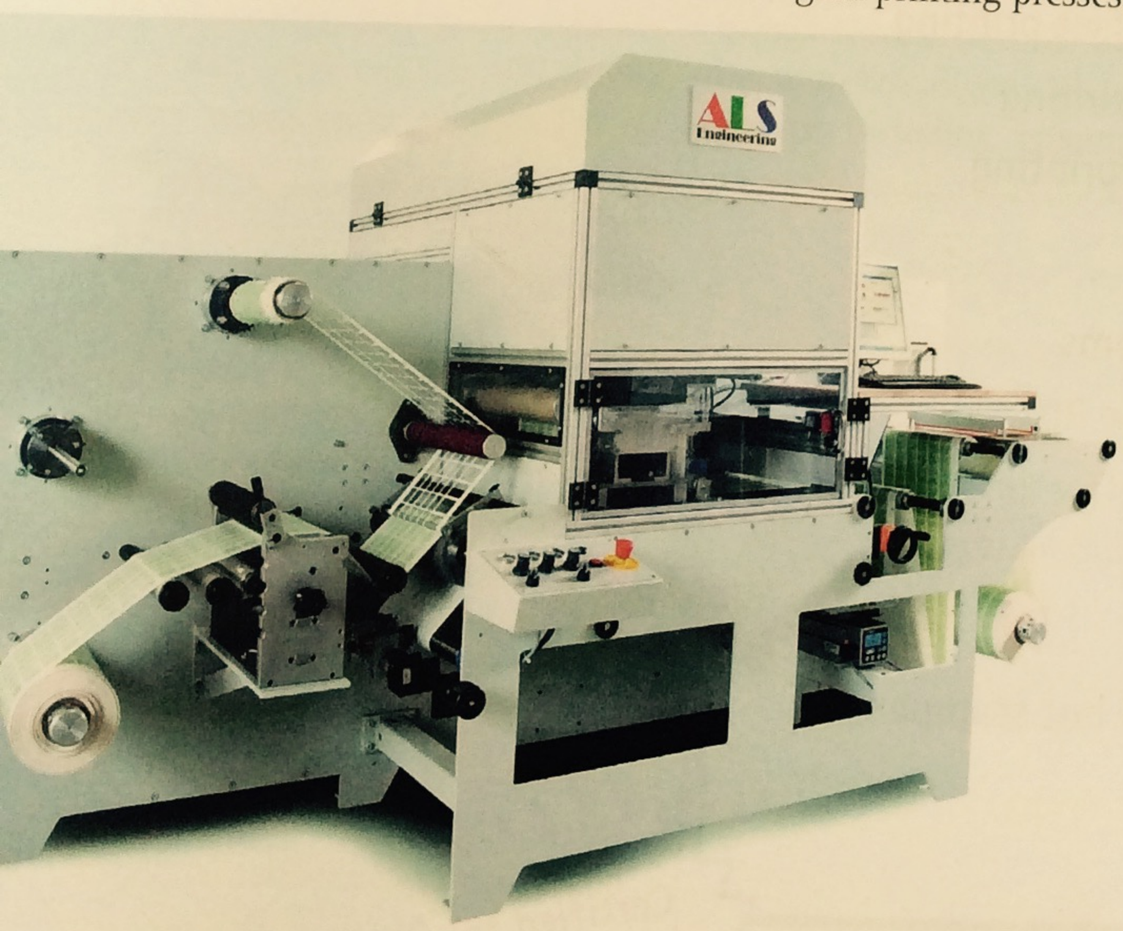
Overview of laser die-cutting systems for label production

Holger Knöll

Laser die-cutting is a contact-free process requiring no physical tools. In label production, CO_2 lasers are used, cutting the desired label shape out of the pressure-sensitive compound. In doing so, the upper material and the adhesive layer must be cut through without damaging the substrate. During processing, contamination due to dust and processing residues occurs. Therefore, such pollution must be continuously removed by means of an extraction unit.

The laser beam is directed on to the web via mobile passive reflectors. The movement of the mirrors also determines the maximum speed of the system. While high speeds are possible for straight lines, bends and more complex shapes can only be created at an adapted speed. Due to its flexibility, this type of processing is particularly suitable for a production workflow with digital printing presses.



