UCY Scalable Sorting Platform
Tech Overview

ucy technologies

A UCY Ventures Group company

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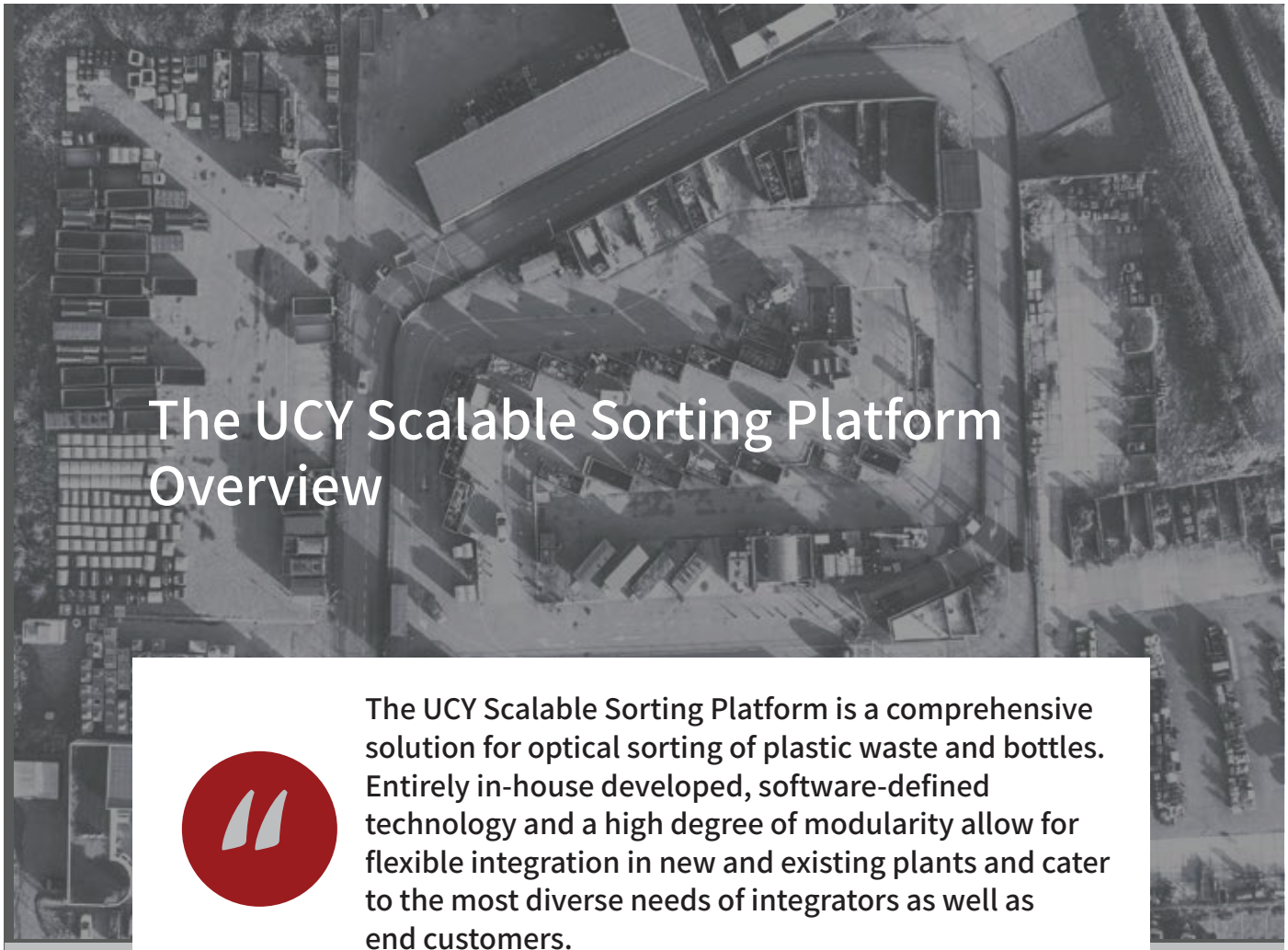
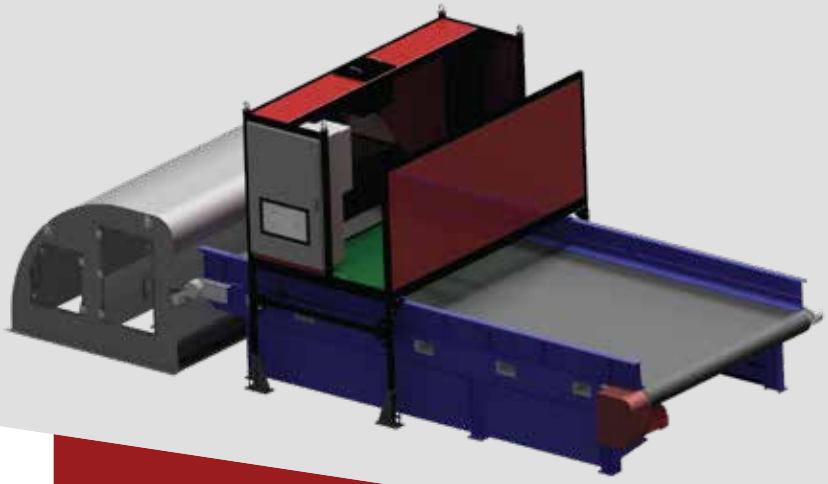


