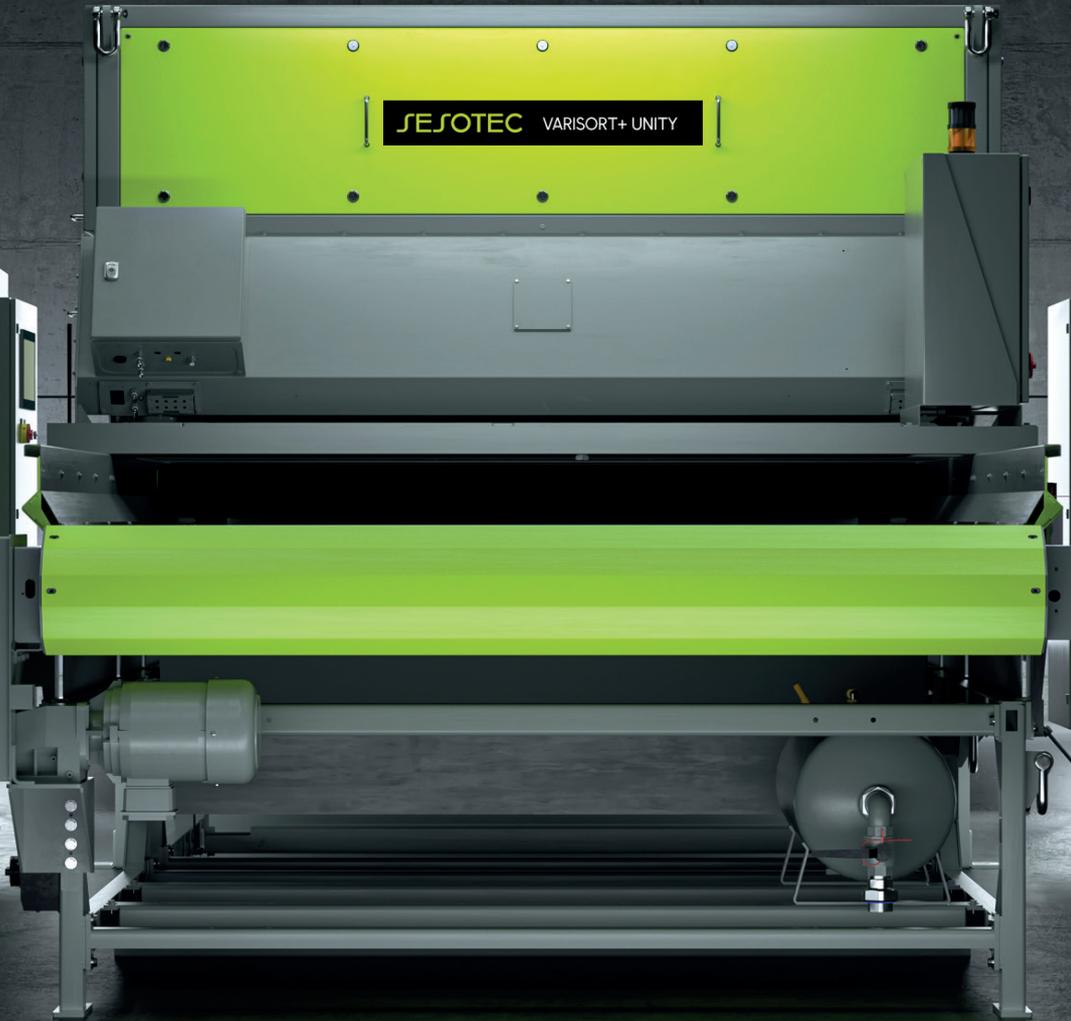


SESOTEC



Recycling

SORTING SYSTEMS

# VARISORT+

Multisensor sorting system for the Recycling Industry

# Efficient sorting of various material streams

Fluctuating material availability and the associated fluctuating material quality are among the biggest challenges facing recycling companies – and can quickly impact their profitability. Our VARISORT+ reliably detects and separates plastic types, colors, shapes, metals and foreign objects in various material streams. Thanks to its modular plug-and-play design, it can be integrated into any production line and can also be operated with a customer-supplied conveyor belt.

## Maximum productivity

Thanks to a conveyor belt with up to 4 m/s belt speed, the VARISORT+ achieves very high throughput rates (up to 8 t/h) and at the same time convinces with a reject reliability of up to 99%, even with poor material quality.

## Optimized machine design

The new and improved machine design guarantees high system availability, quick and easy cleaning, and low maintenance requirements. The modular design also allows individual customer- and product-oriented solutions.



## Application areas

The application areas of the VARISORT+ family are versatile. Primarily, the devices are specialized in plastic and light packaging recycling as well as metal and electrical scrap recycling.



