

 **union process**[®]
ISO 9001:2015 w/ DESIGN



**LABORATORY
GRINDING MILLS**



Union Process Research And Laboratory Attritors Produce Fine And Homogeneous Dispersions Quickly And Repeatedly Under Scientific Conditions

History

From a revolutionary idea proposed and developed by Dr. Andrew Szegvari in 1945, Attritor technology grew to become the basis for Union Process, Inc., an independent, family-owned American company founded in Akron, Ohio. Today, Attritors are considered to be the most efficient grinding/dispersing systems and are used in scores of industries and research laboratories worldwide.

How Attritors Work

The Attritor is often referred to generically as a "stirred ball mill." The operation of an Attritor is simple and effective. The material to be ground is placed in a stationary tank with the grinding media. Carbon steel, stainless steel, chrome steel, tungsten carbide, and ceramic balls are commonly used media. The material and media are then agitated by a shaft with arms, rotating at high speed. This causes the media to exert both shearing and impact forces on the material. The final result of this remarkably efficient process is an extremely fine material, measured in microns or fractions of microns, distributed on a very narrow curve. The laboratory Attritor works up to ten times faster than the conventional ball, pebble or jar mill. Its compact, vertical profile requires minimal space. No premixing is necessary. Adding ingredients (or taking samples) can be done at any time during the grinding.

Why A Laboratory Attritor?

Union Process customers know from experience that the Attritor is one of the most versatile pieces of equipment in their lab. It can be equipped or retrofitted easily and inexpensively with a wide variety of components and accessories. With the Attritor, users can choose wet or dry grinding, introduce inert atmospheres, operate at controlled temperatures, vary grinding speed, overcome product contamination, change media size and type, and get precise energy consumption information, all on the same machine. Results are repeatable from one test grind to another for maximum credibility. Finally, the Attritor is ideal for formulating, quality control, and scale-up studies.

On Cover: S1 Attritor equipped with Touch-Screen Controls with PLC for data acquisition and grind time settings. Also shown is the shaft seal for grinding under inert gases.



Advantages Of Using A Laboratory Attritor

- Fast and efficient grinding
- Scale-up capability
- Numerous options
- No premixing
- Flexibility
- Easy operation
- Repeatability
- Low maintenance

Common Applications

- Agricultural Flowables
- Bagasse
- Biofuel/Cellulosic Biomass
- Catalysts
- Ceramics
- Chemicals
- Chocolate, Confectionery
- Cosmetics
- Cryogenic Grinding
- DSM (Mechanical Alloying)
- Electronic Ceramics
- Ferrites
- Fibers
- Food Products
- Glass Frits
- Industrial Coatings
- Metal Oxides
- Metal Powders and Flaking
- Minerals, Coal
- Paints, toners, inks
- Paper Coatings
- Pharmaceuticals
- Pigments
- Proppants
- Reaction Milling/
Mechanochemical Milling
- Tungsten Carbides

Union Process Offers A Broad Line of Laboratory Mills For Virtually Any Grinding and Dispersion Application

WET OR DRY GRINDING BATCH LABORATORY MILLS

01 Series

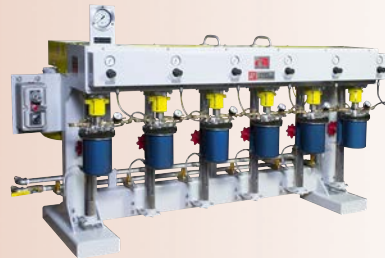
See a complete description of the 01 Research Attritor and Accessories on pages 4-7.



Multi-Tank HD-01 Lab Attritor System

The Multi-Tank HD-01 Lab Attritor System is the ultimate set-up for quality control and test grinding requirements.

- All tanks (expandable from 2 to 6) are controlled by ONE power source.
- A timing belt assures that all connected Attritor shafts run at the same speed for the same period of time.



Choose standard stainless steel or a metal-free system with all tanks constructed from alumina, zirconia, or Tefzel®.

NOTE: Photo above depicts unit with MECO shaft seals.

S-1 Series

See a complete description of the S-1 Laboratory Attritor and Accessories on pages 8-11.



OTHER APPLICATION-SPECIFIC LABORATORY MILLS



DMQX™-07 Wet Grinding (Continuous or Circulation)

Lab mill features specially designed discs to eliminate shaft whip and mill vibration and provide greater random media motion for improved efficiency.

Uses Media
.3 to 1mm

HSA-1 Dry Grinding (Continuous)

A high speed lab Attritor typically used in the continuous mode for fine dry grinding applications. Discharge is through a side screen and valve. For special applications, a ceramic-lined tank is available. Picture shows temperature probes for monitoring the cooling water in and out, a MECO shaft seal for grinding under inert gases, and a metered powder feeder.

Uses Media
.5 to 3mm



Model SDM-1 Attritor

This lab mill offers bead milling in a batch configuration. It includes a side discharge valve with screen. Equipped with a VFD (variable frequency drive). Can be either explosion-proof or non-explosion-proof. This lab mill offers bead milling in a batch configuration and includes a discharge valve.

