Comex

*Innovative Industrial Technologies*

# CXR sorting system series

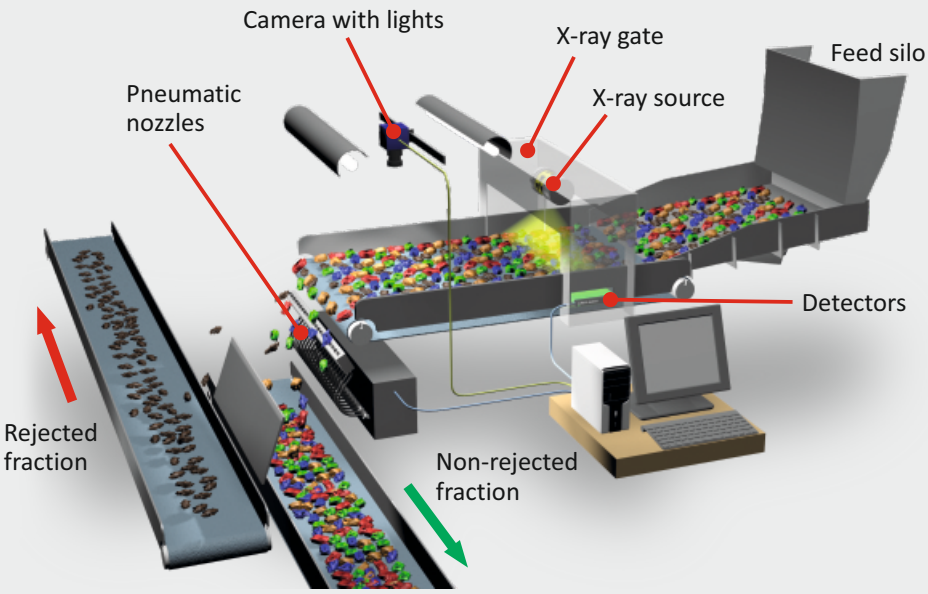
## Eco-Friendly Sorting Technologies for Mining Industry

**Comex delivers innovative sorting solutions and sophisticated processing equipment for demanding industrial applications.**
**The sorting equipment can be applied for separation of various materials, based on differences in physical properties. After significant efforts in R&D projects, Comex provides today the latest state-of-the-art equipment together with the know-how for full scale industrial solutions.**

## Advanced sorting technologies

CXR series represents the complex and robust sensor based sorting systems, used for the analysis, identification and sorting of particles based on different physical properties. The system is operating in **dry mode**, thus it does not require any use of water. The main function is based on recognizing an individual response to **X-ray attenuation** in combination with:

- Colour analysis
- Infrared reflectance
- Transparency
- Size
- Shape
- Surface Texture
- Thermal Transfer
- Conductivity




*Operating principle of the multi-sensor sorting system with XRT sensors in combination with different cameras*

## Typical applications include:

- Pre-concentration of metal ores (iron, zinc and lead, tungsten, copper, gold, nickel, chrome, etc.) and other minerals
- Implementation of sorting in traditional processing plants
- Reprocessing of ore waste material
- Coal enrichment
- Recycling of different materials
- Quality control and material inspection in production systems


*CXR-1000 unit with XRT sensor*

*CXR-1000 unit with XRT and multi-sensor option*

**Key benefits:**

- Possibility to combine different sensors in the same sorting unit
- Advanced software providing complex analysis from different sensors
- High separating efficiency up to 99 %
- High precision separation by pneumatic nozzles
- Complete 2D and 3D analysis of particle geometry
- Possibility for on-site material separation by mobile systems

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

- significant reduction of the investment cost
- huge reduction of the plant operating cost
- increased product quality
- reduced waste generation in form of fine particles
- reduced water consumption or its elimination
- reduced environmental impact of mining activities
- re-processing possibilities for mining waste

