

MYCRONIC

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The production tools that revolutionized the display manufacturing of Smartphone's and Ultra HD-TV's

Impact: Streaming video from smartphones and tablets require high-resolution displays, which are taken for granted in our society today. But it would not have been possible without advanced manufacturing tools. Mycronic develops, manufactures and markets laser mask writers, one of the world's most advanced production systems used for photomask production. Mycronic has more than three decades of experience of microlithography and photomask printing. The display mask writers and metrology systems are the de facto industry standard and their tools are used in production of all high resolution TFT-LCD and AMOLED displays worldwide.

Background: In the mask manufacturing industry in particular, the cost of poor quality (CoPQ) is extremely high. Besides the high materials cost, there are also the stringent requirements placed on critical dimensions (CD) and mask overlay, along with the need for zero defects that make the photomask industry unique. Photomask manufacturing can be regarded as an art, highly dependent on qualified and skilled workers in a few companies located in Asia.

Technology: Pattern generators are used to write microscopic images onto photomasks which then function as templates for mass production of displays, integrated circuits and electronic packaging. The manufacturing process, called microlithography, is similar to the way in which photographs are reproduced with the help of a negative. A considerable challenge is calibration over these large areas such as display photomasks with sizes of 1220 x 1400 mm. An uncertainty specification below 100 nm (3σ) over an area measured in square meters cannot be fulfilled, unless special care is taken to compensate for gravity-induced errors from the photomask itself when it is resting on the metrology tool stage. A pattern generator machine is therefore delicate and can cost up to approx 40 MEUR.

Company: During the 1970s, a group of researchers began research into microlithography at KTH Royal Institute of Technology, Sweden. The goal was to develop equipment capable of writing photomasks for the semiconductor industry and in 1989 the company Micronic Laser Systems AB was founded. The first order for a mask writer for manufacturing of displays came from LG in South Korea in 1992. The big breakthrough for mask writers for shadow masks came in 1994-1995 with orders from China and Japan. During 2007, Apple introduced its Iphone®, which marked the start for the explosive growth in smart telephones. Every display manufacturer in the world was now using the company's systems for manufacturing displays. The company grew during the 1990s from a total of 30 employees in 1995 to a little over 150 persons in 1999. In March of 2000, Micronic Laser Systems was listed on the NASDAQ OMX, Stockholm. In 2009, Micronic Laser Systems acquired MYDATA Automation AB. During 2014, the parent company changed name to Mycronic AB, as did all subsidiaries. The turnover for 2014 was over 155 MEUR with over 500 employees (20% are women), whereas one-third of the staff working in R&D.

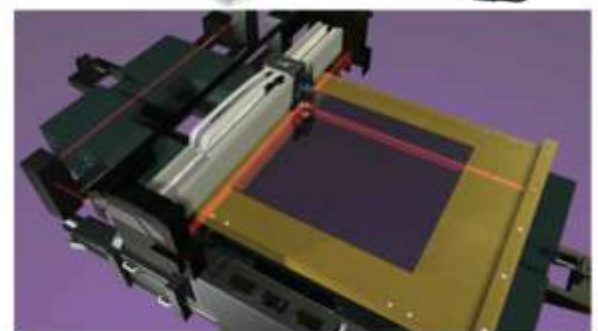


Fig. UHD-TV's with TFT-LCD and AMOLED in the latest Smartphone's. The laser pattern generator in Prexition series is enclosed in a climate chamber to eliminate errors caused by variations in temperature. The stage is made of Zerodur® to further improve registration performance. The Laser pattern machine is shipped by one of the largest air freight to Asia.