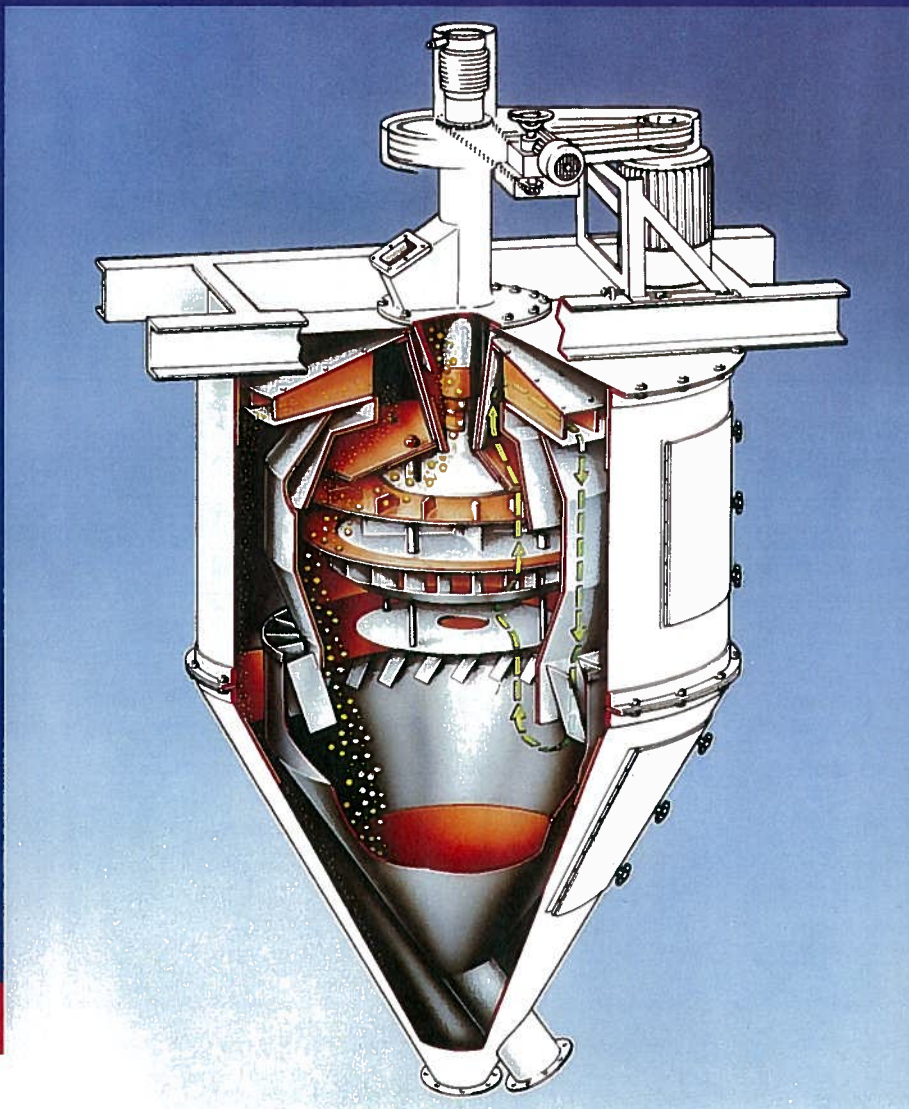# VENTOPLEX® AIR CLASSIFIERS WITH INTERNAL AIR CIRCULATION

HOSOKAWA
MICRON POWDER SYSTEMS
10 Chatham Road • Summit, NJ 07901
Tel. (908) 273-6360 • Fax (908) 273-7432

HOSOKAWA ALPINE Aktiengesellschaft

ALPINE · ALPINE · ALPINE · ALPINE · ALPINE · ALPINE · ALPINE · ALPINE · ALPINE

Trouble-Free Fine Classification

Low specific energy consumption and precise classification at high throughputs

Ventoplex® air classifiers stand out not only because of their economy, but also because of their precision of cut and high specific fines output rates. The total reliability of the machine guarantees a constant end-product quality. Operating safety is a highly-rated priority for all Ventoplex® classifiers.

Standard: The ability to adjust the fineness during operation

Ventoplex® air classifiers effect separations in the fine to medium-fine particle size range from approx. 30 to 300 μ. The fineness can be steplessly set or adjusted during operation – without interruption.

Ventoplex classifiers offer capital investment advantages

A further advantage is that the Ventoplex® classifiers do not require an additional dust separator, e.g. a reverse jet filter. An important aspect of the profitability calculation.

High capacity, economy, and first-class quality make for satisfied customers

The Ventoplex® classifiers can be employed for the most varied materials, and because of their favourable wear behaviour and the high fines capacities per unit achievable, their employment in the mineral powder industry is particularly advantageous, especially for producing fine ceramic powders without iron pick-up. Examples: limestone – dolomite – fireclay – gypsum – quartz – feldspar – pegmatite – raw kaolin – ores – fertilisers – wood flour, etc.

