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AIR CLASSIFIERS FOR CEMENT AND MINERALS

CTC SERIES

CEMTEC

Cement & Mining Technology

CEMTEC – your partner for success.

CEMTEC operates on the basis of individual responsibility. Each member of our team is authorised to make high-level decisions. The entire responsibility for a project – from planning to commissioning – rests with a single person. This means that you will have the same, competent contact partner for all your queries, wishes and suggestions, without exception. In addition to standard orders, your individual requirements can also be fulfilled rapidly and without complications.

CEMTEC HEADQUARTERS AT ENNS AUSTRIA

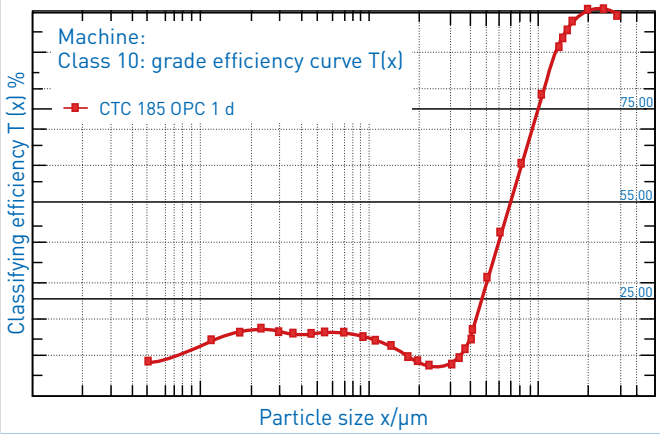
CEMTEC manages projects for the cement and processing industry worldwide.

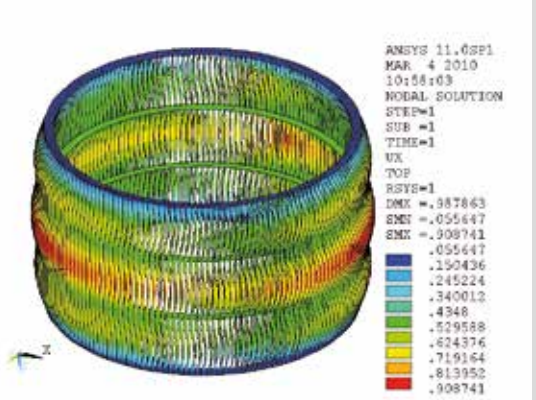
CEMTEC supervises each project from start to finish. From planning to commissioning. Our product spectrum includes tube mills for grinding a wide range of bulk materials and minerals, as well as rotating drums for thermal treatment (calcination, drying, cooling) and mechanical processing (mixing, washing, conditioning, etc.) of different bulk materials. We also offer erection supervision, commissioning and technical support. Successful projects all over the world attest to the competence of CEMTEC.

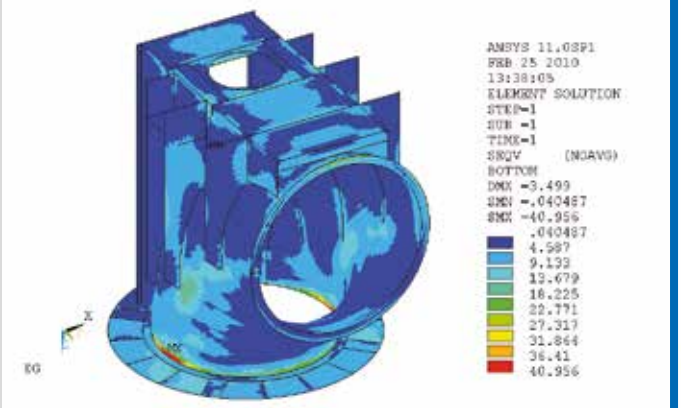
Classification in new dimensions

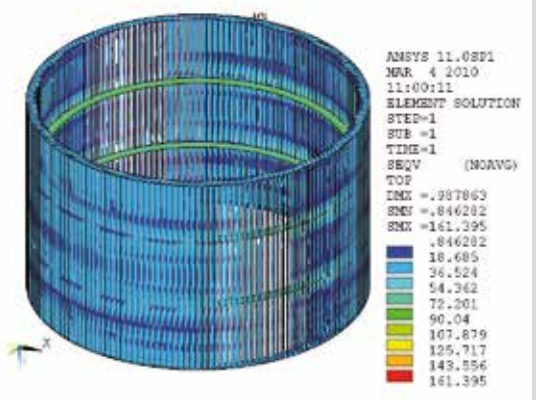
The new CTC fine classifier series is based on the latest findings (4th generation) in the field of classification technology.

This series was developed by a team of experts with international experience and extensive know-how in machine and process engineering development and the design of air classifiers for classifying cement, slag, raw meal and other bulk mineral goods such as $CaCO_3$ or dolomite, together with the required steps such as reconciliation with the grinding unit and configuration of the corresponding peripheral equipment (materials handling, air technology, product transport).