PET recycling – plastic bottles



Mixed plastic & household waste recycling



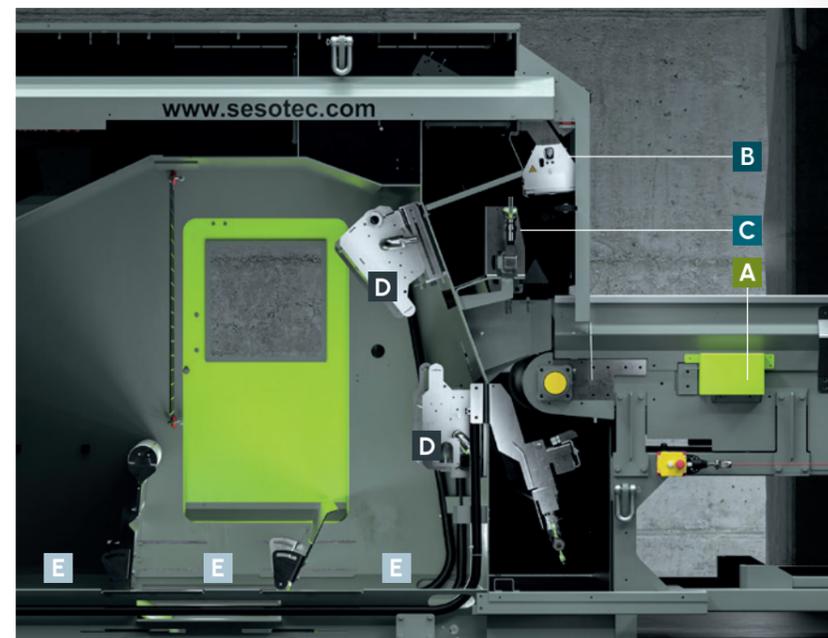
Plastics recycling



Metal scrap recycling



E-waste recycling



## The system has the following components

- A** Metal sensor: for the detection of smallest metal impurities
- B** NIR sensor: for the detection of a wide variety of materials and material combinations
- C** Color sensor: for the recognition of objects and different colors
- D** Blow-out system: with various nozzles for the separation of foreign bodies with precise timing and positioning
- E** Reject systems: the three-chute design enables the sorting of three material fractions simultaneously

## Flexible system configuration

- Combination of up to three sensors
- Selection of different lighting systems
- Four different working widths
- Operation also possible with conveyor belt provided by plant or customer

## Options for maximum efficiency

- A three-chute design allows sorting of three material fractions simultaneously
- A blow-out system with a finer valve grid enables problem-free sorting of smaller material sizes
- A conveying chute matched to the sorter ensures optimal distribution of the material and a homogeneous stock flow

# Functionality of the VARISORT+

With the flexible VARISORT+ sorting system, many different material streams can be sorted – efficiently, flexible and profitable.



### Efficient

The VARISORT+ reliably detects and sorts plastic types, colors, shapes, metals and foreign objects from different material streams. It achieves a high throughput of up to 8 t/h and convinces with a reject reliability of up to 99 %.



