imagine tomorrow. challenge today.

Demcon Focal is part of the international Demcon group and is specialized in design, engineering and assembly of bespoke opto-mechatronic (sub-) systems, for high technological markets like semicon, bio-medical, life science, aerospace, industrial manufacturing and others. Often these systems are used in applications where accuracy, stability and rapid movement or exploitation in extreme environments is required.

Demcon Focal achieves customized design and engineering in a multidisciplinary approach, entailing optical, vision, data, electronic, software, mechanical and system engineering. Activities include high-level requirement engineering, concept optical design, prototyping, detailed engineering, system integration, manufacturing and testing activities.

Demcon Focal also performs specialized volume production that requires trained engineers, dedicated equipment and clean environment. We can offer system service and support and have production facilities available for complex optical modules.

Institutenweg 25
7521 PH Enschede
The Netherlands

Kanaaldijk 29
5683 CR Best
The Netherlands

Delftechpark 23
2628 XJ Delft
The Netherlands

Zernikelaan 6
9747 AA Groningen
The Netherlands

Wilhelm-Schickard-Straße 6
48149 Münster
Germany

25 International Business Park
#03-60A Singapore 609916

www.demcon.com
www.demcon.com/focal

DEMCON | FOCAL

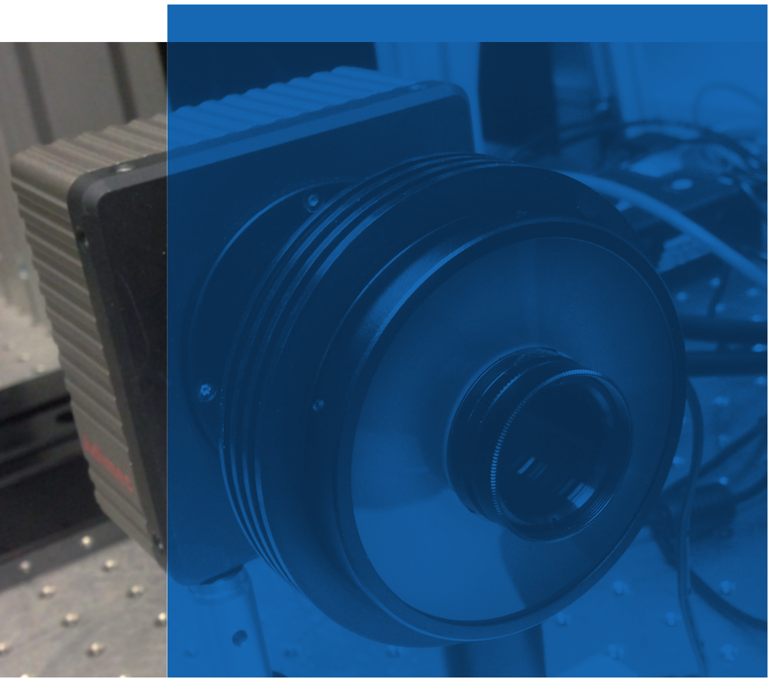
spectroscopy.

BIOMEDICAL SPECTROSCOPY
NEAR INFRARED SPECTROSCOPY
FLUORESCENCE SPECTROSCOPY
FOURIER TRANSFORM SPECTROSCOPY

DEMCON | FOCAL

BIOMEDICAL SPECTROSCOPY

Spectroscopy techniques open new applications in healthcare. Whether it is based on fluorescence measurements or detecting spectral fingerprints, spectroscopy can improve the diagnosis and the early detection of diseases.



Within Demcon Focal we have developed for example a handheld oximetry imager for early treatment of blinding diseases in premature born babies. The solution includes compact optimum fundus design that avoids glares and has a multi-wavelength xenon illumination source, two cameras for the relevant wavelengths and a ring illumination. We designed and made a prototype that has been accepted by the Dutch medical ethical committee and is currently used in clinical trials.

Another example is the development of a camera system that quantitatively determines the age of bruises. This can be used as an extra tool to identify child abuse. The system uses a hyperspectral snapshot camera to measure the fraction of bilirubin and hemoglobin. A bruise turns blue because of the hemoglobin in the bruise. Gradually, over a period of days, that hemoglobin breaks down. The resulting waste bilirubin turns the bruise yellow. The ratio in measured quantity between those two substances can therefore be used to determine the age of a bruise. A 16 band spectral Adimec camera was used to determine the fraction of hemoglobin and bilirubin. A vision algorithm was developed that uses this information to determine the age of a bruise.