CLASSIFIERS

The design of this series was geared to optimized production, operating and maintenance costs. This was achieved by new combinations of rotor geometry and improved flow design. It is expressed in classifying efficiency, low bypass of fines (see Tromp's curves) and the resulting reduced pulverization and classification energy.

The corresponding stress design and optimisation by FEM simulations, together with vibration tests and modal analyses, guarantee the lowest possible maintenance costs on the one hand and optimised manufacturing costs on the other hand. This means that all series are designed so that the critical rotor speeds far exceed the maximum operating speed.

The optimised classification installation is supplemented by comprehensive advice for the required peripheral equipment, which plays a critical role in ensuring optimum production conditions.

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Advantages of the CTC air classifier series

Extremely good top cut (d98)	due to specially formed rotor blades and rotor labyrinth with sealing air
Low vibration level	max. operating speed < n-critical
Low operating costs	due to low speed levels
Reduced pressure loss	due to optimised air-flow design (spiral housing and air guide vanes) and reduced speeds (curved rotor blades)
Reduced power consumption	due to reduced operating speed and pressure drop
Reduced wear	due to reduced operating speeds and optimised wear protection on areas subject to stress, due to use of high-strength steels, compound liner plates and highly wear-resistant HVFB coatings on exposed areas (depending on respective application)

ADVANTAGES

The newly developed CTC series (for fine industrial minerals d98= 25-30 µm) is a new and innovative design which guarantees peak production with the finest quality and optimised operating costs.

The modular built classifier permits optimum tailor-made solutions for CEMTEC ball mills and vertical roller mills.

Since the classifier series are modular, versions with air feed from below are also possible (combined with the CEMTEC vertical roller mill series) or as a standalone solution for tailor-made applications.

Detail-oriented, sophisticated and practical solutions secure a number of advantages which are reflected in quality, low installation, production and maintenance costs.

General function of the CTC series

The CTC series are designed as rod basket deflector wheel classifiers and geared to the varying requirements for cement, slag and raw meal classification. Particle sizes with a top cut (d98) as low as 30-25 µm are obtained for slag and cement.

In the CTC series the coarse fraction is fed into the classifying chamber via an air slide and distributor plate. The air flows tangentially into the classifying chamber via an aerodynamically configured spiral housing and air guide vanes, whereby the coarse fraction fed in from above is pre-accelerated and brought to rotor peripheral speed by the flow forces. In the classifying zone the coarse fraction is exposed for the main part to centrifugal, drag and flow forces.

In the classification zone the particles are subjected to two main forces

- centrifugal force

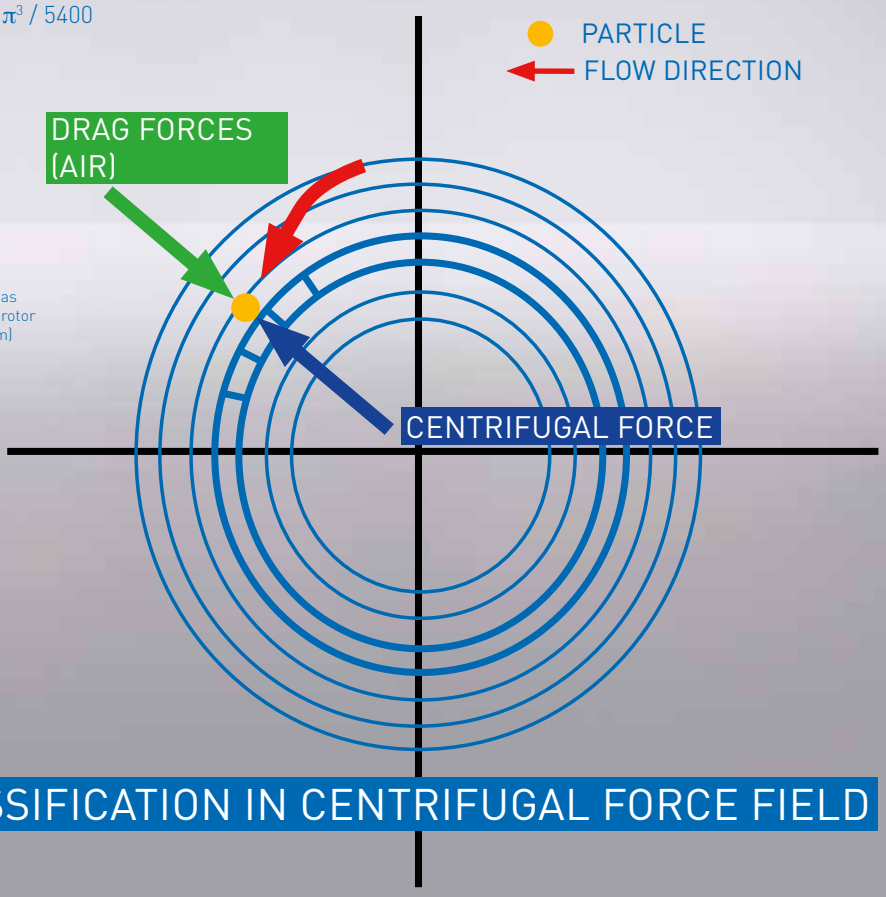
$$F_c = d_p^3 * \rho_p * R * n^2 * \pi^3 / 5400$$