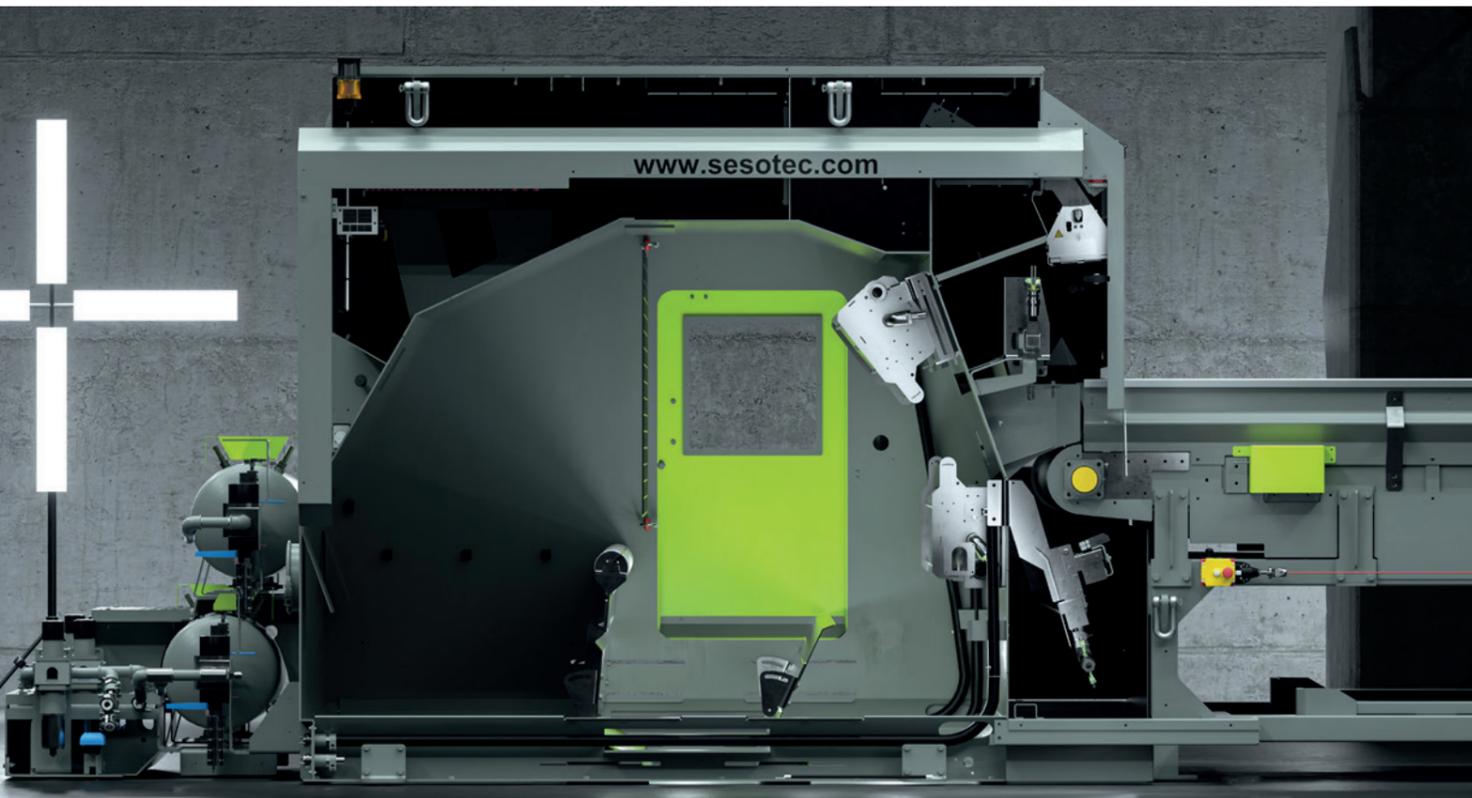
### Flexible

The combination of up to three sensors, different working widths, the choice of different lighting systems and the option of operation with a customer- or plant-provided conveyor belt allow maximum flexibility.



### Profitable

The VARISORT+ is synonymous with a profitable sorting process thanks to the best possible sorting results even with poor material quality, high system availability with low maintenance and cleaning requirements, and a flexible system configuration.

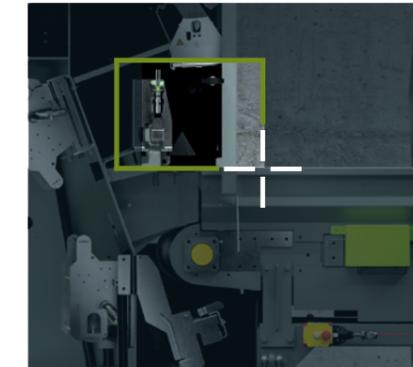


Possible sensors composition

## **C** Color sensor

High-resolution color line scan camera for approximately 17 million teachable colors combined with innovative lighting options

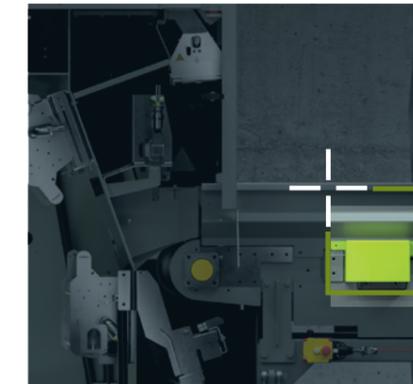
- Incident light – detection of reflection in opaque material
- Transmitted light – detection of transmission with transparent material
- Sorting by colors and shapes
- Separation of unwanted materials like e.g. silicone cartridges



## **M** Metal sensor

Inductive metal sensors for identification or detection of magnetic and non-magnetic metals

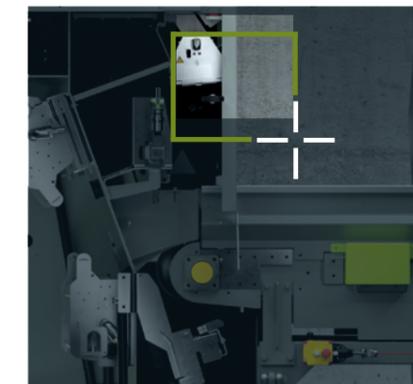
- Detection from 1 mm
- Easy to operate
- Simple sensitivity settings
- M – Detection of all metal types
- M+ – Identification of stainless steel



## **N** NIR sensor

Hyperspectral camera for identification of different polymer types and materials as well as for various special applications

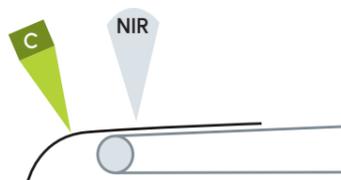
- Detection of PET trays as well as bottle/label combinations
- Recognition of different material types (LDPE / HDPE)
- Detection of mono and multilayer materials



# The lighting options

To have the right solution for every requirement, three different lighting systems are available for the VARISORT+. The BASIC, CLEAR and FLASH options have different sorting efficiencies in color sorting. From simple sorting tasks to the efficient detection of clear material to the optimal detection of transparent and non-transparent material – for the highest demands on color sorting – everything is thus possible with the VARISORT+.

