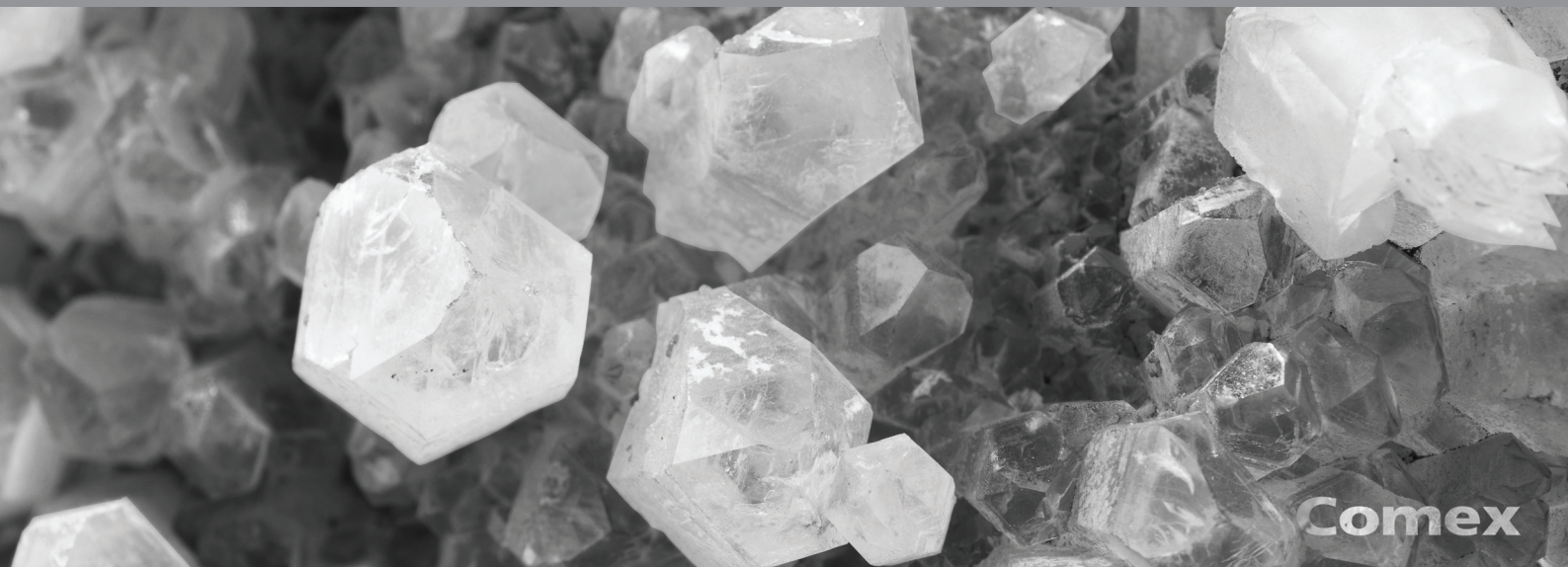


sorting solutions

OSX
separator series



Comex

Comex
Comex

sorting solutions

Comex offers a newly developed complex optical sorting system, in a user friendly platform, for the identification and separation of particles and materials, based on their many physical properties. This is achieved under recognition of individual response to :

- Colour
- Shape
- Texture
- Transparency
- Density
- X-Ray Fluorescence
- Conductivity
- Electromagnetic Induction
- Thermal Transfer

The system is based on a flexible programming platform, which can be modified for a wide variety of demanding applications, using sophisticated processing functions. Efficient separation of materials often requires multiple parallel or multistage processing with many separating units. Comex provides integrated solutions for these applications.

Generally, the new Comex separation system can provide the following benefits:

■ Cost Savings

- Down-stream plant only processes saleable product (especially when grinding costs are considered)
- Increased capacity and performance of down-stream plant, not tied up processing waste materials
- Reduced contamination
- Ore/material can be sorted at face, eliminating unnecessary transport costs

■ Improved Recovery

- Best utilisation of recourse
- Environmental responsibility
- Minimise carbon and green-house foot print by not processing unwanted waste materials

■ Recycling Opportunity

- Potential to reprocess waste stockpiles for efficient recovery
- Beneficiate waste streams (metals, polymers, minerals, etc.) for efficient recovery

Operating Principle and Configurations

The system consists of three major sections:

- Vibratory feeder
- Belt conveyor
- Optical separation unit.