Alslaser POTF 3300 and Alslaser POTF 5000 repectively from ALS Engineering

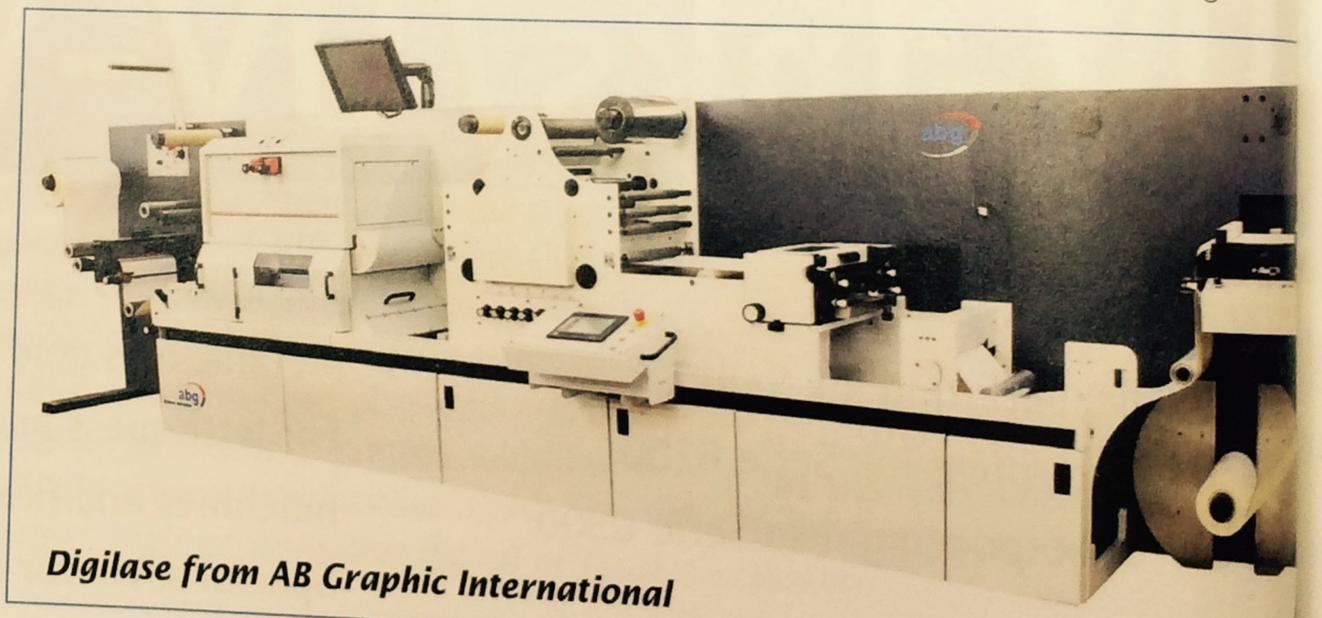
Selection of further processing process

If a label printer decides to invest in digital printing systems, it needs to be checked thoroughly whether or not the in-line or off-line processing provides an economic solution. This also may affect the selection of the printing press since some platforms are now available with in-line laser die-cutting units. In many cases, off-line systems offer the possibility of coupling them with a digital printing press to be capable of in-line production, if required. However, this could, in turn hold up production if the die (conventional finishing) is to be replaced or if the laser die-cutting system (digital finishing) cannot keep pace with the speed of the digital printing press due to complicated label shapes or a high number of multiple-up images.

Additionally, it should be taken into consideration that not every composite film can be processed with a CO_2 laser. For instance, polyethylene (PE) will melt together again after the laser die-cutting process, while toxic vapours and hydrochloric acid may be created when processing polyvinyl chloride (PVC). One solution for the processing of PE is the use of lasers with different wavelength ranges; however, this may in turn lead to limitations for other materials.

Short print runs and complex contours

Materials such as paper, cardboard and polyester can be processed very well. In order to allow for PE to be processed using a CO_2-laser, some manufacturers of laser die-cutting