Uses Media
.25 to 3mm

Smaller units, HDDM01 and SDM05, are available.

Q-03 Wet Grinding (Circulation)

This small, bench-type laboratory-sized circulation mill allows users to perform lab trials using very small sample sizes. Circulation Attritors ("Q" machines) are distinguished by faster grinds and a narrow particle size distribution.

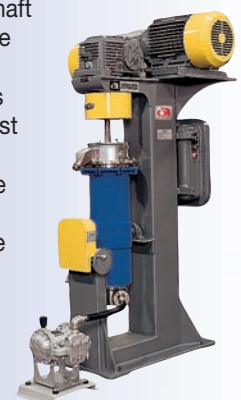


Uses Media
3 to 6mm

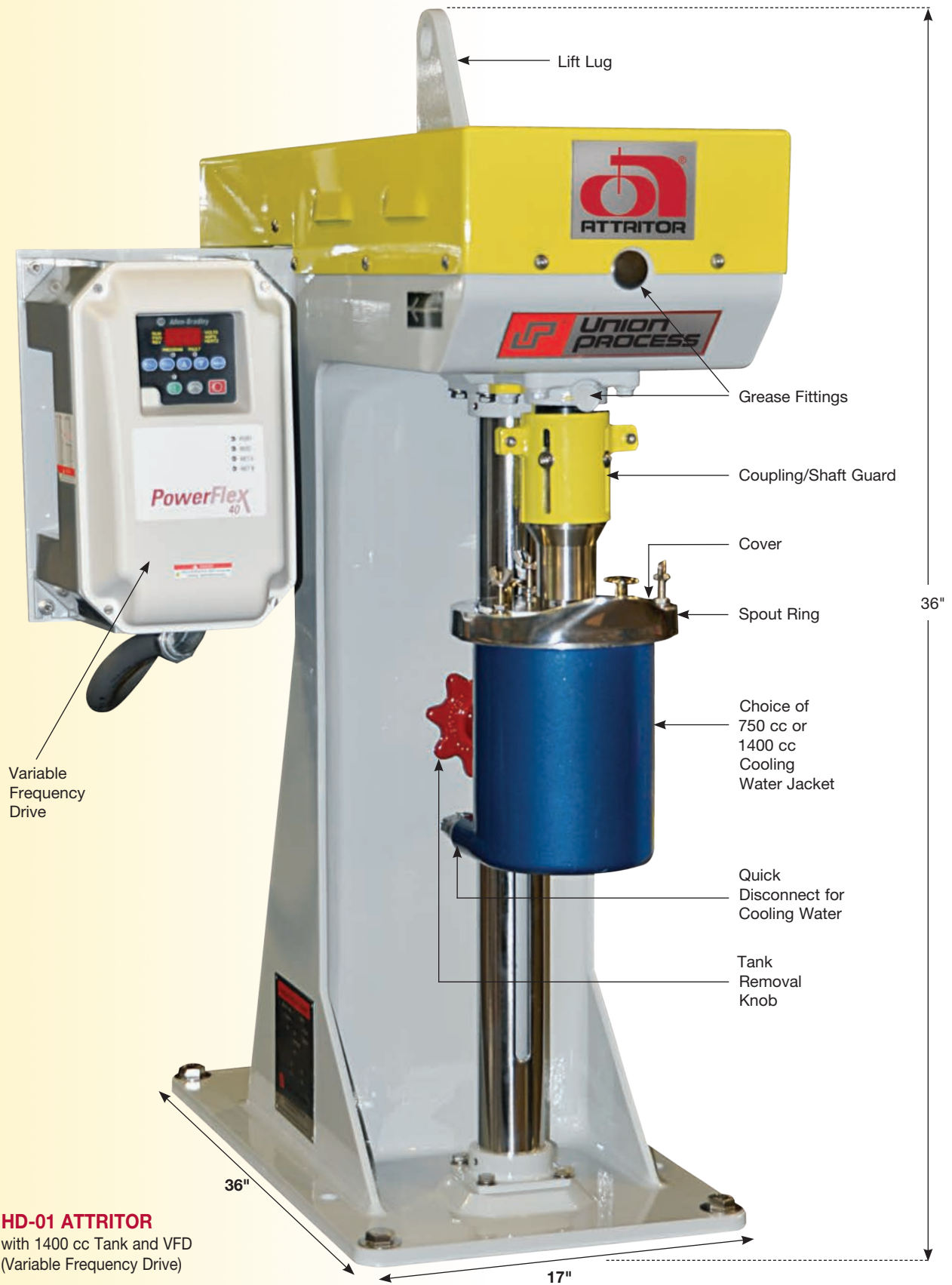
C-5 Wet Grinding (Continuous)

This vertical mill (with no shaft seals) is a lab version of the Union Process Continuous Attritor ("C" machines). It is ideal for continuous and fast grinding of large quantities of material. The C-5 can be used to reliably test and scale-up to production size continuous Attritors.

