

AMS Technologies OptoTech Division
Optoelectronic Components, Instruments and Systems



**Film Deposition
for front-end PV Production**

Advanced PV Laser Processing

**In-Line Monitoring
and Inspection**

**Film Deposition for
OLED & organic PV**

**Mechanical scribe for
mass production P2 P3 structuring**

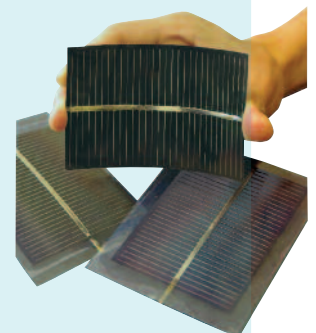
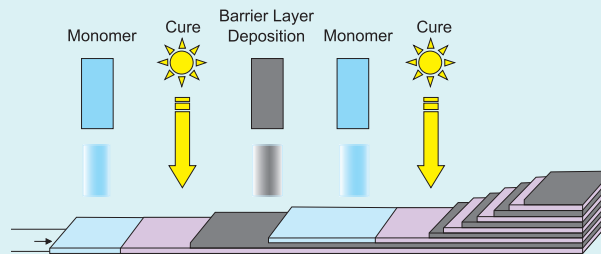
Film Deposition for front-end PV Production

Thin-Film Encapsulation for Thinner and Flexible PV

- Excellent barrier performance WVTR ~ 10^{-6} g/m²/day
- For all thin-film, DSSC and flexible PV
- Transparent, flexible, temperature and UV stable
- Reduction of device thickness
- Proven field performance
- Multilayer structure: polymer/inorganic

Barrier Performance (g/m ² /day)	Application
10 ⁻⁶	OLEDs
10 ⁻⁵	Solar cells
10 ⁻⁴	Thin-Film batteries
10 ⁻³	
10 ⁻²	Sensors, Electrophoretic RFID
10 ⁻¹	Electrochromic displays Medical packaging Food packaging

Single Layer
BARIX™



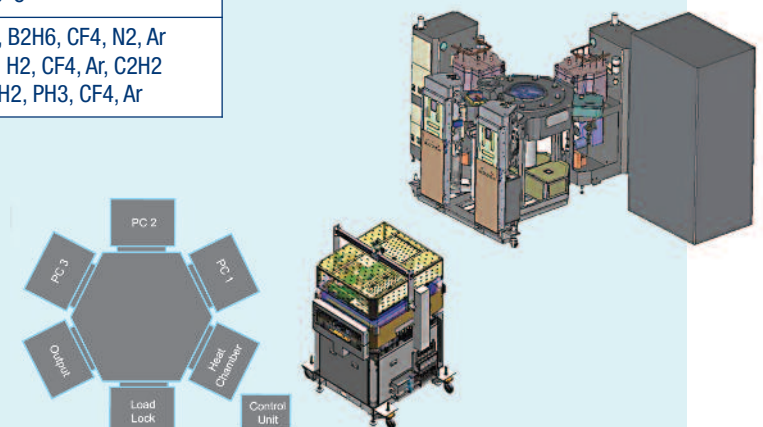
Customer solar cell encapsulated in flexible glass

PE-CVD for Silicon Thin-Film Solar Cells

- Independent process chambers for P, I, N layers
- For a-Si, SiO₂, SiN utilising SiH₄ and TEOS gas
- Flexible choice of chambers
- Rapid load-locks
- Batch approach for higher throughput

Specifications

Substrate size	Wafer: 300mm, Glass : 100 x 100 mm – 730 x 920 mm
Thickness uniformity	± 5 % @ 100nm
Frequency	RF: 13.56MHz, 27MHz – VHF: 40MHz
Temperature range	Ambient up to 450°C
Gas	P type layer (a-Si:H): He, SiH ₄ , H ₂ , B ₂ H ₆ , CF ₄ , N ₂ , Ar I type layer (micro Si:H): He, SiH ₄ , H ₂ , CF ₄ , Ar, C ₂ H ₂ N type layer (a-Si:H): He, SiH ₄ , H ₂ , PH ₃ , CF ₄ , Ar

