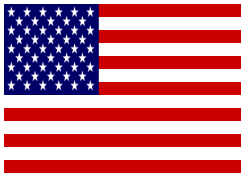

DIGITAL MOBILE VIDEO SYSTEM
TECHNICAL INFORMATION

KMW
KRAUSS-MAFFEI WEGMANN

List of Abbreviations

Abbreviation	Meaning
ACCU	Accumulator
CCD	Charge Coupled Device
DMV	Digital Mobile Video System
HD	High Definition
Hz	Hertz
IPTV	Internet Protocol Television
KMW	Krauss-Maffei Wegmann GmbH & Co. KG
LED	Light Emitting Diode
LiPo	Lithium Polymer
RAL	German standardized color system
RTP	Real-Time (Transport) Protocol
SD	Standard Definition
WLAN	Wireless Area Network

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1 Digital Mobile Video System (DMV)

1.1 Scope

This document describes the Digital Mobile Video System (DMV) from Krauss-Maffei Wegmann GmbH & Co. KG.

2 Digital Mobile Video System (DMV) Overview

The Digital Mobile Video System (DMV) is used for wireless video and voice transmission under difficult working conditions. Due to the small design the system is suitable for different fields of application, in the following are some examples:

- Tele maintenance in/at a wide variety of vehicles or machineries
- Monitoring of maintenance activities during training
- Video image and voice transmission of shielded vehicles and machineries
- Permanent monitoring for troubleshooting, failure localization and limitation
- Error documentation by means of the recording capability via laptop
- Monitoring tasks for backup purposes