Uses Media
3 to 6mm



01 SERIES



RESEARCH ATTRITOR

The 01 Series Attritors offer users great flexibility as all models share the same column and interchangeable tank design. All models have water cooled jackets for cooling (or heating) and quick water disconnects for removing the tank. These mills are great research tools for formulating, testing, feasibility studies, quality control, and basic research when quantities are small. Results are repeatable. 01 Series Attritors are easy to clean and require no shaft seals.

The HD-01 and 01 Models are designed for media from 1/8" to 1/4". They have shafts with arms and run at RPMs from 100 to 650 and can be used for wet or dry grinding.

The Model HDDM-01 is designed for small media ranging from 0.25mm (or smaller) to 2mm. These models have shafts with special discs (similar to those used on the Union Process DMQX™ Bead Mill) and typically run at RPMs from 500 to 2,500. The HDDM-01 features a special one-piece cover with charging port and media deflector. This mill is recommended for wet grinding only.

MODEL 01

The Model 01 is the most basic model in the 01 Series. It comes with a light duty frame, 110 volt AC motor with variable electronic speed, and no RPM reading. A Model 01 cannot be made explosion-proof.

MODEL HD-01/HDDM-01

A special HD-01/HDDM-01 combination system is available. In minutes, the RPM of the shaft can be changed from slower HD-01 mode to higher HDDM-01 mode and vice versa. Simply release the belt guard (equipped with quick disconnects), move the belt to an alternative set of pulleys and replace the guard. The appropriate coupling, shaft and cover also must be changed.

CHOICE OF TWO DRIVE SYSTEMS

All HD-01 and HDDM-01 Models are available with either TEFC or explosion-proof motors.

1. A non-explosion-proof electronic variable frequency drive system. LCD display will be programmed to show agitator RPM, motor AMPS, and motor HP being used.
2. This can be made explosion-proof if the drive controls are installed in a safe area away from the machine. On the machine is a mechanical tachometer and an operator station with an ON/OFF button and speed potentiometer. An optional explosion-proof readout of motor AMPS is available.

| 01 SERIES MODELS | 01 electronic | HD-01 electronic | HDDM-01 electronic |
|-----------------------------|--------------------|-------------------------|-------------------------|
| Tank Capacity (cc)**** | 750 or 1400 | 750 or 1400 | 750 or 1400 |
| Working Capacity (cc)*** | 250 or 500 | 250 or 500 | 175 or 350 |
| Media Volume (cc)*** | 380 or 760 | 380 or 760 | 280 or 560 |
| HP | 1/4 | 1/2 | 1 |
| Voltage** | 110/230 1 phase | 208/230/460 3 phase* | 208/230/460 3 phase* |
| Variable Speed Drive System | electronic | electronic | electronic |
| Explosion-Proof Motor | no | optional | optional |
| Height (in./mm) | 33/838 | 36/914 | 36/914 |
| Bench Space (in./mm) | 12x21/305x533 | 21x27/533x686 | 21x27/533x686 |
| Weight (lbs./kg) | 80/36 | 220/100 | 220/100 |

Dimensions and weights are approximate and subject to change.

*On special order, a 110/220 single phase motor may be ordered.

**60 Hz standard. 50 Hz/380 V, 3 phase available.

***Based on stainless steel tank.

****Tank capacities are approximate.



Gauge on the column, which shows clearance between the bottom of the shaft and tank.



Belt guard raised to show pulleys for quick change-over from Model HDDM-01 to HD-01 mode.



One-piece tank showing bottom discharge grid and valve.



1. Silicon Carbide, 1400cc
2. 316 Stainless Steel, 1400cc
3. Ceramic (99.5% Alumina), 1400cc
4. UHMW (Polyethylene), 1400cc
5. Zirconium Oxide, 750cc
6. 316 Stainless Steel, 110cc
7. Tefzel-Coated SS, 750cc



1. One-Piece Stainless Steel Cover with Teflon Seal and Vent for Cryogenic Grinding with Liquid Nitrogen
2. Stainless Steel Cover with Media Deflector and Floating Seal for HDDM-01
3. Special Adapter for Quick-Change of 110cc Tanks
4. One-Piece Stainless Steel Cover with MECO Shaft Seal, Gas Inlet/Outlet, and Charging Port for Grinding Under Inert Gas
5. Two-Piece Plastic Cover
6. Two-Piece 304 Stainless Steel Cover



1. SS Shaft with Lub-R (Plastic) Disks and Spacers, 1400cc
2. SS Shaft with 440C SS Disks and Spacers, 750cc
3. Halar-Coated SS Shaft with Zirconium Oxide Disks and Lub-R (Plastic) Spacers, 1400cc