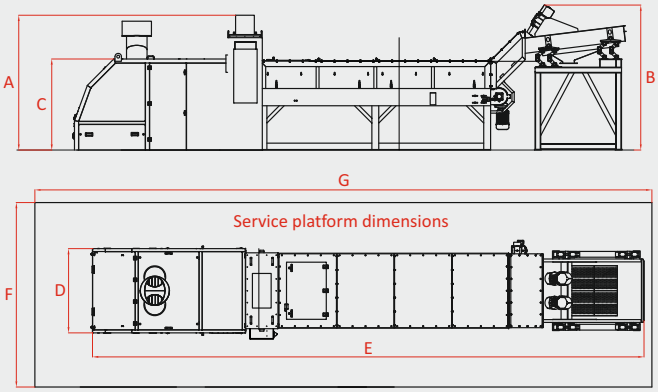
**When used for pre-concentration of ROM material, it will additionally result in:**

- removed impurities in the early processing stage
- impurities, being in form of large particles can be used for other purposes like building industry
- reduced transportation cost between a mine and a processing plant
- improved profitability for mining operations

**Technical specification**

| System parameter | CXR-1000 | CXR-2000 | CXR-3000 |
|---|---|---|---|
| Material | Standard steel<br>Stainless steel / Hardox 400<br>for wear-resistant lining<br>Lead as protection against X-rays | Standard steel<br>Stainless steel / Hardox 400<br>for wear-resistant lining<br>Lead as protection against X-rays | Standard steel<br>Stainless steel / Hardox 400<br>for wear-resistant lining<br>Lead as protection against X-rays |
| Working width | 1000 mm | 2000 mm | 3000 mm |
| Belt speed | 2-3 m/s | 2-3 m/s | 2-3 m/s |
| Capacity | 15–150 t/h depending on material size and density | 30–300 t/h depending on material size and density | 45–450 t/h depending on material size and density |
| Material size | Min: 8 mm; Max 100–250 mm depending on particle density | Min: 8 mm; Max 100–250 mm depending on particle density | Min: 8 mm; Max 100–250 mm depending on particle density |
| Number of pneumatic nozzles* | 110 to 192 depending on size of sorted material | 220 to 384 depending on size of sorted material | 330 to 576 depending on size of sorted material |
| Power supply | 3x400V, 15kW | 3x400V, 30 kW | 3x400V, 45 kW |
| Compressed air flow rate | 6–8 bar, 30–500 $m^3$/h depending on application | 6–8 bar, 60–1000 $m^3$/h depending on application | 6–8 bar, 90–1500 $m^3$/h depending on application |
| Operating temperature* | +5 to 35°C | +5 to 35°C | +5 to 35°C |
| Dimension (LxWxH)* | 9560x1460x2510 mm | 11010x2460x2450 mm | 12020x3460x2590 mm |
| Total weight* | **6 t** | **11.5 t** | **18 t** |

* these parameters may vary depending on the final equipment version

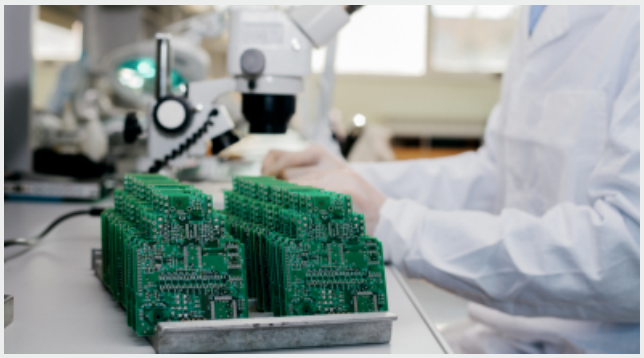



## Main dimensions

| Sorting model | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | F [mm] | G [mm] |
|---|---|---|---|---|---|---|---|
| **CXR-1000** | 2 340 | 2 510 | 1 580 | 1 460 | 9 560 | 3 200 | 10 700 |
| **CXR-2000** | 2 390 | 2 450 | 1 580 | 2 460 | 11 010 | 4 660 | 12 200 |
| **CXR-3000** | 2 390 | 2 590 | 1 580 | 3 460 | 12 020 | 6 660 | 13 150 |