Digilase from AB Graphic International

L 360 from Cartes

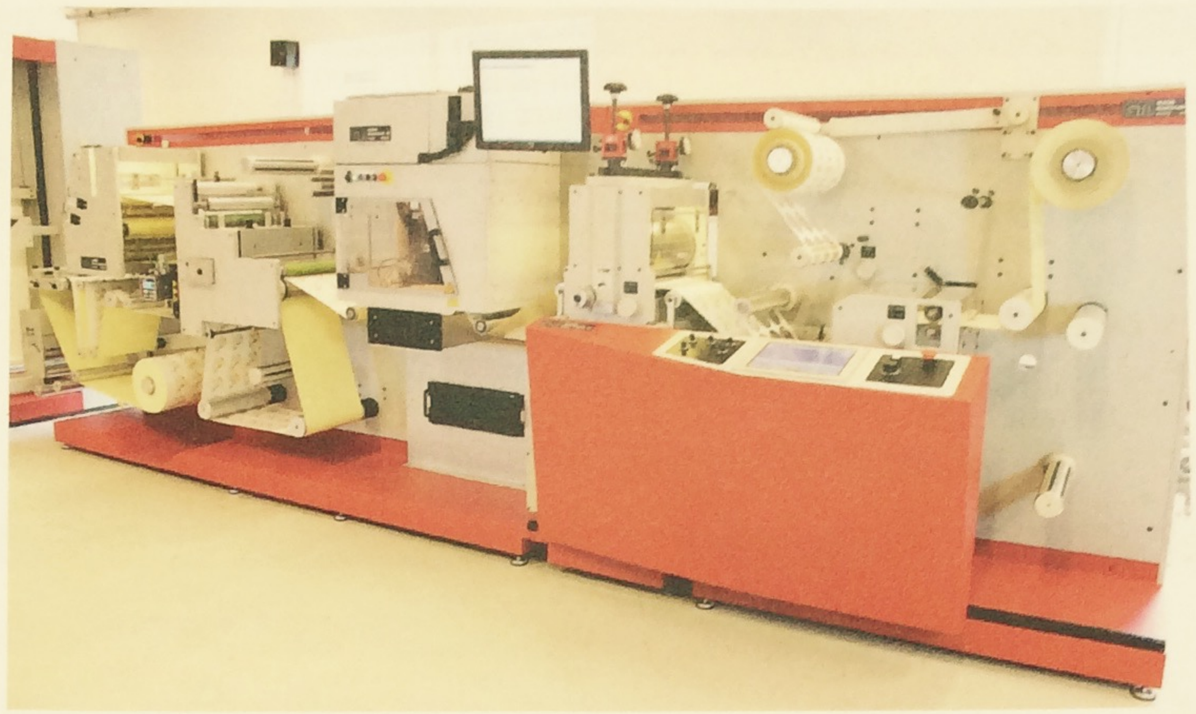
systems recommend mixed materials which are based on PE but also contain other components in order to make them more stable during the laser die-cutting process. However, it should be thoroughly checked with the customer whether these materials are suitable for the subsequent label application.

When producing labels which are extensively printed-on beyond the edge, additionally, a white edge may occur if the laser cuts out the contours of the label and burns printed inks. It should be noted, however, that this white edge is

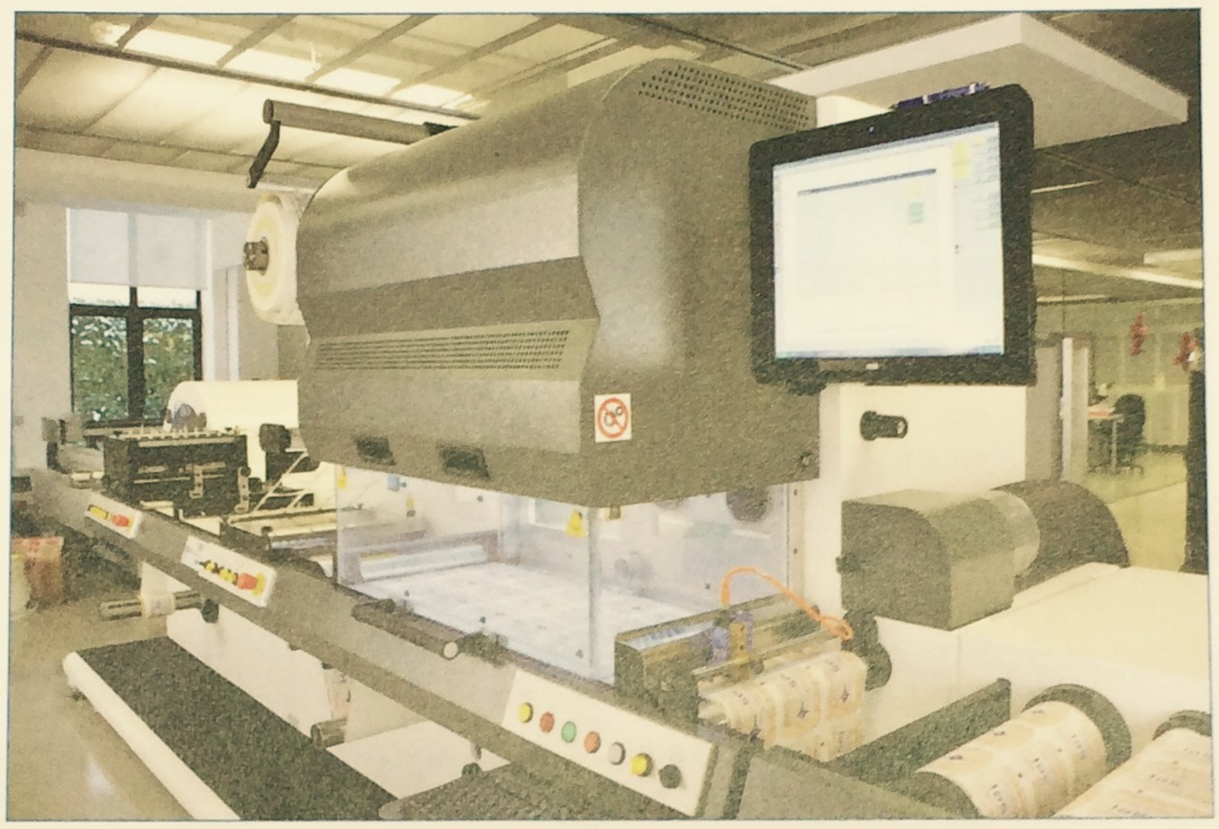
"Laser die-cutting is a contact-free process and therefore most suitable for production workflows with digital printing presses."