The UCY Scalable Sorting Platform Overview

The UCY Scalable Sorting Platform is a comprehensive solution for optical sorting of plastic waste and bottles. Entirely in-house developed, software-defined technology and a high degree of modularity allow for flexible integration in new and existing plants and cater to the most diverse needs of integrators as well as end customers.

- Unique software-defined data processing architecture leading to better sorting decisions
- Modular architecture allows for easy and flexiblle substitution of hardware and software parts
- Advanced hyerspectral system with class-leading cost efficiency offering better data resolutions
- Based on local in-stock components, creating a viable spare part supply chain with short lead times
- Cutting-edge AI technology enabling superior visual distinction of material classes
- Proven technology platform used at renowned PET recyclers across the EU since 2016



Components and Working Principle

01 Vision Unit

The technological heart of the machine. Containing all the optics, sensors, power supply and processing electronics, it is a compact and innovative powerhouse. Its design adheres to a strictly software-driven philosophy, meaning that all the processing is independent of any custom electronics or specific hardware manufacturers. Using off-the-shelf, interchangeable electronics makes it possible to react quickly to new developments, changing requirements and part availability issues.

02 Sorting Unit

The place where actual sorting happens, using pneumatics to separate the objects. With either two or three separate chutes, the Sorting Unit can be designed and manufactured independently by the integrator depending on a specific project's needs. UCY Technologies supplies pneumatic valve units in different widths (typically 1050, 1400, 2100 or 2800 mm) and equipped with high quality valves and a state-of-the-art, Ethernet-based bus system which can be plugged right in to the Vision Unit. After the integration of the valve units, the case design is flexible and can be adjusted freely to the customer's requirements and the integrator's branding.

03 Inductive Sensing Unit

As a separate option, UCY Technologies can supply an array of inductive sensors, intended to be mounted right below the conveyor belt. It shares the signature UCY design philosophy – standardized, modular parts and one simple Ethernet-based connection to the Vision Unit. Leveraging the inductive sensing capabilities in conjunction with the RGB camera data, ferrous as well as non-ferrous metal contaminations can be reliably detected and removed from the material stream.

04 Vision Processing Software

Software is what makes all modern technology tick, and it is where you can make all the difference between a good-enough product and an excellent one. This is why UCY Technologies developed its sorting technology platform from a software-defined perspective from the beginning. The UCY Operating System is a hard real-time capable, PC-based platform providing hardware abstraction layers (HALs) for all the input and output hardware. Therefore, changing suppliers of any piece of hardware across the platform is in many cases a simple matter of "plug and play". It also enables the synchronization of all input data streams in one processing application. While competitors have to rely on single pixels for making decisions and calculating ejections, the UCY stack analyzes the entire object and can reliably account for unfortunate-but-inevitable conditions like seeing jittery or physically different overlapping objects in the same place on the conveyor belt. Also, UCY OS is able to detect black objects out-of-the-box without requiring any additional sensor technology. This is made possible by doing intelligent continuous calibration of the background belt and then looking for changes in the camera picture in comparison to previous belt roundtrips, which is another exclusive UCY innovation.

05 UCY Hyperspectral Classification

Distinction of different types of plastic such as PET, PVC, HDPE and many others has always been a key challenge in recycling. Hyperspectral imaging is a way to solve this challenge, and this is where UCY's classification technology shines. While competitors buy their hyperspectral analysis software from third-party vendors or have to rely on crude legacy technologies like single-wavelength photosensors and rotating mirrors, UCY Technologies uses its own unique, in-house developed and Machine Learning-based algorithm for classification of hyperspectral data. Not only does this make it possible to create entirely custom analysis profiles for the specific distinctions a particular customer is most interested in, but it also allows effortless upgrades to the spectrograph and sensing hardware at the very moment when new developments enter the market. The capability of always using state-of-the-art technology that way is unheard of elsewhere in the industry.