### Sophisticated hardware and software package

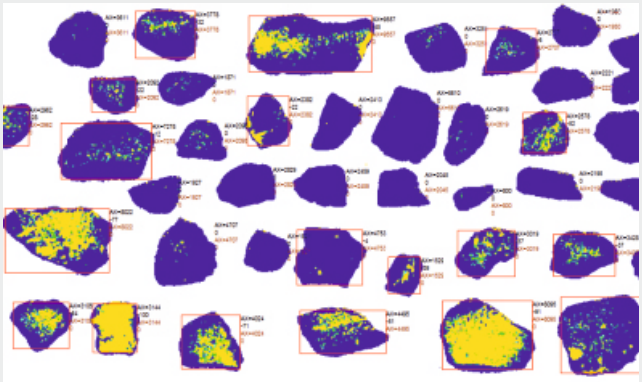
The time critical computing sections are controlled by the robust FPGA based systems, which guarantee precise timing during particle rejection, which allows achieving an efficient separation with good process stability. Critical hardware components are designed and optimized by the Comex engineering team.



The software package includes an advanced analysis of sorted material done by different sensors in the same sorting device. All particles are described by set of parameters related to their physical properties and indirectly to their chemical composition. By adjusting the threshold parameters, it is possible to establish priorities between different sensors together with the limits for chosen parameters used for further rejection.

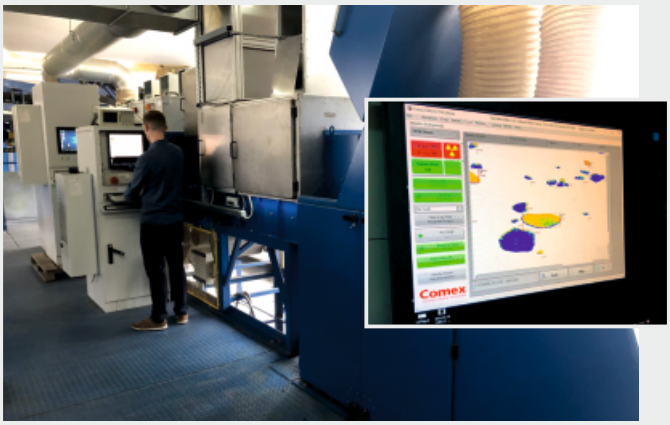
### Key software features:

- Free choice of sensor types
- Optimized high processing speed
- Advanced texture and morphology functions
- Image masking features to reduce processing time for advanced calculations
- Calibration tools for different sensors
- Real time display of sorted material with specified parameters
- Rejection rate display
- Indication of a tonnage of sorted fractions



*Separation example of rich ore particles (green and yellow) identified for sorting and marked by red squares, from the waste rocks (blue).*

*Comex test centre – CXR multi-sensor sorting system*




*Comex test centre – operating panel of the sorting system*

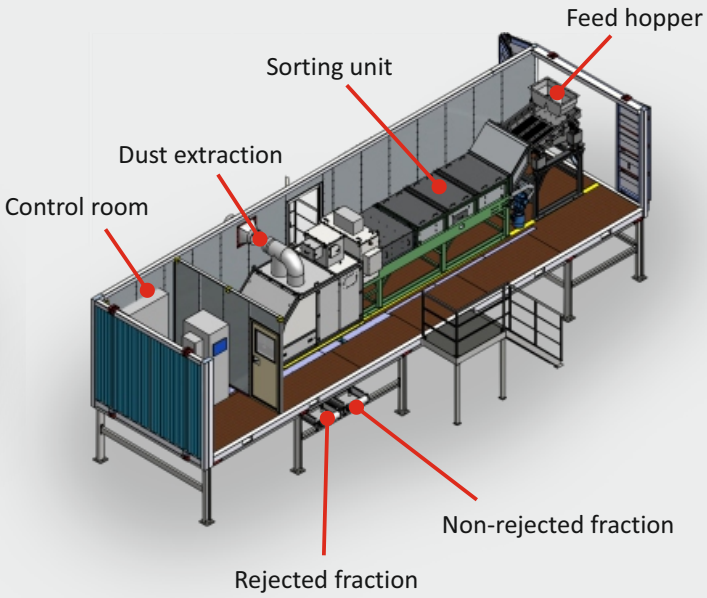
**Container based sorting systems**

Comex sorting equipment configured in different sensor configurations, can be installed inside the containers as mobile systems. This provides possibilities for temporary installations, where the sorting equipment can be moved among different application sites. It also facilitates installations in remote areas with difficult infrastructure, where no sorting houses are available.