The vibratory feeder provides a uniform particle distribution along the separator width when the processed material is discharged to the transport belt. The uniform particle distribution is of critical importance for further efficient optical separation.

The optical separation unit can be built in two main configurations.

1. Demanding Applications (where complex analysis is necessary for particle identification). In this configuration, the image analysis is carried out by an optical camera with lighting installed over the transport belt conveyor.

The particles identified as the waste fraction are removed by the rejecting mechanism after the discharge end of the belt. This allows for the maximum time interval between the image grabbing and time of rejection, which allows the image analyzing program to carry out sophisticated mathematical calculations before rejection takes place.

2. Routine Applications (where reject is readily identifiable). In this configuration the particles are analyzed just after the belt discharge end. In this case the particles are rejected almost immediately after being analyzed. This option uses lighting from above (scanning light) or below (transmitted light) the particle stream. The particles are rejected just after the analysing point while the computing system provides a quick mathematical calculation and reaction performance.

The main processing unit, based on the CPU, is multiply tasked. It is used to:

- Transfer images from the analyzing camera
- Provide a basic analysis
- Process advanced electronic filtration
- Define coordinates of the particles for rejection
- Calculate the time delay for initiating the rejecting mechanism (pneumatic nozzles or flaps)



Application example of the OSX-1000 separator

This last information related to the rejection function, is further processed in the FPGA hardware (field-programmable gate array). This allows the rejection function to be totally separated from the main CPU operation. In the FPGA area, the program related to rejection of particles is 'burned' in permanently and the main CPU device is not engaged in any activity related to this action. Therefore, the CPU area can be used more accurately with image analysis and advanced electronic filtration. As a result the complete system provides much more precise timing for rejecting waste particles thus improving the overall system performance.

The rejecting mechanism can employ air nozzles or mechanical flaps. The air nozzles are used for finer particles up to 100 mm in size, and the mechanical flaps are employed for larger and heavier particles over 100 mm.

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The most important design features of the Comex separator which make this equipment unique are:

- Vibrating feeder for particle dispersion providing good particle distribution
- Belt conveyor for precise particle trajectory control before separation stage
- Special belt conveyor design providing stable particle orientation during analysis and separation
- Advanced image analysis of the separated particles involving colour, shape, pattern, size, and other physical material characteristics
- High intensity LED lighting providing reliable and stable light intensity over a long operating time period
- Advanced shape analysis involving over 50 parameters describing each processed particle
- High resolution cameras providing clear image of particles
- Hardware flexibility allowing application of different camera types (IR, Line Scan, X-Ray, etc)
- Precision valves allowing accurate rejection of waste particles and limited losses of the product particles
- High speed electronic system for rejecting of waste particles allowing precise separation within short time intervals
- Compact modular design allowing easy transportation and mechanical modification
- Optional particle washing over the belt allowing limited cleaning of the particle surface being analyzed

