DUALL

Vertical and Horizontal Wet Scrubbers

For Air Pollution Control

Packaged systems for easy installation

Professionally engineered and certified for structural integrity

Corrosion and UV resistant PVC, PP, CPVC, PVDF, stainless steel and DUALLast™ FRP Construction

Hot gas and extrusion welded per AWSG1.10 standards

Hydrostatically tested at factory

Known for our quality, Proven to be dependable
# Features and Benefits of Duall Series F, FW, and PT Scrubbers

- P.E. certified for long-term structural integrity
- Thermoplastic construction for maximum corrosion resistance
- UV-resistant PVC, polypropylene and polyethylene available for all outdoor installations
- Hot gas and extrusion welded construction per AWS Gl.10 standards
- Hydrostatically tested at factory
- Heavy duty, leak resistant, bolt-on doors
- Full cone spray nozzles
- PVC or CPVC Schedule 80 piping
- Full union PVC or CPVC ball valves
- Sealless vertical pumps (factory mounted)
- Packing removal door
- Differential pressure gauge
- Fresh water flow meter
- Heavy-duty flanges
- Heavy-duty scrubber bottom
- Integral coated steel base
- Stainless steel hardware

## FW303 and FW305 Vertical Fume Scrubbers with Integral Fans and Self-Contained Recirculation Systems

These packed tower-type fume scrubbers are space-savers. They incorporate a rugged built-in fan to eliminate the need for a fan base and connecting duct work between the fan and scrubber. This feature makes the FW303 and FW305 economical models. Standard sizes up to 17,500 CFM are available. Remote circulation systems available.

### Dimensions in Inches

#### FW303-305 Vertical Fume Scrubbers

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### Dimensions in Inches

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F103 AND F105 HORIZONTAL FUME SCRUBBERS WITH SELF-CONTAINED RECIRCULATION SYSTEMS

Horizontal fume scrubbers are offered in standard sizes from 500 to 63,000 CFM. They are ideal when a low profile is a necessity. The F103 and F105 incorporates an overhead weir to insure complete saturation of filter media. Remote recirculation systems available.

### F103-18S
- CFM: 500
- A: 18
- B: 10
- C: 39
- D: 44
- E: 3
- F: 2
- G: 34
- DRY WEIGHT: 842 lb
- PUMP QTY AND H.P.: 1 HP

### F103-22S
- CFM: 1,000
- A: 22
- B: 14
- C: 43
- D: 48
- E: 3
- F: 2
- G: 36
- DRY WEIGHT: 1,876 lb
- PUMP QTY AND H.P.: 1 HP

### F103-28S
- CFM: 2,000
- A: 28
- B: 20
- C: 49
- D: 54
- E: 3
- F: 2
- G: 41
- DRY WEIGHT: 3,920 lb
- PUMP QTY AND H.P.: 1 HP

### F103-32S
- CFM: 2,700
- A: 32
- B: 24
- C: 53
- D: 58
- E: 3
- F: 2
- G: 43
- DRY WEIGHT: 5,346 lb
- PUMP QTY AND H.P.: 2 HP

### F103-37S
- CFM: 3,700
- A: 37
- B: 29
- C: 58
- D: 63
- E: 3
- F: 2
- G: 47
- DRY WEIGHT: 6,796 lb
- PUMP QTY AND H.P.: 2 HP

### F103-41S
- CFM: 4,700
- A: 41
- B: 33
- C: 62
- D: 67
- E: 3
- F: 2
- G: 51
- DRY WEIGHT: 8,586 lb
- PUMP QTY AND H.P.: 2 HP

### F103-45S
- CFM: 6,000
- A: 45
- B: 37
- C: 66
- D: 71
- E: 3
- F: 2
- G: 56
- DRY WEIGHT: 12,120 lb
- PUMP QTY AND H.P.: 2 HP

### F103-52S
- CFM: 8,000
- A: 52
- B: 44
- C: 73
- D: 78
- E: 3
- F: 2
- G: 61
- DRY WEIGHT: 18,528 lb
- PUMP QTY AND H.P.: 2 HP

### F103-58S
- CFM: 10,000
- A: 58
- B: 49
- C: 78
- D: 84
- E: 3
- F: 2
- G: 66
- DRY WEIGHT: 27,776 lb
- PUMP QTY AND H.P.: 2 HP