*CXR-1000 inside the container*

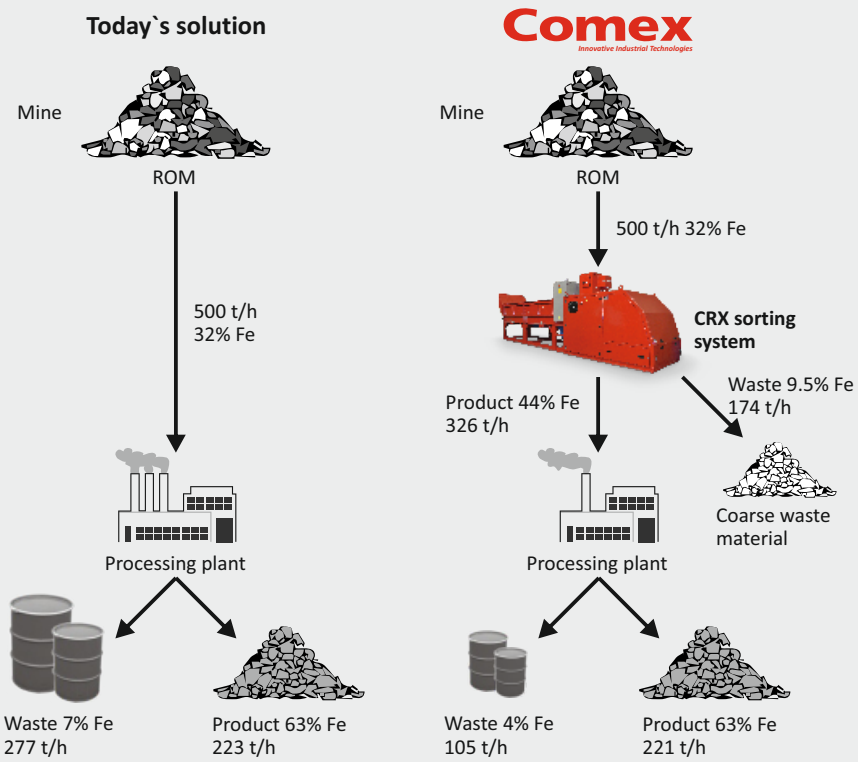
**Comex test centre**

Comex offers extensive test and development activities at the test centre nearby the production facilities in Poland. Here, different materials can be accurately tested prior to final design of the industrial systems, for determination of the optimal process parameters. The pilot scale facilities include application of different advanced sensors, detectors and cameras, covering sophisticated X-ray detection and analysis in both visible and infra-red light. The sorting plant includes the full-scale sorting machines operating in closed circuit, to simulate high capacity processes as it takes place in industrial conditions. Additionally, it is possible to test and produce small material samples for optimisation work, and also massive fractions during bulk testing.