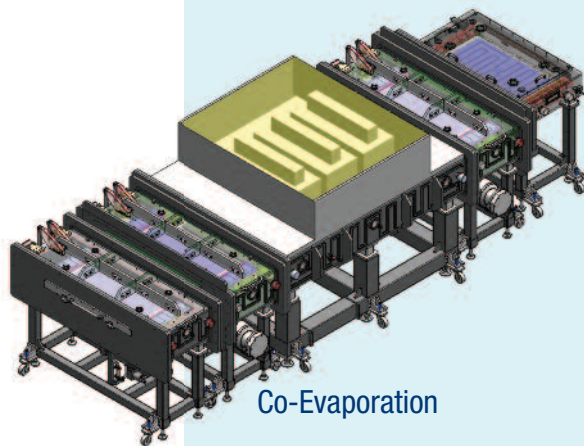


Deposition Systems for CIGS Thin-Film Solar Cells

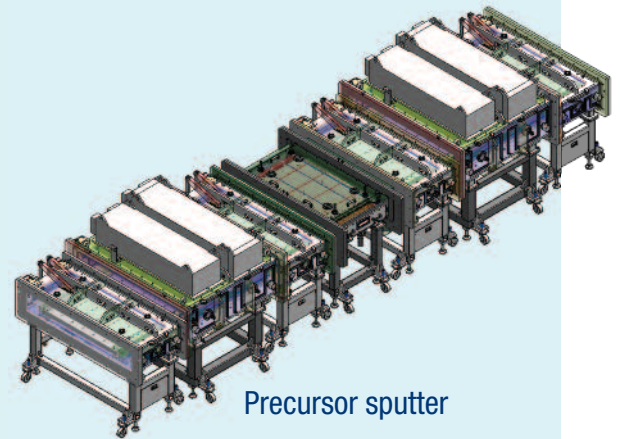
- Substrate size up to 600 x 1200mm
- Co-deposition or layer-by-layer
- Evaporation, e-beam, sputtering
- Substrate temperature variation during processing
- Very short tact times for in-line mass production

Specifications

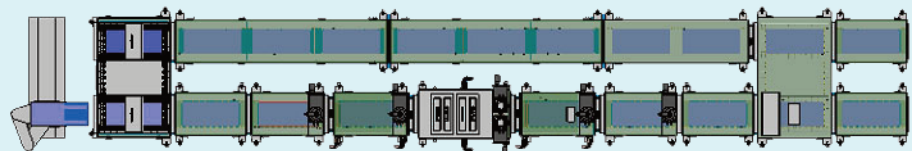
Substrate size	300 x 400 mm – 600 x 1200 mm
Substrate moving speed	0.5 m/min
Substrate temperature	550°C ± 20°C
Material usage	40%
Film uniformity	± 5%



Co-Evaporation



Precursor sputter



Se Evaporation

Advanced PV Laser Processing

R&D Tools

Laser scribing
Wafer cutting (re-sizing)
Hole drilling (wrap through)
Edge isolation
Edge deletion
Buried contact groove cutting
Laser fired contacts
Thin-film scribing
Oxide removal
Marking

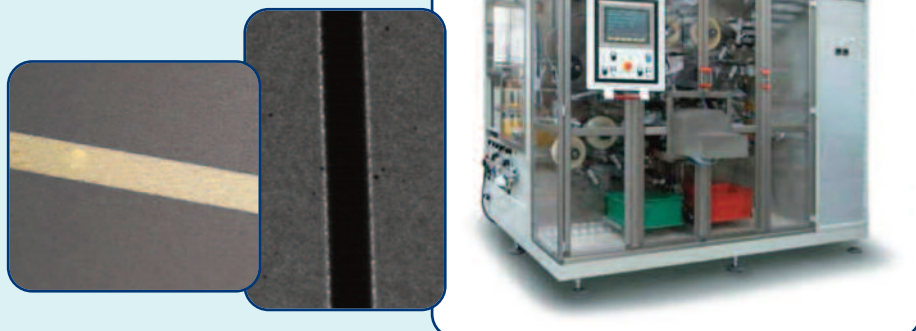
- Range of tool platforms
- IR, Visible and UV Laser sources
- Multi-wavelength configuration available
- Flexible tools with user friendly interface
- Si wafer, flex foil, glass panel formats



Reel-to-reel Flex scribing

Laser scribing
TCO & conducting metal layers
Scribe insulating oxides and coatings
Foil cutting
Edge deletion
Trim and seal encapsulation
Welding electrical contacts
Marking product identity code and legends