and

- drag force of the air

$$F_w = d_p * 3\pi * \eta_g * v_{rad}$$

d_p	particle diameter
ρ_p	particle density
η_g	viscosity of the gas
v_{rad}	radial speed of the gas
R	radius of classifying rotor
n	operation speed (rpm)



CLASSIFICATION IN CENTRIFUGAL FORCE FIELD

FUNCTION

Centrifugal force predominate for particles larger than the cut size, and drag forces predominate for particles smaller than the cut size. The coarse particles fall spirally outside the rotor bowl into the coarse particle discharge, the finer particles are transported by the air flow through the rotor and fine particle discharge to the downstream classification devices.

In practice, the interaction of the classification forces is far more complex, because particle swarms (intensive dust clouds) rather than individual particles are subjected to the process.

With the appropriate engineering design the centrifugal force generated by the rotation of the classifier cage is amplified by effective flow configuration. This additionally reduces the possible cut size. The classifying rotor can then operate at a lower speed (with correspondingly less pressure loss).

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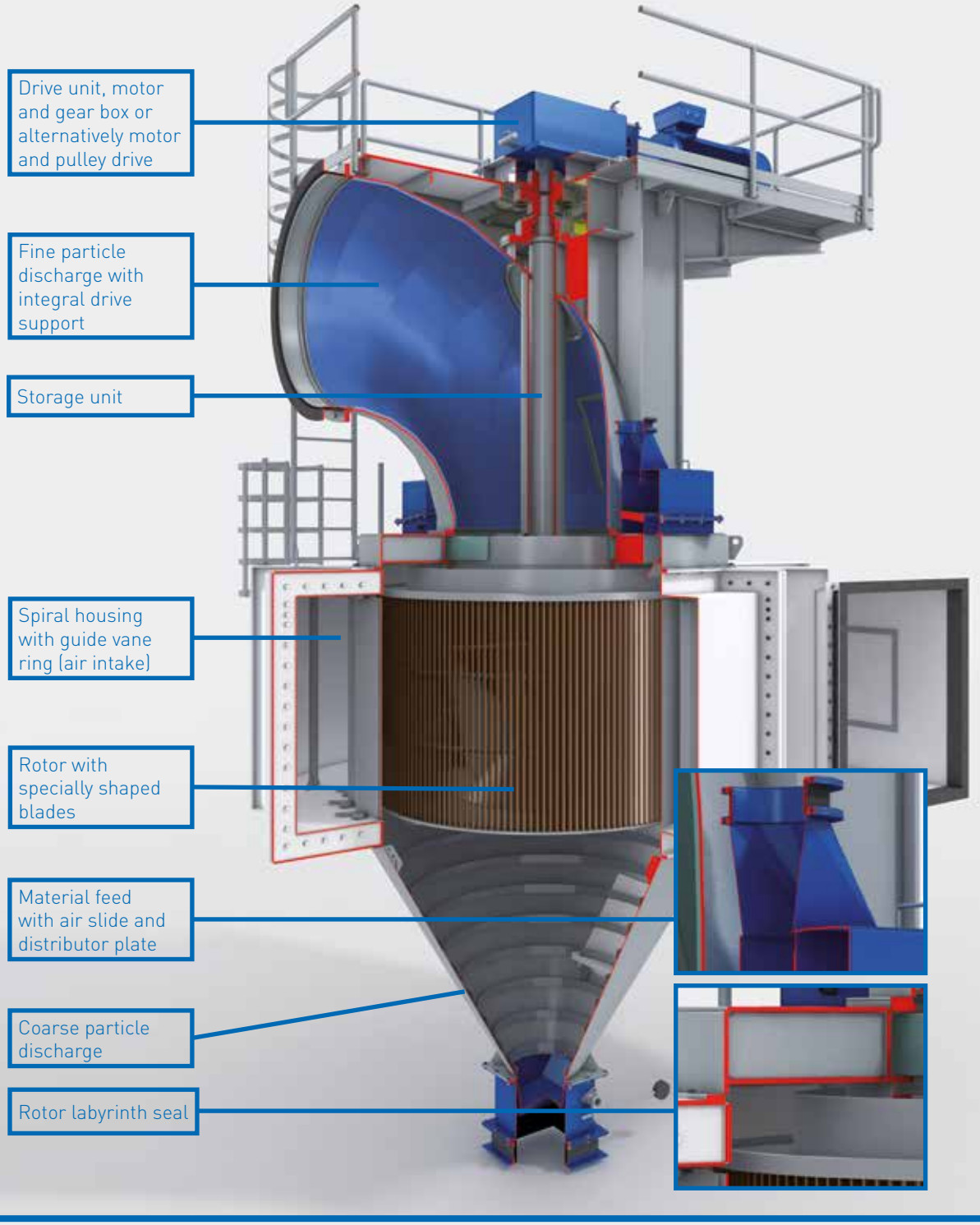
General structure and function of CTC classifiers