### F103-64S
- CFM: 12,000
- A: 64
- B: 54
- C: 83
- D: 90
- E: 3
- F: 2
- G: 61
- DRY WEIGHT: 40,424 lb
- PUMP QTY AND H.P.: 2 HP

### F103-69S
- CFM: 14,000
- A: 69
- B: 59
- C: 88
- D: 95
- E: 3
- F: 2
- G: 61
- DRY WEIGHT: 59,072 lb
- PUMP QTY AND H.P.: 2 HP

### F103-74S
- CFM: 16,000
- A: 74
- B: 64
- C: 93
- D: 100
- E: 3
- F: 2
- G: 61
- DRY WEIGHT: 86,712 lb
- PUMP QTY AND H.P.: 2 HP

### F103-79S
- CFM: 18,000
- A: 79
- B: 67
- C: 97
- D: 103
- E: 4
- F: 3
- G: 61
- DRY WEIGHT: 115,440 lb
- PUMP QTY AND H.P.: 2 HP

### F103-84S
- CFM: 21,000
- A: 84
- B: 71
- C: 101
- D: 110
- E: 4
- F: 3
- G: 61
- DRY WEIGHT: 175,712 lb
- PUMP QTY AND H.P.: 2 HP

### F103-90S
- CFM: 23,000
- A: 90
- B: 73
- C: 103
- D: 116
- E: 4
- F: 3
- G: 61
- DRY WEIGHT: 238,928 lb
- PUMP QTY AND H.P.: 2 HP

### F103-96S
- CFM: 25,000
- A: 96
- B: 73
- C: 103
- D: 122
- E: 4
- F: 3
- G: 61
- DRY WEIGHT: 304,272 lb
- PUMP QTY AND H.P.: 2 HP

### F103-104S
- CFM: 27,000
- A: 104
- B: 73
- C: 103
- D: 130
- E: 4
- F: 3
- G: 61
- DRY WEIGHT: 379,904 lb
- PUMP QTY AND H.P.: 2 HP

### F103-112S
- CFM: 30,000
- A: 112
- B: 73
- C: 103
- D: 138
- E: 4
- F: 3
- G: 61
- DRY WEIGHT: 462,032 lb
- PUMP QTY AND H.P.: 2 HP

### F103-123S
- CFM: 32,500
- A: 123
- B: 73
- C: 103
- D: 149
- E: 4
- F: 3
- G: 61
- DRY WEIGHT: 544,544 lb
- PUMP QTY AND H.P.: 2 HP

### F103-135S
- CFM: 35,000
- A: 135
- B: 73
- C: 103
- D: 161
- E: 4
- F: 3
- G: 61
- DRY WEIGHT: 629,664 lb
- PUMP QTY AND H.P.: 2 HP

### F103-157S
- CFM: 40,000
- A: 157
- B: 73
- C: 103
- D: 183
- E: 4
- F: 3
- G: 61
- DRY WEIGHT: 806,176 lb
- PUMP QTY AND H.P.: 2 HP

### F103-179S
- CFM: 45,000
- A: 179
- B: 73
- C: 103
- D: 205
- E: 4
- F: 3
- G: 61
- DRY WEIGHT: 968,880 lb
- PUMP QTY AND H.P.: 2 HP

### F103-202S
- CFM: 52,000
- A: 202
- B: 73
- C: 103
- D: 228
- E: 4
- F: 3
- G: 61
- DRY WEIGHT: 1,480,448 lb
- PUMP QTY AND H.P.: 2 HP

### F103-224S
- CFM: 57,000
- A: 224
- B: 73
- C: 103
- D: 250
- E: 4
- F: 3
- G: 61
- DRY WEIGHT: 1,804,096 lb
- PUMP QTY AND H.P.: 2 HP

### F103-247S
- CFM: 63,000
- A: 247
- B: 73
- C: 103
- D: 273
- E: 4
- F: 3
- G: 61
- DRY WEIGHT: 2,131,584 lb
- PUMP QTY AND H.P.: 2 HP

**DIMENSIONS IN INCHES**
The PT Series, along with the FW Series, offer maximum efficiency due to their counter flow configuration. Standard PT Series scrubbers are available in sizes up to 25,000 CFM. Remote recirculation systems available. Large custom units available upon request.