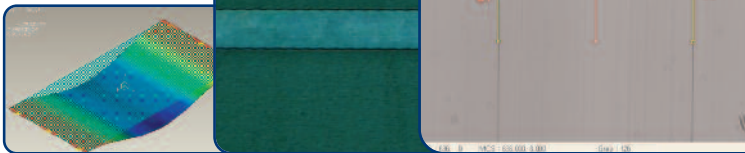
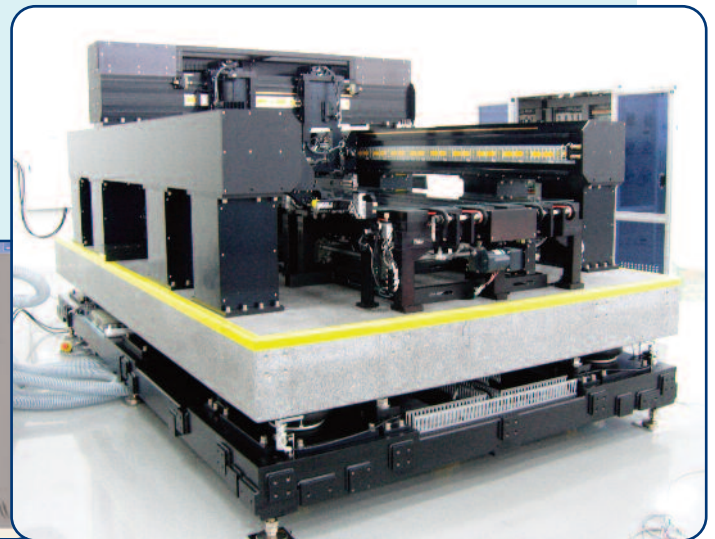
- Line integrated scribing modules
- Full turnkey process solutions
- Scribing all conducting and insulating layers
- Polymer and metal foil web handling
- Active tracking and scribe alignment



Fully Automated Production Systems

- High throughput and yield
- P1 P2 P3 and edge deletion
- Large area glass panel processing
- Single or multiple wavelength processing
- On-line inspection and process control

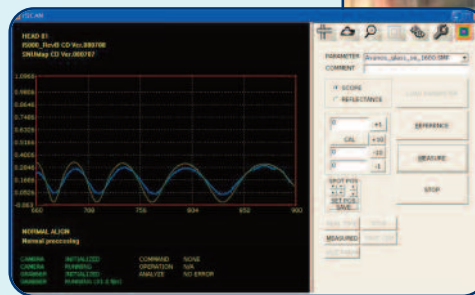
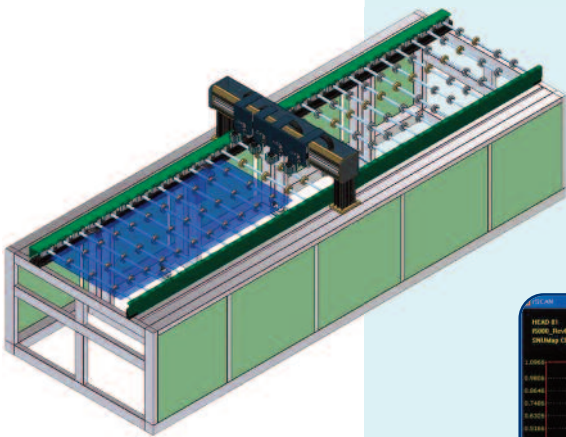
Flat panel production
Thin-film scribe P1,P2,P3
Edge deletion
Glass size to 2,20m x 2,60m
Line writing to 1500 mm/sec
Multi-line scribing for max throughput
Integrated input and output stages
Integrated inspection stages