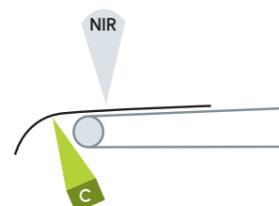
## BASIC



**Color and shape detection on conveyor belt for rugged applications**

- For standard sorting tasks (sorting of clear material) and the detection of opaque material
- For use in the most difficult conditions (dirt, labels, etc.)
- Low maintenance requirements
- Low operating requirements

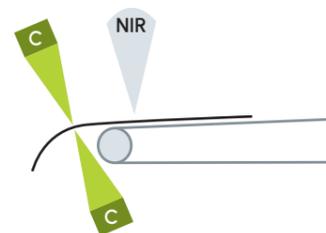
## CLEAR



**Color and shape recognition in free fall for distinguishing the finest color nuances in transparent materials**

- For optimal detection of clear materials
- For high requirements on the color sorting of transparent materials
- For high demands on object detection (object in a bottle)
- Easy adjustment of color detection

## FLASH



**Color and shape recognition in free fall for distinguishing the finest color nuances in transparent, non-transparent and semi-transparent materials**

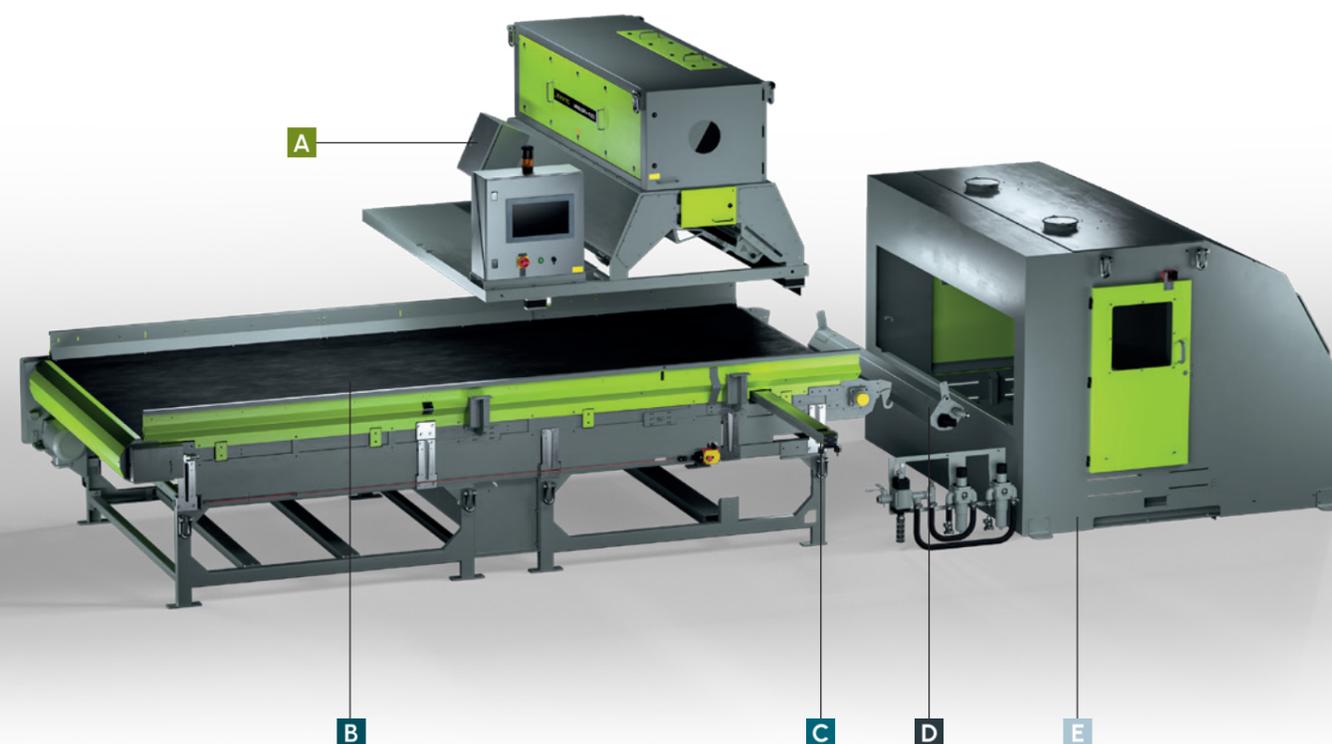
- For highest demands on color sorting and detection of transparent and non-transparent material
- Best material and color detection (light, white, silver, black, etc.) through the combination of signals

### Sorting efficiency of the VARISORT+ options

The result of combining the advantages of the two technologies BASIC and CLEAR is the best color and material recognition of both transparent and non-transparent material: FLASH.

# Integration of the sensors into existing plants

Depending on requirements, the VARISORT+ FLEX can be configured either as a complete solution with rejector housing and conveyor belt or as individual components. The VARISORT+ FLEX is particularly suitable for integration into existing plants as a renewal or upgrade and for suppliers of complete solutions in the recycling sector.



**A** Ai-assisted color, shape and NIR sensor for detecting objects of a wide range of colors, shapes and materials

**B** High speed conveyor belt

**C** Metal sensor: for the detection of smallest metal impurities

**D** Blow-out system: with various nozzles for the separation of foreign bodies with precise timing and positioning

**E** Rejector housing

PLEASED TO MEET YOU

# The new VARISORT+ Family



# VARISORT+

The high-end sorting system for plastic and light packaging recycling

<b>CMN</b>	<b>4</b>	<b>350</b> mm
Sensors	Work widths	Grain size

## Innovative lighting systems

BASIC for color and shape detection on the conveyor belt, CLEAR for in-flight detection to distinguish the finest color nuances in clear material, and the innovative FLASH technology for the best possible color detection and for detecting bottles with additives

## Optional 3-chute system

A third discharge chute with an additional discharge chute enables the division into three different material streams and thus allows maximum productivity