### PT50 Series

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<th>D</th>
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<th>H</th>
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### PT510 Series

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<th>F</th>
<th>G</th>
<th>H</th>
<th>DW</th>
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<td>6,900</td>
<td>(1/2) H.P.</td>
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</tbody>
</table>

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**DIMENSIONS IN INCHES**
Custom designed scrubbers for specialty applications

**Typical Applications**

- Metal Finishing NOx
- Industrial Wastewater
- Municipal Wastewater
- Food Processing
- Refineries
- Medical
- Foundries
- Chemical
- Pesticides
- Animal Food
- Pulp and Paper
- Fish Processing
- Rendering
- Pharmaceutical
- Tanning
- Battery Manufacturing
- Painting
- Breweries
- Textile

**Application:** Pharmaceutical

**Problem:** Odor

**Solution:** DUALL Multi-Stage System

**Construction:** U.V. Stabilized Polypropylene

**Application:** Anodizing of Aluminum

**Problem:** NOx (Orange Plume) Emissions

**Solution:** DUALL Beta NOx 2000® Multi-Stage NOx System

**Construction:** U.V. Stabilized Polypropylene

**Control of NOx gases**

**Typical Beta NOx 2000® Layout**
**Standard Features**

**Chemical Addition Control Package**
The pH, ORP and conductivity control systems can be used with any new or existing scrubber installation. It will automatically regulate the addition of either acid or alkaline reagents to the scrubbing solution enhancing the removal of contaminants by the fume scrubber.

The pH control system consists of an enclosure, probe, a meter/analyzer and a chemical metering pump. It operates on 120 volts electrical power.

The probe is heavy-duty industrial grade. The probe comes with 10 feet of cable attachment to the analyzer.

The meter/analyzer has a weather-tight, corrosion resistant (NEMA 4X) enclosure. The analyzer is a state-of-the-art digital unit with one (1) 4-20 mA output for proportional control.

The metering pump delivers up to 5.5 gph and a maximum pressure of 150 psi.

The analyzer is housed in a corrosion-resistant, NEMA 4 enclosure that is fabricated from FRP. The panel is suitable for wall mounting.

**Spray Nozzles**
Full cone non-clogging, polypropylene nozzles are specified with every standard Duall scrubber.

**High Efficiency Mass Transfer**
Duall’s standard media is corrosion-resistant molded polypropylene random dumped packing. Free space is a minimum of 93%, making for a maintenance-free low pressure drop packing.

Several other types of packing may be used in custom designed scrubbers. Duall’s engineers select the best packing for a specific application.

**Inspection Doors**
Inspection doors are standard for ease of inspection at all critical points.

**Chemical Addition Control Package**

The pH, ORP and conductivity control systems can be used with any new or existing scrubber installation. It will automatically regulate the addition of either acid or alkaline reagents to the scrubbing solution enhancing the removal of contaminants by the fume scrubber.

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The probe is heavy-duty industrial grade. The probe comes with 10 feet of cable attachment to the analyzer.

The meter/analyzer has a weather-tight, corrosion resistant (NEMA 4X) enclosure. The analyzer is a state-of-the-art digital unit with one (1) 4-20 mA output for proportional control.

The metering pump delivers up to 5.5 gph and a maximum pressure of 150 psi.

The analyzer is housed in a corrosion-resistant, NEMA 4 enclosure that is fabricated from FRP. The panel is suitable for wall mounting.

**Mist Eliminator**
PVC Chevron blades are the core of the F Series fume scrubbers’ mist eliminator. Four (4) 30% air directional changes take place impinging droplets to the blades which then drain off. This results in less static pressure and makes the eliminator practically maintenance-free. Molded polypropylene packing is standard for PT and FW models.

**Recirculation Pump**
Vertical sealless or end-suction horizontal corrosion-resistant pumps are specified, depending on the project requirements. Pump and motor are factory mounted.

**Optional Features**

**System Monitoring Control Package**
A monitoring package is available when monitoring of system “vital signs” is required by local regulatory agencies. Important parameters to be monitored would include air flow rate, recirculating liquid flow rate, pressure drop and solution chemistry.

**Motor Control Package**
A motor starter panel with fused disconnect is available for start-stop motor control. Standard panel includes fan and recirculation pump control, based on 460 volt/3 Ph/60 Hz power supply.

**Complete System Control Package**
A system control package is available which combines all of the above functions, if applicable, into a single panel. Contaminant removal is achieved by adsorption of gases and vapors, condensation of condensable vapors and impaction of aerosols. All mechanisms occur in a packed bed for intimate gas-liquid contacting. Contaminants transferred to the liquid phase are removed from the scrubber by continuous or periodic overflow of blowdown.