1. Plastic-Coated Stainless Steel Shaft with Zirconium Oxide Arms, 110cc
2. Stainless Steel Shaft with Tungsten Carbide Arms, 750cc
3. Zirconium Oxide Shaft with Zirconium Oxide Arms, 750cc
4. Plastic-Coated Shaft with Xylethon Sleeved Arms, 750cc
5. Stainless Steel Shaft with Colmonoy Arms, 750cc
6. Stainless Steel Shaft with 440C SS Arms, 1400cc

01 SERIES ACCESSORIES

Many accessories are available for the 01 Series. With the basic mill, one can equip it for metal-free grinding. Note, the same tanks can be used for the 01/HD-01 or the HDDM-01 modes. The 01/HD-01 series can be equipped for grinding under inert gases and for cryogenic grinding. The special covers fit all tank sizes (110cc, 750cc, and 1400cc). Most parts are interchangeable. Each size tank does need its own shaft and arms, and arm lengths do vary depending upon the size of media being used. There is also a special cooling water jacket and tank with a valve at the bottom so one can discharge the slurry and even hook-up a small pump for circulation.

Please see the list below of all accessories available.

COMPLETE LIST OF ACCESSORIES

Tank Options (approx. gross volume) —

For use with all 01 Series Attritors

- | | |
|----------------------------------|----------------------|
| ■ Stainless steel | 110cc, 750cc, 1400cc |
| ■ Tefzel®-coated stainless steel | 110cc, 750cc, 1400cc |
| ■ Polyethylene | 110cc, 750cc, 1400cc |
| ■ Alumina | 750cc, 1400cc |
| ■ Zirconium oxide | 750cc, 1400cc |
| ■ Silicon nitride | 750cc, 1400cc |
| ■ Silicon carbide | 750cc, 1400cc |

Agitator Arms — For use with 01 and HD-01 Models

The following arms can be installed in either stainless steel, plastic coated, or zirconium oxide shafts:

- | | |
|-------------------------------------|---------------------|
| ■ Colmonoy* | ■ Stainless steel |
| ■ Plastic coated, steel reinforced* | ■ Tungsten carbide* |
| ■ Silicon nitride | ■ Zirconium oxide* |

*Available for 110cc tanks.

Agitator Disks — For use with HDDM-01 Models

- | | |
|--------------------------|-------------------|
| ■ Tool Steel (hardened) | ■ Plastic |
| ■ Stainless Steel (440C) | ■ Zirconium oxide |

Covers — For use with 01 and HD-01 Models

- 2-piece aluminum, stainless steel or plastic
- 1-piece stainless steel with simplified, mechanical shaft seal with gas inlet/outlet and charging port
- 1-piece stainless steel with Teflon floating seal, charging port, and vent for grinding in liquid nitrogen (cryogenic grinding)

Covers — For use with HDDM-01 Models

- Stainless Steel Cover with Media Deflector & Floating Seal for HDDM-01

Discharge Valves

- Cooling water jacket with bottom discharge valve — requires special tank with openings — **For use with 01 and HD-01 Models**
- Cooling water jacket with side discharge valve and optional bottom plug valve — for stainless steel tanks only — **For use with HDDM-01 Models**

Special — For use with 01 and HD-01 Models

- Adapter for quick change of 110cc tanks (polyurethane or stainless steel)

Pumps For Circulation — For use with all 01 Series Attritors

- Air driven, explosion-proof
- 110V, 1/4 HP, variable speed
- 110V, 1/4 HP, variable speed, explosion-proof

Portable Stand w/Heavy-Duty Casters — For use with all 01 Series Attritors

Tefzel® is a registered trademark of E.I. DuPont deNemours Co., Inc.
Colmonoy® (a nickel-based alloy) is a registered trademark of Wall Colmonoy Corporation.

Model 01 Attritor

With simplified electronic variable speed drive and 1400cc tank.



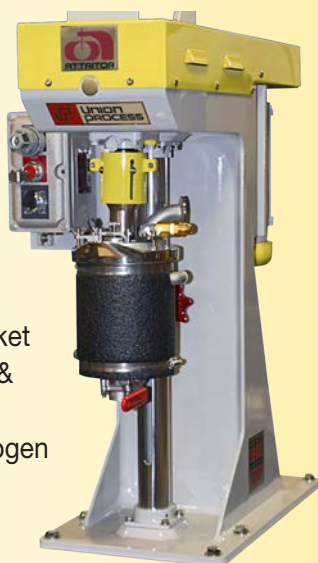
Model HD-01/HDDM-01 Attritor

With VFD (variable frequency drive) with quick belt change. Shown with HDDM tank with special side discharge valve.



Model HD-01 Attritor

With VFD. Designed for cryogenic grinding with a special one-piece stainless steel cover, special stainless steel tank, & stainless steel jacket sheathed with insulation, & cryogenic stainless steel bottom valve. Liquid nitrogen control feeding system & cyclone separator on the discharge are available.



Model HD-01 Attritor

With explosion-proof variable frequency drive (mounted remotely). Includes explosion-proof operator station. Mounted on portable stand with heavy duty casters.



