HelioFlex F2000 – A new milestone in flexo CtP development

Hell Gravure Systems is the world's leading supplier of systems for digital engraving of gravure forms. The experience which Hell has gathered from the development, production and support of over 1000 HelioKlischographs is now going into the production of flexo block plates. The HelioFlex F2000 is equipped with the first multi-channel fiber laser, a feature that halves exposure times. Hell's know-how in processing rotational printing forms is reflected in the exceptional sleeve processing concept.

The *HelioFlex F2000* consists of the basic machine and an external filter unit. Additional units for cooling, for example, are not required. The machine bed and bearing blocks are cast parts, while the machine feet are cast in concrete. This design ensures maximum stability. The basic machine comprises the machine electronics, PC, laser and compressor. Operation is via a touchscreen. The filter unit contains a vacuum cleaner with upstream active carbon filter and a vacuum pump.

The *HelioFlex* has a symmetrical design, which means that the bearing blocks of the imaging cylinder can be moved symmetrically and hold the cylinder in a central position by means of pivot mounts. The bearing blocks are motor-driven. This ensures that imaging cylinders and sleeves can be exchanged quickly.

At the heart of the *F2000* is an innovative high-performance fiber laser head, which sets new standards in terms of beam quality and exposure speed. When processing sleeves in particular, it offers unique advantages in terms of handling, processing speed and quality.

The modular design and construction of the *HelioFlex F2000* means it can be upgraded easily for direct reliefing. The open system technology supports both TIFF and LEN data. This ensures that the *F2000* can be integrated easily into existing environments.

Materials

The *HelioFlex F2000* processes digital flexographic plates using »Laser Ablation Mask System« technology. This technology removes the black lacquer – the LAMS layer – by means of the laser. The exposed mask on the surface of the block replaces the film employed in conventional technology. All the usual operations such as pre-exposure, main exposure and washing off remain unchanged. All major makes of plates over the thickness range 0.76–4.7 mm can be processed.

For exposing plates, *Hell* provides six vacuum cylinders of diameters 300 to 1200 mm and widths up to 1600 mm. Customised dimensions are also possible. The vacuum cylinders can be changed by the customer in a matter of minutes. The cylinders are supported by pivot mounts. The flexographic plate is secured on the imaging cylinder by means of a vacuum and, if necessary, by additional adhesive tape.

If necessary, sleeves are slipped onto an adapter sleeve outside the machine and onto the air cylinder. The air cylinder is held in the *HelioFlex* by means of pivot mounts. Air cylinders with circumferences of 300 to 1200 mm and face widths of 400 to 1600 mm are supported.

The fiber laser technology

The fiber laser technology is still relatively young. Up until now this type of solid-state laser has been used primarily in communications technology. Fiber lasers have a number of advant-

ages over conventional solid-state and semiconductor lasers.

The fiber laser uses laser diodes as a pump source. The diode beam is injected into a specially prepared optical fiber which is several meters long. The fiber is constructed in such a way that it acts as a laser resonator and produces a stable, constant laser beam in the same way as a high-efficiency solid-state laser. The fiber also serves as a means for transferring the light to the processing location. Simplifying matters, you could say that the fiber laser converts the low-quality laser light from the laser diodes into laser light of the very highest quality.

The fiber is around 300 µm thick, several meters long and is sheathed in a protective layer known as cladding. The largest part of the fiber accommodates the pump core into which the external pump light is injected. The laser core, which is only a few µm thick, is the actual active part of the laser. This area functions as a laser resonator. In other words, it is doped with material capable of generating laser light. The special construction also prevents the generated laser light being beamed back to the pump source.

The laser light emitted by the pump source (laser diodes) has a wavelength of approx. 915 nm. This light is injected into the pump core. Total reflection at the pump core/cladding interface and pump core/laser core interface bundles the light when it travels through the fibers in the laser core. The pump light excites the laser core material capable of generating laser light. This in conjunction with the resonator properties of the pump core produces a controlled, stimulated emission of light in the form of the laser effect (Light Amplification by Stimulated Emission of Radiation). Monochromatic and coherent laser light of the very best quality and with a wavelength of around 1110 nm emerges at the end of the optical fiber.

