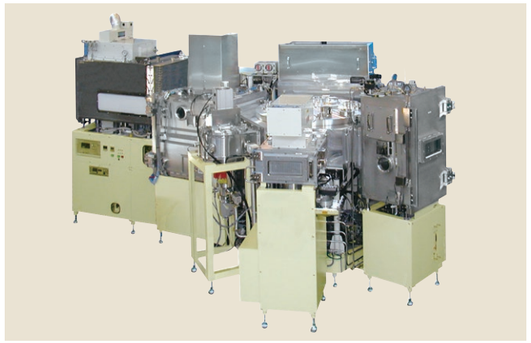
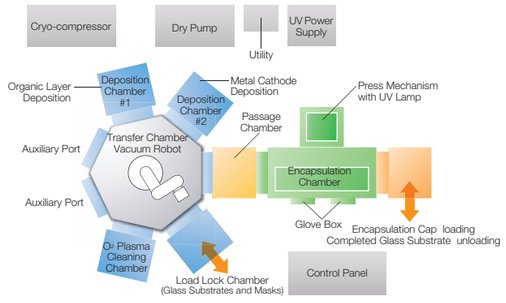
Small to Medium Volume Production System

Small-ELVESS

This system was developed for the small to medium volume production of OLED displays.

Small-ELVESS supports everything from the development and prototyping of OLED displays to the small-volume production of color displays. All processes, from O_2 plasma cleaning to deposition and encapsulation, can be performed in a single system. Substrates are automatically transported by robots that make it possible to fabricate high-performance OLED devices with a high degree of reproducibility. The Small-ELVESS system is ideal for prototyping panels, right up to the point of transition to mass production.





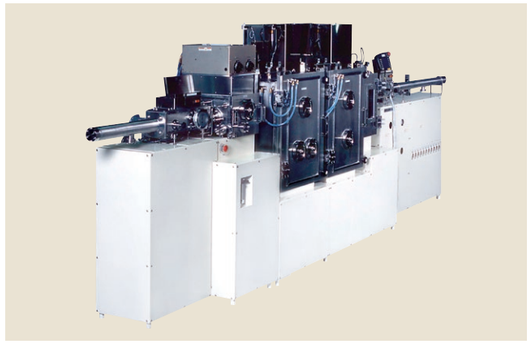
	Exhaust System	Overview
Glass Substrate Size		200 x 200mm, with an effective deposition area of 175 x 175 mm(Customization is available.)
Load Lock Chamber	Dry Pump	One substrate and two masks in a three-stage elevation mechanism
Plasma Cleaning Chamber	Turbo-Molecular Pump	RF plasma power supply, O_2 mass flow controller
Deposition Chamber #1	Cryo-pump	Low-temperature cell evaporation source (8 pieces), CCD alignment mechanism ±5 μm
Deposition Chamber #2	Cryo-pump	Low-temperature cell evaporation source (4 pieces), CCD alignment mechanism ±5 μm
Passage Chamber	Dry Pump	Glass substrate passage mechanism, N_2 gas line
Encapsulation Chamber	Dry Pump	Semi-automatic laminating mechanism, UV lamp unit, N_2 purifier
Pass Box	Dry Pump	N_2 gas line
Control System	Exhaust: fully automatic Deposition: semi-automatic operation Encapsulation: semi-automatic operation Substrate transfer: semi-automatic operation film thickness control through crystal thickness monitor	
Options	Deposition chamber, sputter chamber, or CVD chamber addition; electron beam gun evaporation source, high-temperature cell, oxygen meter	

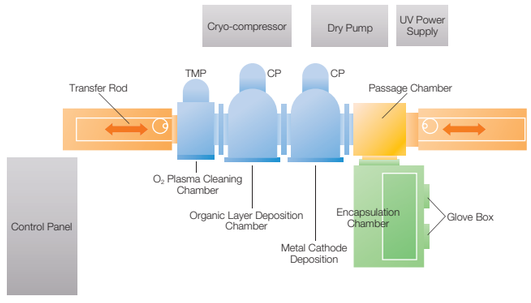
Research & Development System

Try-ELVESS

This system is designed for developing organic materials, and for prototyping, researching, and developing OLED panels.

The Try-ELVESS system is ideal for OLED research & development, as well as material development. It includes an O_2 plasma cleaning chamber, an organic light-emitting diode layer deposition chamber, a metal cathode deposition chamber, an encapsulation chamber, and other components in a unified and compact system that makes it possible to prototype high-grade OLED devices without any contact with the air.





	Exhaust System	Overview
Glass Substrate Size		100 x 100 mm, with an effective deposition area of 82 x 90 mm(Customization is available.)
Plasma Cleaning Chamber	Turbo-Molecular Pump	RF plasma power supply, O_2 mass flow controller
Deposition Chamber #1	Cryo-pump	Low-temperature cell evaporation source (8 pieces), pin mask alignment mechanism ±0.1 mm
Deposition Chamber #2	Cryo-pump	Low-resistance heating evaporation source (4 pieces), pin mask positioning mechanism ±0.1 mm
Passage Chamber	Dry Pump	Substrate passage mechanism, N_2 gas line
Encapsulation Chamber	Dry Pump	Manual laminating mechanism, UV lamp unit, N_2 purifier
Control System	Exhaust: fully automatic Deposition: semi-automatic operation Encapsulation: manual operation Substrate transfer: manual operation film thickness control through crystal thickness monitor	
Options	Electron beam gun evaporation source, high-temperature cell, oxygen meter	

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OLED Production Systems

ELVESS

System-ELVESS OLED Mass Production System

Small-ELVESS Small to Medium Volume Production System

Try-ELVESS Research & Development System

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OLED Production Systems
ELVESS

System-ELVESS	OLED Mass Production System
Small-ELVESS	Small to Medium Volume Production System
Try-ELVESS	Research & Development System

When OLED displays are manufactured, deposition occurs in a vacuum to prevent the degradation of organic layers, and bonding and encapsulation must occur without any contact with the air. Key process atmosphere parameters are controlled in a unified fashion, and all processes are completely automated, resulting in stable production.

