

H.265

KAMERA/TECHNIK

H.265 (HEVC - High Efficiency Video Coding) ist der Nachfolger von H.264 mit etwa 50% besserer Kompressionseffizienz. Es ist der moderne Standard für 4K-, HDR- und High-Framerate-Videoverteilung.

H.265 Video Codec (HEVC) H.265, formally known as High Efficiency Video Coding (HEVC), is the modern successor to H.264, standardized in 2013. It provides approximately 50% better compression efficiency, making it essential for 4K, HDR, and high-framerate video delivery while maintaining or improving visual quality. Development and Standardization H.265 evolution reflects advancing technology needs: Standardization : ITU-T VCEG and ISO/IEC MPEG joint effort (2013) Motivation : Enable UHD and HDR video with manageable bitrates Advancement : ~50% compression improvement over H.264 Adoption : Rapidly becoming primary standard for modern delivery Technical Improvements Over H.264 Enhanced Compression Architecture : Larger Block Sizes : 64x64 coding units (vs. 16x16 for H.264) Better Prediction : More sophisticated intra/inter prediction Improved Entropy Coding : CABAC-only (no CAVLC option) Adaptive Loop Filtering : Context-based filtering refinement Sample Adaptive Offset (SAO) : Advanced post-processing Practical Result : Same quality as H.264 at half the bitrate Superior quality at equivalent bitrates Better handling of complex content Improved visual quality in low-bitrate scenarios Profiles and Tiers H.265 defines comprehensive profiles for different applications: Main Profiles : Main : 8-bit standard definition content Main 10 : 10-bit color depth for HDR Main 4:2:2 10 : 4:2:2 chroma sampling for professional Main 4:4:4 10 : Full 4:4:4 sampling for mastering Tiers and Levels (similar to H.264): Level 5.2: 8192x4320@60fps Higher levels support 8K and beyond Tier distinction (main vs. high) affects bitrate limits Bitrate Performance H.265 efficiency enables: Typical Bitrates : 1080p/24fps : 2-4 Mbps (H.264: 5-8 Mbps) 4K/24fps : 8-12 Mbps (H.264: 15-25 Mbps) 4K/60fps : 15-25 Mbps (H.264: 25-50 Mbps) 4K HDR/24fps : 12-20 Mbps with Main 10 profile Advantage for Delivery : Streaming services deliver 4K more efficiently Broadcast can add HDR without bitrate increase Archival requires smaller storage footprint Distribution bandwidth requirements reduced HDR and Wide Color Gamut Support H.265 natively supports modern color technologies: HDR Standards : Rec.2020 : Wide color gamut specification PQ (Perceptual Quantizer) : HDR transfer function (Rec.2084) HLG (Hybrid Log-Gamma) : Broadcast HDR alternative Metadata : HDMI, DCI, and frame-based HDR signaling Main 10 Profile : 10-bit color depth essential for HDR Maintains detail in highlights and shadows Enables next-generation display technology Professional standard for HDR mastering Industrial Applications Streaming Platforms : Netflix (primary 4K codec) Amazon Prime Video YouTube (UHD content) Apple TV+ Broadcast : Ultra HD television transmission NextGen TV (ATSC 3.0) 8K broadcasting trials HDR broadcast delivery Digital Cinema : 4K DCP distribution Archive masters Festival distribution Theatrical special format delivery Professional/Archival : Mastering format for 4K content Long-term archive preservation Broadcast quality assurance Professional deliverables Hardware Support H.265 increasingly enjoys hardware acceleration: Encoding Hardware : NVIDIA NVENC (second-generation and newer) Intel Quick Sync (7th generation and newer) AMD VCE Apple ProRes (GPU acceleration) Decoding Hardware : Modern smartphone SoCs Television chipsets Consumer devices increasingly standard Streaming devices widely support H.265 vs. Alternatives Codec Efficiency HDR

Support Adoption H.264 Baseline Limited Universal H.265 50% better Excellent Growing VP9 35% better Good Growing AV1 55% better Excellent Emerging Future of H.265 H.265 remains central to modern video delivery and remains the primary standard for 4K and HDR content across streaming, broadcast, and archive applications.

FilmFarm - filmfarm.de/c/h265-hevc