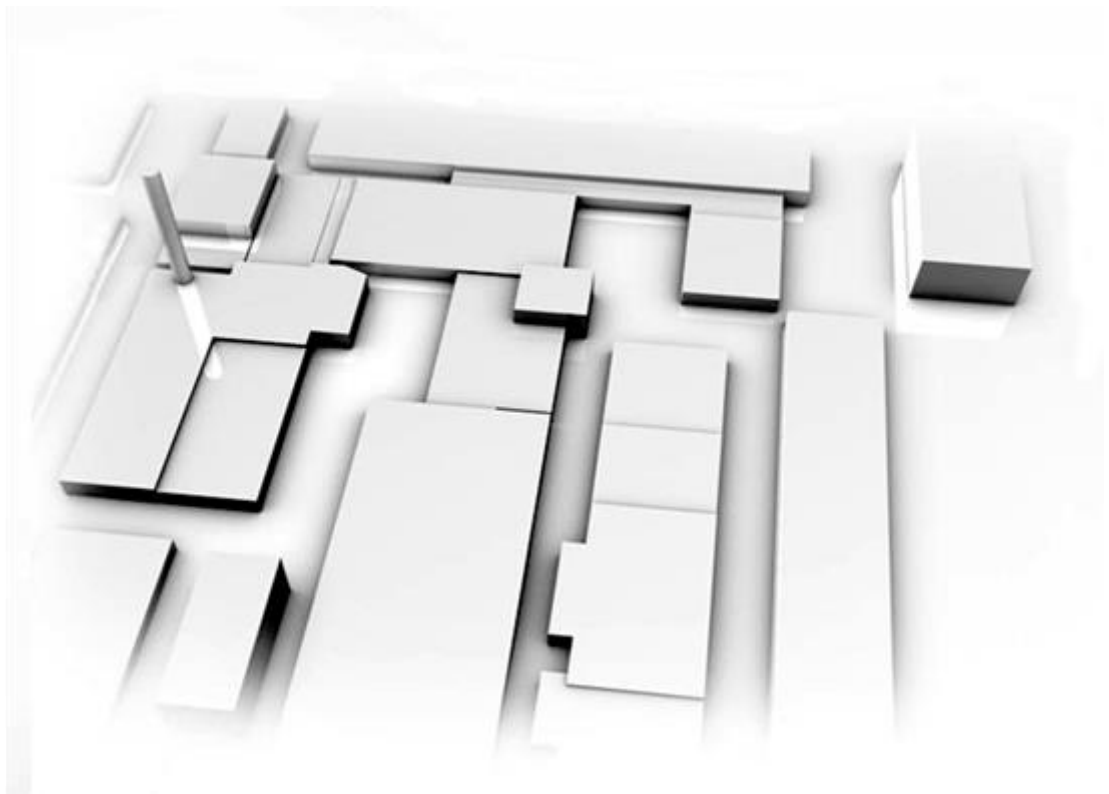


# DMC

PRODUCTION

**Technical Guidelines**  
**Broadcast Center DMC PRODUCTION GERMANY GMBH GmbH**  
A Brand of DMC Production Germany GmbH



2025

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## **1. GENERAL CONDITIONS**

The present technical guidelines apply to all program contributions produced, transferred, and/or broadcasted at the DMC PRODUCTION GERMANY GMBH broadcasting center. This also specifically applies to broadcast material not produced by the DMC PRODUCTION GERMANY GMBH broadcasting center.

Unless deviating or supplementary values and data are specified, the recommendations of the ITU are considered part of these Technical Guidelines. To achieve optimal picture and sound quality of the television program, the equipment and materials used in recording must meet broadcast standards.

Both program preparation and broadcast processing work with automation systems. Therefore, adherence to the points listed in Chapter 5 is of particular importance.

It should also be noted that due to the compressed digital broadcast, no material will be broadcasted that does not meet the in-house standard – XDCAM HD.