Model HD-01 Attritor

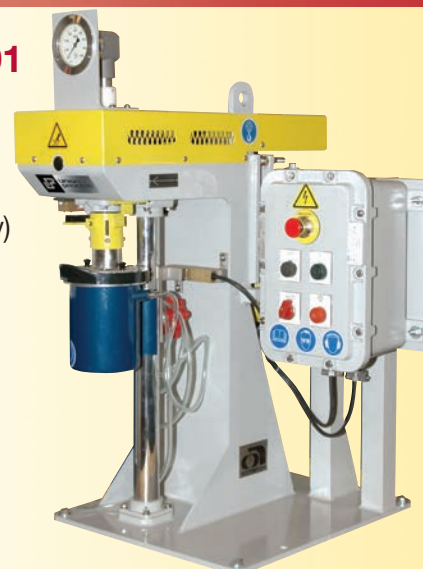
With VFD which depicts read-out with RPM and percent torque; also with bottom discharge valve, electrical drive, and peristaltic pump for circulation.



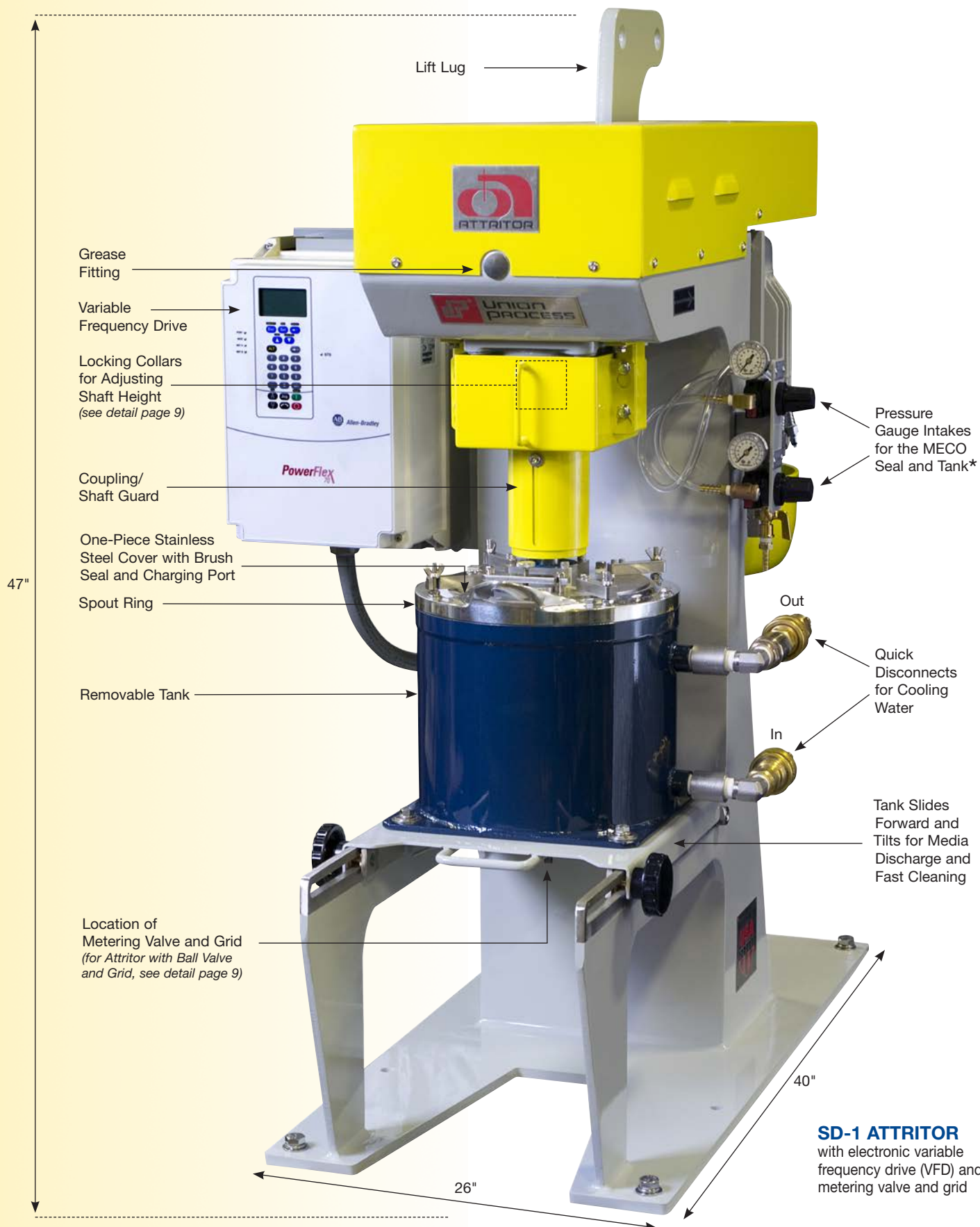
Model HD-01 Attritor

With variable frequency drive (mounted remotely) with flame-proof operator station. CE-marked for Europe.