## Optimized machine concept

The entire machine concept has been optimized once again - for highest throughputs and purities as well as the reliable ejection of black materials. The integration of the sensor system and blow-out unit into the separator housing also makes the VARISORT+ particularly compact



Application in plastic recycling

Free consultation

<https://www.sesotec.com/contact>



## Application areas

Sensor combination/application	C/CN/CM/CMN			N	MN
	Basic	Clear	Flash		
Bottle recycling	+++	+++	+++	+	+
Mixed plastics (PS/PE/PP)	+++	+	++	+	+
Functional materials	++	++	+++	+	+
Color sorting transparent	+	+++	+++		
Color sorting intransparent	+++	+	+++		
Metal detection	Option (M): Metal sensor				

## Technical data

Working width [mm]	1024	1536	1920	2816
Throughput up to [t/h]	3	4.5	6	8
Number of valves	64/40	96/60	120/75	160/110
Valve pitch [mm]	16/25.6	16/25.6	16/25.6	17.6/25.6
Suitable grain sizes [mm]	15-350			
Power [max. KVA]	2-4	2-4	2-4	2-4
Temperature range	+5 °C up to +40 °C			
Protection class	IP54	IP54	IP54	IP54

## Options

Conveyor belt length	3 m, 4.4 m or 6.2 m conveyor belt with a speed of up to 4 m/s for optimum distribution and separation of the elements in the material flow to increase throughput
Three-chute version	Additional third chute and second valve bar for sorting the material flow into three fractions
Valve grid	Alternative valve pitch possible for certain sorting applications
Sensor upgrade	Pre-wiring for possible sensor upgrade
M+: selective metal sensor	Selective inductive multi-channel detection coil for detection of stainless steel, steel and non-ferrous metal
Vibratory feeder chute	Vibratory feeder for optimal distribution and separation of the elements of the material flow
Cooling system	Vortex cooling for use in environments with high temperatures
Roll vertex	Roll vertex on the separator plate to avoid material accumulation
Belt cleaner	Rotating brush under the conveyor belt for cleaning the belt
Device division	For parallel sorting of two different material streams or for 2-stage sorting

# VARISORT+ WEEE

The high-end sorting system for metal & electrical scrap recycling

<b>CMN</b>	<b>4</b>	<b>250</b> mm
Sensors	Work widths	Grain size

## Inverse sorting technology

One of the special features of the VARISORT+ WEEE is the inverse sorting. The combination of camera and metal sensors enables very high degrees of purity in the sorting of electronic scrap while optimizing the consumption of energy and compressed air

## M+ coil

A multi-channel inductive stainless steel detection coil enables the highly precise detection of stainless steel materials (16 mm×30 mm)



## Flexible sensor combination

All existing sorting sensors can be combined within one machine, depending on the sorting requirement: a camera sensor for detecting different types of material by color, shape or size, a NIR sensor for distinguishing the different polymers and an inductive metal sensor for detecting all types of metal



Sorting system for metal & electric scrap recycling

Free consultation

<https://www.sesotec.com/contact>



## Application areas

Sensor combination/application	M	M+	C	CM(+)	CN	CM(+N)
Metal detection	+++	+++	+	+++	+	+++
Non-metal detection				+++	+	+++
Cable detection	+	+	++	+++	++	+++
Stainless steel detection		+++		(+++)		(+++)
Copper-aluminium distinction			++	+++	++	+++
Circuit board detection		+		++		++
Zobra factions upgrade			+	+++	+	+++
Processing of engineering plastics				+	++	+++

## Technical data

Working width [mm]	1024	1536	1920	2816
Throughput up to [t/h]	3	4.5	6	8
Number of valves	128	192	240	320
Valve pitch [mm]	8	8	8	8.8
Suitable grain sizes [mm]	10–250			
Power [max. KVA]	4–8	4–8	4–8	4–8
Temperature range	+5 °C up to +40 °C			
Protection class	IP54	IP54	IP54	IP54

## Options

Device division	For parallel sorting of two different material streams or for 2-stage sorting
Conveyor belt length	4.4 m or 6.2 m conveyor belt with a speed of up to 4 m/s for optimum distribution and separation of the elements in the material flow to increase throughput
Valve grid	Alternative valve pitch possible for certain sorting applications
Sensor upgrade	Pre-wiring for possible sensor upgrade
M+: selective metal sensor	Selective inductive multi-channel detection coil for detection of stainless steel, steel and non-ferrous metal
Vibratory feeder chute	Vibratory feeder for optimal distribution and separation of the elements of the material flow
Cooling system	Vortex cooling for use in environments with high temperatures
Roll vertex	Roll vertex on the separator plate to avoid material accumulation
Film chute	Foil chute between conveyor belt and separator housing for separation of light material
Belt cleaner	Rotating brush under the conveyor belt for cleaning the belt

# VARISORT+ UNITY

The versatile sorting system for recycling plastic and rigid packaging

<b>CMN</b>	<b>4</b>	<b>350</b> mm
Sensors	Work widths	Grain size

## Modular concept

Depending on the sorting task and requirements, the VARISORT+ UNITY is available as a complete solution with separator housing and conveyor belt, or as VARISORT+ FLEX, a separate sensor attachment for existing sorting lines