Files in the MPEG2 codec (see Chapter 6) can be sent for broadcast. It must be ensured that audio tracks 1, 2, 3, and 4 are necessarily filled with broadcast sound. Tracks 5-8 must be present but can be filled with silence.

To ensure optimal picture and sound quality, compliance with the technical capabilities and limitations of television technology must already be considered during production. Additionally, only technically verified material should be delivered.

A technical quality control by DMC PRODUCTION GERMANY GMBH must be separately commissioned and be part of the contract.

## **2. TECHNICAL PARAMETERS**

### **2.1 VIDEO SIGNALS**

For tolerances in video levels, the specifications according to EBU R 103 must be adhered to.

#### **2.1.1 SIGNAL STANDARDS**

DMC PRODUCTION GERMANY GMBH accepts digital video signals in the following standards:

##### *SD Signals*

For SD signals, the encoding parameters according to SMPTE 259M apply.

576i (PAL), Color Subsampling 4:2:2, 10-bit quantization, 0.270 Gbit/s

Transmitted image field: Line 23-310/336-623, 702 pixels (52µs)

Important image part: Line 33-300/346-613, 652 pixels (48.4µs)

Title field: Line 38-295/351-608, 562 pixels (41.6µs)

Delivered signals must not contain widescreen signaling (WSS) or video index (VI).

### *HD SIGNALS*

For HD 1.5G signals, the encoding parameters according to SMPTE 292M apply.

1080i, Color Subsampling 4:2:2, 10-bit quantization, 1.485 Gbit/s

For HD 3G signals, the encoding parameters according to SMPTE 424M apply.

1080p, Color Subsampling 4:2:2, 10-bit quantization, 2.970 Gbit/s

Only signals according to Level A (direct image format mapping) are accepted.

### *UHD Signals*

For UHD signals, the encoding parameters according to SMPTE ST 2082 and ST 2036-1 apply.

2160p, Color Subsampling 4:2:2, 10-bit quantization, 11.88 Gbit/s

Only single link signals are accepted.

Signals must lie within the parameters of the respective SMPTE standard according to resolution and scan format.

## **2.1.2 ASPECT RATIO**

The aspect ratio of the active image area must always be 16:9 for all derivatives. A deviating aspect ratio is only possible after prior consultation.

## **2.1.3 PHYSICAL ATTRIBUTES**

To ensure AV synchronization, transmission paths should be able to play a test pattern. The DMC PRODUCTION GERMANY GMBH broadcasting center can read these patterns and adjust offsets accordingly. The test patterns should be valid and Hitomi-compatible.

Level: 800mV-ss  $\pm$ 10%

*rise and fall times less than:*

- SD-SDI: 1,5 ns
- HD-SDI: 0,270 ns
- 3G-SDI: 0,135 ns
- 12G-SDI: 0,034 ns

*JITTER LESS THAN:*

- SD-SDI: Timing 0,2 UI, Alignment 0,2 UI
- HD-SDI: Timing 1,0 UI, Alignment 0,2 UI
- 3G-SDI: Timing 2,0 UI, Alignment 0,3 UI
- 12G-SDI: Timing 3,0 UI, Alignment 0,3 UI