Guide values: Fines throughput capacities with limestone

Fineness[1]	30 μ		45 μ	60 μ	90 μ	150 μ
Throughput[2]	t/hr		t/hr	t/hr	t/hr	t/hr
Feed	Fines		Fines	Fines	Fines	Fines
Model 7 V 0,2–1	0,07–0,1		0,13–0,18	0,15–0,22	0,22–0,35	–
Model 12 V 1,25–5	0,35–0,5		0,5–0,8	0,8–1,2	1,2–1,5	1,5–2
Model 15 V 2,2–9	–		0,9–1,4	1,4–2,0	2,0–2,7	2,7–3,6
Model 18 V 3,5–15	–		1,4–2,1	2,1–3,2	3,2–4,2	4,2–5,6
Model 21 V 5–20	–		2,0–3,0	3,0–4,5	4,5–6,0	6,0–8,0
Model 25 V 7,5–30	–		3,0–4,0	4,5–6,8	6,8–9	9–12,0
Model 28 V 12,5–40	–		3,5–4,5	6,3–9,5	9,5–12,5	12,6–17,0
Model 32 V 15–60	–		–	8,6–12,8	12,8–17	17,0–23,0
Model 36 V 20–80	–		–	11,5–17,5	17,5–23	23,0–30,0

Ventoplex®

The performance capacity of Ventoplex® air classifiers is mostly characterised by the amount of fines which can be obtained. This is dependent on the particle size distribution of the feed material, the precision of cut and the type of material being processed. For limestone ($\mu = 2.7\,g/cm^3$) and many other mineral powders with similar classifying characteristics, the above capacity data represent guide values taken from practical operation for normal precision classifications.
1) Fines fineness d_{97} = particle size where 97% is smaller than the quoted grinding fineness in microns (particle size at which there is 3% residue).

Proven Classifying Principle
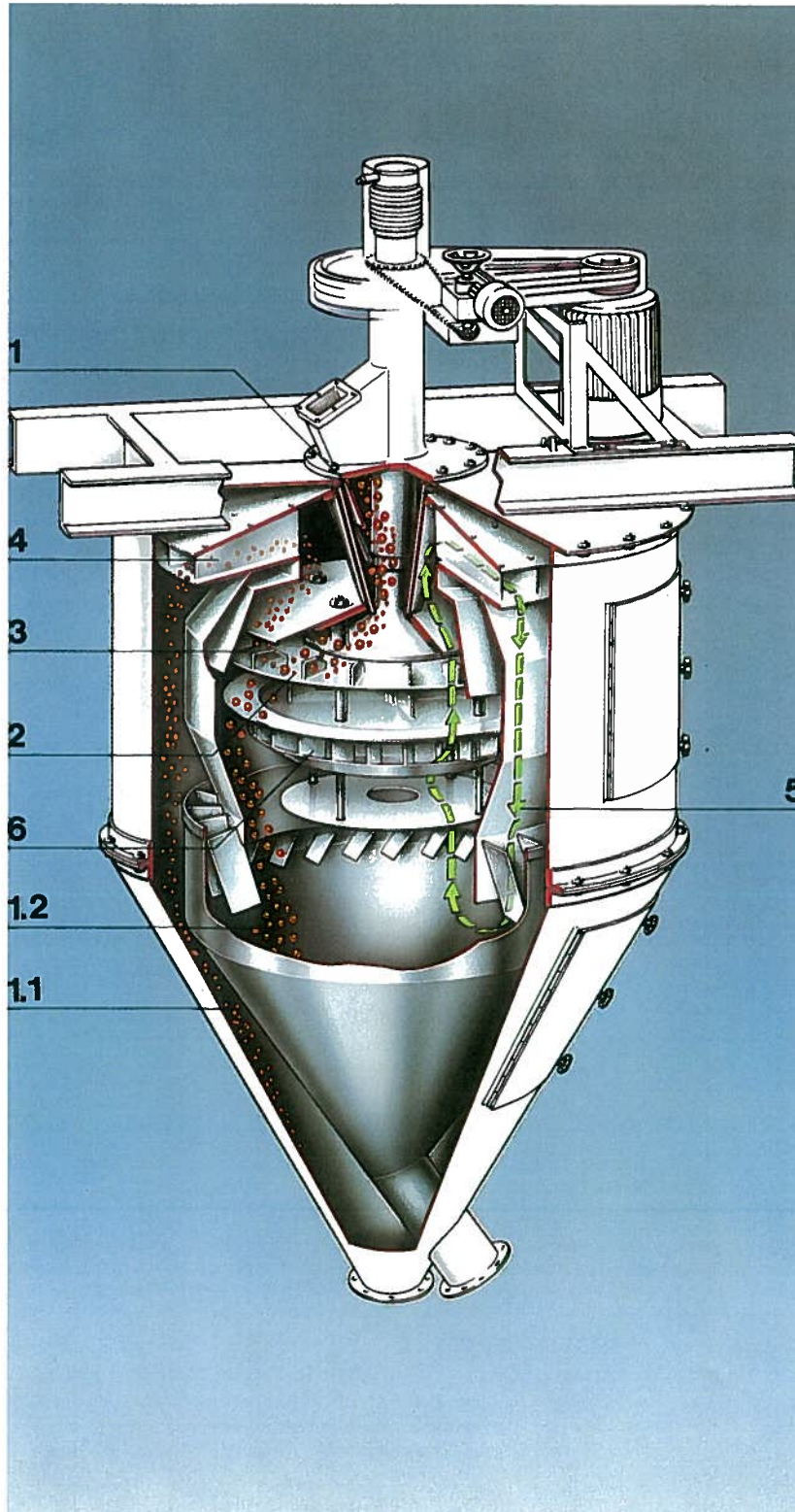
Mode of operation

The Ventoplex® classifiers operate on the proven international air recirculation principle.

The feed material (1) is rated without air. The fines (1.1) and coarse material (1.2) are also yielded without air, meaning that a separate, external dust separator is unnecessary.