CE



S-1 SERIES



SD-1 ATTRITOR
with electronic variable frequency drive (VFD) and metering valve and grid

*If a MECO sealed cover is ordered with the Attritor, the controls with gauges are mounted on the mill. If the MECO sealed cover is ordered later, the frame comes pre-drilled and tapped so it is easy to install these controls with gauges on the side of the frame.

LABORATORY ATTRITOR

MODELS S-1, SC-1, and SD-1

The S-1 Batch Attritor is a versatile, reliable, rugged laboratory-size machine designed to meet virtually all lab grinding and dispersing needs — either wet or dry. It allows easy and precise scale-up to production size equipment with reproducible results from batch to batch. It is also suitable for small production or pilot plant work.

The S-1 also is available in two additional configurations for specific applications.

- SC-1 — designed for tungsten carbide milling and uses tungsten carbide media and is supplied with tungsten carbide sleeved agitator arms.
- SD-1 — equipped for dry grinding, includes a metering valve or ball valve and stainless steel cover with floating brush seal for dust control. For continuous operation, disks are added to the shaft.

The Models S-1, SC-1, and SD-1 are designed for media ranging from 1/8" to 3/8" and run at RPMs of 100 to 500. With a different shaft/arm configuration, media up to 1" can be used. All share the following features:

- Variable shaft RPM.
- Adjustable agitator shaft height to accommodate different size grinding media (see top right).
- Bottom discharge grid with valve for easy sampling and discharge (see right).
- Tank rotates or slides forward and tips 90° for media discharge and fast cleaning.
- Jacketed for cooling (or heating).
- Quick disconnects for cooling water.

MODEL SDM-1

The Model SDM-1 (see bottom right) is designed for grinding media ranging from 0.25mm to 2mm. The SDM-1 has a shaft with specially designed discs or special designed arms and runs at RPMs of 150 to 1500. It has its own frame, and its tanks are not interchangeable with S-1, SC-1, or SD-1 models. It has a side discharge screen and valve, and the tank tilts for ease of cleaning. The SDM-1 comes with a special stainless steel one-piece cover with charging port. It does not require a shaft seal.

The Model SDM-1 is available with either a stainless steel, alumina- or zirconium-lined tank. Agitator disks are available in tool steel, stainless steel, plastic, or zirconium oxide.

CHOICE OF TWO DRIVE SYSTEMS

All models in the S-1 Series are available with either of the following two systems:

1. An electronic variable frequency drive system with a LCD display that will be programmed to show agitator RPM, motor AMPS, and motor HP being used.
2. This can be made explosion-proof when drive controls are installed in a safe area away from the machine. On the machine is a mechanical tachometer and an operator station with an ON/OFF button and speed potentiometer. An optional explosion-proof readout of motor AMPS is available.

| S-1 SERIES MODELS | S-1/SC-1/SD-1 <i>electronic</i> | | SDM-1 <i>electronic</i> |
|------------------------------------|------------------------------------|--------------------|----------------------------|
| Tank Capacity (gal./liters) | 1.5/5.7 | 2.5/9.5 | 2.9/11.0 |
| Working Capacity (gal./liters)** | 0.7/2.7 | 1.1/4.2 | 0.8/3.0 |
| Media Volume (gal./liters)** | 1.0/3.8 | 1.5/5.7 | 1.25/4.7 |
| HP-standard use | 3 | 3 | 5 |
| HP-(SC) for tungsten carbide media | 3 | 5 | — |
| HP-(SD) for dry grinding | 3 | 5 | — |
| HP-(SD) for mechanical alloying | 5 | 7.5 | — |
| Voltage* | 230/460 3 phase | 230/460 3 phase | 230/460 3 phase |
| Variable Speed Drive System | electronic | electronic | electronic |
| Height (in./mm) | 46/1168 | 46/1168 | 60/1524 |
| Bench Space (in./mm) | 26x50/660x1270 | 26x50/660x1270 | 31x46/787x1165 |
| Weight (lbs./kg) | 750/340 | 750/340 | 1400/635 |

Dimensions and weights are approximate and subject to change.

*60 Hz standard. 50 Hz/380 V, 3 phase available.

**Based on a Stainless Steel Tank



Adjustable Agitator Shaft Detail



Bottom of tank showing ball valve and plug for draining water jacket.