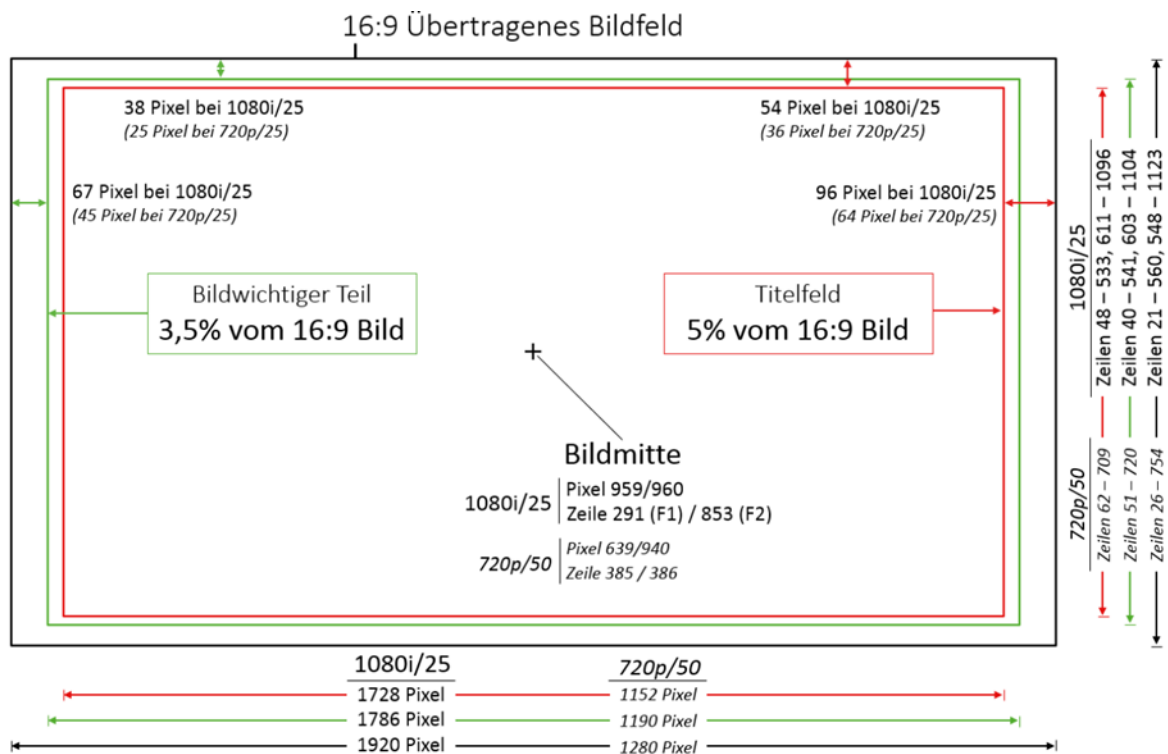
The SDI data frames must be interpreted flawlessly by our end devices (no CRC errors, etc.). Some of the defined parameters and limits only apply to electrical signal transport.

## 2.1.4 PAYLOAD

The Video Payload Identifier (PVID) contained in the SDI must accurately describe the active image component in terms of the used data rate, SDI standard, resolution, aspect ratio, scan format, color subsampling, color space, and EOTF.

## 2.1.5 SAFE AREA

With regard to active image content, the recommendation according to EBU R 95 'safe areas for 16:9 TV production' applies. Resolution derivatives not considered here are to be considered proportionally identical.



## 2.1.6 COLOR SPACES

The image contained in the SDI must adhere to the respective limits regarding video levels and compliance with the respective color space.

SDR image signals must adhere to the ITU-R BT.709-6 color space standards.

HDR image signals must adhere to the ITU-R BT.2020-2 color space standards.

In EBU R 103, a headroom of 5% is defined as an acceptable value. Any signal outside this headroom is rejected as a gamut error.

Regarding EOTF, the following specifications apply:

- SDR content: Gamma 2.4
- HDR content: BT.2100 HLG

Deviations are only permissible with prior consultation.

## 2.2 AUDIO SIGNALS

### 2.2.1 GENERAL PARAMETERS

The following audio levels apply at DMC PRODUCTION GERMANY GMBH

	Analog		Digital	ITU
Peak levels	0 dB	6 dBu	-9 dBFs(Full scale)	100 %
Reference levels	-9 dB	-3 dBu	-18 dBFs	35 %

The following audio levels apply at DMC PRODUCTION GERMANY GMBH

	Track 1	Track 2	Track 3	Track 4
Stereo	Left channel	Right channel	IT left channel	IT right channel
	Left channel	Right channel	Left channel	Right channel
Mono	Mono-Broadcast Audio	Mono-Broadcast Audio	IT Mono	IT Mono
	Mono-Broadcast Audio	Mono-Broadcast Audio	Original-Mix	IT Mono
	Mono-Broadcast Audio	Mono-Broadcast Audio	Mono-Broadcast Audio	Mono-Broadcast Audio

Exception:

In recordings intended to be dubbed live during the broadcast, tracks 1, 2, 3, and 4 must be filled with IT tone.

