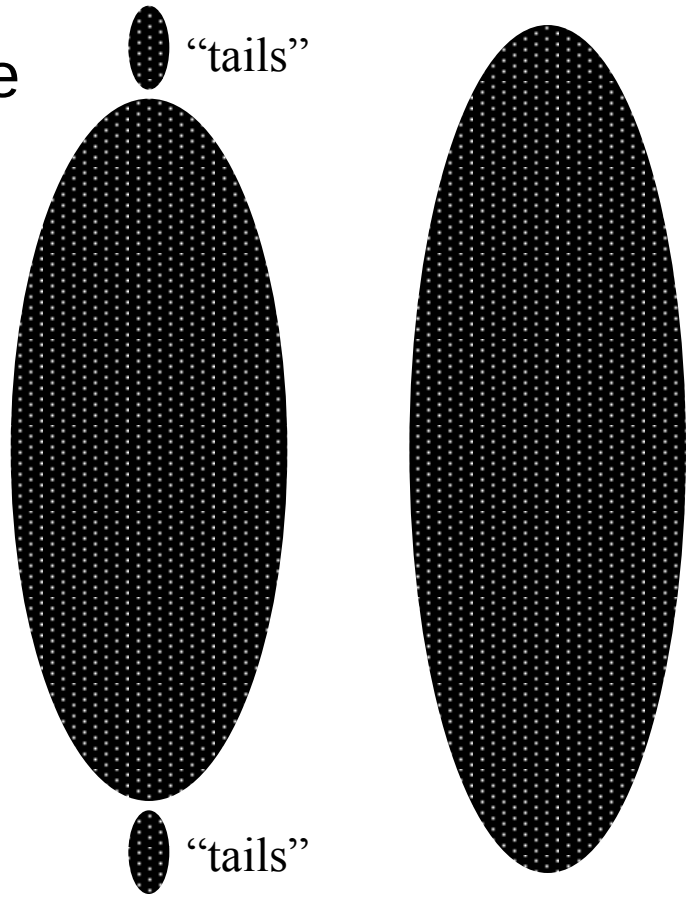
Fluid Pressure
10 - 20 psi
0.66 - 1.3 bar



8 - 10 in
200 - 250 mm

Setting Air Assist Fluid Pressure

- Start at 400 psi (28 bar) fluid pressure
- Check pattern for consistent particle size
- Increase fluid pressure in 50 psi increments until consistent pattern
- Turn on pattern air to eliminate “tails”



Cleanup and Daily Maintenance

- Turn off electrostatics
- Flushing
- Grounded pail
- Cleaning nozzle and air cap
- Don’t use metal tools

Basic Troubleshooting

- Poor spray pattern
- Excessive spray
- Poor wrap
- Operator gets shocked

Thank You