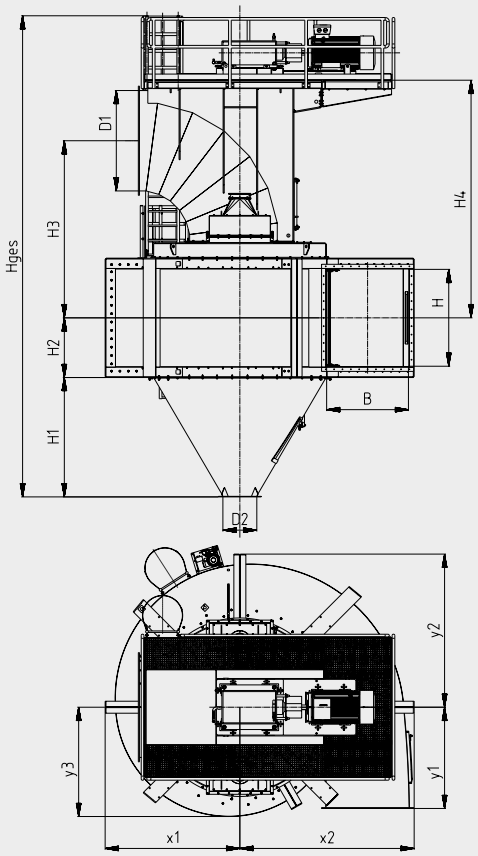
Classifiers consist of the main assemblies shown below. The classifier bearings can be lubricated by a circulatory oil lubrication system with integral oil cooler or by a grease lubrication system. This ensures adequate lubrication conditions over the entire speed range and for higher process temperatures.

GENERAL STRUCTURE



SIZE		CTC-0019	CTC-0030	CTC-0045	CTC-0075	CTC-0090	CTC-0110
Classifer air flow	m³/h	19.000	30.000	45.000	75.000	90.000	110.000
Class airflow steps		1,00	1,58	1,50	1,67	1,20	1,22
Max. classifier speed	rpm	529	474	424	376	359	342
Max. installed power	kW	75	90	90	110	110	132
Max. fines FG t/h	t/h	15	24	36	60	72	88
Max. feed total AG t/h	t/h	42	66	99	165	198	242

SIZE		CTC-0140	CTC-0165	CTC-0185	CTC-0200	CTC-0240	CTC-0285
Classifer air flow	m³/h	140.000	165.000	185.000	200.000	240.000	285.000
Class airflow steps		1,27	1,18	1,12	1,08	1,20	1,19
Max. classifier speed	rpm	321	309	300	295	281	268
Max. installed power	kW	160	200	250	300	355	400
Max. fines FG t/h	t/h	112	132	148	160	192	228
Max. feed total AG t/h	t/h	308	363	407	440	528	627



CTC SERIES

SIZE	CTC-0019	CTC-0030	CTC-0045	CTC-0075	CTC-0090	CTC-0110	CTC-0140	CTC-0165	CTC-0185	CTC-0200	CTC-0240	CTC-0285
D1	620	770	924	1174	1274	1400	1580	1700	1800	1880	2040	2220
B	1080	1220	1220	1330	1450	1420	1420	1450	1480	1500	1550	1650
H	610	740	900	1140	1170	1350	1530	1670	1770	1830	2010	2170
H1	844	997	1191	1455	1573	1705	1900	2039	2150	2151	2152	2153
H2	445	510	590	720	735	835	950	1020	1070	1115	1205	1325
H3	1255	1470	1734	2134	2279	2505	2800	3015	3165	3315	3590	3915
H4	1170	1395	1626	2001	2151	2340	2610	2790	2905	3025	3265	3535
H ges	3459	3902	4407	5176	5459	5880	6460	6849	7125	7291	7622	8013
D2	220	240	300	400	450	450	550	550	600	650	650	700
X1	1194	1377	1534	1780	1951	2028	218	2293	2381	2443	2604	2778
X2	1820	2055	2182	2452	2711	2740	2896	3012	3104	3180	3344	3527
Y1	1000	1100	1250	1450	1550	1600	1750	1850	1800	1900	2000	2150
Y2	1470	1676	1830	2085	2296	2355	2511	2626	2716	2785	2949	3129
Y3	840	1000	1155	1385	1524	1613	1761	1866	1951	2006	2163	2330