## Ai with added value

Previously unidentified or difficult-to-identify contaminants are reliably detected within the material stream, depending on the application, thanks to Sesotec Object-Ai and/or NIR-Ai, and sorted by the air blast nozzles

## Optimized hardware design

By the optional three chute design and second blasting bar the material flow can be divided into three separate streams with just one device, thereby increasing productivity



Flexible sensor technology for plastic and rigid packaging recycling

Free consultation  
<https://www.sesotec.com/contact>



## Application areas

Sensor combination/application	C	CN	CM	CMN	N	MN
Bottle recycling	+	+++	+	+++	++	++
Mixed plastics (PS/PE/PP)	+		+	+++	++	++
MSW	+	+++	+	+++	++	++
Color sorting	+++	+++	+++	+++		
Metal detection						Option (M): Metal sensor

## Technical data

Working width [mm]	1024	1536	1920	2816
Throughput up to [t/h]	3	4.5	6	8
Number of valves	64/40	96/60	120/75	160/110
Valve pitch [mm]	16/25.6	16/25.6	16/25.6	17.6/25.6
Suitable grain sizes [mm]	15–350	15–350	15–350	15–350
Power [max. KVA]	3.5	3.65	3.8	4.5
Temperature range	+5 °C up to +40 °C			
Protection class	IP54	IP54	IP54	IP54

## Options

Split machine	Splitting of the sorting machine for sorting two different material streams in parallel or for 2-step-sorting
3rd chute	Additional 3rd chute and 2nd valve bar for sorting the input material into 3 fractions
Valve grid	Other valve grids possible depending on type of sorting application
Sensor upgrade	Pre-wiring for future integration of additional sensors
M+: Selective metal sensor	Selective, inductive multi-channel detection coil for detection of stainless steel, steel and non-ferrous metal
Roller splitter	Roll vertex on the separator plate to avoid material accumulation
Cooling system	Vortex cooling for use in environments with high temperatures
VISUDESK system visualization software	Web-based visualization of sorting systems using OPC UA
Belt scraper	Rotating brush below the conveyor belt to keep the belt clean
Vibratory feeder	Additional vibratory feeder for the sorting device for optimum distribution and separation of the elements in the material flow

# VARISORT+ FILM

The efficient sorting system for film and light packaging recycling

CMN	4	400 mm
Sensors	Work widths	Grain size

## Optimal material conveyance

Flexible packaging and films are stabilized by a device generated laminar air-flow, allowing for both reliable detection and sorting. At the same time, throughput can be significantly increased compared to sorting on conventional devices



## Maximum efficiency

Air turbulence within the ejection unit is a thing of the past thanks to the aerodynamic ejection unit design of the VARISORT+ FILM

## Safe and proven

The VARISORT+ FILM is based on the extensively deployed and reliable Sesotec sensors. These ensure low-maintenance and error-free production around the clock



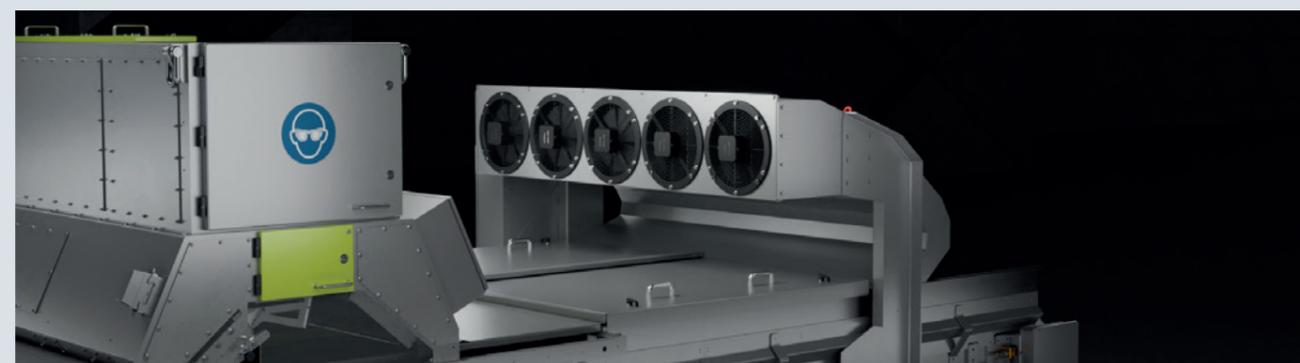
Flexible sensor technology for film and light packaging recycling

**Free consultation**

<https://www.sesotec.com/contact>



## Detail: Unit for generating laminar air flow



## Technical data

Working width [mm]	1024	1536	1920	2816
Throughput up to [t/h]	Material dependent			
Nozzle count	128	192	240	352
Nozzle grid [mm]	8	8	8	8
Suitable material sizes [mm]	100–400			
Power [max. KVA]	3.8	3.95	4.1	4.8
Temperature range	+5 °C up to +40 °C			
Protection class	IP54	IP54	IP54	IP54

## Options

Sensor upgrade	Pre-wiring for future integration of additional sensors
M+: Selective metal sensor	Selective, inductive multi-channel detection coil for detection of stainless steel, steel and non-ferrous metal
Conveyor belt length	6 m conveyor belt
Cooling system	Vortex cooling for use in environments with high temperatures
VISUDESK system visualization software	Web-based visualization of sorting systems using OPC UA
Disk spreader	Disc spreader for optimum distribution and additional breaking up of the input flow