Stereo program contributions must be mono-compatible. Following CCIR Rec. 408, the correlation degree between the left and right channels must be greater than or equal to zero.

## 2.2.2 ANALOG AUDIO SIGNALS

Analog audio signals are assumed to be received in a continuously symmetric signal feed.

## 2.2.3 DIGITAL AUDIO SIGNALS

### *HEADROOM AND FULL-SCALE*

According to the recommendation of ITU-R 777, the code value for the reference level must be 18 dB below the maximum possible code value. This results in a headroom of 9 dB.

The digital peak meter used must comply with ITU-R 777 and operate with an integration time of 10 ms. Occasionally occurring level peaks must not exceed a value of -6 dBFs.

### *Implementation of Loudness Guideline EBU R 128*

Program Loudness must be calibrated to the target value of -23 LUFS ('Target Level'). The permissible deviation from the target value must not exceed +/- 1 LU. This applies to programs that do not allow precise normalization to the target value, such as live programs.

### *PERMISSIBLE MAXIMUM LEVEL*

The exact maximum peak level for PCM audio is -3 dBTP (dB True Peak).

### *Loudness Range*

The allowed loudness range for stereo and 5.1 productions is a maximum of 20 LU.

### *PROGRAM LOUDNESS FOR SHORT ELEMENTS (COMMERCIALS, TRAILERS, AND SPONSORSHIP)*

For short elements such as commercials, trailers, and sponsorship, the values mentioned above apply, but the following values are allowed:

- Momentary Loudness maximum (400ms): -15 LUFS (+8 LU)
- Short Term Loudness maximum (3s): -20 LUFS (+3 LU)

### *Sampling Rate*

Only digital audio signals with a sampling rate of 48 kHz may be used.

## PREEMPHASIS

Preemphasis should not be used under any circumstances.

### Mixing of Program Contributions

When mixing broadcast-ready tapes, it is important to ensure a consistent perceived loudness throughout. Therefore, heavily compressed music, for example, should not be mixed at the same reference level as less compressed speech to maintain consistent loudness perception.

Individual program components and thus the overall program are mixed according to EBU R 128. This standard specifies a target level of -23 LUFS ( $\pm 1$  LU).

### Dolby E / AC3

	Stereo	Dolby 5.1	Bemerkung
<b>Parameter</b>			
Dialog Level	- 23 dB		The actual program loudness must match exactly.
Channel Mode	2/0	3/2	
LFE Channel	off	off	
Bitstream Mode	Main Complete		
Line Mode Pro	Film Standard		
RF Mode Pro	Film Standard		
RF Ovmd Protect	off		
Center Downmix	-3 dB		
Surround Downmix	-6 dB		
Dolby Surround Mode	off	off	
Copyright	Yes	Yes	
Orig. Bitstream	Yes	Yes	
Preferred Stereo Downmix	Lo/Ro	Lo/Ro	
Lt/Rt Center Downmix	-3 dB	-3 dB	
Lt/Rt Surround Downmix	- 4,5 dB	- 4,5 dB	
Lo/Ro Center Downmix	- 3 dB		
Lo/Ro Surround Downmix	- 4,5 dB		
Dolby Surround EX Mode	off		
A/D Converter Typ	Standard		
DC Filter	on		
Lowpass Filter	on		
LFE Lowpass Filter	on		
Surround 3 dB Att.	off		
Surround Phase Shift	off		

\* Metadata for downmixing from 5.1 to stereo (Lo, Ro) or ProLogic II (Lt, Rt)

## **3. ONSITE BROADCAST AND LINE TRANSMISSIONS**

### **3.1 ONSITE BROADCAST**

The same general conditions and technical parameters defined in Chapters 1 to 3 must be adhered to for onsite broadcasts.