2.1 DMV System Overview

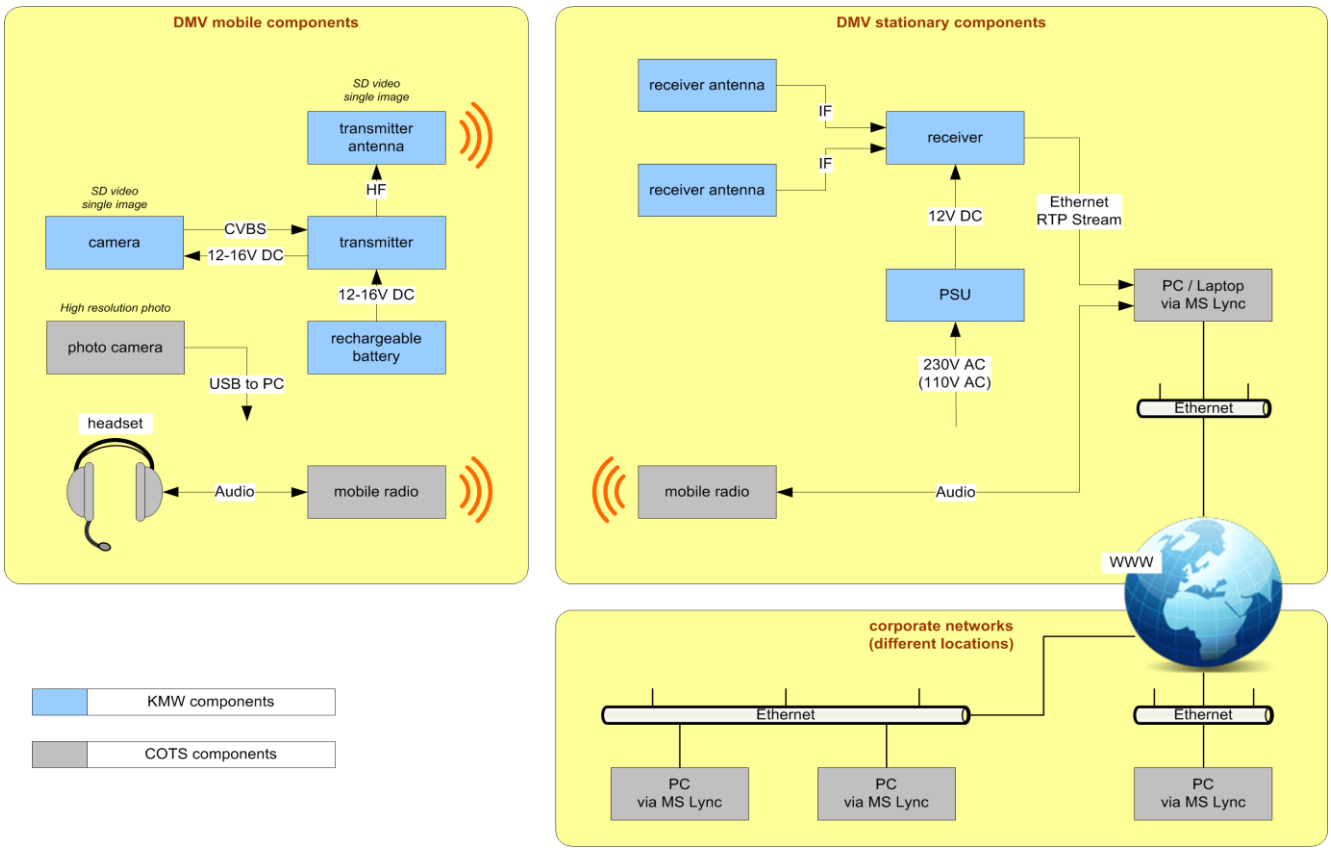

Figure 1: System Overview DMV

The SD color camera gathers the activities of the service personnel as live video or as single images. The camera is optimized for video transmission on the move. The video images are transmitted via the digital transmitter. By means of the transmitter antenna the video images can be transferred via the receiving antenna to the radio receiver. The power source of the mobile components is a rechargeable power pack.

The transmission of audio signals is realized by headset and mobile radio transmission for example by means of walkie-talkies.

2.2 Man Portable Equipment

The man portable equipment allows DMV to gather the particular view of the maintenance personnel. It also enables a two-way communication. The man portable equipment is equipped with a color camera and a noise protection headset with an integrated microphone.

The gathered signals (video and audio) are transmitted (using a digital transmitter) to the instructor station. There the signals are used for displaying purposes or to transfer the information by means of Microsoft Lync via internet.

Accumulators provide the power supply of the equipment which enables independent working. To wear the equipment suitable means, the equipment shall be borne by the maintainer (e.g. belt, vest carrying system, backpack, etc.), so that an undisturbed work is possible.

Figure 2: Example of the man portable equipment

2.3 Digital Radio Receiver

The digital radio receiver receives the video and audio signals of the man portable equipment and provides these signals for displaying and processing of the video images and audio signals in digital form as a RTP data stream (IPTV output to RJ45 plug socket). The device works on the DVB-T standard at the frequency range of 2.7 GHz. Other frequencies are available and can be offered on request.

Further processing (display and recording) of the data is done either directly by means of a connected laptop, or the data will be forwarded to another location using different transmission media such as:

- corporate network
- satellite connection
- UMTS/LTE

The power supply of the receiver is provided by an external power supply or if necessary with one of the supplied rechargeable battery packs for mobile applications. A supply via the 12 V connection (vehicle power) of a car is possible.

Figure 3: Digital 1-channel radio receiver

Technical data:

- Receiving frequencies: 300 MHz to 10 GHz (depends on the used receiving antenna)
- HF bandwidth: 8, 7 or 6 MHz selectable
- Video resolution: maximum HDTV 1080P
- Video outputs: RJ 45 (via ETHERNET, RTP)
- Power Supply: 12 to 16 VDC, ca. 1A or 230V via external power supply
- Control: RS 232 via 6 Pol. VG-connector
- Audio: RJ 45, 2 channel, 20 Hz to 20 KHz, (via ETHERNET, RTP)
- Frequency switching: 8 frequencies per rotary switch (or in 1 MHz steps via RS232)
- Data: RJ 45 (via ETHERNET, RTP)
- Operating temperature: -25 to + 50°C
- Dimensions : L 129, B 105, H 49, (without connector)
- Mechanical interface: 6x screw sockets M4
- Surface anodized aluminum

2.4 Receiving Antenna with Mounting

The antenna is used to receive video and audio signals from the man portable equipment. The antennas are used as a couple in the so-called diversity operation. This ensures interference-free reception even under inappropriate reception conditions. Also reflections of radio signals are used.

Figure 4: Receiving antenna with mounting

Technical data:

- Receiving frequencies: 2,32 GHz to 2,5 GHz (frequency range from 1,95 GHz to 6 GHz possible)
- Antenna gain: 8 dBi
- Amplifying: 15 dB
- Angel of aperture: H 65° V 50°
- Intermediate frequency: 520 MHz to 700 MHz (depends on the receiving frequency)
- Cable length antenna/receiver: RG 232 max. 35m, RG223 max. 60m
- Power supply: 12V DC via N-connector
- HF pin : Connector type N (with protection cap)
- Type of protection: IP 67 (electronic housing purged with nitrogen)
- Operating temperature: -21 - + 63°C
- Dimensions: L 130, B 125, H 90, (without N-plug socket and holder)
- Mechanical interface: 4x thread M8

2.5 Digital 1-Channel Transmitter

The digital 1-channel transmitter transmits the video signal of the camera and the audio signal (optional) of the microphone to the receiver.

Accumulators provide the power supply of the transmitter. The device works on the DVB-T standard. For wireless components a frequency range is selected, which is outside of the range of commercially available components (e.g. WLAN, mobile phones, etc.), to avoid interruptions in the transmission.