# Driving the AiVOLUTION

ARTIFICIAL INTELLIGENCE FOR MAXIMUM SORTING PERFORMANCE

## NIR-Ai: Making the invisible visible



### Typical application areas

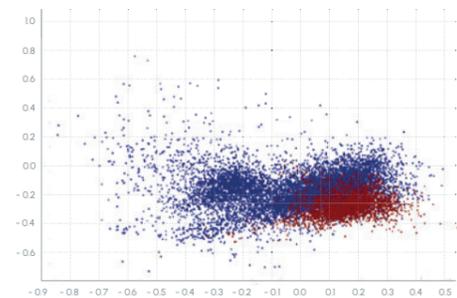
- Differentiation between PET monolayer and multilayer (tray and bottle)
- Detection of PE multilayers
- Differentiation between HDPE bottles and foamed PE
- Improved differentiation between PET and PETG (bottles and flakes)
- Recognition of various bottle-label combinations



**Note:**  
The list of use cases can be expanded according to customer-specific requirements.

### The issue:

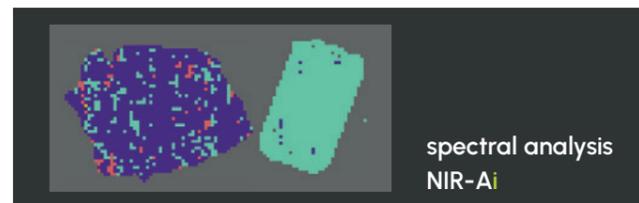
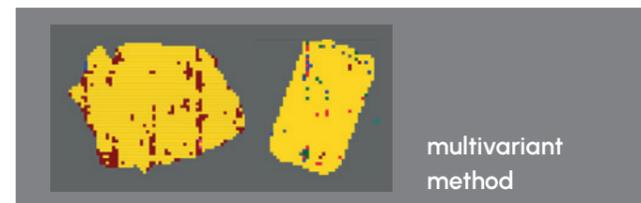
Multivariant methods reach their limits of detection accuracy when dealing with optically similar products, resulting in valuable materials being sorted out 'just to be safe'.



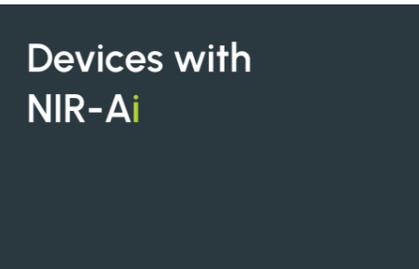
The point-clouds defined by the spectral analysis of the near-infrared sensor must be clearly distinguishable from each other for reliable differentiation. Once strong overlaps occur, as indicated in the left-hand image, the risk of false detection increases. Valuable resources for feeding into the material cycle are lost. A typical application scenario with limits for NIR sensor technology: Monolayer and multilayer PET.

### The Solution: NIR-Ai Application

#### Example: monolayer vs. multilayer PET trays



Thanks to Artificial Intelligence for the near infrared sensor spectral analysis optically similar products can be clearly distinguished from each other. For better sorting results. For higher profitability.



NIR-Ai is available and retrofitable on all models of the VARISORT+ family



- Efficiency: Consistently high results in standard applications
- Quality: Differentiation of very similar polymer structures possible
- Flexibility: Retrofitting possible on all Sesotec sorting devices
- Innovation: Solution already addressing tomorrow's challenges (tray sorting, multilayer juice bottles, ...)



# Driving the AiVOLUTION

ARTIFICIAL INTELLIGENCE FOR MAXIMUM SORTING PERFORMANCE

## Object-Ai: Optical Sorting Perfection



### The issue:

What may seem easy to recognize for the human eye pushes machine sorting of heterogeneous material streams to its limits in detecting contaminants.

### The solution: OBJECT-Ai

Thanks to Artificial Intelligence specific properties are assigned to each object during color and shape analysis by the color sensor. This ensures a clear classification and differentiation of good material and foreign matter based on shape, color, and texture (bounding boxes).



#### Legend:

- HDPE\_Bottle\_Labeled\_Food
- Mixed\_Bottle\_Colored\_Food
- HDPE\_Bottle\_White\_Food
- PET\_Bottle\_Colored\_Food
- HDPE\_Bottle\_White\_nonFood
- Silicon\_Cartridge\_White\_nonFood
- HDPE\_Canister\_Colored\_nonFood
- HDPE\_Cap\_Colored\_unknown
- Silicon\_Cartridge\_Black\_nonFood
- Mixed\_Bottle\_White\_Food
- PET\_Bottle\_Clear\_Food
- Silicon\_Cap\_White\_NonFood
- HDPE\_Bottle\_Colored\_nonFood

### Typical application areas

- PE / PP
  - Films
  - Electronic waste (WEEE)
  - Food vs. Non-Food in various forms
- Examples of food-grade materials:  
Juice and milk bottles, HDPE packaging, Squeeze bottles (butter, oil, syrup, ...), Bottle caps
- Examples of non-food materials:  
Cleaning and cosmetic containers, Silicone cartridges, Oil canisters, Pipes or cable casings