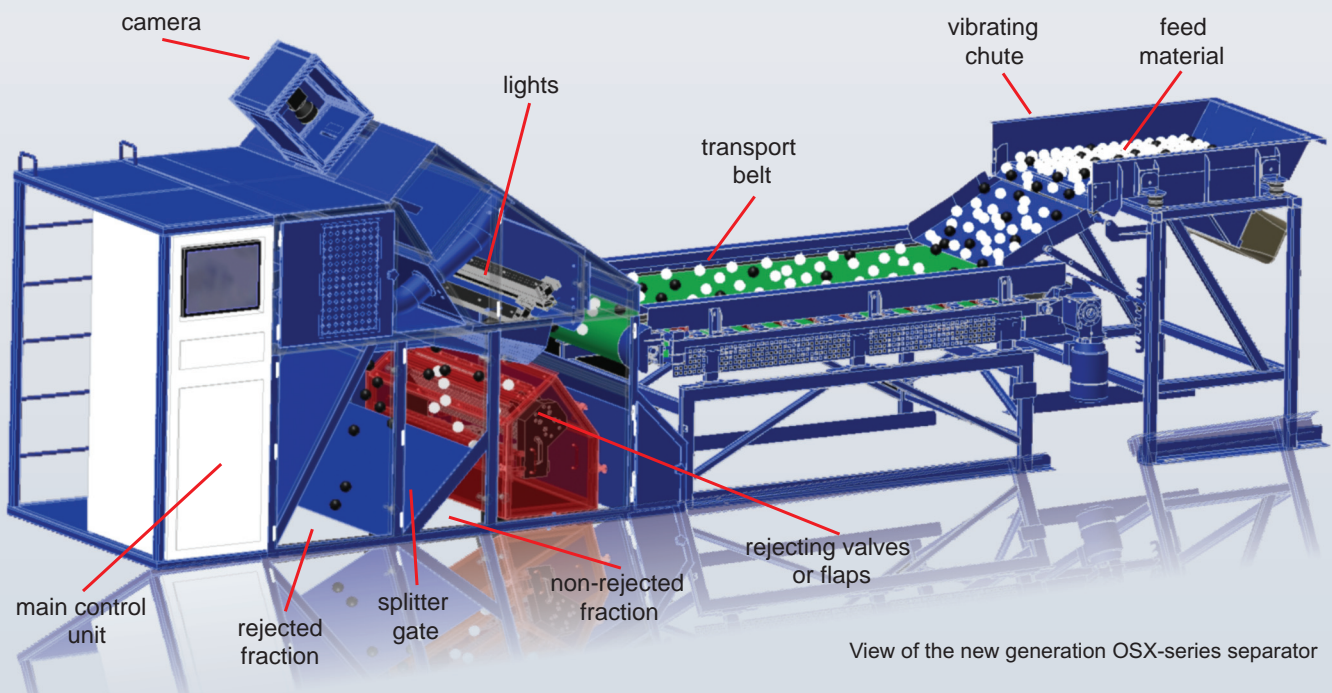


Inlet to the OSX-1000 separator

This results in the following benefits from application of the Comex separation system:

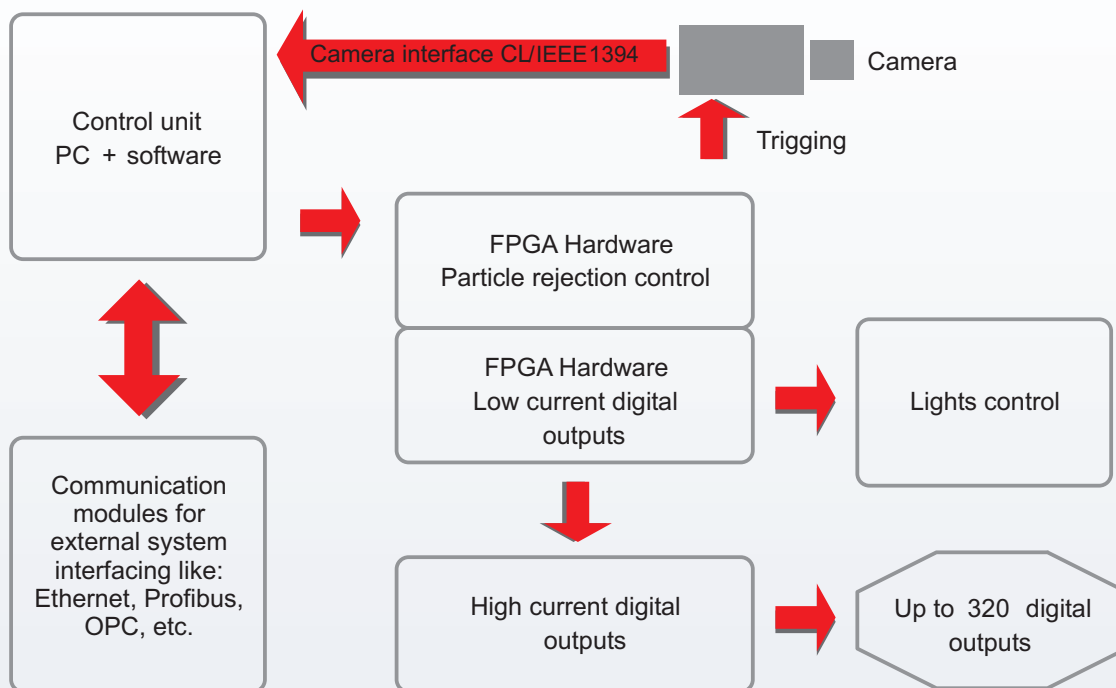
- High separation efficiency up to 99.9%
- Large processing capacity
- Possibility to process a wide range of particle sizes without necessary pre-screening
- Possibility to process material with high moisture content
- Efficient separation of particles having small differences in colour or greyness level