This centrifugal plate (2) spins the material into the classifying chamber (3). Classifying air is generated by the main fan (4.). As a result of the low peripheral speed of the centrifugal plate (2) and the low speed of the classifying air (5), Ventoplex classifiers (in suitable design) are particulary suitable for abrasive materials. Manual or motorised adjustment of the fan (6) alters the cut point and thus the end-product fineness:
– finest separation in upper setting
– coarse separation in lower setting

1 = feed material; 1.1 = fines;
1.2 = coarse material
2 = centrifugal plate
3 = classifying chamber
4 = main fan
5 = classifying air
6 = adjustable fan

Product Dedusting

Versatile application for a multitude of separating tasks for end-product finenesses of
d_{97} = approx. 30–300 μ

Ventoplex® air classifiers make short work of solving problems in many different areas.
Whether for normal products, abrasive ones, or for special applications (e.g. explosive dusts; which form deposits materials etc.), the Ventoplex® classifiers deliver excellent product quality and are hardy and durable under even the most trying wear conditions.
The comprehensive product line – from the 7 V pilot system right up to the large classifier 36 V – is your guarantee of fulfilling every capacity requirement demanded in normal practise. Vento-

plex air classifiers can be found in operation in all areas:
limestone – lime (burnt lime, hydrated lime, manuring lime, fodder lime, etc.) –bentonite – dolomite – gypsum – slate powder – serpentine – raw kaolin – pearl white – pyrite – quartz – phosphor – cellulose – glass powder – wood sanding dust – abrasives – bone powder – animal carcass powder – chicken powder – rice powder, etc.

*separating range dependent on classifier model, material density, and particle shape, etc.

Practical capacity examples
These capacity values do not represent maximum values in respect of the achievable fineness, precision of cut, and throughput. Alpine is happy to quote guaranteed values in individual cases, or will determine them through trials in the testing centre.
The fineness values d_{50}, d_{90}, and d_{97} is the particle size at which 50, 90, or 97% passes through.

Product specification			Capacity values – Ventoplex Model 12 V			
Material	Feed fineness		Throughput		Fines-fineness	
	d_{50}	d_{90}	Feed	Fines	d_{97}	d_{50}
Aluminiumoxide	35 μ	80 μ	1350 kg/hr	410 kg/hr	50 μ	20 μ
Dolomite	120 μ	500 μ	3700 kg/hr	930 kg/h	63 μ	17 μ
	120 μ	500 μ	3700 kg/hr	1220 kg/hr	90 μ	22 μ
Corundom	15 μ	60 μ	600 kg/hr	540 kg/hr	70 μ	11 μ
	15 μ	60 μ	570 kg/hr	420 kg/hr	40 μ	10 μ
Feldspar	35 μ	100 μ	1450 kg/hr	650 kg/hr	55 μ	23 μ
	60 μ	120 μ	1300 kg/hr	330 kg/hr	50 μ	15 μ
	50 μ	140 μ	3070 kg/h	430 kg/hr	45 μ	16 μ
Fly ash	63 μ	210 μ	1600 kg/hr	450 kg/hr	70 μ	15 μ
Ilmenite	75 μ	145 μ	2500 kg/hr	680 kg/hr	63 μ	32 μ
	75 μ	145 μ	1700 kg/hr	170 kg/hr	40 μ	19 μ
Calcium hydrox.	26 μ	63 μ	1660 kg/hr	1175 kg/hr	60 μ	18 μ
Limestone	35 μ	140 μ	1000 kg/hr	350 kg/hr	35 μ	12 μ
	40 μ	360 μ	2200 kg/hr	1490 kg/hr	90 μ	18 μ
	40 μ	360 μ	1900 kg/hr	1060 kg/hr	63 μ	8 μ
	65 μ	300 μ	3500 kg/hr	1100 kg/hr	60 μ	18 μ
Manganese diox.	70 μ	180 μ	1500 kg/hr	735 kg/hr	120 μ	28 μ
Phosphor, red	10 μ	400 μ	500 kg/hr	280 kg/hr	40 μ	5 μ
Quartz sand (argentiferous sand)	50 μ	135 μ	1020 kg/hr	250 kg/hr	40 μ	18 μ
	50 μ	135 μ	1650 kg/hr	400 kg/hr	45 μ	18 μ
	50 μ	135 μ	1270 kg/hr	450 kg/hr	63 μ	20 μ
	50 μ	135 μ	1500 kg/hr	640 kg/hr	80 μ	18 μ
	50 μ	135 μ	1530 kg/hr	710 kg/hr	100 μ	23 μ
	50 μ	200 μ	2040 kg/hr	1020 kg/hr	150 μ	35 μ
Silicon carbide	20 μ	70 μ	500 kg/hr	335 kg/hr	45 μ	13 μ

Practical Examples

Precise separations when dedusting

When dedusting, the Ventoplex® has the task of separating the feed material so that the fine fraction only contains the nuisance ultra-fine portion and the coarse fraction (more often than not the desired end product) contains only the coarse portion. Even with demanding tasks such as these, the Ventoplex® air classifiers rise to the occasion and demonstrate their superior performance and advantageous features: the high precision of cut ensures that even relatively small amounts of fine dust are separated from coarser granulations; and the low air flow speeds in the classi-

fier enable a gentle classification without size reduction – and thus without additional dust formation.
The separation curves show examples taken from practical operation. As can be seen, the Ventoplex® classifiers operate precisely not only in the fine range with separations of 40 µ (Fig. 1 + 2), but also when separating the dust portion smaller than 160 µ (Fig. 3): the end products (coarse material) are practically free from dust; the yielded fine portion, and thus loss of material, is low.
Further examples: foundry sand, quartz, basalt, steel powder, etc.

