SENSIDYNE®
Industrial Health & Safety Instrumentation

Dust Fraction and Size Distribution

Accessories for Particulate Sampling

Historically, industrial hygiene has its roots in the mining industry as a result of black lung disease in coal miners. The earliest form of personal monitoring was conducted in the 1930s for dust exposure in coal mines using hand cranked pumps and impingers. Today monitoring for dust exposure in various industries remains one of the more common monitoring applications. Numerous devices have emerged for particle size distribution, and various organizations have defined particle size ranges that represent particle fractions of airborne dust. The table below lists size fractions that are commonly sampled today.

Dust Fraction	Description	Size Distribution
Total Dust	All airborne particles	Size range encompassing all airborne particles
Inhalable Dust	Particle size range that can be hazardous anywhere in the respiratory tract	50% cut at 100 microns (ACGIH-US)
Thoracic Dust	Particle size range that can be hazardous when deposited anywhere within the lung airways and gas exchange area	50% cut at 10 microns (ACGIH-US)
Respirable Dust	Particle size range that can be hazardous when deposited in the gas exchange region	50% cut at 4 microns (ACGIH-US) 50% cut at 5 microns (BMRC-Europe)

Gilian Cyclones for Respirable and Thoracic Dust Sampling

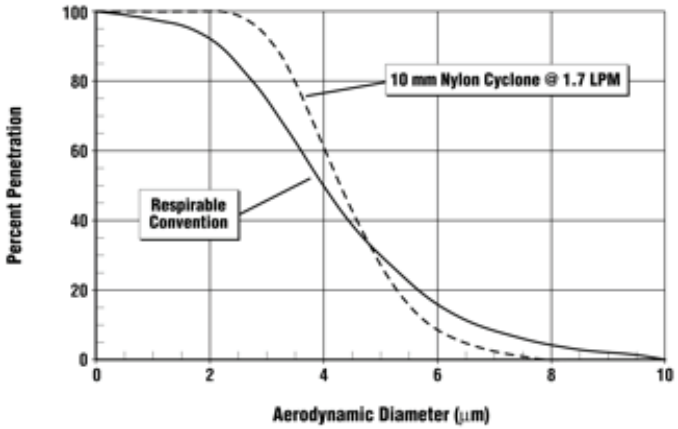
Cyclones have been utilized in personal air sampling since the early 1960s as a way to collect a respirable fraction of airborne dust at a worker's breathing zone. They follow the particle size distribution of the human respiratory system nicely when used at a specific air flow rate. Just as the body removes larger particles in the upper respiratory tract, the cyclone will remove those particles at a similar ratio, allowing the smaller respirable sized particles to collect onto a filter for gravimetric determination or lab analysis. Sensidyne, LP offers a full line of respirable dust cyclones as accessories for Gilian air sampling pumps. Note that some of the cyclones described here were developed in the US and some in Europe, and a few types are used in both markets. The US and Europe follow different particle size distribution curves. The ACGIH in the US specifies a distribution curve with a 50% cut at 4 microns particle size. The BMRC in Europe (UK) specifies a particle size distribution curve with a 50% cut at 5 microns particle size. The same cyclone can be used for both applications, but it will be specified at two different flow rates. Be sure to use the correct flow rate for your intended application.

Traditional 10 mm Nylon Cyclone

10 mm nylon cyclone is used in NIOSH & OSHA sampling methods.

The traditional personal air sampling cyclone in the US is the Dorr-Oliver, 10mm nylon cyclone. It was first utilized in US coal mines in the early 1960's, and it continues to be the most commonly used model in the US. It will follow the US ACGIH size distribution curve (50% cut at 4 microns) closely when used at 1.7 LPM. This cyclone is specified in numerous NIOSH and OSHA Test Methods for use with 37mm, 5 micron, PVC, 3-piece filter cassettes. The GilAir Plus and Gilian 5000 pump models are recommended for use with this cyclone. Calibration jar P/N 7013376 (2 Liter size) is also recommended.

Dust Fraction and Size Distribution



Distribution Curve for 10 mm Nylon Cyclone at 1.7 LPM (vs. ACGIH curve)

Higgins-Dewell Style BGI-4L Cyclone (US Version)

The Gilian BGI-4L is a Higgins-Dewell style aluminum cyclone that operates at 2.2 LPM to produce a 50% cut at 4 microns per the US-ACGIH size distribution curve. This style cyclone is specified in NIOSH 0600 and other respirable dust methods as an alternative to the 10 mm nylon cyclone. It is used with 37 mm, 5 micron, PVC, 3-piece NIOSH-style filter cassettes. The GilAir Plus and Gilian 5000 pump models are recommended.

HD style cyclone with US style cassette is specified in numerous NIOSH protocols

Higgins-Dewell Style FSP-2 Cyclone (European Version)

Identical in function to our BGI-4L Higgins-Dewell style cyclone, this Higgins-Dewell style cyclone incorporates two different styles of European filter cassettes and holders. It is ideal for respirable dust sampling according to HSE MDHS 14/3 (UK) at 2.0 LPM (50% cut at 5 microns). In that sampling method glass fiber filters and MCE filters are recommended, depending upon the application. The GilAir Plus and Gilian 5000 pump models are suggested for use with this cyclone.