**Note:**  
The list of use cases can be expanded according to customer-specific requirements.

### Devices with Object-Ai



VARISORT+ UNITY



VARISORT+ FILM

### Your benefits

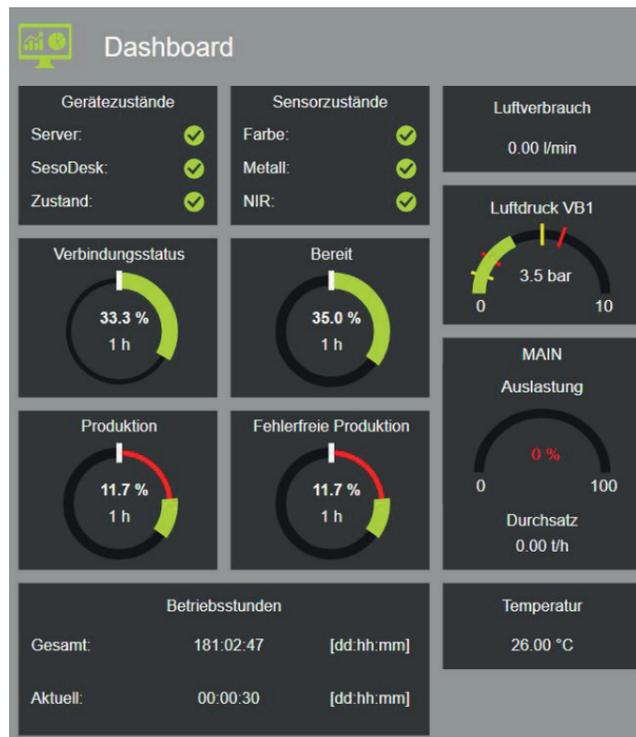
- Efficiency: Consistently high results in standard applications
- Quality: Differentiation of very similar polymer structures possible
- Flexibility: Retrofitting possible on all Sesotec sorting devices
- Innovation: Solution already addressing tomorrow's challenges (tray sorting, multilayer juice bottles, ...)

# VISUDESK

To improve product quality and the efficiency of sorting and recycling plants, process data is essential for operators. With the VISUDESK visualization software, this data can be easily and clearly displayed on all Sesotec equipment. Based on this data, they can derive targeted measures to increase efficiency and effectiveness on the one hand and minimize downtimes on the other. The OPC UA-based machine communication model is implemented both on the devices and on a server and thus enables both stationary and mobile access to the application.

## Advantages of VISUDESK

- Control of the sorting process
- Optimization of the sorting system
- Predictive maintenance
- Reduction of downtime
- Fact-based decisions

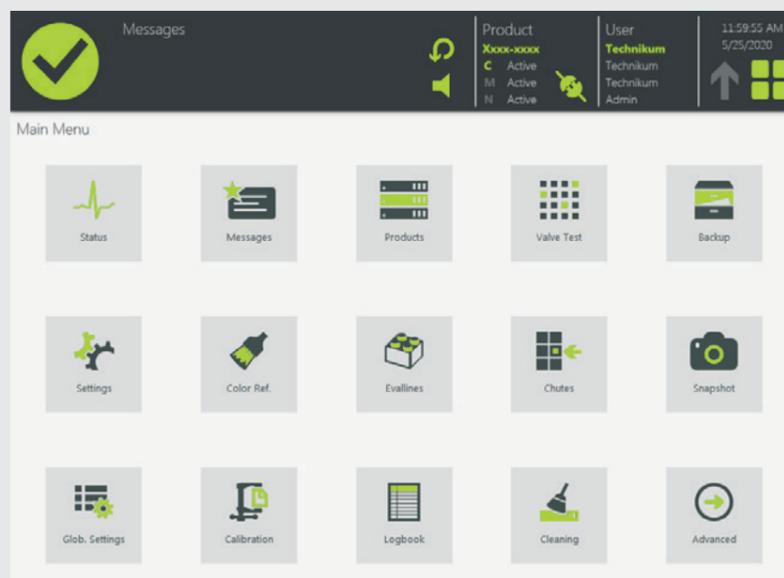


Dashboard visualization of process data, valve data, evaluation data and material data

# SesoDesk

Our SesoDesk operating software allows for intuitive and fast configuration of all sorting devices for each application.

- Modern design
- Error/status messages
- Intuitive operation
- Logbook
- Integrated remote maintenance
- Predictive maintenance



Main menu of the SesoDesk user interface

# Fast and reliable service



## Phone support

Many questions and incidents can be solved by phone. Our free telephone support is available for you daily from 6 am to 8 pm, on weekends from 8 am to 5 pm.

**Service Hotline Sorting**  
+49 (0) 8554 308-129  
service.sorting@sesotec.com



## Remote Access

Sesotec service technicians have direct access to your machines via Ethernet connection and can perform error analyses, optimizations and parameter settings.



## Augmented Reality

In addition to telephone support and remote access, Sesotec also offers video-based support with augmented reality. This is done via the TeamViewer Pilot App.



Want to learn more about our technology for recycling industries?

Get in touch with us directly! We look forward to advising you. You can reach us at:

**+49 (0) 8554 308-0**    [www.sesotec.com](http://www.sesotec.com)

## Imprint

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SESOTEC VARISORT+ UNITY