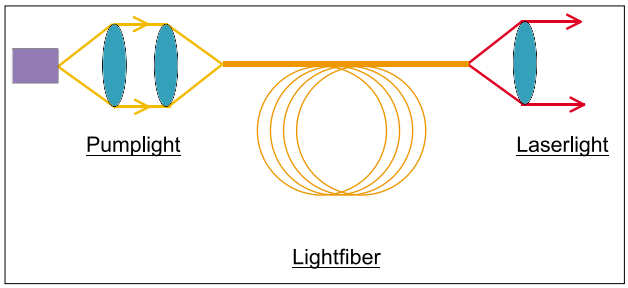
The advantages of the eight-channel fiber laser

The *HelioFlex F2000* supports up to eight independent fiber lasers. Each channel has a power output of 7.5 W, giving a total of up to 60 W. The wavelength of the emitted light is 1110 nm. This corresponds to the wavelength of conventional YAG lasers. More powerful modules are in the development stage. These will make it possible in the medium term to produce high-quality flexographic plates using direct reliefing. The *HelioFlex F2000* has already been prepared for this application.

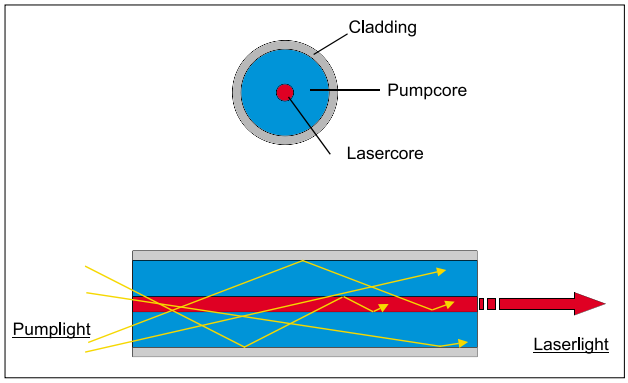
The compact design of the fiber laser, which uses the optical fiber as a transport medium, makes the unit relatively insensitive to vibration. Unlike conventional units, no special foundations are required. The unit can be used with ease in multi-story buildings. What is more, the fiber laser requires no maintenance. No lamps need to be exchanged or mirrors adjusted.

One of the advantages of the fiber laser is its high 50 percent efficiency. With an output power of 60 W, only 120 W of input power in the form of electrical energy needs to be supplied. No water cooling is required. This saves considerable electrical energy compared with conventional systems.

The *F2000* exposes screens over the range 30–60 dots/cm with an adapted write resolution of 500–1000 l/cm (corresponds to 1270–2540 dpi). The write resolution is achieved by adapting the feed increment and spot size to the resolution of the file being exposed. Depending on the exposure file, the feed and effective spot size can be infinitely adjusted over the range between 10 and 20 µm.



The fiber laser is of compact design. The fiber functions as both resonator and transport medium.



The fiber laser generates a virtually ideal laser light.

One of the major advantages of the fiber laser is its long depth of focus. The fiber laser has a depth of focus which is 3 to 15 times longer than other lasers. This is particularly important in practice! Unevennesses can sometimes occur on the surface of the block plate due to dust inclusions or air bubbles. If the depth of focus of the record beam is too short, this can result in the black lacquer not being removed completely. Poor concentricity of sleeve cylinders can have the same result. The long depth of focus significantly increases the tolerance and, consequently, the process reliability. The effects described above are therefore far less common on the *F2000* than on units employing laser diodes featuring very short depths of focus or YAG lasers which also have a short depth of focus.

Exceptional exposure speed

The *F2000* has an exceptionally high exposure speed! An area of 1 m^2 is exposed in only around 12 minutes. The screen or the write resolution used for exposure is unimportant. This figure applies for all sleeves and plates which are exposed over their full circumference.

If a plate only partially covers the imaging cylinder circumference, this will result in an unavoidable »rotation delay« inside the gap. To reduce this, full use should be made of the entire circumference of the cylinder wherever possible. Since this naturally applies for all makes of imagesetter, cylinders that are matched to the order structure will increase the productivity of the output device. *Hell*'s portfolio therefore includes different sizes of imaging cylinder, including customized ones.

The recording head travels with fast crossfeed over areas which do not require exposure and thereby reduces exposure times. The saving averages around 25 percent.

Speed advantages for sleeves

The *F2000* exposes at around twice the speed of conventional imagesetters. When exposing sleeves, this factor becomes even larger, since the F2000 runs at higher speeds where small diameters are involved.