### **3.2 LINE AND SATELLITE TRANSMISSION**

In transfers of program contributions and in live broadcasts, video and audio signals are to be considered as coherent. The party responsible for the production must ensure the availability of a transfer point accessible to any communication service provider for the transfer or live broadcast of productions.

#### **3.2.1 TELEVISION AND DUBBING**

To ensure AV synchronization, transmission paths should be able to be loaded with an analyzable test pattern. The DMC PRODUCTION GERMANY GMBH broadcast center can read these patterns and adjust offsets accordingly. The test patterns should be Valid and Hitomi compatible.

#### **3.2.2 DIGITAL TRANSFERS**

When it comes to digital transfers via lines or line-like networks such as ATM and via satellites, transmission parameters must be coordinated with the client in advance. The point of contact is the client's line office. The following transmission standards are possible and must be coordinated and definitively determined before the transfer:

- |             |             |                |
|-------------|-------------|----------------|
| • ETSI      | G.703       | 34Mbit/s       |
| • DVB-MPEG2 | 4:2:0 MP@ML | 8 - 15 Mbit/s  |
| • DVB-MPEG2 | 4:2:2 P@ML  | 15 - 45 Mbit/s |

#### **3.2.3 DIGITAL TRANSFERS VIA SATELLITE**

In addition to 4.2.1 and 4.2.2, the following provisions must be observed:

Every digital satellite transmission must comply with one of the transmission standards listed under 4.2.3.

In the ordering process before each transmission, the following signal parameters are to be provided to or jointly determined with DMC PRODUCTION GERMANY GMBH-ITVC:

- Satellite, Transponder, Channel, and possibly Orbit Position
- Downlink Frequency, Polarization, and Modulation (DVB-S2, NS3, NS4)
- Encoding (MPEG-4 / MPEG-2) and Compression (H.264)
- Color Subsampling (4:2:0 / 4:2:2) and Bitrate (8 / 10)
- Bandwidth, Symbol Rate, and FEC (Forward Error Correction)
- Data Rate and Roll-off
- Possibly MCPC Channel
- Encryption Algorithm (BISS-1/E) and Code
- Number and Assignment of Audio Channels

### **3.3 RECEIVING EXTERNAL STREAMS**

When receiving streams, parameters must always be coordinated in advance. The following streaming standards can be accepted:

- RTMP push
- RTMP pull
- HLS push
- SRT
- Bifrost Protocol - if the sender also has an Intinor device.

### **3.4 COMMAND AND COMMENTARY INTEGRATION**

#### **3.4.1 COMMAND/EMERGENCY COMMENTARY VIA TELEPHONE HYBRID**

To establish a connection via telephone hybrid, the MCR must be called at:

+49 (0) 89 996 336 888.

From here, the call will be forwarded to one of our hybrids.

#### **3.4.2 COMMAND/ COMMENTARY VIA SIP USING IP CODEC**

To establish a SIP connection using an IP Codec, guest access credentials must be requested from the MCR. After the production (or the previously agreed-upon period), these access credentials must be actively and completely deleted from the devices used.

Applicable algorithms depending on the intended use and device:

- HQ: MPEG Layer II with up to 256 kBit/s
- LD: G.722, G.711
- HE: AAC, AACv2
- OPUS
- HQ with FEC (requires Digigram devices)

## **4. AUTOMATION SYSTEMS**

In the DMC PRODUCTION GERMANY GMBH broadcast center, all channels are managed using automation systems.

The following points must be strictly observed:

*File-based delivery / playout:*

To ensure quality standards, the hardware and software configurations of the external service provider, which are valid and tested at the beginning of the contract, as well as compatibility with the current software or firmware of the playout server in the broadcast center, serve as safeguards.