only minor and inconspicuous, and so is not noticeable at first sight. For this reason, customers usually accept this effect as it allows them to obtain cheaper labels, which can be delivered at short notice.

Plain standard dies are already available at an extremely favourable price. Nevertheless, the investment in a laser die-cutting system can be profitable – in particular, if customers tend to order many smaller print runs. Additionally, there are other benefits if complex contours, e.g. stars, specific patterns and perforations are to be punched or if consecutive numbering is to be integrated. Jobs with variable label shapes are also possible. This allows the user a great deal of flexibility.



GM L330 from Grafisk Maskinfabrik

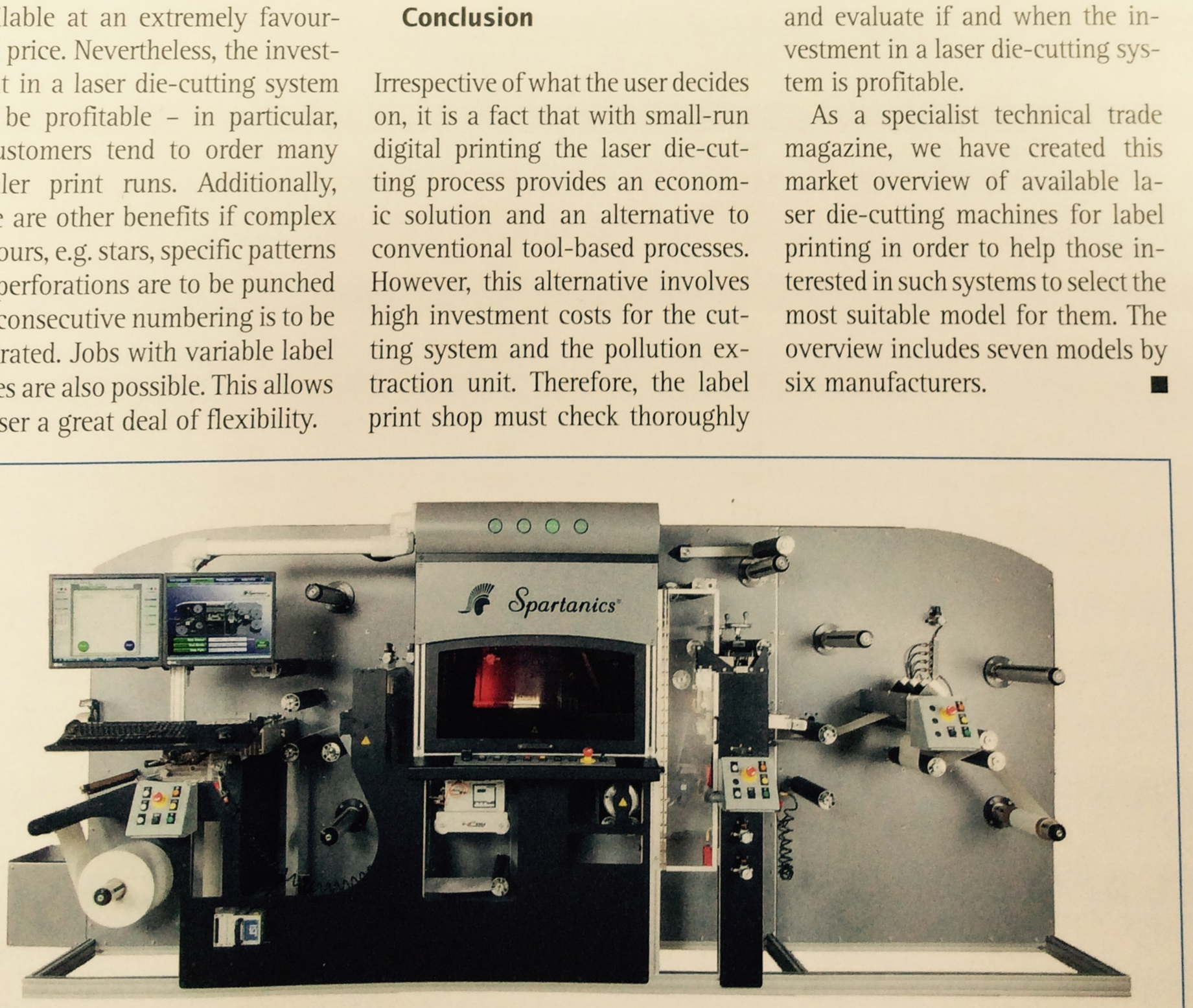


Labelmaster from SEI Laser Converting

Conclusion

Irrespective of what the user decides on, it is a fact that with small-run digital printing the laser die-cutting process provides an economic solution and an alternative to conventional tool-based processes. However, this alternative involves high investment costs for the cutting system and the pollution extraction unit. Therefore, the label print shop must check thoroughly and evaluate if and when the investment in a laser die-cutting system is profitable.

As a specialist technical trade magazine, we have created this market overview of available laser die-cutting machines for label printing in order to help those interested in such systems to select the most suitable model for them. The overview includes seven models by six manufacturers. ■



L350 from Spartanics

Manufacturer		AB Graphic International	ALS Engineering GmbH	ALS Engineering GmbH	Cartes
Type		Digilase	Alslaser POTF 3300	Alslaser POTF 5000	L 360
Year of launch		2013	2005	2007	2001
Prozess					
Kind of laser					
CO_2		yes	yes	yes	yes
others		–	–	–	–
Lifetime of the laser	(in hours)	aprox 20,000	aprox 20,000	aprox 20,000	unlimited
max number of laser heads		2	2	2	2
Laser power per laser head	(in Watt)	200	100 bis 1000	400	250, 350