Unlike the *F2000*, other units do not adapt the rotational speed to the sleeve diameter. Instead, all cylinders rotate at the same speed. Consequently, large sleeves rotate at high surface speeds, whereas small sleeves rotate at low surface speeds.

To apply the laser energy required to remove the LAMS layer, these units adapt the laser power to the sleeve diameter. Large sleeves = high laser power, small sleeves = low laser power.

The laser power on the plate directly affects the productivity of an imagesetter, however. High laser power = high productivity, low laser power = low productivity. This explains the design drawback of these units when processing sleeves. Large sleeves = maximum productivity, small sleeves = low productivity.

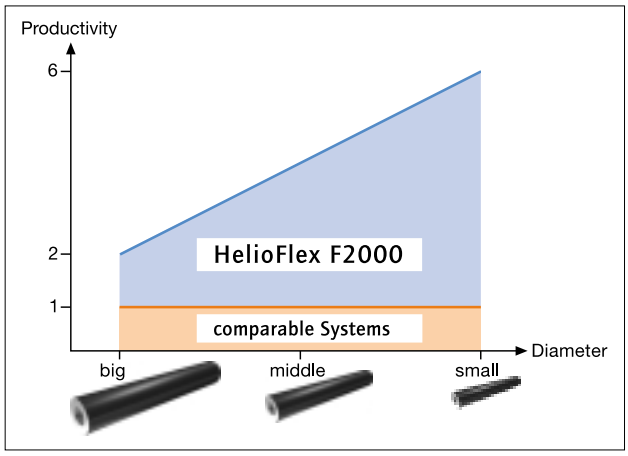
The *F2000* adapts the rotational speed (and not the laser power) to the sleeve diameter in question. Exposure is therefore always performed at full laser power, i.e. maximum productivity.

Quality benefits for sleeves

The *HelioFlex F2000* can expose in both helical and polar lines. This ensures that it meets both speed and quality requirements equally. Helical exposure is faster than polar line exposure by up to 20-30 percent, depending on the diameter of the imaging cylinder. The polar line is required for perfect seamless exposures, as is often required for sleeves.

Operation/setup times

The *F2000* is extremely productive. In order not to waste this advantage, *Hell* has integrated numerous details in the *HelioFlex F2000* in order to minimize setup times. The unit has therefore been designed as a single-purpose, easy-to-use output de-vice. All data is processed in the prepress stage and not in the unit.

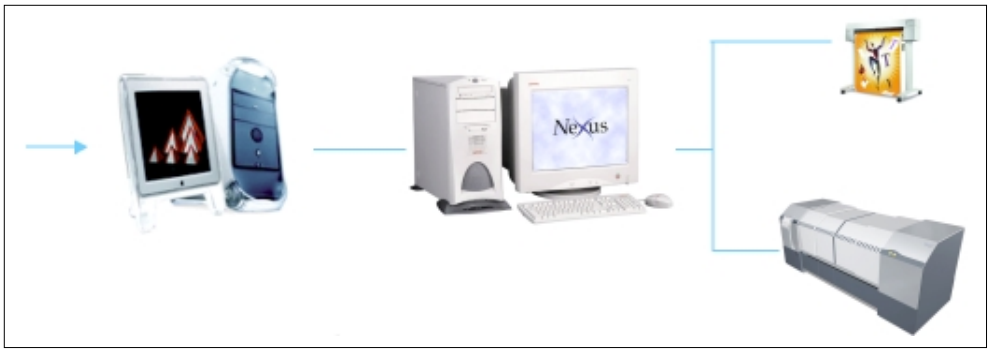


One significant advantage when exposing sleeves is that small cylinders are exposed at a higher speed.

The *HelioFlex* user interface combines intuitive user guidance with the very latest expertise in software ergonomics. The operating and control programs run under Windows NT, an international standard. Operation is via a touchscreen. The operator is informed of the exposure time on the touchscreen when exposure starts. The time remaining is counted down during the exposure.

Hell has been designing and selling *HelioKlischographs* for engraving gravure cylinders for many years. It is therefore familiar with working with round printing forms. This fact is reflected in the *F2000*. The *F2000* is of symmetrical design, which means that the bearing blocks of the imaging cylinder are moved symmetrically and hold the cy-

The open interface allows the HelioFlex F2000 to be integrated easily into existing systems.



linder in a central position by means of pivot mounts. The bearing blocks are motor-driven. This ensures that imaging cylinders – whether vacuum cylinder or sleeve – can be exchanged quickly and easily. *HelioFlex* can be fitted with an optional device for automatic balancing. To simplify the process of mounting the block plate, *Hell* can supply an optional mounting table.