Dicalcium phosphate
Requirement:
Separate the dust below 40 µ

Residue R in %
Particle size d in µ
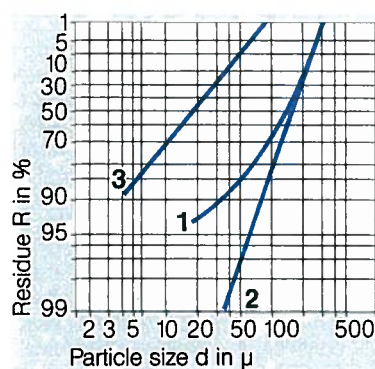
Ventoplex® 12 V model

Feed	approx. kg/hr	1000
Dust extract	approx. %	8.8
	≙	88

Particle size distribution
Feed material	(1)	12% < 40 µ
Coarse material	(2)	1.5% < 40 µ
Fines	(3)	78%. < 40 µ

Permissible fine portion below 40 µ in coarse material/end product up to a max. of 3%
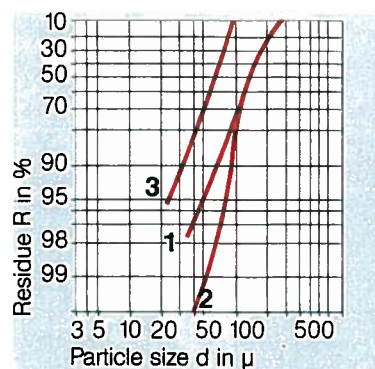
Analysis device
Alpine Air Jet Sieve 200 LS

Potassium sulphate
Requirement:
Separate the dust below 40 µ

Residue R in %
Particle size d in µ

Ventoplex® 25 V model

Feed	approx. kg/hr	13000
Dust extract	approx. %	15.8
	≙ kg/hr	2054

Particle size distribution
Feed material	(1)	4.5% < 40 µ
Coarse material	(2)	0.4% < 40 µ
Fines	(3)	20.4% < 40 µ

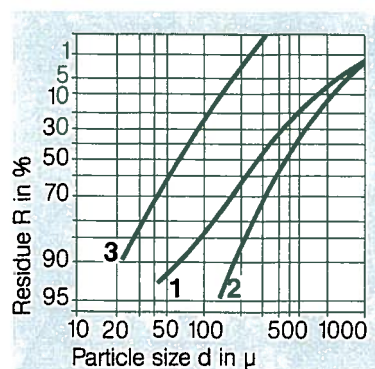Permissible fine portion below 40 µ in coarse material/end product up to 0.5%

Analysis device
Alpine Air Jet Sieve 200 LS

Rock salt
Requirement:
Separate the dust below 150 µ

Residue R in %
Particle size d in µ

Ventoplex® 28 V model

Feed	approx. kg/hr	30000
Dust extract	approx. %	29
	≙ kg/hr	8700

Particle size distribution
Feed material	(1)	26% < 150 µ
Coarse material	(2)	6.5% < 150 µ
Fines	(3)	90% < 150 µ

Permissible fine portion below 150 µ in coarse material/end product 5–7%.

Analysis device
Alpine Air Jet Sieve 200 LS

Mechanically Reliable
Technically Versatile

The Ventoplex® Concept

The schematics merely represent set-up possibilities; special measures and assemblies can be used to tailor the Ventoplex® classifier to the specific problem and to expand the range of application.
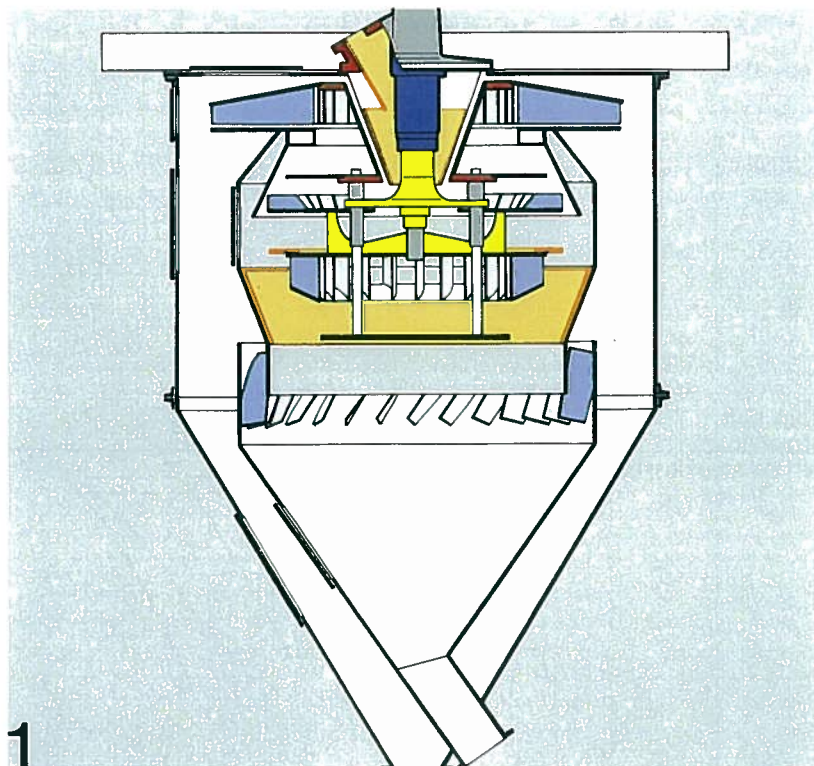
Design 1
Standard construction
Simple and sturdy construction are key characteristics of every Ventoplex® design. The exclusive use of proven materials increases the operating safety and reduces maintenance to a minimum.
Exchangeable, steel wear-protection parts from the basis of every Ventoplex® classifier design, from the standard design 1 on up. These parts are colour-coded in the adjacent sketches.
The Ventoplex design 1 represents the ideal classifier for all low-wear materials. And because in many cases, minerals are processed in bulk, the limit for economical application is a maximum of 3 when measured on the Mohs hardness scale.
Examples: talcum, rock salt, gypsum, limestone, whetstone, etc.

Three basic designs
The individual conditions are the determining factors for the Ventoplex® air classifiers designs.

Decades of application experience in constructing Ventoplex® classifiers are the basis of today's product line and standard designs. Constructive, effective improvements have been constantly incorporated with the result of a 20 % increase in capacity.

The majority of problem specifications can be optimally solved by three basic designs.

Long-term economical advantages – plus iron-free classification – are achieved when processing abrasive materials by using exchangeable classifier parts and linings to protect wear-endangered sections.

Depending on the material to be classified and the wear-endangered areas in the classifier, Alpine selects different wear-protection materials, e.g. soft or hard steel, hard alloy, ceramic, wear-proof coatings, soft rubber, and Vulkollan, etc.