NEAR INFRARED SPECTROSCOPY

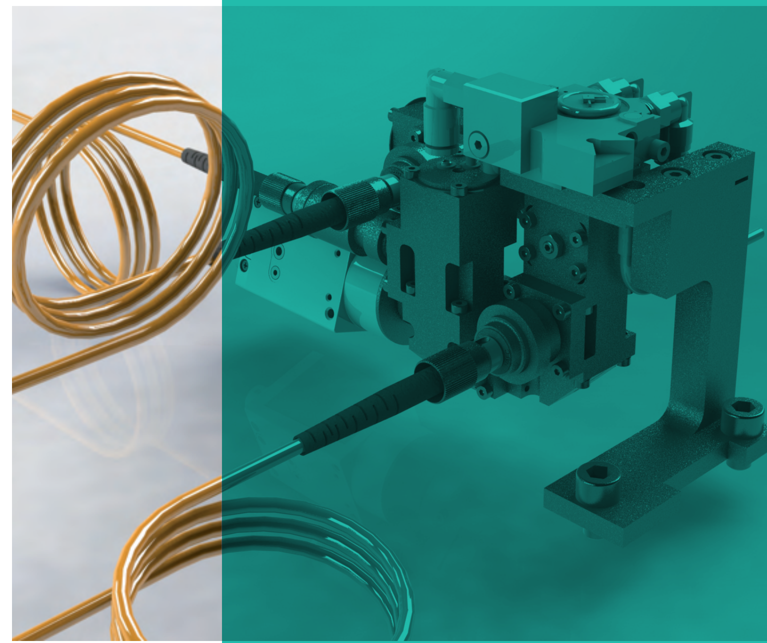
Near-infrared (NIR) spectroscopy is suitable for polymer detection and it is a rapid, non-destructive analysis method that can be applied to an automatic in-line sorting system. We are working together with waste collectors, sorters & recyclers, the chemical industry, end users and knowledge institutions to develop recycling technologies that make high-quality recycled plastics available for the two dominant types of polymers as raw materials: polyolefins (PE / PP) and polyethylene terephthalate (PET).

Near infrared spectroscopy can also be used for quality control of fuel. For one of our customers, we have developed a flow cell that uses this near infrared spectroscopy to classify fuel quality. This flow cell allows continuous analysis of the fuel and is ATEX approved.

FLUORESCENCE SPECTROSCOPY

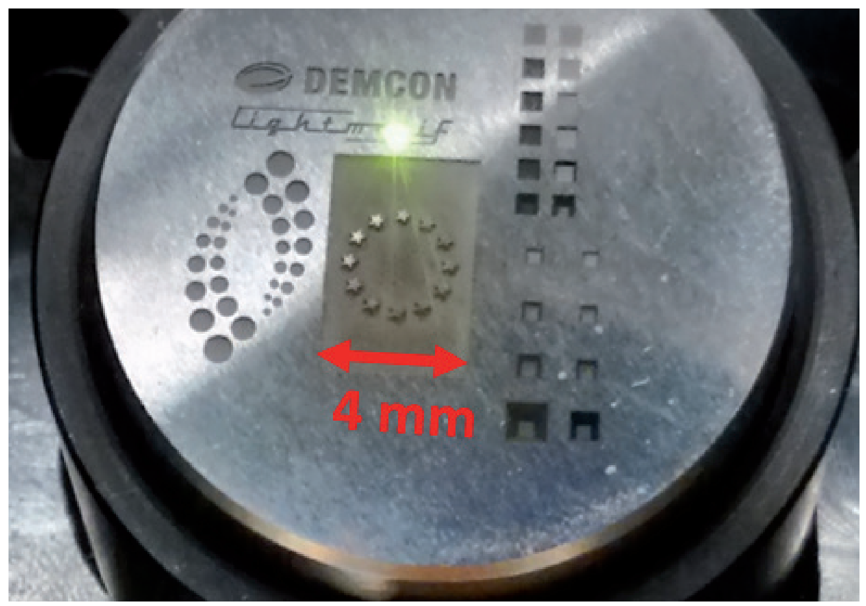
For an OEM customer we developed an optical microscopy system that is capable of imaging a single cell in a lab-on-chip environment. Beside a bright imaging function, fluorescence measurement was added to the microscope in order to measure the cells that were labeled with fluorochromes. The design had to fit into existing image cytometry equipment. We developed for this purpose ½ inch optical building blocks that can be used to fit the filters, splitter and lens elements. The optical elements within the building blocks can be aligned before they are interconnected. The typical specification for the microscope that has been achieved are:

- Resolution: 5µm
- Field of View: 0,25mm
- Microscope size: +/- 100x100x100 mm^3



FOURIER TRANSFORM SPECTROSCOPY

We developed a depth sensor that uses the optical interference effect of broadband light between a reference path and signal path to derive the optical path length difference between these two branches.



The calculation of the Fourier transformation of the acquired spectrum provides a spectral intensity as function of the depth. Therefore, for each scanned position, an intensity peak is derived at the distance which represents the depth of the sample.

The depth sensor was successfully integrated into a laser micromachining system. This new sensor allows the machine to get feedback on the actual machined depth, which is used to automatically adapt the micromachining process. This process results in an increased depth accuracy of the machined structures.

The most important results:

- Range: 1.2mm
- Lateral resolution: 20 µm
- Repeatability: 1.5 µm
- Max. Meas. Rate: 20 kHz
- Max. FOV: 20 x 20 mm