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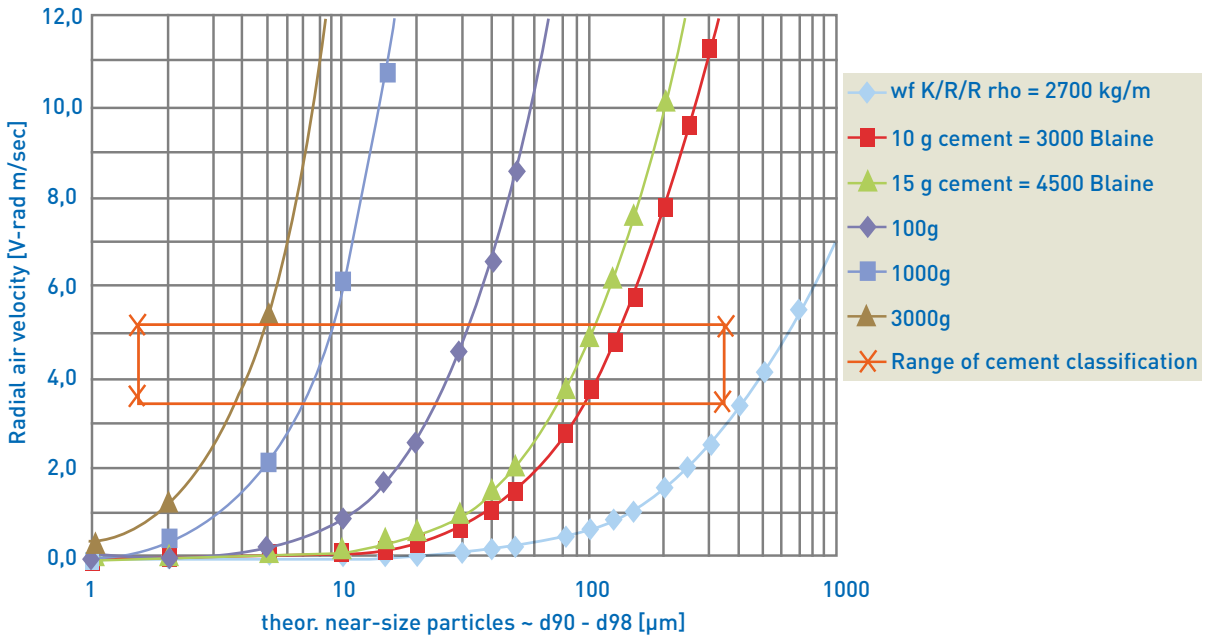
NEAR-SIZE PARTICLES

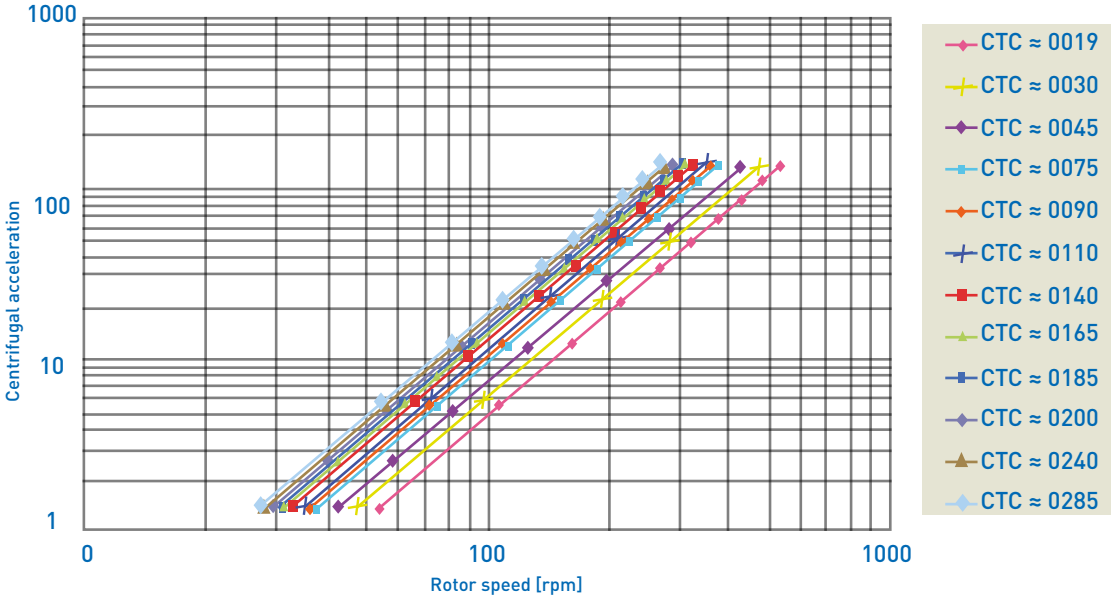
Simplified theoretical near-size particles depending on centrifugal acceleration and radial feed rate [V-rad]



Due to the relationship of radial air velocity this gives the required centrifugal acceleration for the desired maximum particle size d98. The required diameter-speed combination can thus be determined. Depending on the classifier speed, in practice the result will deviate by approx. 10-20%.