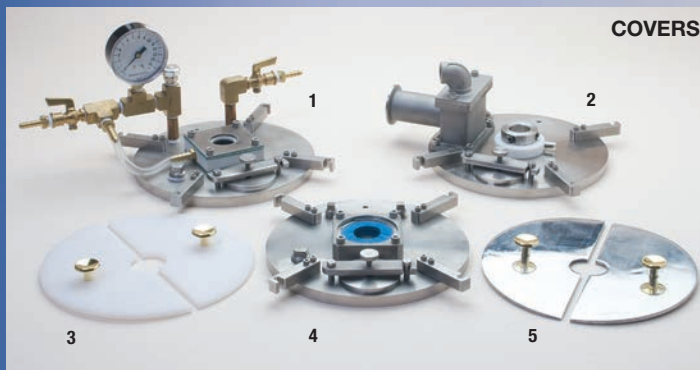


Model SDM-1



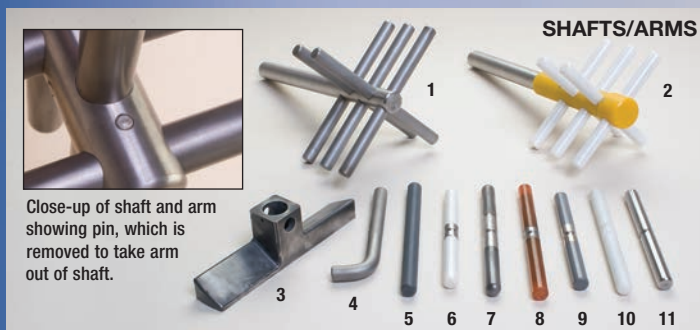
TANKS

1. 1-1/2 Gallon Stainless Steel Tank with Stationary Arms
2. Stainless Steel Sample Vessel for Discharging Under Inert Gas
3. 1-1/2 Gallon Tefzel-Coated SS Tank



COVERS

1. One-Piece SS Cover with MECO Shaft Seal, Gas Inlet/Outlet, and Charging Port for Grinding Under Inert Gas
2. One-piece Stainless Steel with Floating Seal, Charging Port, and Vent for Grinding in Liquid Nitrogen (Cryogenic Grinding)
3. Two-Piece Plastic
4. One-piece Stainless Steel with Brush Seal and Charging Port
5. Two-Piece Aluminum



SHAFTS/ARMS

Close-up of shaft and arm showing pin, which is removed to take arm out of shaft.

1. SS Shaft with Hardened Tool Steel Arms, 2.5 Gallon
2. Plastic-Sleeved Shaft with Zirconium Oxide Sleeve, 1.5 Gallon
3. Bottom Lifter Arm
4. L-Shaped Arm, Hardened Tool Steel
5. Xylethon Sleeve Arm
6. Zirconium Oxide Sleeve Arm
7. Tungsten Carbide Sleeve Arm
8. Polyurethane Sleeve Arm
9. Silicon Carbide Sleeve Arm
10. Polyethylene Sleeve Arm
11. 440C Stainless Steel Arm



GRIDS

1. Plastic (Xylethon), 3/32"
2. Plastic (Lub-R), 1/8" Openings
3. Zirconium Oxide, 1/16" Openings
4. SS, WC Faced, 3/32" Openings
5. Plastic (Lub-R), 3/32" Openings
6. SS, 1/8" Openings
7. 1/8" Slot Metering Valve Bar Grid
8. SS, 1/32" Openings

S-1 SERIES ACCESSORIES

Many accessories are available for the S-1. With the basic mill, one can equip it for metal-free grinding, for grinding under inert gases, and for cryogenic grinding. Most parts are interchangeable. Each size tank has its own arm sizes but the 1 gallon, 1-1/2 gallon and 2-1/2 gallon tanks share the same shaft size. For all covers, one size fits the 1-1/2 gallon and 2-1/2 gallon, and one size fits the 1/2 gallon and 1 gallon. Bar grids are interchangeable for tanks made from the same material. One size bar grid fits the 1-1/2 and 2-1/2 gallon tanks, and another size bar grid fits the 1/2 and 1 gallon tanks. A pump is available to duplicate the circulation process in the production-based Attritor.

There is also an adapter available to allow the use of the HD-01 series tank sizes on the S-1. There is also a special top assembly available to convert the S-1 to a circulation type "Q" system. A special jacket design to ASME pressure vessel code is available. Normal pressure rating of jacket is 10 PSIG.

For cryogenic grinding, also available is a liquid nitrogen feeding control system and a cyclone exhaust.

COMPLETE LIST OF ACCESSORIES

Tank Options (approx. gross volume):

- Stainless steel — 1/2 gal., 1 gal., 1-1/2 gal., 2-1/2 gal.
- Stainless steel with stationary arms — 1-1/2 gal., 2-1/2 gal.
- Alumina-lined — .4 gal., .8 gal., 1.1 gal. and 1-1/2 gal.
- Zirconium oxide-lined — .4 gal., .8 gal., 1.1 gal. and 1-1/2 gal.
- Silicon carbide-lined — 1-1/2 gal.
- Silicon nitride-lined — 1-1/2 gal.
- Rubber-lined — 1/2 gal., 1 gal., 1-1/2 gal., 2-1/2 gal.
- Tefzel®-lined — 1/2 gal., 1 gal., 1-1/2 gal., 2-1/2 gal.
- Polyurethane-lined — 1/2 gal., 1 gal., 1-1/2 gal., 2-1/2 gal.
- Working capacity for 1/2 gal. tank is 1 quart.
- Working capacity for 1 gal. tank is 1/2 gal.