Calibration

When the *HelioFlex F2000* is switched on, it automatically calibrates the lasers. To do this, the recording head travels in front of a photo measuring cell and calibrates the individual lasers to an identical output power.

The unit is supplied with factory presettings for the focus and material sensitivities. If necessary, the operator can very easily obtain new focus and/or material values and save them in the machine.

The machine automatically accesses the focus value and adjusts the recording head for the relevant plate thickness before each exposure. The operator specifies the type of material being exposed before each exposure so that the stored value can be loaded and used for setting the power level.

Extraction

A vacuum device is fitted to the laser head which extracts the soot particles of the lasered black lacquer. The extracted air is cleaned by means of an active carbon filter. Compressed air helps carry away the particles.

Data processing

The individual repeats which are to be exposed are processed on an upstream workstation and are arranged in accordance with the geometry of the plate/sleeve being exposed. A downstream RIP process creates a bitmap file for all production parameters such as screen, screen angle, dot gain compensation and distortion factor. This file is transferred to the *HelioFlex F2000*. Data is exchanged via Ethernet or a data carrier such as a CD-ROM.

Hell recommends the extremely powerful *Nexus* workflow solution from *Artwork Systems* for the front-end and RIP. *Nexus* has a whole range of flexo-specific functions not supported by standard RIPs. All popular graphics formats are supported on the input side. In addition to amplitude- and frequency-modulated screens, *Nexus* also supports a hybrid screen. A Linkfile mechanism can be used to exclude data on either vector, pixel or screen level. *Nexus* can run under Windows NT.

Data formats

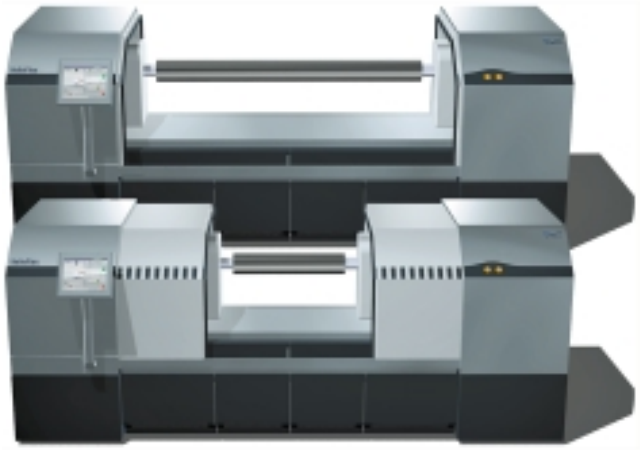
The *HelioFlex* has an open interface, which means that it can be controlled using TIFF or LEN data. This allows the *HelioFlex* to be easily integrated into existing systems.

TIFF is a standardized data exchange format used all over the world. Depending on the application, different versions are used. The *HelioFlex* exposes screened TIFF-B data. »B« stands for black & white and shows that this file contains only black or white information. Each bit in this file represents exactly one exposure dot on the block. It is therefore known as a bitmap. A screen dot is composed of, for example, 16 x 16 exposure dots or bits. Since the TIFF files for controlling an imagesetter are very large – and depend on the plate size and exposure resolution – data compression is used. *Nexus* from *Artwork Systems*, for example, provides Packbit-compressed data. The great advantage of TIFF is that many RIP solutions generate this format. LEN on the other hand is a proprietary (manufacturer-specific) data format, i.e. it is not standardized. LEN can contain a screened and compressed bitmap in the same way as TIFF-B.

The workflow

- The sleeve on the air cylinder is positioned in the machine. The electrically-driven bearing blocks and the simple pivot mounts assist the operator in clamping the cylinder. The procedure is the same when using the vacuum cylinder for plate exposure.
- Plate exposure: The vacuum pump is switched on. This creates a vacuum in the imaging cylinder which is transferred via ducts to the cylinder surface. The flexographic plate is placed onto the imaging cylinder by the operator and held in place by the vacuum. If necessary, adhesive tape can be applied to the edges of the plate. The optional mounting table can also be used to assist in positioning the plate.
- The operator moves the laser head to the start position and closes the hood. He selects the file to be imaged from the touch-

The HelioFlex F2000 is based on an innovative concept which sets new standards in terms of speed. The bearing blocks are moved symmetrically. The cylinders can be exchanged quickly and easily.



screen and starts the process.