CENTRIFUGAL ACCELERATION

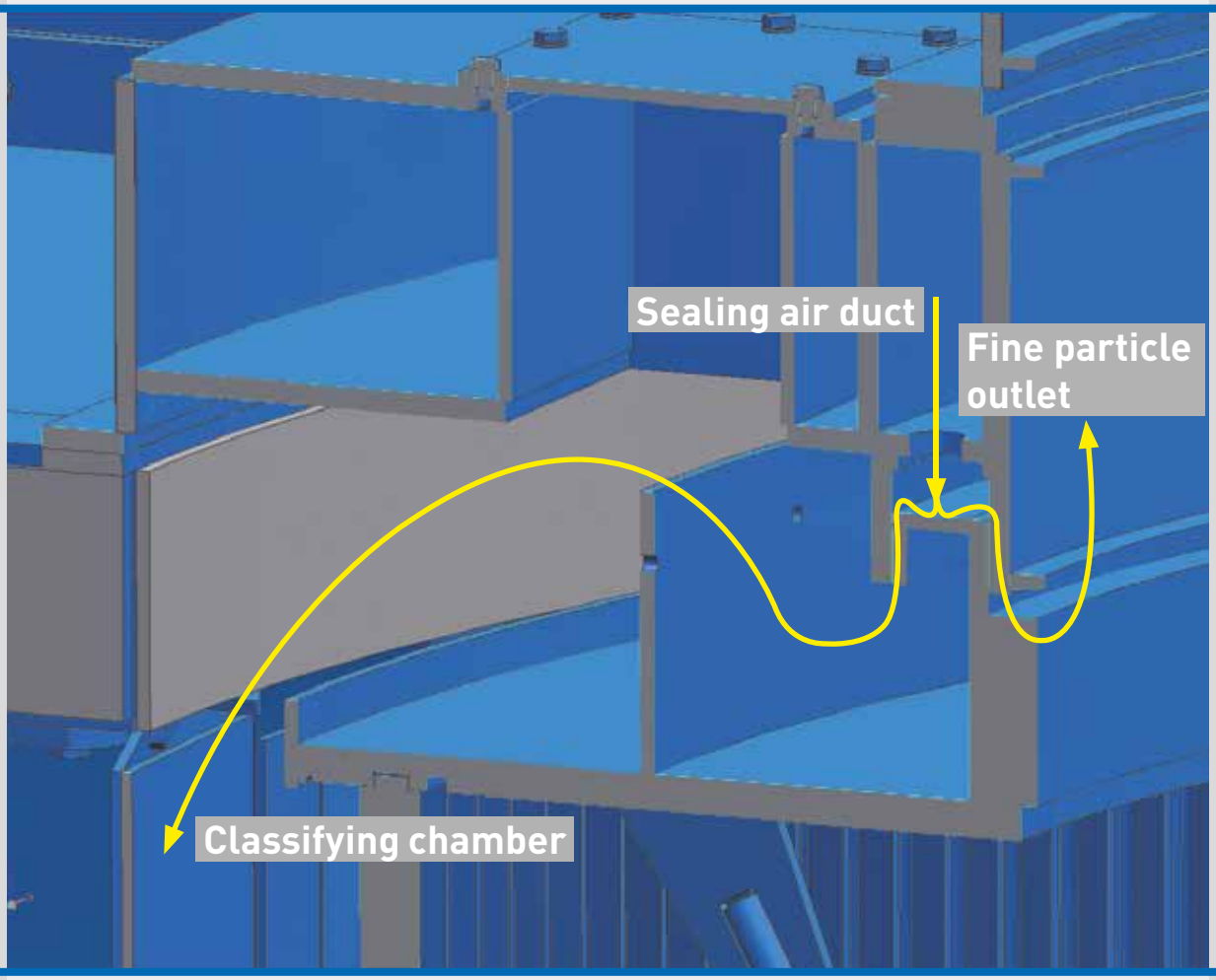
Relationship of centrifugal acceleration to rotor speed for the CTC model series



The deviations arising are influenced by speed level, particle shape and classifying air temperature.

CTC air swept seal

The sealing air is fed to the rotor labyrinth via the sealing air channel and flows to the classifying chamber or fine particle discharge. Suitable configuration and clearances guarantee optimum gap sealing. This prevents coarse particles (oversize grain) from being transported into the fine particle outlet.