Special designs
For numerous special cases, e.g. in the chemical industry, Alpine constructs the Ventoplex® air classifiers in application-orientated special designs.
Generally speaking, the following demands have to be met:
☐ Explosion-pressure-shock-proof designs, so that even explosive dusts can be classified safely.

☐ Gastight designs for operation with inert gas, for reliable prevention of dust explosions.

☐ Protection against material build-up when processing products which tend to deposit.
The points of the classifier endangered by such deposits, for example, are protected with a special elastic rubber. This flexible lining prevents the material from depositing and thus the Ventoplex® classifier from blocking.

☐ Stainless materials, etc.

The Ventoplex concept, as a sum of all the designs, always offers the right solution for separating tasks in the medium-fine powder range.

1

Individual Wear Protection Decreases Maintenence Costs
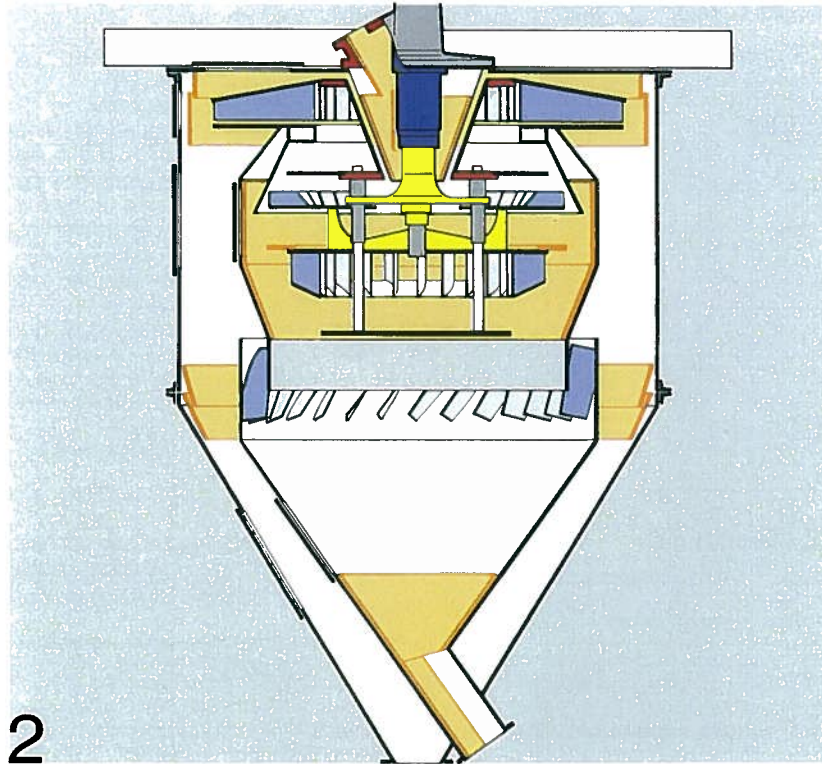
Design 2
Steel wear protection

Some classifier parts are generally subjected to a higher degree of wear when processing harder, more abrasive materials.

For materials with a Mohs hardness above 3, or for soft materials which nonetheless contain a great deal of harder, abrasive contaminants, Alpine recommends employment of the Ventoplex design 2. This design is characterised by additional protective measures to classifier parts which are constantly subject to wear.

In principle, every wear problem demands an individual solution. The Ventoplex with steel wear protection principally offers excellent durability with: dolomite, magnetite, limestone with a high quartz content, calcite, ilmenite, apatite, pyrite, carbon, and ore, etc.

Orange and brown colour-coded components are designed as exchangeable wear-protection parts.

2

Design 3
Rubber/Polyurethane wear protection

For extremely hard, abrasive materials – or if iron-free classification is required – Alpine uses rubber/polyurethane wear protection to fulfil these high technological demands.

Product contact surfaces are either lined with rubber/polyurethane, or the affected parts are suitably coated.

The Alpine experts are happy to provide precise information on the specific material attributes, for example the temperature stability.

Typical key application areas for the Ventoplex® design 3 are: Quartz/argentiferous sand, zircon sand, abrasives, feldspar, pegmatite, raw kaolin, glass, and fireclay, etc.