*CXR-1000 placed in the container*

## CASE STUDY: Iron ore pre-concentration



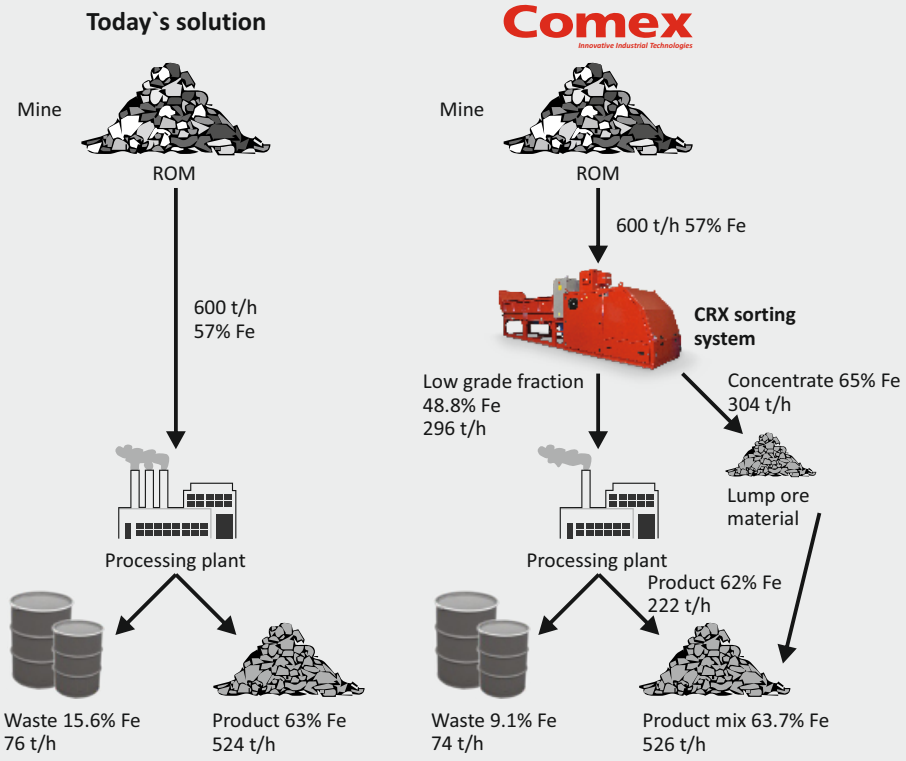

- 62% reduction of fine ground waste
- 35% reduction of the plant processing cost
- 35% reduction of the transportation cost to the plant

**Example of the iron ore pre-concentration**

Initial production was based on processing of the complete ROM material output. This generated about 277 t/h of waste from the processing plant in form of fine particles.

After sorting of the ROM material, 174 t/h of the waste material was removed in form of the coarse particles. Only 326 t/h was processed at the plant. This resulted in **35%** reduction of the transportation cost to the plant and the same reduction of the processing cost. The fine waste material was reduced by **62%**.

## CASE STUDY: Iron ore final concentration



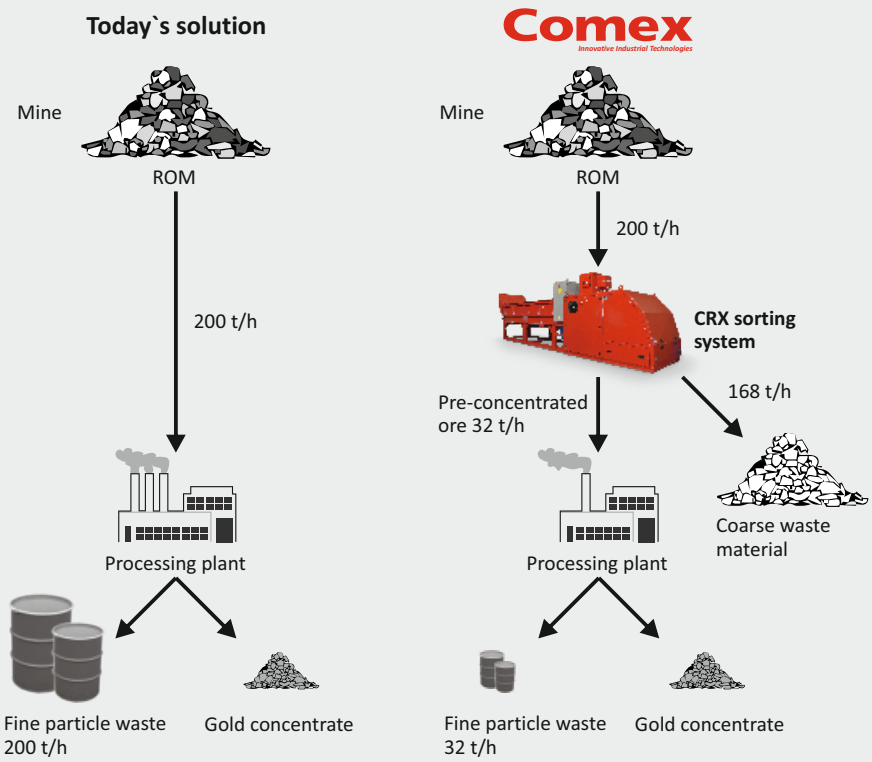

- 51% reduction of the transportation cost to the plant
- 51% reduction of the plant processing cost

**Example of the iron ore final concentration**

Initial production was based on processing of the complete ROM material output, representing high quality iron ore. This required processing plant capacity of 600 t/h.