Changes in the production process of the external service provider may only be implemented in the production system after consultation with the DMC PRODUCTION GERMANY GMBH broadcast management system administration and their explicit approval.

### **4.1 FILE FORMATS / VIDEO COMPRESSION**

The file formats are defined according to SMPTE standards 292M (HD) and SMPTE 295M (SD), or ITU-R BT.601.

#### **4.1.1 HD VIDEO**

The used video data rate for HD is 18-85 Mbit/s (MPEG2-Long GOP) or 50-100 Mbit/s (MPEG2-I-FRAME ONLY). For audio, 8 tracks of AES/EBU (24-bit resolution/sample rate of 48 kHz) or SDI-embedded audio are used.

The HD video format at PM is 1920 x 1080 50i, with format conversion of all common formats possible.

For 5.1 transmission, DOLBY E may be used. The format question needs to be determined for new customer connections.

Metadata should be delivered in XML format (see example). Delivery via FTP, hard drive, solid-state drive, or similar means.

#### **4.1.2 XDCAM HD**

*Container:*

MXF OP1A self-contained XDCamHD 422 in MXF Container. The partition status of the header partition must be 'closed' and 'complete'. This ensures that the header metadata is fully available at the beginning of the file.

*Video:*

Resolution: 1920 x 1080  
Aspect: 16:9  
Codec: MPEG2 LGOP (422P@HL, MPEG HD422)  
GOP-Length: 12 (IBBPBBPBBPBB)  
Sub GOP-Length: 3  
Frame Rate: 25  
Sequence Header: on each GOP  
Field dominance: Topfield first  
Bit Rate: 50 MBit/s  
Chroma Subsampling: 4:2:2  
IntraDCPrecision: 10 bit

*Audio:*

Codec: PCM  
Sample Rate: 48 Khz  
Bits/Sample: 24  
Max. Channels pro File: 8 / 4 Stereopairs

*Track Allocation:*

Track 1 – 2: German Mix  
Track 3 – 4: O-Ton, IT or MUTE  
Track 5 – 6: Dolby E – German in 5.1 (L, R, C, LFR, Lx, Rs) + Metadaten or MUTE  
Track 7 – 8: Dolby E – Original in 5.1 (L, R, C, LFR, Lx, Rs) + Metadaten or MUTE

*Timecode:*

- SMPTE 328m Timecode in Picture User Data
- Program start at TC 00:00:00:00

The used video data rate for SD is 3-25 Mbit/s (MPEG2-Long GOP) or 25-50 MBit/s (MPEG2-I-FRAME ONLY) and IMX 50.

For audio, 4 tracks of AES/EBU (24-bit resolution/sample rate of 48 kHz) or SDI-embedded audio are used, with the wrapper being the Quicktime container or MXF.

## **5. EXTERNAL NETWORK CONNECTION**

DMC PRODUCTION GERMANY GMBH is redundantly connected through multiple providers.

## 5.1 VPN-ACCESS

VPN access is implemented using 2FA procedures by default. Additionally, for Site-to-Site VPN, it is necessary for the communicating partner to have a fixed public IPv4 address so that authentication based on a combination of IP address and fixed password is technically feasible.

## 5.2 FTP-ACCESS

FTP access is specified as follows:

- FTP activation is only possible if a data protection declaration is signed.
- Passwords for FTP usage are only provided to authorized personnel.
- The FTP server is only used for 'exchange'. Data is automatically delivered according to customer preferences.
- Archiving is done by arrangement.
- Each FTP account is regulated by a defined disk quota.
- The delivered files are checked by a firewall.
- Access to FTP is only allowed with a fixed IPv4 address.

## 6. ADDRESS AND CONTACT

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Handbuch Fernsehbetriebstechnik: Erhältlich beim Institut für Rundfunk und Fernsehtechnik IRT  
Funktechnische Richtlinien (FTZ): Erhältlich bei der Regulierungsbehörde für Telekommunikation und Post sowie beim Institut für Rundfunk- und Fernsehtechnik

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