Figure 5: Digital 1-channel transmitter

Technical data:

- Transmission frequency: 2,2 GHz - 2,7 GHz
- Transmission power: 200 mW
- Modulation type: COFDM / QPSK, QAM 16, QAM 64
- Video transmission: SD PAL, Resolution D1 (720x576) or HDTV up to 1080P
- HF bandwidth : 2, 6, 7, or 8 MHz
- Power supply: 12 - 16 V DC, ca. 1,2A VG plug
- Access: 1x FBAS, 2x Audio, or HDMI access via VG plug
- HF connection: Plug type N
- Type of protection: IP 64
- Operating temperature: -21 - + 43°C
- Environment: Mil. Standard 810F
  High temperature:
  Procedure 501.4-I (Basic hot, ambient Air +43°C)
  Low temperature:
  Procedure 502.2-II (Basic cold -21°C)
  Vibration:
  Procedure 514.5-I (partial)
  Shock:
  Procedure 516.5-I (Peak acceleration 20g's)
  Sand and dust:
  Procedure 510.4-I
- Dimensions L 129, B 105, H 49, (without plug socket) 2-Channel L 150, B 105, H 49
- Mechanical interface: Belt clip

2.6 Required Equipment

2.6.1 Rechargeable Power Pack

The rechargeable power pack provides the transmitter and the camera with the required electrical energy.

In use is a LiPo accumulator with a carrying back and belt loop.

Figure 6: Example of a rechargeable power pack

Technical data:

- Accumulator type: HS-LIPO.4,2.4.8-35
- Voltage : 14,8 V
- Connector type: VG 96912-D-8-35SN
- Mounting: Belt
- Operating temperature: -20 - +50 °C

2.6.2 Charger (4-fold)

The charger charges up to 4 accu packs simultaneously. The charging process runs fully automatically, the 4 particular cells in the LiPo accu packs are balanced automatically. The power supply of the charger is either via an external power supply (230VDC / 12 V AC) or while operating in vehicles with a 12 V connecting cable.

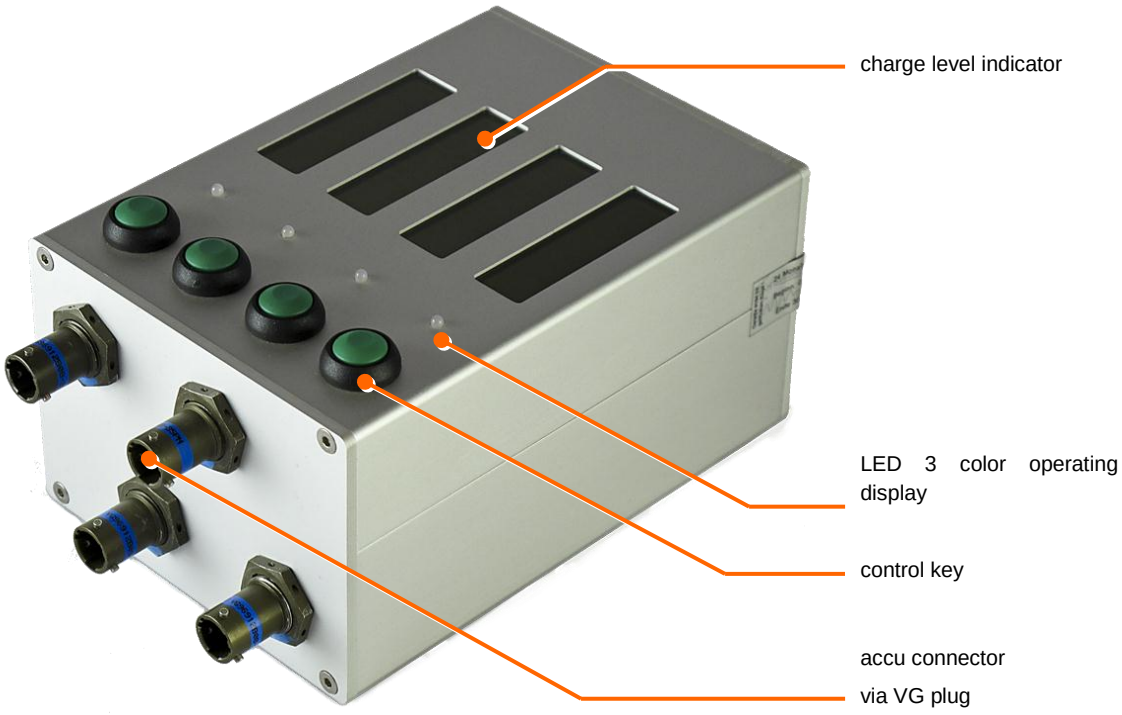

Figure 7: Charger for LiPo accu packs

Technical data:

- Charging process: fully automatic
- Charging rate: depends on the accumulator, ca. 1,6A per accumulator
- Display: LCD, for displaying of charging information
- LED status: 3 colored, for displaying of status information
- Number of accumulator: up to 4 accu packs simultaneously
- Input voltage : 12V DC to 10 A or 230 V AC via external power supply
- Operating temperature: -20 - + 50°C
- ACCU connector type: VG 96912-B-8-35PN