The internal components of the panel are prewired. A terminal strip is provided for attachment of power and control lines in the field.
**Performance Data**

**Descriptions**
Contaminant removal is achieved by absorption of gases and vapors, condensation of condensable vapors and impaction of aerosols. All mechanisms occur in a packed bed for intimate gas-liquid contacting. Contaminants transferred to the liquid phase are removed from the scrubber by continuous or periodic overflow of blowdown.

**F103 and F105 Packed Bed Wet Scrubber.** Horizontal crossflow design minimizes height requirement and is ideal for roof mounting with remote recirculation. Standard units up to 63,000 CFM.

**FW303 and FW305 Packed Bed Wet Scrubber.** Integral fan makes this vertical countercflow unit very compact. Standard units up to 17,500 CFM.

**PT503 and PT505 Packed Bed Wet Scrubber.** Maximizes mass transfer efficiency while minimizing footprint requirement. Standard units up to 25,000 CFM.

**Mist Elimination**
Turbulent gas-liquid contacting causes some droplets to become entrained in the air. The mist eliminator collects these droplets that would otherwise be ejected from the scrubber.

**Water Supply**
All Duall fume scrubbers must be supplied with water. It is generally recommended that a recirculation system be used to conserve water unless once through water is advantageous to meet performance requirements. The actual fresh-water consumption with recirculation is only 0.1 to 0.7 gpm/1000 cfm* depending on the contaminant involved. Duall scrubbers with remote recirculation systems are self-draining and may be installed outdoors in sub-zero conditions without freeze-up. If these conditions exist, the recirculation tank should be placed in a heated area. A complete chemical metering and pumping system is available upon request. For applications involving gases with low solubility, chemical addition is required for liquid recirculation.

* Fresh-water consumption can vary depending on the solubility of contaminants.

**Installation**
Every Duall fume scrubber is shipped completed with an integral coated steel base. No special mounting is required. Simply connect the duct, the water and power supply, and the unit is ready for operation. Complete installation and operating instructions are supplied with all scrubbers, or Duall’s trained staff can install equipment quickly and efficiently.

**Pressure Drop**
The following pressure drops are applicable for scrubbers operated at design:

- **F103** 2.0" w.g.
- **F105** 2.5" w.g.
- **FW303** 2.0" w.g.

On the FW series, the blower is designed for 2.0" external static pressure.

**FW Blower Section**
The top section of the FW fume scrubber consists of a Duall centrifugal blower complete with TEFC motor and OSHA belt and shaft guards. The blower section may be rotated through 360° to obtain any desired angle between scrubber inlet and blower outlet. This blower section utilizes the same low-maintenance, guaranteed corrosion-resistant blower described in Duall Brochure No. CINH 151.

**Maintenance**
The Duall fume scrubber incorporates low-maintenance components in its entirety, including the packing, plumbing system and eliminators. Spray header access doors, differential pressure gauges, heavy duty flanges, packing removal doors are all critical points differentiating the

---

### Contaminant Removal Efficiencies

<table>
<thead>
<tr>
<th>CONTAMINANT</th>
<th>3 ft Bed Series</th>
<th>With pH Control</th>
<th>5 ft Bed Series</th>
<th>With pH Control</th>
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<tr>
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<td>NR</td>
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<td>Aqua Rega</td>
<td>85-90</td>
<td>86-92</td>
<td>95-96</td>
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<td>98-99</td>
<td>98-99</td>
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</tr>
</tbody>
</table>

*These efficiencies are intended only as a guide. Specific combinations and concentrations of fumes may result in significant variation from these values.

1. The use of pH control for these applications reduces water usage.
2. Performance is improved by chemical addition (other than for pH control).
3. These applications require extended packing depths and chemical addition (other than for pH control) or once-through water.
4. Wet scrubbing is not necessary, only a mist elimination device is needed, such as Duall Mist Misers or Chemical Mist Eliminators. Expected efficiencies on fumes from molten salt baths using the indicated salt will be less than those shown for aqueous mists; efficiencies on molten salt bath applications will range from 70-90%.
5. Under certain conditions such as high loadings or high process temperature, a fine fog forms which will not be removed at the stated efficiencies. A special high efficiency mist eliminator is required.
6. For applications involving high levels of chlorine, consult Duall Division, Met-Pro Corporation.
**SPECIFICATIONS**

**EXHAUST GAS SCRAPPERS**

Scrubbers shall be designed for specified collection-removal efficiency of air contaminants arising from the processes listed herein. Collection efficiencies shall apply to the unit as a whole, including mist eliminators downstream of the process. Collection efficiencies shall be achieved with a scrubbing solution waste flow rate of not more than 0.7 gallons per minute per thousand (1,000) cubic feet per minute of gas flow, and pressure drop across the entire scrubber unit including the mist eliminator of not more than 2.5 inches water column.