3
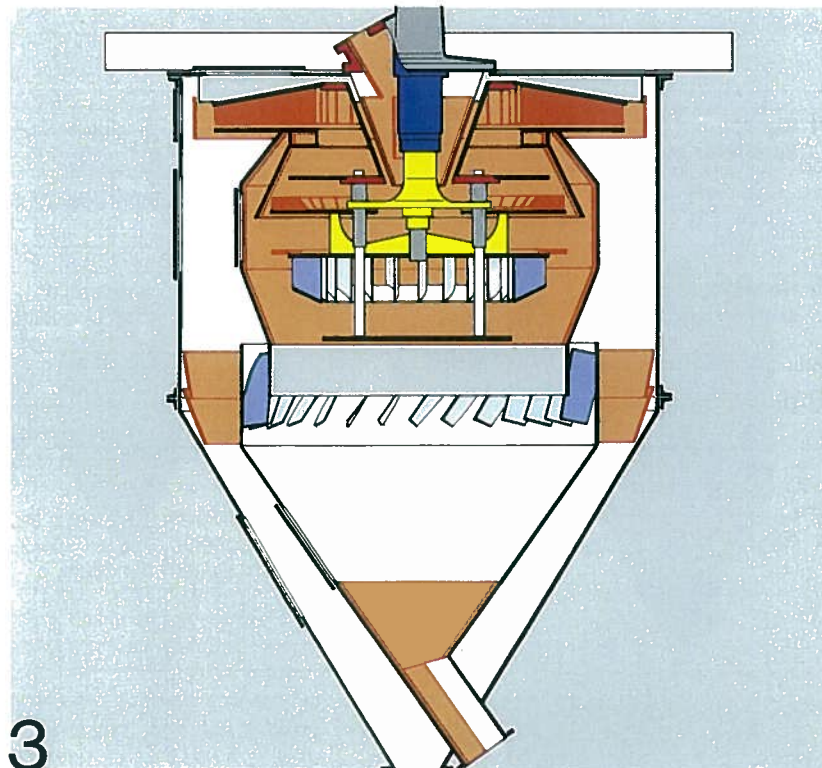
Ventoplex® Features at a Glance

| Characteristics	Special features
1 Classifying principle	Closed-circuit classifier with internal air circulation, characterised by: ☐ High specific fines capacity. The permissible amount of fines depends on the particle size distribution of the feed material. The greater the percentage of fines contained in the feed material, the higher the capacity of fines that the Ventoplex® can classify out. ☐ High insensitivity to overload with increasing feed amounts. The quality of the fines is practically independent of the amount of feed; the higher portion of fines in the coarse material with increasing feed is in most cases desirable. ☐ Low specific energy consumption. ☐ Low degree of wear
2 Classifying air	Additional classifying air does not need to be supplied. An external dust separator, e.g. reverse jet filter, is also not needed. Low airflow speeds lessen the possibility of wear occurring.
3 Fineness adjustment	Stepless, even during operation. The adjustment assembly can be designed to order: – for manual operation – as a motorised unit with or without remote control.
4 Centrifugal plate (4.1) **Ventilator system (4.2)**	Low peripheral speed of product supply and air supply results in: – high resistance to wear – gentle classification without additional dust formation
5 Hermetically-sealed, sturdy bearings	Trouble-free in continuous operation. A further plus which reduces operating costs.
6 Doors/inspection openings	Easy access to the classifying components for inspection and maintenance. Doors located to order.
7 Product feed (7.1) **Coarse material discharge (7.2)**	Minimal height difference between the important components enables space-saving, low-cost system concepts.
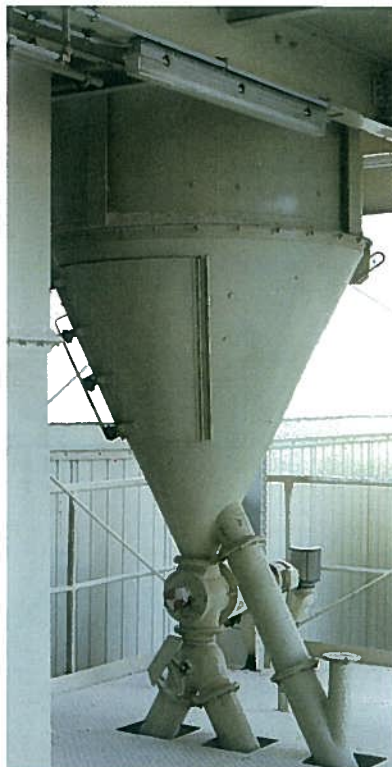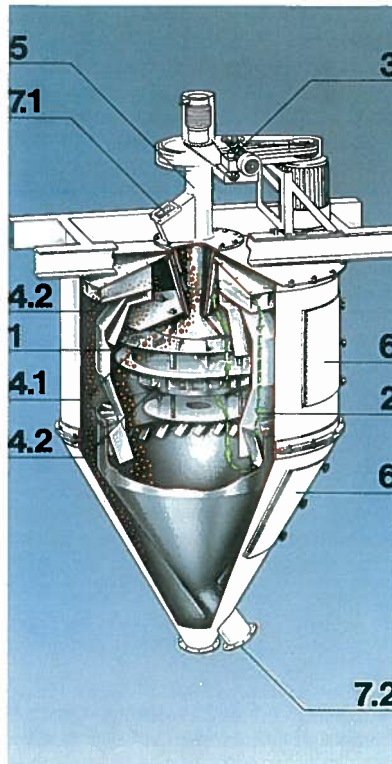
Model Range

Ventoplex®-Air Classif.[1] Model			7 V	12 V	15 V	18 V	21 V	25 V	28 V	32 V	36 V
Scale-up factor[2]	F = ap.		—	1	1,7	2,8	4	5,9	8,2	11,5	15,4
Standard drive											
without starting clutch		kW	1,5	4	5,5	7,5	11	—	—	—	—
with starting clutch		kW	—	—	—	—	—	15	22	30	45
motor speed		r.p.m.	1500	1500	1500	1500	1500	1000	1000	1000	1000
motor construction			V6	V6	V6	V6	V6	V6	V6	V6	V6
Centrifugal plate											
speed		r.p.m.	1140	640	500	450	360	315	280	240	210
direction of rotation			☺	☺	☺	☺	☺	☺	☺	☺	☺
Weights											
standard design		kg	450	800	1000	1800	2500	3500	4500	7500	9000
steel wear protection		kg	550	900	1200	2200	3000	4200	5500	8500	10500
rubber wear protection		kg	550	900	1200	2200	3000	4000	5000	8000	10000
motor		kg	16	45	65	70	115	175	280	350	660
Classifier volume[3]		m³	0,4	1,3	3	5,4	8	11	17	24,5	34,5
Fineness adjustment[4]			T	T	T/Ⓜ	T/Ⓜ	T/Ⓜ	T/Ⓜ	T/Ⓜ	T/Ⓜ	T/Ⓜ
Main dimensions											
overall height	A	mm	1900	2820	3250	4080	4425	4825	5440	6230	6770
housing - ø	B	mm	760	1200	1500	1800	2100	2430	2800	3200	3600
maintenance space[5]	C	mm	200	500	300	300	300	300	450	1200	1340

[1] **Delivery status.** Depending on the model, the classifier is sometimes dispatched in a partially assembled condition.
To order, Alpine will complete the assembly on site.

[2] **The scale-up factor** is intended as a guide value only within the same fineness range of the respective classifier.