CTC wear protection

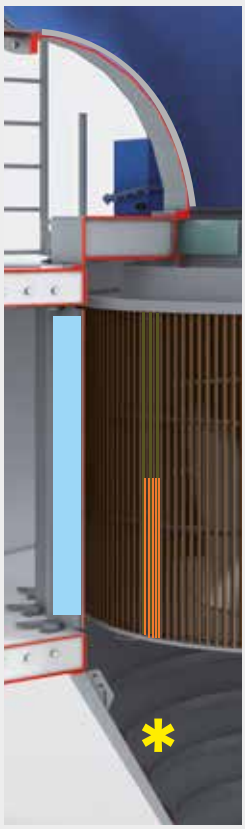
Depending on the dynamic and wear stress, static parts such as the fine particle discharge duct are ceramic coated

In the case of higher stress, wear-resistant deposit welding is used (body exposure,...)

Components subject to a high level of wear are made of high-strength structural steel

For increased demands, wear-resistant coatings are additionally provided

Autogenous protection (*) is used for components subject to a low level of wear



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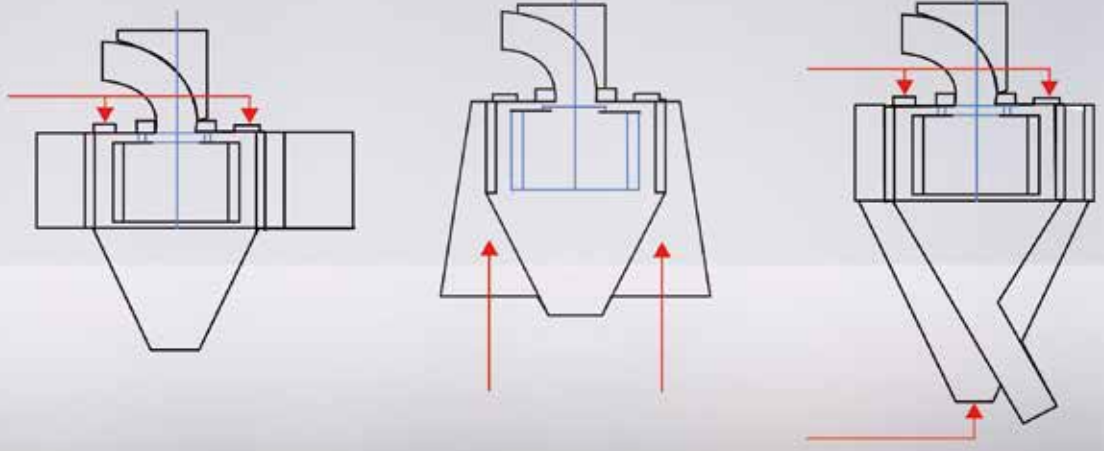
CTC classifier alternative designs

The following versions are available for the CTC series:

CTC standard version:	Material infeed above air slide, fine particle discharge top, drive unit above classifier
CTC-V „air swept"	Material feed from below with air flow (used for vertical roller mill) Fine particle discharge below, drive unit top
CTC-TB	Feed from above + „air-swept" - for combination

MODELS AVAILABLE

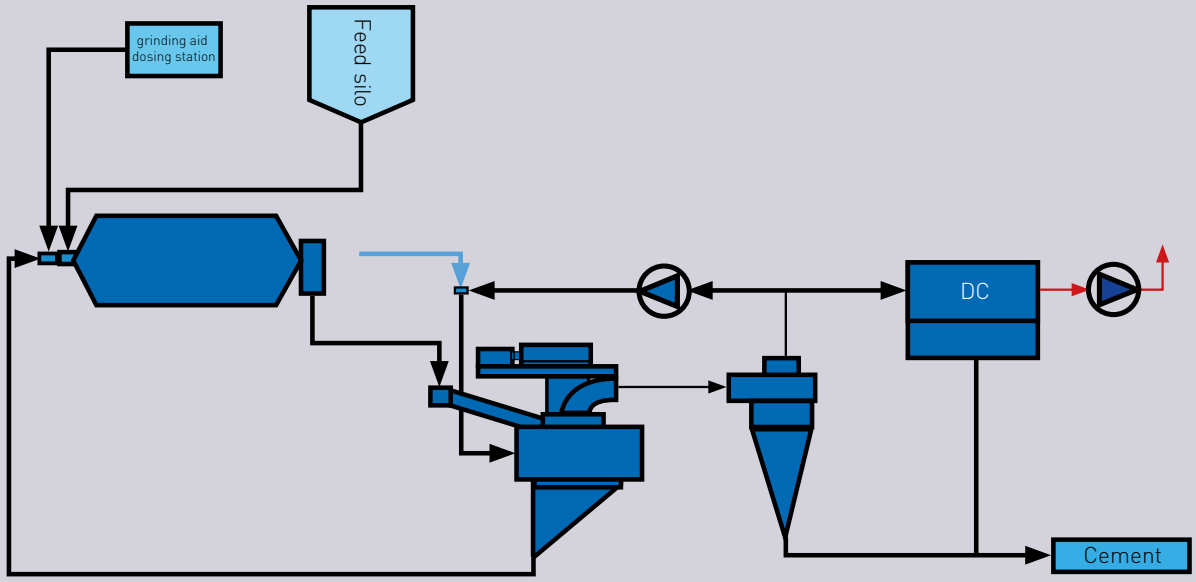
Standard solution Material feed from above	„air-swept feed" Material feed from below	Special solution Material feed from above + „air-swept feed"