In-Line Monitoring and Inspection

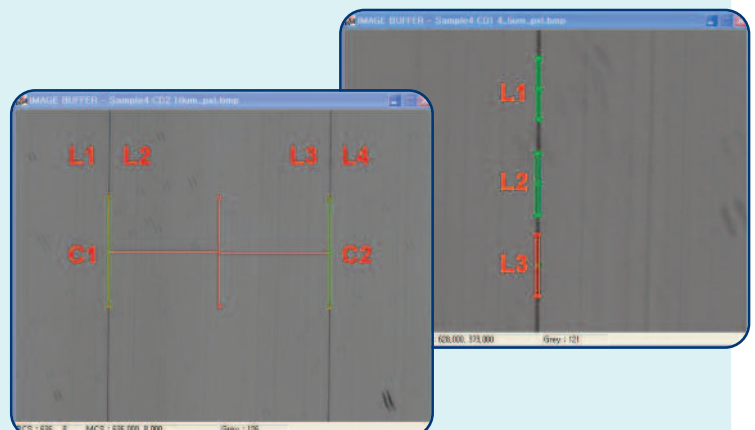
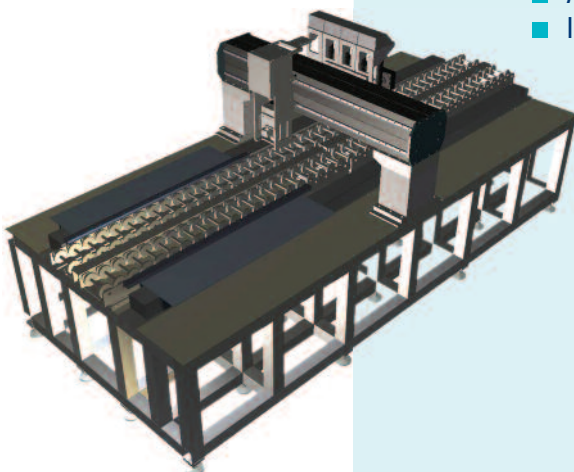
In-Line Film Thickness Monitoring

- Glass substrate sizes up to 2,20m x 2,60m
- Applications for any thin-film layer
- LED illumination for long life time & stable intensity
- Automatic calibration function
- Thickness repeatability < 10nm @ 3 sigma
- In-line configuration for mass production tact time



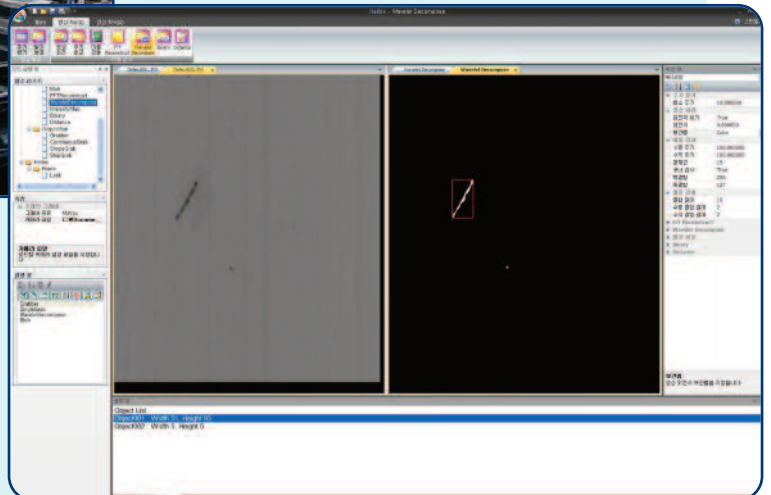
In-Line Quality Control

- Glass substrate sizes up to 2,20m x 2,60m
- Scribe line width & parallelism
- Geometry control
- Thin-film quality
- LED illumination for long life time & stable intensity
- Micro review camera & line scan camera
- Automatic calibration function
- In-line configuration for mass production tact times



In-Line Defect Inspection

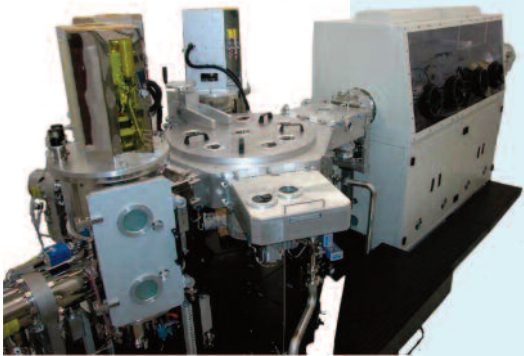
- Glass substrate sizes up to 2,20m x 2,60m
- Scribe line defects, bridges & shorts
- Film defects
- Glass scratches
- LED illumination for long life time & stable intensity
- Whole glass scanning
- Automatic calibration function
- In-line configuration for mass production tact time