[3] **Classifier volume.** The volume of the empty classifier serves to calculate the "catastrophe weight" in the event that the classifier runs full due to a malfunction of the system.

Capacity examples see page 2. Model 7 V without factor (pilot system).

[4] **Fineness adjustment.** The symbols designate:

[T] Manual fineness adjustment (Basic design)
Ⓜ Motorised remote control assembly (design to order)

[5] **Maintenance space.** Necessary space under the classifier to remove the fines cone for maintenance work.

Model 7 V to 36 V – size comparison
Compact construction enables space-saving system design

12 V 15 V 18 V 21 V 25 V 28 V 32 V 36 V
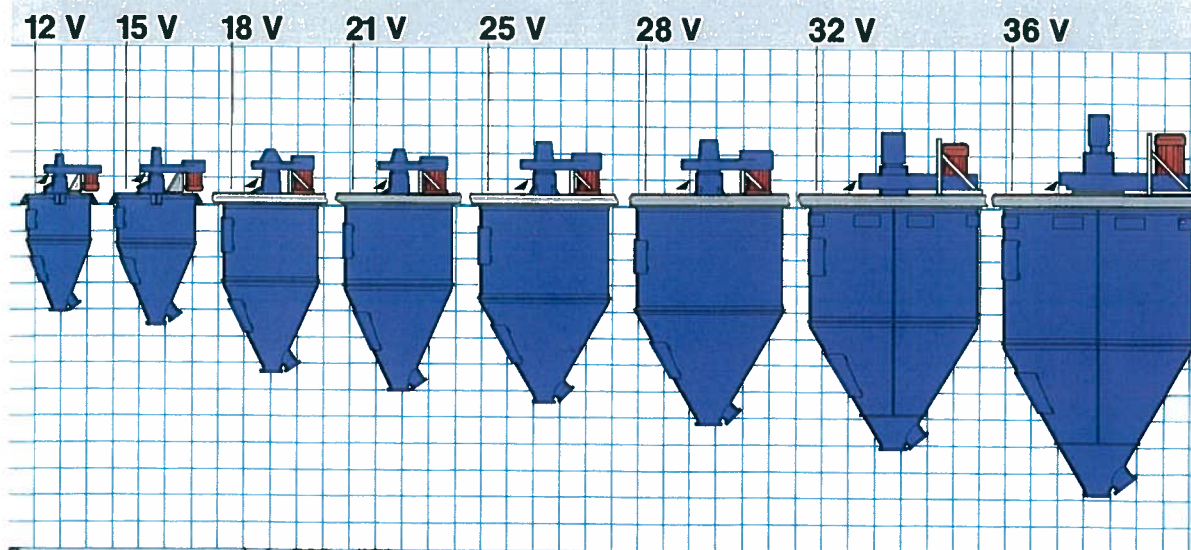
One square corresponds to 500 x 500 mm.
Alpine will place binding dimensional drawings at your disposal, with reference to your project.

Compact Construction Brings Engineering Advantages

Circuit grinding systems

Ventoplex® air classifiers are often used together with ball mills in circuit grinding systems. Due to the low wear and the possibility of achieving very high throughputs per classifier unit, Ventoplex classifiers are mainly incorporated into systems which produce fine mineral powders.

In grinding systems where different end-product finenesses are to be achieved, the flexible Ventoplex® classifiers can be adapted quickly to the respective requirements. For example, the fineness adjustment assembly enables the product fineness to be steplessly adjusted within a wide range during operation.

A critical factor when planning a classifier into a system is the distance between the point at which the product is fed into the classifier and the coarse material discharge, because the coarse material is frequently returned to the mill inlet via gravity ducts. Generally speaking, product feed is effected with bucket elevators. The compact construction of the Ventoplex enables the overall height of this conveying device, and with new systems the ceiling height (and thus the costs), to be kept low.

The compactness of design, low overall height, and low construction bulk are very favourable factors when it comes to planning the Ventoplex® air classifiers into existing systems where only limited space is available.

Figure

Ventoplex Air Classifier Model 25 V
The complete grinding-classifying system with Super Orion Ball Mill S.O. 190/690 was supplied by Alpine for the production of fine quartz powder/argentiferous sand.
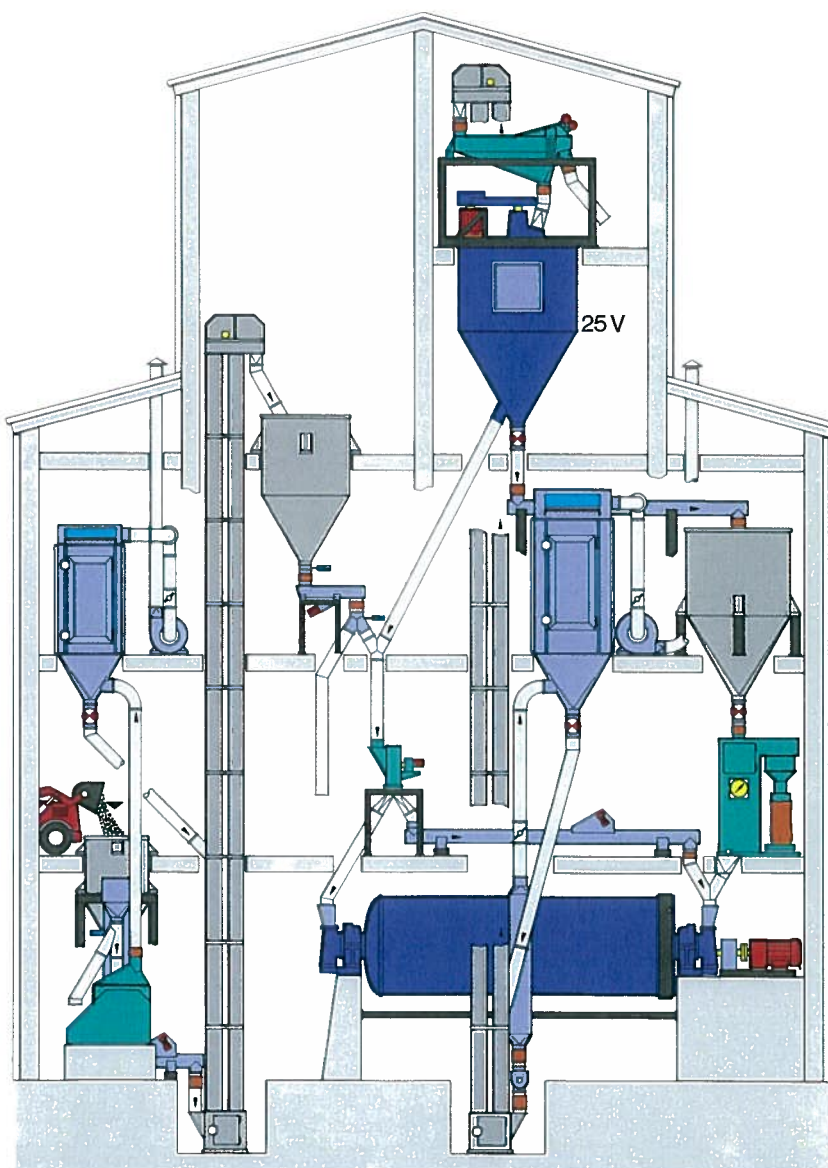
Practical examples:

Fineness d_{97}	Capacity		Approx. Energy Consum.*
	Fines	Feed	
150 μ	6 t/hr	12 t/hr	2 kWhr/t
100 μ	4,2 t/hr	9 t/hr	2,8 kWhr/t
80 μ	3,75 t/hr	9 t/hr	3,2 kWhr/t
63 μ	2,65 t/hr	7,5 t/hr	4,5 kWhr/t
40 μ	1,5 t/hr	6 t/hr	8 kWhr/t

*Specific energy consum. during classification

Ventoplex® Air Classifiers: Always Economical to Run, Successful in Numerous Systems

Further supply examples
Figure: Ventoplex® Model 36 V
Product	spent limestone
Feed	approx. 36 t/hr
Fines	approx. 22 t/hr
Fineness	3% R 90 μ
Spec. energy	2.05 kWhr/t

Product: Limestone
Ventoplex® Model 36 V
Feed	approx. 35 t/hr
Fines	approx. 10 t/hr
Fineness	3% R 130 μ

Product: Cornstarch
Ventoplex® Model 21 V
Feed	approx. 5 t/hr
Fines	approx. 4.88 t/hr
Fineness	1% R 160 μ

Product: Chicken meal
Ventoplex® models 15 V, 18 V, 21 V, and 32 V are frequently employed to classify chicken, pork, and fish meal.
Aim of classification:
– Produce a fine product (end product) with approx. 5% R 630 μ
– Increase the ash content in coarse material.
Feed for Model 32 V: approx. 15 t/hr

Product: Fly ash
Supply scope:
– Alpine S.O. 200/470 Ball Mill
– 2 x Ventoplex Model 32 V
System fines capacity:
– 18 t/hr at 20% R 63 μ
– 15 t/hr at 10% R 63 μ
– 10 t/hr at   5% R 63 μ

◀ Figure Ventoplex Model ...

Alpine Classifying Technology – Successful the World Over, Available for Trials in the Alpine Testing Centres

Alpine Classifying Technology – Systems and Ranges of Separation

Separating range $d_{97} = 3$–150 µ
Turboplex® Classifiers

The advanced Turboplex® classifying technology enables separation with product finenesses of down to $d_{97} = 3$ µ. With exact precision of cut – and high throughputs.

The multi-wheel classifying principle: To increase the specific throughput rate, up to 6 classifying wheels are incorporated into the head of a Turboplex classifier.
Patented technology – exclusive to Alpine the world over!

Model range:
Models ATP 100; 100/4; 200; 200/4; 315; 315/3; 315/6; 500; 500/4; 630; 750

Separating range $d_{97} = 30$–300 µ
Ventoplex® Classifiers

Matured to technical perfection: the Alpine Ventoplex air classifiers realizes one of the oldest classifying principles.

Constant improvements incorporating the latest in classifying technology have kept the Ventoplex in the Alpine product range for over 80 years, and have led to today's outstanding performance:
– extremely high specific fines throughput;
– low energy and wear costs.

Model range
9 machines sizes up to 3600 mm housing diameter.

Separating range $d_{97} = 0.1$–10 mm
Zigzag Classifiers

Two versions – each in many sizes – designed as a single- or multi-tube classifier. The throughput ranges from several kg/hr with the laboratory classifier to approx. 200 t/hr with the multi-tube production classifier.

MZM model

MZF model

Application-technical tests
The Alpine application testing centres in Augsburg, Great Britain, and the USA each have a wide range of equipment at their disposal for conducting customer trials with the aim of laying out the perfect system for the requirement in hand.
The versatility and diversity of the systems for size reduction, air classification, sieving, and mixing, etc., as well as the scope of the general facilities available are both astounding and impressive.
Test results are recorded and commented upon in comprehensive test reports for each customer, and with the Ventoplex test reports, additional information is given on which materials can be economically and advantageously combined in the various application areas. Only when the tested system has proved itself as the optimum solution for the customer's requirements, does Alpine recommend it for practical operation.

Alpine also specialises in finding effective solutions to engineering problems, for example when single machines are to be incorporated into existing systems, or when a complete system is to be engineered.

In fact, Alpine is an experienced partner in each and every phase of counselling and engineering, drawing on its worldwide organisation of experts to find the best solution to your problem.

Special brochure upon request:
"Introducing the New Alpine Testing Centre"