HD style cyclone with European style sampling cassette.

Medium Flow Rate GK 2.69

The GK 2.69 respirable dust cyclone operates at 4.2 LPM to follow the US-ACGIH respirable dust size distribution curve with 50% cut at 4 microns. It can also be used at 1.6 LPM to follow convention for thoracic dust sampling with a 50% cut at 10 microns. It also uses 37 mm, 5 micron, PVC, 3-piece NIOSH style cassettes. An alternate version using 25mm cassettes is also available. The Gilian 12 sampling pump is recommended for respirable sampling. The GilAir Plus and Gilian 5000 pump models are recommended for thoracic sampling.

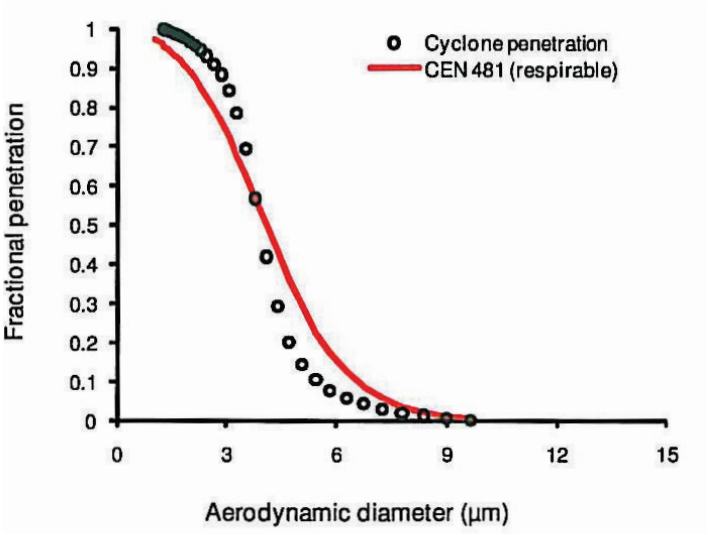
GK 2.69 Cyclone can be used for respirable or thoracic sampling.

High Flow RASCAL Cyclone GK 4.162

The Gilian RASCAL (Respirable Air Sampling Cyclone, Aluminum, Large), made in the US, follows the ACGIH particle size distribution curve (50% at 4µm) at flow rates between 8.5 and 9.5 LPM, per NIOSH Report ECM/2011/03. It is ideal for use with the Gilian 12 air sampling pump for larger volume sampling per the OSHA silica standard. The high flow rate range optimizes the sensitivity for respirable dust and respirable silica dust measurements. The RASCAL is used in conjunction with a 47 mm diameter, 5 micron pore size, PVC filter membrane.

RASCAL Cyclone with Optional Aluminum Filter Holder

RASCAL Cyclone with standard plastic filter holder



Distribution Curve for RASCAL at 9 LPM.

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FSP-10 High Flow European Style Cyclone

Gilian FSP-10 cyclone offers a high flow rate alternative for better sensitivity in silica sampling.

The new OSHA standard for silica dust requires larger air samples to attain improved sensitivity for lab analysis, and application of this high flow European cyclone is described in NIOSH Report ECM/2011/03 using a 37mm, 5 micron PVC filter membrane. Developed in Germany for 10 LPM sampling following Europe's 5 micron 50% particle size curve, it also conforms to the traditional US respirable dust curve (50% at 4 microns) at 11.2 LPM. The unit uses a European style 37mm filter holder, and is suggested for use with the Gilian 12 pump.

Inhalable Dust Samplers

The inhalable fraction of airborne dust represents dust of 100 microns and smaller that can enter the respiratory tract through the nose and mouth. Inhalable dust sampling differs from traditional total dust sampling (or total suspended particulates) in that total dust includes all particulate sizes that can become airborne, and inhalable dust includes only those sizes that can enter the body through respiration.

GSP-3.5 Conical Inhalable Dust Sampling Head

Inhalable dust sampling may be conducted at 3.5 LPM using this European style conical sampling head following HSE MDHS 14/3 (UK). In that sampling method glass fiber filters and MCE filters are recommended, depending upon the application. This unit uses a 37 mm European style sample holder.

Inhalable Dust Sampling Head, UK Style

UK style Inhalable Dust Sampler with reusable 25mm cassette.

Inhalable dust sampling may be conducted at 2.0 LPM using this European style sampling head following HSE MDHS 14/3 (UK). In that sampling method glass fiber filters and MCE filters are recommended, depending upon the application. This unit incorporates a 25 mm reusable cassette.