The new Comex optical system has already been tested and applied for sorting of: glass, diamonds, metals and mineral particles.



View of the new generation OSX-series separator

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Electronic system architecture

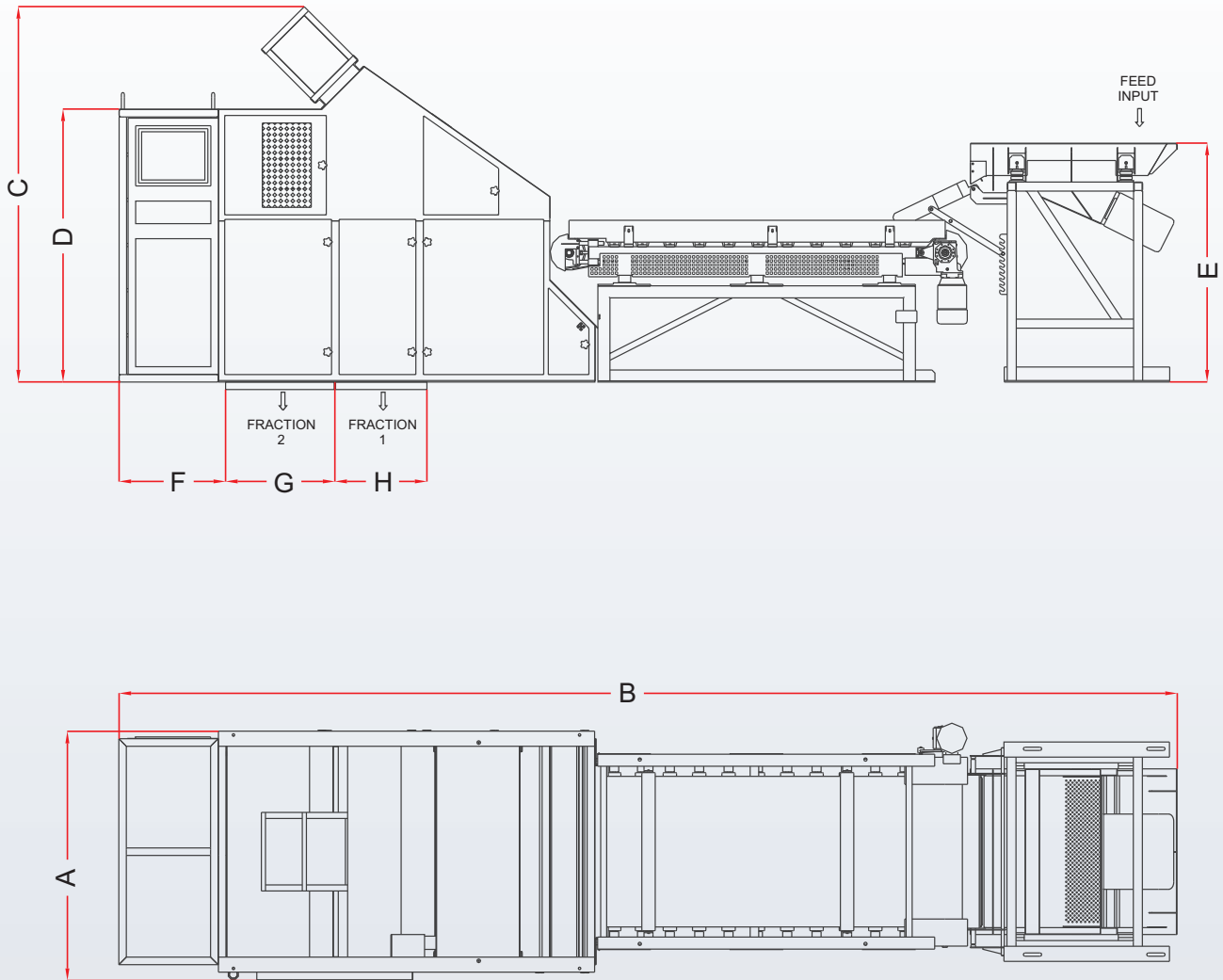
Size Ranges and Technical Specifications

The optical separation systems can be manufactured in different size ranges. Dimensions of the equipment will mainly depend on the processing capacity. The table below shows the general dimensions of the separation equipment.