After sorting of the ROM material, 304 t/h of the high quality ore particles were separated as the final product. Consequently, only 296 t/h was processed at the plant. This resulted in **51%** reduction of the transportation cost to the plant and the same reduction of the processing cost.

## CASE STUDY: Gold ore pre-concentration



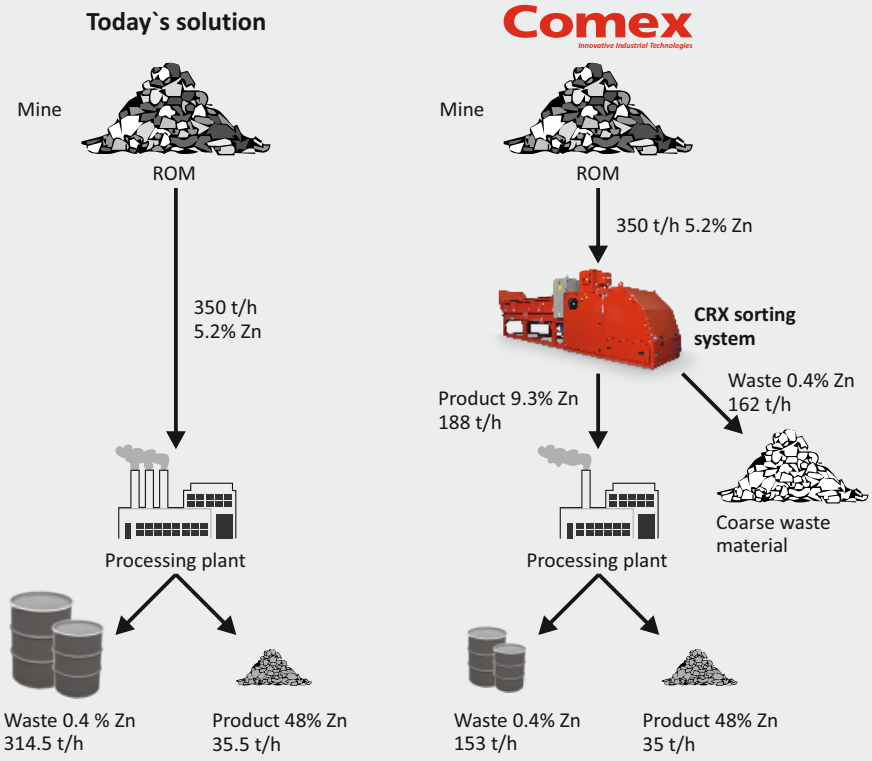

- 84% reduction of fine ground rejects and chemical wastes
- 84% reduction of plant processing and transportation cost

**Example of the gold ore pre-concentration.**

Initial production was based on processing of the complete ROM material output. This generated about 200 t/h of waste from the processing plant, mainly as fine particles.

After sorting of the ROM material, 168 t/h of the waste material was removed in form of the coarse particles. Only 32 t/h was processed at the plant. This resulted in **84%** reduction of the transportation cost to the plant and the same reduction of the fine waste material and the processing cost at the plant.

## CASE STUDY: Zinc ore pre-concentration




- 51% reduction of the fine ground waste material
- 46% reduction of the plant processing cost
- 46% reduction of the transportation cost

**Example of the zinc ore pre-concentration**

Initial production was based on processing of the complete ROM material output. This generated about 314 t/h of the waste material from the processing plant in form of fine particles.

After sorting of the ROM material, 162 t/h of the waste material was removed in form of the coarse particles. Only 188 t/h was processed at the plant. This resulted in **46%** reduction of the transportation cost to the plant and the same reduction of the processing cost. The fine waste material was reduced by **51%**.

Comex AS

Comex AS
P.O.Box 53
1309 Rud
Norway

www.comex-group.com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