Laser dot size	(diameter in mm)	0.130	0.16	0.21	0.2
Accuracy of laser control	(± in mm)	0.10	0.1	0.1	0.02
Processing opportunities					
Die cutting		yes	yes	yes	yes
Punching		yes	yes	yes	yes
Perforate		yes	yes	yes	yes
Numbering		–	yes	yes	yes
Format					
min web width	(mm)	200	50	50	30
max web width	(mm)	340	350	520	360/560
work space	(mm)	330 x 330	350 x 350	500 x 250	350 x ∞
Druckleistung					
max web speed	(m/min)	90	120	90	150
Type of substrates					
Paper		yes	yes	yes	yes
Polypropylene		yes	yes	yes	yes
PET		yes	yes	yes	yes
Polyethylene		option	option	option	option
Polyvinyl chloride		–	–	–	–
Substrate parameters					
thickness (min)	[µm]	20	20	30	20
thickness (max)	[µm]	400	300	350	1000
grammage (min)	[g/m²]	40	30	40	35
grammage (max)	[g/m²]	300	280	320	400
Web transport					
roll/roll		yes	yes	yes	yes
roll/sheet		yes	yes	yes	yes
Material input					
max roll diameter	(mm)	800	700	1000	800
max roll weight	(kg)	210	100	160	210
Peripheries					
corona		yes	option	option	yes
web cleaning		yes	yes	yes	yes
conditioning (e.g. humidification)		–	option	option	–
matrix rewinder		yes	yes	yes	yes
video web inspection (inline)		yes	yes	yes	yes
Operation					
Touchscreen		yes	yes	yes	yes
Operating system		Windows	Windows	Windows	Windows
Inline-Finishing					
Die cutting					
Rotary		yes	yes	yes	yes
flat		yes	yes	yes	yes
Perforation		yes	yes	yes	yes
Hot foil stamping		yes	yes	yes	yes
Cold foil stamping		yes	yes	yes	yes
Relief embossing		yes	yes	yes	yes
Coating/varnishing		yes	yes	yes	yes
Laminating		yes	yes	yes	yes
Cutting					
slitting		yes	yes	yes	yes
transversely (cross-cutting)		yes	yes	yes	yes
Dimensions (mm)					
length x width x depth	(mm)	2000 x 1600 x 1260	3200 x 1560 x 2000	3200 x 1800 x 2000	3100 x 1800 x 2100
Weight	(kg)	2000	2500	2900	1500
Connections					
req. compressed air connection power	(bar)	6	6	8	6
power supply		63 A	15 KW, 50 Hz	28 KW, 50 Hz	400 V, 3 Phases, 50/60 Hz, 5/7 KW
extraction	(kW)	5.5	n.a.	n.a.	7
filtration plant	(kW)	5.5	n.a.	n.a.	7