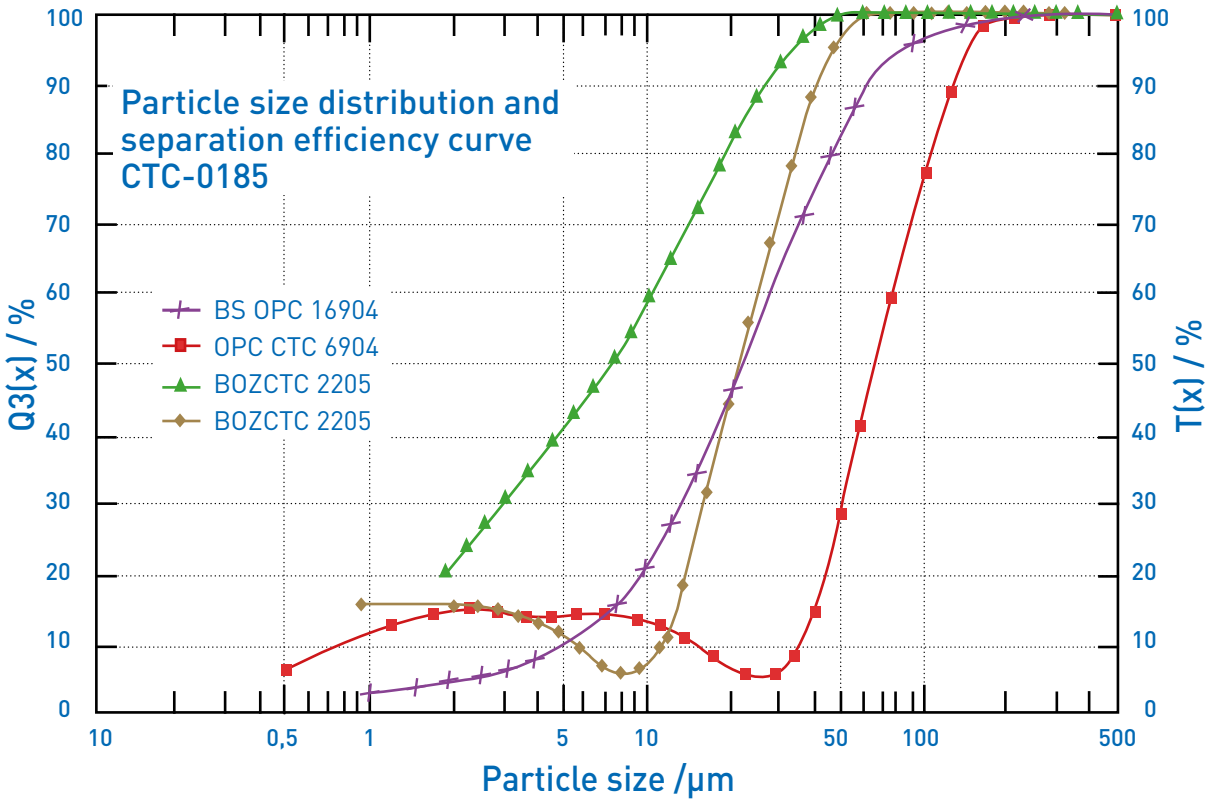


CTC **CTC-V** **CTC-TB**

Process design, selectivity, efficiency of CTC classifiers

The process design is geared to production and product requirements. The discharge temperature of the fines can be optimally set or adjusted for downstream process steps by appropriate configuration of the air circulation. CTC classifiers can thus be operated in an open or closed/semi-closed circuit.





CROSS-SECTIONS

The newly developed CTC series for cement and coarse filters distinguishes itself by extremely high yield of fines and low levels of screen residue. This results in additional optimisation of the specific production and investment costs, together with an indirect reduction of the specific grinding energy. With optimised configuration and the corresponding grinding conditioning the bypass of fines portion can be below 5%.

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EACH PROJECT STARTS IN OUR **PILOT PLANT!**

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