Separator specification data

System parameter	OSX-600	OSX-1000	OSX-1500
Transport belt width [mm]	600	1000	1500
Belt velocity [m/s]	3-5	3-5	3-5
Image identification	Digital frame grabbing or line scan		
Scanning principle	Progressive scan or line scan		
Camera type	CCD, CMOS, IR, X-ray		
Lighting type	High power LED		
Identifcation function	Color, size, shape, structure, texture		
Rejection mechanism	Air nozzles for particles below 100 mm; Pneumatic flaps for particles over 100 mm		
Minimal particle size [mm]	10	15	20
Typical capacity for particles having 15-50 mm size [t/h]	5-20	10-50	15-80
Typical capacity for particles having 50-250 mm size [t/h]	20-80	50-150	80-250

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Dimensions and weights of the separation systems

Parameter	Unit	OSX-600	OSX-1000	OSX-1500
A	[mm]	1280	1680	2180
B	[mm]	6650	7050	7650
C	[mm]	2200	2500	3600
D	[mm]	1850	1850	1850
E	[mm]	1600	1600	1600
F	[mm]	710	710	710
G	[mm]	730	730	730
H	[mm]	610	610	610
Weight	[t]	0.6	1.6	2

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Applications

The Comex optical separation equipment has been successfully tested and applied for different materials with varying physical properties. Comex has provided separation systems mainly for separating particles like minerals in connection with their further processing, and for the recycling industry where the high purity of the end product is of critical importance for most successful applications. Separation efficiencies varied from 95 to 99.9% depending on the processed material and separation difficulty.

Research and Development

Comex offers extensive test and development facilities where different separating units can be accurately tested, for determination of the optimal process prior to final design. Extensive instrumentation on the pilot scale units, combined with different types of cameras and lighting, provides a facility to search for the optional set-up for each individual application.

Configuration Options:

The optical separation unit can be manufactured according to the following code reflecting the system configuration.

- **OSX-xxx is the optical separator having xxx belt width defined in mm**
- **/F - rejection mechanism realized by mechanical flaps**
- **/N - rejection mechanism realized by pneumatic nozzles**
- **OA – image analysis over the belt**
- **DA – image analysis at the belt discharge**
- **S M- scanning mode**
- **TM – transmission mode**

Example: OSX-1000/F-DA-SM is the **Optical Separator** from **Comex** having 1000 mm belt width, image analysis at the belt discharge and the camera with lights above the belt (scanning mode).

Separation examples of different materials

Calcite particles in size range 65-125 mm



Feldspar particles in size range 25-65 mm



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Feldspar particles in size range 15-30 mm



Feed



Product



Waste

Quartz particles in size range 20-50 mm



Feed

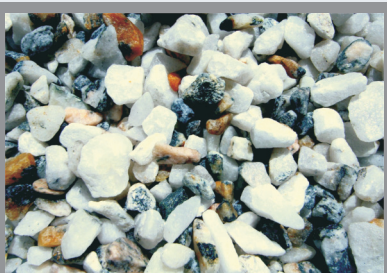


Product



Waste

Quartz particles in size range 15-45 mm



Feed



Product

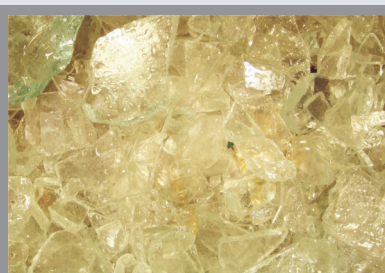


Waste

Glass (curllets) particles in size range 15-45 mm



Feed



Product



Waste

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