Unified processing that includes both deposition and encapsulation makes long, continuous, and stable operation possible

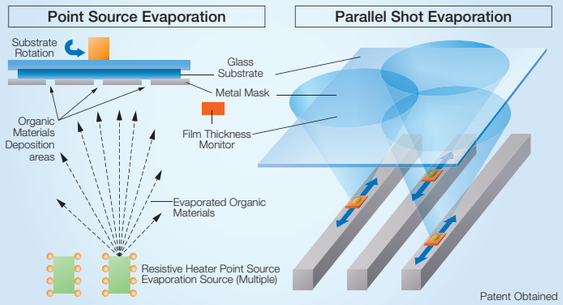
OLED Mass Production System
System-ELVESS

Ever since the beginning of commercial production of OLEDs, Canon Tokki has consistently led in mass production system technology, based on its 30 years of experience in vacuum deposition equipment manufacturing and 35 years of experience in the design and development of factory automation systems. The ELVESS OLED Mass Production System brings together crucial and indispensible know-how in areas such as the deposition of fast-evolving organic materials and metallic materials, the high-precision mask alignment vital to full-color pixel fabrication, and the encapsulation processes that directly affect the reliability of OLED panels. This system will continue to evolve as OLED devices evolve.

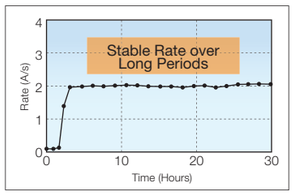
System Features

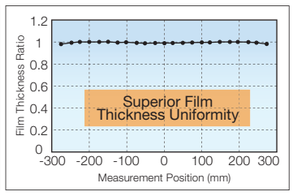
- Stable deposition is realized through the use of our proprietary cell-type evaporation source and control of the vapor deposition rate.
- Improved operating efficiency is realized through the stocking of vapor deposition material, the automated supply of cathode metal material, and the automated replacement of metal masks.
- Deposition demonstrates superior uniformity and reproducibility.
- Stable encapsulation is realized through the use of an automated encapsulation glass supply line and a fully automated encapsulation mechanism.
- High-precision alignment is realized through the use of a proprietary alignment mechanism and a control system using a CCD camera.
- A long life span and stable, continuous device production have been realized by integrating the deposition and encapsulation processes.
- A versatile range of extensibility also allows for the support of large substrates.

Organic Thin Film Deposition



Patent Obtained





Deposition Cluster-1

1. A clean robot installed outside the cluster automatically transfers glass substrates (with ITO) to the cluster.
2. Pre-treatment cleaning of substrates.
3 to **5.** Evaporation of stacked organic layers followed by transfer of substrates to Deposition Cluster-2.

Encapsulation Cluster

11. Encapsulation glass provided with desiccant and adhesive is transported to the encapsulation chamber in N_2 gas atmosphere maintained at a low humidity by controlling the dew point where they are pressed onto the glass substrates, followed by adhesion and encapsulation by UV irradiation.
12. Finished glass substrates on which the encapsulation process has been completed are automatically unloaded to a storage stocker by the robot installed outside the cluster to complete the integrated continuous production process.

Automated Encapsulation Glass Supply Line

Automatic supply of encapsulation glass
▼
UV Cleaning
▼
Adhesive dispensing
▼
Desiccant setting
▼
Degassing followed by automated transport to encapsulation cluster

Deposition Cluster-2

6 to **9.** Evaporation of stacked organic layers.
10. The full-color deposition step is completed with metal cathode deposition, followed by the transfer of substrates to the encapsulation cluster.

- This is a general OLED full-color mass production system configuration. The configuration can be flexibly modified, depending on the process requirements.
- This configuration is created by connecting the deposition cluster-1, the deposition cluster-2, the encapsulation cluster, and the automated encapsulation glass supply line.
- A vacuum robot in the middle of the clusters is part of a fully automated system that completes full-color OLED panels while transporting glass substrates one after the other to the deposition and encapsulation chambers.
- One glass substrate requires a cycling time of between three and five minutes, and continued operation is possible for five or six days.

Basic Specifications of the Mass Production Systems

Glass Substrates	370 x 470 mm to 1,250 x 2,200 mm
	ITO patterned glass substrates (PM)/TFT formed glass substrates (AM)
Exhaust	Deposition process: 10^{-5} Pa level
	Encapsulation process: Low vacuum close to atmospheric pressure, N_2 gas atmosphere maintained at low humidity by control of the dew point
Deposition	Organic material: Resistively heated point source, film thickness distribution: ±5%
	Metal material: THP or EB evaporation source, film thickness distribution: ±7%
Encapsulation	Positioning of glass substrates and encapsulation glass aligned to within ±50μm with a CCD camera
Control	Automated operation by controlling transport, exhaust, deposition, and encapsulation conditions based on computer and sequencer settings
Mask Alignment	Positioning of glass substrates and metal masks is aligned to within ±5μm with a CCD camera