Agitator Arms:

Following arms can be installed in either stainless steel or plastic-sleeved agitator shafts:

- Tool steel (hardened)
- Stainless steel (440C)
- Colmonoy®-faced stainless steel
- Plastic sleeved, steel reinforced
- Transformation toughened alumina sleeved
- Polyurethane coated
- Silicon nitride sleeved
- Tungsten carbide sleeved
- Zirconium oxide sleeved
- Specially configured "L" arms available in stainless and tool steel
- Special bottom-lifter arms

Conversion Assembly:

This assembly is designed to convert a S-1 to a Circulation-type "Q" system. The assembly includes a top discharge chamber, grid plate with slotted grids, axial seal, and shaft impeller. Also included is a new agitator shaft for the required six agitator arms. A pump and holding tank are also required (see photo upper right on page 11).

Covers:

- 2-piece aluminum, stainless steel or plastic
- 1-piece stainless steel with simplified mechanical shaft seal, with gas inlet/outlet and charging port
- 1-piece stainless steel with floating Teflon seal and charging port
- 1-piece stainless steel with brush seal and charging port
- 1-piece stainless steel with floating seal, charging port, and vent for grinding in liquid nitrogen (cryogenic grinding)

Bottom Valves:

- Stainless steel ball valve (standard)
- Dry grind metering valve (cannot seal for inert gas use) (standard for dry grind)

Discharge Grids:

- Hardened tool steel
- Stainless steel
- Plastic
- Zirconium oxide
- Tungsten carbide-faced stainless steel

Grids come with a choice of the following openings: 1/8", 3/32", 1/16", 1/32", or 1mm, .5mm, or .4mm

Special:

- Stainless steel sample vessel for discharge under inert gases complete with site glasses
- Adapter for S-1 to hold HD-01 750cc or 1400cc tanks (includes shaft reducer to enable standard HD-01 shafts to fit S-1 coupling)
- Special top assembly to convert to a Circulation ("Q") Attritor

Pumps For Circulation:

Same as 01 Series

- Air driven, explosion-proof
- 110V, 1/4 HP, variable speed
- 110V, 1/4 HP, variable speed, explosion-proof

Portable Stand w/Heavy Duty Casters:

Available for use with S-1 Attritor

Model SD-1 Attritor

With VFD (variable frequency drive) and integrated feeder and hopper system all mounted on portable stand. CE-marked for Europe.

CE



Model S-1 Attritor

Shown with optional circulation conversion assembly (see full description at bottom of page 10).



Model S-1/SDM-05 Attritor

With VFD (variable frequency drive) and quick belt change to go from S mode to SDM mode. Model shown has interchangeable SDM-05 tank with side discharge mounted on the machine.



Model S-1 Attritor

With VFD (variable frequency drive). Equipped with a ceramic tank and a MECO shaft seal. Includes new crank tilting mechanism that makes it much easier to tilt the tank for cleaning. This system can take any of the replacement tanks that are offered. CE



Model S-1 Attritor

With VFD. Designed for cryogenic grinding with a special one-piece stainless steel cover, a special stainless steel tank (sheathed for insulation) with stainless steel jacket, and a cryogenic bottom valve. A liquid nitrogen control feeding system and a cyclone separator on the discharge are available.



Model S-1 Attritor

With VFD (variable frequency drive), sealed cover. CE-marked for Europe. CE



The Union Process Advantage



From years of experience in designing and building thousands of Attritors for use all over the world, Union Process people have developed the "know-how" to custom-design the Attritor to specifically meet your

requirement — whether in the lab or in the field. Union Process maintains a very well equipped laboratory and pilot plant to simulate actual production conditions. Skilled technical service representatives are always available for consultation. When required, a representative will visit the customer's facility.

Experience. Technical "know-how." Service after the sale. That's the Union Process advantage. At Union Process, customer satisfaction is our number one goal.

Grinding Media

Union Process carries a full line of the highest quality grinding media available to meet your particular needs.



Laboratory Testing Facilities



S-1 Attritor with variable frequency drive and 3 HP motor.

Union Process maintains a complete laboratory with all the machines described on page 3 for testing customers' materials. In addition, its pilot plant facilities contain mid-size and full-size production machines for customers to conduct scale-up studies or make test product. Particle size is determined through a laser defraction instrument, surface area analyzer, x-ray sedigraph, and Fisher Subsieve, as well as the usual grind gauges, sieve tests and microscope.

Contact Union Process for more information on our Wet and Dry Grinding Production Attritors and Bead Mills.

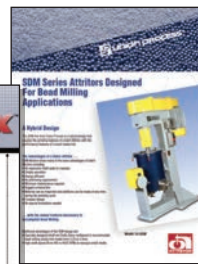
*Dry Grinding
Production Attritors*



Continuous Attritors



SDM Series Bead Mill



*DMQX™ Bead
Milling System*



*Wet Grinding
Production Attritors*



Circulation Attritors



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