- The machine starts up and images the block. Feed is either continuous (exposure in a helical pattern) or stepped (exposure in a circular pattern). White areas are automatically recognised and passed over in fast crossfeed mode.
- Once imaging is complete, the cylinder is stopped. The operator opens the hood. Plate exposure: The operator switches off the vacuum, removes any adhesive tape and transfers the plate for further processing. Sleeve exposure: The operator unloads the sleeve cylinder and transfers it for further processing.

Installation and maintenance

The innovative concept of the *HelioFlex F2000* offers a whole raft of benefits for the installation process, particularly when compared with conventional systems.

- No special foundation is required. The unit can be used with ease in multi-story buildings.
- No water cooling is required.
- No external vacuum or compressed air supply is required.
- An extraction system and active carbon filter are integrated into the unit.
- Power supply requirements are low.
- Approximately half a day is needed to put the unit into service ready for the first exposure.

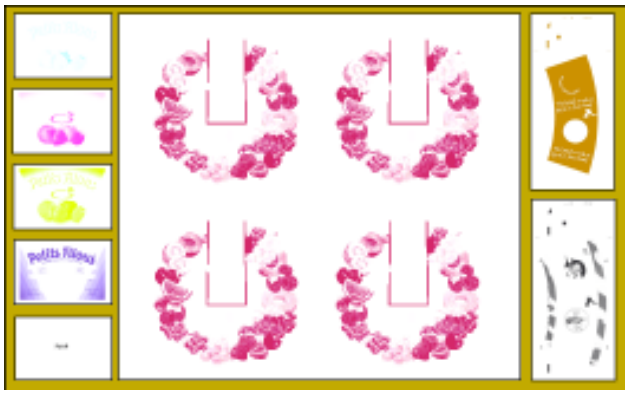
Anyone who has gained practical experience of the new technology of CtP for flexographic printing will know the importance of maintenance. *Hell*'s vast experience in providing support to more than 1000 *HelioKlischographs* means it is equal to this requirement. A worldwide, reliable service is a matter of course for Hell. A Center of Competence for support was set up at an early date in Kiel. Personnel trained in Kiel work at local representations worldwide.

Further measures guaranteed to ensure the customer reliable production:

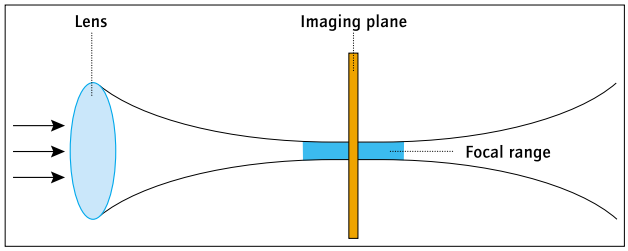
- Ease of maintenance was ensured when designing the *HelioFlex F2000*.
- An integrated modem facilitates error diagnosis through remote maintenance.
- The fiber laser requires no maintenance. No lamps need to be exchanged or mirrors adjusted.
- The *F2000* supports up to eight independent lasers.
- If a single beam fails, production can still be continued. The beams which are still intact are simply combined (Beam Reducing Security).
- *Hell* offers its customers a complete maintenance agreement.

Summary

Hell has used a new technological concept to develop a CtP imagesetter which has set new standards in terms of productivity, quality and flexibility. The *HelioFlex F2000* offers exceptional advantages in terms of sleeve processing. The use of an innovative, multi-channel fiber laser brings as yet unrivalled exposure speed and depth of focus. Use of a modular laser concept means that the *F2000* is already prepared for direct engraving. The picture is rounded off by an open system concept which allows simple integration of the *F2000* into an existing environment. ■



The Nexus RIP supports a whole range of flexo-specific functions such as layouting of color separations on a printing form.



The HelioFlex F2000 has a very long depth of focus compared with other systems.

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G&K TechMedia GmbH · Am Stollen 6/1 · D-79261 Gutach-Bleibach · Germany
Phone +49-7685-918110 · Fax +49-7685-909011 · e-Mail: info@flexo.de · www.flexo.de