06 Cloud-enhanced classifier training

New challenges such as the distinction of material origin (food/non-food) by subtle cues such as shape and texture of an object as well as the potential for substantial yield improvements through enhanced object detection call for innovative new technologies. UCY's cloud-connected AI brings true intelligence to sorting. Since 2023, every Vision Unit ships with preparation so that Cloud connection can be enabled at any time.

Technical Data
UCY A-series Sorting Platform

AVAILABLE MODELS AND NOMENCLATURE

- Width of 1050, 1400, 2100 or 2800 mm
- Base models with either color detection only (”C” models) or with color as well as NIR detection (”CN” models; not for 1050mm)

COMPRESSED AIR SUPPLY

- In accordance with ISO8573-1:2010 classes of at least [7:4:4], lubricated operation possible
- Operating pressure typically 4-8 bar (depending on use case as well as the exact sorting unit design)

COOLING AND ENVIRONMENT CONDITIONS

- Built-in AC unit (default), alternatively vortex tube or connection to existing liquid cooling is possible
- Operating temperature: + 5 ... +40 *C
- Relative humidity: 5% - 95% (non-condensing)

OPTIONS

- Inductive Metal Sensing Unit
- Cloud-powered AI-based continuous training and adaptation to current input conditions
- Multi-Lane (different sorting profiles across the width of the conveyor belt)
- 4G/5G modem for standalone remote access

INTERFACES / PLC STATE SIGNALING

- Internet connection is optional and recommended
  - Obligatory for remote support via VPN as well as Cloud-based features
  - Connection either via Ethernet to customer’s network or alternatively via a built-in 4G/5G modem (extra fees may apply in the latter case)
- Options for signaling of machine state to PLC
  - Two output bits (SORTING ACTIVE and ERROR) and one input bit (ENABLE SORTING) connected directly via simple wires
  - EtherCAT
  - Integration of other fieldbus systems such as PROFINET and signaling of customer information is possible on request

AVAILABLE MODELS AND NOMENCLATURE

SYSTEM WIDTH [MM]	1050	1400	2100	2800
POWER INPUT	3-phase 400 V, 4A, 50 Hz	3-phase 400 V, 10A, 50 Hz	3-phase 400 V, 16A, 50 Hz	3-phase 400 V, 18A, 50 Hz

NOMENCLATURE

Glossary

Vision Unit	Part of the machine that houses the cameras and processing equipment as well as the lamps. It is located on top of the belt.
Sorting Chamber	Main housing containing chutes and valve bars
Ejection Bar(s) / Valve Bar(s)	One or two bars of pneumatic valves that are located in the Sorting Chamber above or below the trajectory of material
Vision Box	Housing for RGB and SWIR optics and sensors
Processing Cabinet	Main control cabinet containing Touch Panel and electronics

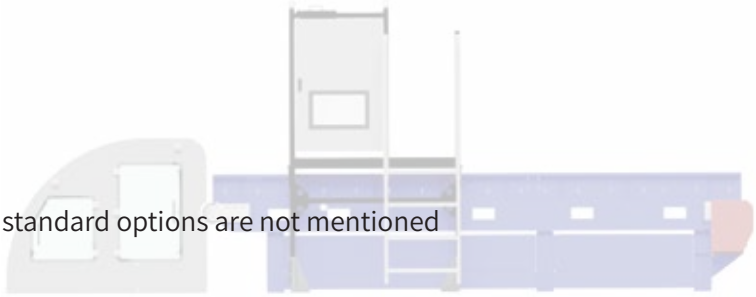
Part Number

Base Unit

UCY A <Width> <Options> G1

<Width> (in mm) : 1050; 1400; 2100; 2800

<Options> : In alphabetical order; see options; standard options are not mentioned



Options

Option ID	Remark	Standard
Cp1	Control Panel Left	x
Cp2	Control Panel Right	
Es1	Ejector Bar 1: Standard (25 mm grid)	x
Eh1	Ejector Bar 1: High Density (12,5 mm grid)	
Es1	Ejector Bar 2: Standard (25 mm grid)	
Eh2	Ejector Bar 2: High Density (12,5 mm grid)	
M1	Metal Detection	
Ir1	SWIR Sensor (unavailable for 1050 mm machines)	
R1	BRICS Version	
R2	EU Version	x
T	Tensor Processing Unit	x
Vis1	VIS Sensor	x