**CORROSION RESISTANCE**

1. Scrubbers, including all internals and appurtenances, shall be completely resistant to chemical corrosion from the process chemicals listed herein and shall carry a warranty against corrosion-induced failure for one year after initial start-up.

2. Scrubber housings shall be constructed of Type II, Grade 1, high-impact polyvinyl chloride (PVC)* conforming to ASTM D 1784-69 Cell 1433D. Outdoor installation shall be white PVC for UV resistance.

Base: Each scrubber shall be complete with a corrosion-resistant coated steel base of sufficient strength to make the unit self-supporting when wet.

**SCRUBBER PIPING**

1. Furnish all scrubber internal piping necessary for recirculation of scrubbing solution such that installer need only make single external piping connections for scrubbing solution supply and return. Piping shall be polyvinyl chloride (PVC)*. Wherever possible, piping shall be installed at the factory. Interior piping to be removable through access doors for maintenance.

2. Spray nozzles shall be full cone non-clogging type of sufficient quantity to insure complete coverage of the packing face. On horizontal scrubbers, overhead spray headers shall be provided to prevent channeling of the gas stream.

**Pumps**: Recirculation pumps shall be vertical sealless centrifugal chemical duty type, constructed of materials completely resistant to corrosion from all contaminants listed herein. Pump motors shall be single-speed, NEMA Design B, Class-B insulated, 230/460 volts, 3-phase, 60-hertz. All external pump and drive components shall be corrosion-resistant construction or otherwise epoxy-coated. Pumps shall be securely mounted to sump box or remote tank. Pumps shall be sized to handle a minimum of 40 TDH on self-contained and 70 TDH on remote recirculation systems.

Remote Recirculation Tanks: If required, each scrubber shall be furnished with a remote recirculation tank to be constructed of PVC*. Fittings will be provided on the tank for pump suction, overflow, and drain. Tanks shall be of sufficient capacity and structural rigidity for intended service. Tank freeboard above the overflow connection shall be of sufficient volume to contain liquid volume suspended in supply and return pipes and scrubbers. Recirculation pumps shall be mounted on top of tank. Pipe and fittings necessary for connection of pump suction to tank will be furnished.

Scrubber Packing: The scrubber packing shall be resistant to corrosion from all contaminants listed herein. Packing shall be non-clogging, non-nesting and of such design and bed depth as to achieve certified collection efficiencies stated herein. Minimum void volume of packing to be 93%.

Mist Eliminator: A mist eliminator shall be provided to effectively remove entrained water droplets prior to leaving the scrubber.

Access Panels: Removable access panels for packing removal and spray nozzle maintenance shall be furnished. Transparent view ports to allow for inspection of packing and spray nozzles are also standard.

Flow Meter: A flow meter for indicating/adjusting fresh-water make-up will be furnished. Dwyer instruments Series RM that clearly indicates design flow on scale will be utilized.

Pressure Gauge: All Duall fume scrubbers are supplied with a pressure gauge to monitor pressure differential across the filter packing. The Duall specified gauge would be a Dwyer instruments Series 2000 Magnehelic, or equal.

**OPTIONAL CONTROL PACKAGES**

Chemical Addition Control Package: The Duall chemical addition control system consists of a weathertight, corrosion-proof enclosure containing an analyzer, prewired chemical feed pump and weather-protected terminal block. Enclosure can be mounted on any vertical surface. A heavy-duty industrial probe with a 10-ft. lead wire is supplied, along with two 10-ft. lengths of vinyl tubing to connect the feed pump.

Motor Control Package: A motor starter panel with fused disconnect is available for start-stop motor control. Standard panel includes fan and recirculation pump control, based on 460 volt / 3 Ph / 60 Hz. power supply.

*Optional corrosion-resistant materials are:

<table>
<thead>
<tr>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPVC</td>
</tr>
<tr>
<td>Polypropylene</td>
</tr>
<tr>
<td>Stainless Steel</td>
</tr>
<tr>
<td>PPV</td>
</tr>
<tr>
<td>DUALLast FRP™</td>
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