Manufacturer		Grafisk Maskinfabrik	Sample Enterprises	SEI Laser Converting	Spartanics
Type		GM L330	Laser Cutter X34	Labelmaster	L350
Year of launch		2013	2013	2010	2009
Prozess					
Kind of laser					
CO_2		yes	yes	yes	yes
others		–		–	–
Lifetime of the laser	(in hours)	aprox 15,000	aprox 15,000	aprox 15,000	aprox 15,000
max number of laser heads		2	2	2	1
Laser power per laser head	(in Watt)	130, 230, 400, 700	130, 230, 400	130, 230, 400	200, 400
Laser dot size	(diameter in mm)	0.2	0.2	0.2	0.21
Accuracy of laser control	(± in mm)	0.1	0.1	0.1	0.1
Processing opportunities					
Die cutting		yes	yes	yes	yes
Punching		yes	yes	yes	yes
Perforate		yes	yes	yes	yes
Numbering		yes	yes	yes	yes
Format					
min web width	(mm)	30	30	n.a.	165
max web width	(mm)	330	360	360	350
work space	(mm)	330 x 350	350 x 350	350 x 350	350 x 350
Druckleistung					
max web speed	(m/min)	72	60	60	100
Type of substrates					
Paper		yes	yes	yes	yes
Polypropylene		yes	yes	yes	yes
PET		yes	yes	yes	yes
Polyethylene		yes	–	–	–
Polyvinyl chloride		–	–	–	–
Substrate parameters					
thickness (min)	[µm]	30	20	20	10
thickness (max)	[µm]	500	1000	1000	1000
grammage (min)	[g/m²]	35	35	n.a.	n.a.
grammage (max)	[g/m²]	200	150	n.a.	n.a.
Web transport					
roll/roll		yes	yes	yes	yes
roll/sheet		–	yes	yes	yes
Material input					
max roll diameter	(mm)	700	600	600	600
max roll weight	(kg)	200	90	90	120
Peripheries					
corona		option	yes	yes	yes
web cleaning		option	–	–	yes
conditioning (e.g. humidification)		–	–	–	–
matrix rewinder		yes	yes	yes	yes
video web inspection (inline)		yes	yes	yes	yes
Operation					
Touchscreen		yes	yes	yes	yes
Operating system		Windows	Windows 7	Windows	Windows
Inline-Finishing					
Die cutting					
Rotary		yes	yes	yes	yes
flat		–	–	–	–
Perforation		yes	yes	yes	yes
Hot foil stamping		yes	yes	yes	yes
Cold foil stamping		yes	–	–	–
Relief embossing		yes	–	–	–
Coating/varnishing		yes	yes	yes	yes
Laminating		yes	yes	yes	yes
Cutting					
slitting		yes	yes	yes	yes
transversely (cross-cutting)		yes	yes	yes	yes
Dimensions (mm)					
length x width x depth	(mm)	4000 x 1600 x 1700	3000 x 400 x 1700	depends on config.	depends on config.
Weight	(kg)	2000	1200	depends on config.	depends on config.
Connections					
req. compressed air connection power	(bar)	6	6 bar – 100 l/min	6	depends on config.
power supply		32 to 63 A	32 A to 63 A (depends on options)	32 to 63 A	35 to 65 A
extraction	(kW)	2	5.5	5.5	n.a.
filtration plant	(kW)	2	7.5	7.5	n.a.