Film Deposition for OLED & organic PV

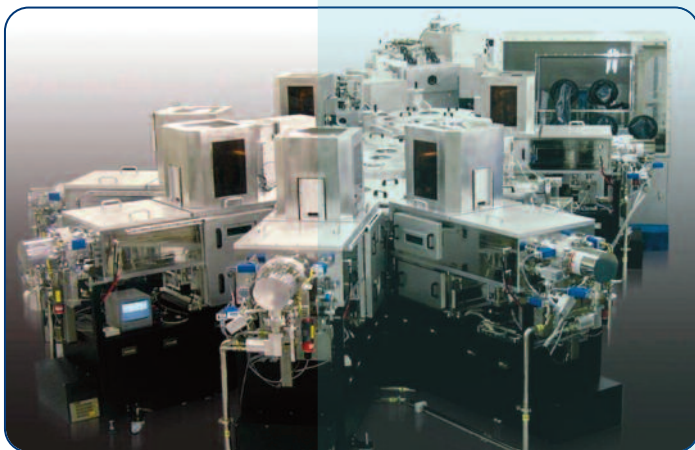
Organics Modular R&D Tool

- Substrate size up to 100 x 100mm (bigger on request)
- Glove box incl. choice of options (e.g. semi-auto encapsulation)
- Pre-treatment chamber
- Organic process chamber - incl. SNU's proprietary organic evaporation sources
- Metal process chamber
- Extensible according to customer requirements up to 4 chambers



Organics Thin-Film Cluster - R&D and Pilot Line

- Substrate size up to 370 x 470mm (bigger on request)
- Up to 8 SNU's proprietary organic evaporation sources
- Metal sputtering
- Automated mask handling
- Octagonal transfer chamber with central robot
- Optional Glove Box with choice of interior components



Thin-Film Encapsulation for all sensitive organic layers

- R&D, Pilot Line & Mass Production

For glass substrates

	Barrier Performance (g/m ² /day)	Application
BARIX™	10 ⁻⁶	OLEDs
	10 ⁻⁵	Solar cells
	10 ⁻⁴	Thin-Film batteries
Single Layer	10 ⁻³	
	10 ⁻²	Sensors, Electrophoretic RFID
	10 ⁻¹	Electrochromic displays
		Medical packaging Food packaging

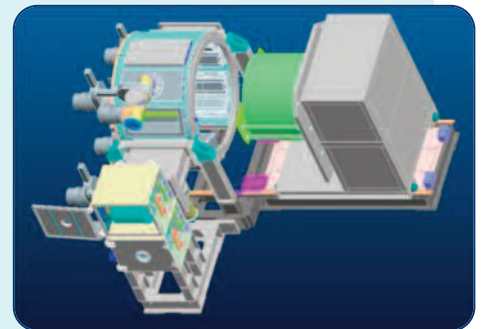
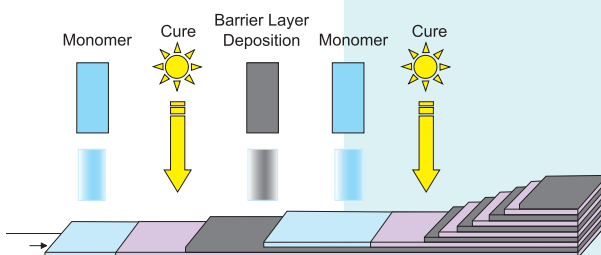
- Excellent barrier performance MVTR < 5x10⁻⁶ g/m²/d patented VITEX multilayer process
- Glass substrates up to 730 x 920 mm
- Organic process incl. UV curing
- Reactive sputter for metal oxide
- Automated mask handling
- Proven field performance
- For OLED and organic PV



For flexible substrates roll-to-roll processing

Additionally to the above:

- Foil widths up to 800 mm
- Foil speed up to 5m/min
- For OLED and organic PV

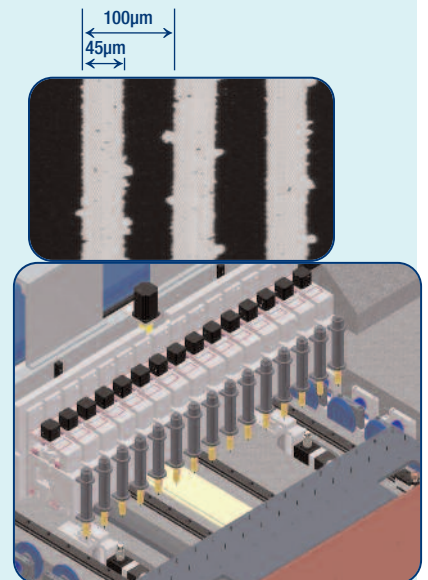


Mechanical scriber for mass production

Mechanical scriber for mass production P2 P3 structuring

- Substrate sizes up to 2,20m x 2,60m
- Scribing thin-films P2 P3
- Multi-head scribing
- Rapid scribing 600 mm/sec.
- 45µm scribes at 100µm pitch
- Automatic needle changer
- In-line mass production at 50sec tact time

