Optical (free space) data and analog video signal transmission in the infrared range are frequently used as an alternative to HF microwave systems, wireless LAN and Bluetooth, where wireless connections are required that are extremely insensitive to electro-magnetic interference and that are expected to have a very high availability of >99 ... 100 %, depending on the operating range.

The optical information transmission is mainly used for the frequency-modulated transmission of analog video signals in real time, which makes this transmission method particularly suitable for safety-relevant applications on conveying equipment, which requires the transmission and presentation of video images from the cameras to a monitor without any delay.

This system uses modular opto-electronic solutions that will ensure the safe transmission over the entire transmission area as well as a high transmission quality.

All this will be achieved by a transmission strategy that has been adapted to the requirements in an optimal way and by the constructive design of both infrared transmitter and infrared receiver.

The system design is based on a relatively simple description of the application conditions, which includes a description of the ambient conditions, such as the exposure to dust, apart from a specification of the required transmission ranges, of the kinematic motion sequences and of the installation locations for the transmission components on site.

The latter may be designed for an additional one-directional or bi-directional transmission of switching commands or data signals.

This infrared transmission technique has been tried and tested over a long time and has proved its reliability under all conceivable operating, weather and ambient conditions.

Its particular benefits are listed below:

- The infrared transmission energy emitted is very low and will not be generated by lasers but by infrared LEDs, so that human eyes are safe pursuant to DIN EN 60825-1 (laser class 1).
- The infrared transmitter’s operating range is exactly defined under geometrical aspects, so that any undesired interaction with neighboring transmission systems can be safely excluded.
- The infrared transmission technique is extremely resistant against external electro-magnetic radiation sources of drive and plant systems and against EMC interference from the immediate vicinity and beyond.

Example of an infrared video transmission system at a crane of Corus Steel NL (Fig. 1 – 4)

(Reproduction of the photographs by courtesy of CORUS STEEL® IJMULDEN/NL)

The video signal will be transmitted to the crane operator so as to allow him monitoring the load pick-up, the handling of the load and its positioning as well as the ambient area within a traveling range of approx. 4 m at three stations.

The transmission and reception angle required in this case is 22.5°.
It is a truly modularized system with numerous components, all being tried and tested, that will make it possible to design, individually or in combination with each other, an optimal system for the transmission of video signals to a moving object or between two moving objects of the conveying equipment, all of which being duly adapted to the application requirements.

The range of requirements includes:

- Configuration of both the transmitter and the receiver on an axis and the crane making translational movements, with a transmission and reception angle of 3° being generally sufficient
in this case, in order to ensure the required tolerance for adjusting the irregular rotational movement caused by the running gear and load impacts. This, in turn, will ensure the undisturbed transmission, irrespective of, whether the transmission is made from the crane to the receiver (as shown in Fig. 5) or vice versa, and whether the transmission range is large or small (as in the example above).

Fig. 5: Example of the infrared video transmission involving a bridge crane

...and even challenges (for which there seem to be no solutions):

- **Solution for the cordless infra-red transmission of video signals involving a crane for handling ore, with transmitter and receiver moving relatively towards each other on concentric circular paths.** The signals will be transmitted at/from any spot of the circular path, while the crane is stationary or moving.

- **Infrared image transmission for the NASA drop tower (USA) – during the fall of the capsules which can, of course, be used again.** The drop tower has a height of approx. 140 m; the capsules will be dropped almost under vacuum conditions, which generates zero gravity for approx. 5 s. They will plunge into a basin filled with polystyrene globules. The slow-down generates a lot of stress: G from 0 to 65 G in 150 ms (35 G's RMS).