Ordering Information

Cyclones & Accessories	Part Number
10 mm Nylon Cyclone: Dorr-Oliver (uses 37 mm US style filter cassettes)	800061
Higgins-Dewell style BGI-4L Aluminum Cyclone (Uses 37 mm US style filter cassettes)	811-9924-01
Higgins-Dewell style FSP-2 Aluminum Cyclone (Uses 37 mm German style filter cassettes)	811-9930-01
Medium Flow Rate GK 2.69 Aluminum Cyclone, for 37 mm cassettes	811-9926-01
Medium Flow Rate GK 2.69 Aluminum Cyclone, for 25 mm cassettes	811-9926-02
GK 4.162 RASCAL (Respirable Air sampling Cyclone Aluminum Large) with Plastic Filter Holder	811-9925-01
FSP-10, High flow rate cyclone (uses 37 mm German style cassette)	811-9931-01
Inhalable Dust Samplers	**Part Number**
GSP 3.5 Conical Sampler (Uses 37 mm German style cassette)	811-9929-01
Inhalable Dust Head (UK Style, uses 25 mm special cassette)	811-9909-01
Filters/Cassettes & Accessories	**Part Number**
Filter Media	
Filter Membrane PVC, 5.0µm, 25mm, 100/pk	GF25500PVC
Filter Membrane PVC, 5.0µm 37mm, 100/pk	GF37500PVC
Filter Membrane PVC, 5.0µm 47mm, 100/pk	GF47500PVC
Filter, Glass Fiber Binderless, 1.1µm, 37mm, 100/pk	GFG85037MM
Filter, PTFE, pure 2.0µm, 37mm, 50/pk	GF37200PT
Filter, MCE, 0.8µm, 25mm, 100/pk	GF25080
Filter, MCE, 0.8µm, 37mm, 100/pk	GF37080
Filter, MCE, 0.8µm, 47mm, 100/pk	GF47080
Support Pads	
Filter Support Pads Cellulosic, 25mm, 40.0µm, 100/pk	GPG25100
Filter Support Pads Cellulosic, 37mm, 40.0µm, 100/pk	GPG37100
Filter Support Pads, Porous Plastic, 25mm, 100/pk	GPP3700
Filter, Support Pads, Porous Plastic, 37mm, 20.0µm, 100/pk	GPG37100
US Style Filter Cassettes-Preloaded	
Filter Cassettes, PVC, 5.0µm 37mm, 50/pk (US style 3-piece cassette)	GCU37500PVC
Filter Cassettes, PVC, 5.0µm 37mm, Pre-weighed, 50/pk (US style 3-piece cassette)	GCU37500PVCPW
European Style Filter Cassettes- Cassette only	
Filter Cassettes, 37mm, (German style for 811-9930-01, 811-9931-01 & 811-9929-01), Cassette only	811-9932-02
Filter Cassettes, 25mm, conductive plastic for Inhalable Dust Sampler 811-9909-01 with transport clip (UK style)	811-9910-01
Miscellaneous Accessories	
Calibration Jar, 2L for Dorr-Oliver Cyclone (800061) and Inhalable Dust Head (811-9909-01)	7013376
Calibration Jar, Large Size for FSP-10 High Flow Cyclone (811-9931-01)	Call
Optional RASCAL Aluminum Filter Holder, 47 mm	811-9928-01

Dust Fraction and Size Distribution

Cyclone Specifications

Cyclone Model	Part Number	Material	Overall Height (mm)	Weight Aprox. (Kg)	Flow rate ACGIH Respirable (50% @ 4 µm) (US)	Flow rate BMRC Respirable (50% @ 5 µm) (Europe)	Flow rate Thoracic (50% @ 10 µm)
10 mm Dorr-Oliver	800061	Nylon	160	0.08	1.7 LPM		
BGI-4L, HD style (US version)	811-9924-01	Aluminum	105	0.8	2.2 LPM	2.0 LPM	1.0 LPM
FSP-2 HD style-European Version	811-9930-01	Aluminum	130	0.14	2.2 LPM	2.0 LPM	
Medium flow rate GK 2.69 for 37 mm Cassettes	811-9926-01	Aluminum	125	0.1	4.2 LPM		1.6 LPM
Medium flow rate GK 2.69 for 25 mm Cassettes	811-9926-02	Aluminum	125	0.1	4.2 LPM		1.6 LPM
High flow rate RASCAL Cyclone with Plastic Filter Holder	811-9925-01	Aluminum	170	0.26	8.5 to 9.5 LPM		
FSP-10, High flow rate cyclone	811-9931-01	Aluminum	203	0.26	11.2 LPM	10 LPM	

ACGIH: American Conference of Governmental Industrial Hygienists
BMRC: British Research Medical Council

Inhalable Dust Sampler Specifications

Inhalable Dust Sampler Model	Part Number		Overall Height (mm)	Weight Aprox. (Kg)	Flow Rate
GSP 3.5 Conical Sampler	811-9929-01	Aluminum	75	0.1	3.5
Inhalable Dust Head	811-9909-01	Plastic	125 (including lapel clip)	0.02	2

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