Tool type	Tungsten carbide needle
Scribing width	40µm (typical)
Line to line distance	10mm (typical)
Number of needles	>10
Number of strokes per substrate	8 (4 round trips)
Scribing velocity	up to 1000 mm/s
Tact time	50sec (typical)
Line width tolerance	< 5µm
Needle life time	50.000min (automatic needle changer)
Parallelism	< 20µm
Chuck flatness	± 30µm
Straightness	± 10µm (all travel)
Position accuracy	± 10µm (all travel)
Velocity stability	± 5 % (all travel)



Manufacturer and sales & support network



SNU Precision Co., Ltd. designs and manufactures front-end production equipment for existing and next generation solar cells and thin-film modules in two business units. While the PV unit manufactures thin-film deposition equipment like evaporators and sputtering tools for CIGS as well as Pe-CVD systems for TF-Si, the IS unit markets inspection systems for quality control and defect detection. All systems can be offered in R&D, pilot line and mass production configurations - for processing glass and flexible substrates.



OpTek Systems is a leading manufacturer of production tools for precision laser processing. A range of laser processing tools are supplied to PV cell manufacturers for low volume production or R&D through to fully automated mass production. Customer applications are also supported through process development, qualification sampling and sub-contract manufacture. OpTek has facilities in Abingdon UK, Boston MA and Greenville SC, and is supported by partner organisations throughout Europe and Asia.

Founded in 1982, **AMS Technologies** is a leading pan European distributor of high-tech systems today. The product offering includes deposition equipment for front-end thin-film PV, turnkey systems for organic PV, OLED display and lighting, thin-film encapsulation; optical inspection systems for defect detection, quality control and film thickness monitoring; laser and mechanical scribes for thin-film structuring. All systems are available in cluster and in-line, as well as R2R configurations for flexible substrates. The systems are available for in-line mass production, pilot line and R&D. Headquartered in Martinsried/Munich, Germany, the company serves regional markets from local sales and service offices in Spain, the United Kingdom, France and Italy.

More than Distribution

Germany

AMS Technologies AG
Fraunhoferstraße 22
82152 Martinsried/München
Phone +49 (0)89 895 77-0
Fax +49 (0)89 89577-199
info@ams.de

United Kingdom

AMS Technologies Ltd.
Unit 11, St Johns Business Park
Lutterworth
Leicestershire LE17 4HB
Phone +44 (0)1455 556360
Fax +44 (0)1455 552974
uk_info@ams.de

France

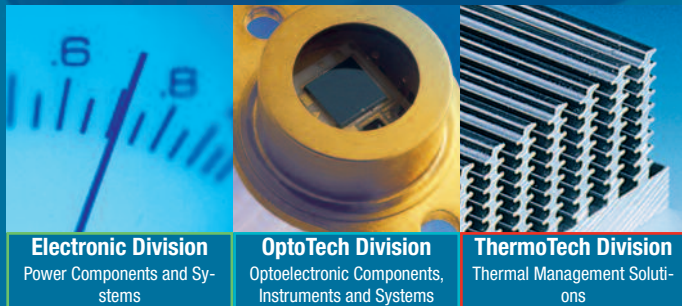
AMS Technologies S.A.R.L.
Les Conquérants
1, avenue de l'Atlantique
ZA Courtaboeuf
F-91976 Les Ulis Cedex
Phone +33 (0)1 64 86 46 00
Fax +33 (0)1 69 07 87 19
fr_info@ams.de

Italy

AMS Technologies S.r.l.
Via San Bernardino, 49
20025 Legnano (Milan)
Phone +39 0331 596 693
Fax +39 0331 590 732
i_info@ams.de

Spain

AMS Technologies S.L.
C/Muntaner, 200 Atico, 4^a
08036 Barcelona
Tel. +34 93 238 9407
Fax +34 93 238 9406
e_info@ams.de



Electronic Division
Power Components and Systems

OptoTech Division
Optoelectronic Components, Instruments and Systems

ThermoTech Division
Thermal Management Solutions

www.ams.de