

SHOOT FOR THE STARS

DP David Klein ASC and focus-puller Dominik Mainl shed some light on working with Caldwell Chameleon Anamorphic lenses with StageCraft LED virtual production technology on *The Mandalorian* and forthcoming *The Mandalorian And Grogu*.

David Klein ASC is a distinguished cinematographer whose impressive body of work spans film and television. Klein's journey to working on *The Mandalorian* (2020-2023), part of the *Star Wars* universe, is rooted in his reputation as a versatile and innovative DP with a knack for creating visually-stunning and immersive narratives.

Klein first gained industry recognition through collaborations with director Kevin Smith on films such as *Clerks* (1994) and *Mallrats* (1995). Over the years, he expanded his repertoire, working on high-profile projects such as *True Blood* (2011-2014) and *Homeland* (2013-2020). His ability to blend technical expertise with storytelling earned him acclaim and opened doors to larger projects.

The DPs involvement in *The Mandalorian* began when Jon Favreau, the series' creator and executive producer, sought to assemble a team of top-tier talent to bring his vision of the *Star Wars* universe to life. The series required cinematographers who could seamlessly integrate traditional cinematic techniques

with ground-breaking virtual production technology, notably the use of the StageCraft Volume, a massive LED wall system developed by Industrial Light & Magic. Klein's technical aptitude and his ability to adapt to new tools made him an ideal choice.

On *The Mandalorian*, Klein worked closely with directors, VFX teams and fellow cinematographers like Baz Idoine ASC to craft the series' signature look. His contributions involved not only capturing dynamic and visually-arresting imagery, but also navigating the challenges of shooting within the LED Volume, where real-time rendered backgrounds replace greenscreens. This method demands meticulous pre-visualisation and collaboration, areas in which Klein excelled.

Klein's work on *The Mandalorian* reflects his mastery of both the art and technology of modern cinematography, solidifying his place as one of the industry's most respected DPs. His ability to merge cutting-edge techniques with a deep understanding of narrative visual language helped make *The Mandalorian* a visual and storytelling triumph, beloved by fans and critics alike.

The DP's mastery of storytelling and cinematography on the series also leveraged a deep collaboration with a highly-skilled crew. Among them was focus puller Dominik Mainl, whose expertise in virtual production played a pivotal role in the series' technical success.

“Once we mounted the Chameleons, the choice became clear.”

Mainl, known for his precision and adaptability, proved indispensable in navigating the unique challenges of working within the StageCraft Volume.

Whilst this technology offers unprecedented visual realism, it also demands an exacting approach to focus-pulling, as depth, parallax and virtual set extensions are projected directly on the walls. Klein relied heavily on Mainl's technical acumen and problem-solving abilities to ensure that the imagery captured within the Volume maintained the seamless illusion of a vast and immersive *Star Wars* universe.

Mainl's proficiency with complex lens data systems, as well as his ability to adapt focus marks and distances to dynamic changes in the virtual environment, was critical.

Working closely with Klein, Mainl ensured that every shot maintained the sharpness and depth

required to sell the realism of the scenes, whether it involved intimate character moments or sprawling action sequences. His technical finesse and attention to detail allowed Klein to push creative boundaries without compromising on visual fidelity.

The collaboration between Klein and Mainl highlights the importance of having a team that can marry artistry with cutting-edge technology. Mainl's role as a focus puller on *The Mandalorian* demonstrates how the evolving landscape of virtual production continues to elevate the craft, making him an integral part of the series' success and a testament to the collaborative nature of modern filmmaking.

Klein and Mainl recently spoke about their work on *The Mandalorian*, shedding some light on their approach to achieving the show's distinctive visual style. They discussed the process of lens selection, testing and the challenges of working within the cutting-edge StageCraft virtual production environment.

Their search for the most suitable lens was an extensive testing process, where they evaluated every Anamorphic lens available in their market. The lenses they ended-up using were the Caldwell Chameleon 40mm, 50mm, 60mm, 75mm and 100mm Anamorphics, paired with a 135mm and 180mm Cooke 1.8x SF on the ARRI LF sensor.

When asked about how they selected lenses and their criteria for testing, Klein explained, “We used Panavision's de-tuned UltraVista glass before but just didn't have enough lenses. Running two units with multiple cameras at any given moment pushed us into researching different options.”

This shortage of lenses prompted the team to explore alternatives that could meet the demands of their unique production workflow.

“Before deciding on the Chameleon lenses, we tested several sets of Anamorphic glass, including Panavision's UltraVista, T-series and C-series, Vantage Hawk glass, TechnoVision and Cooke 1.8x Special Flare lenses. We also explored offerings from other manufacturers. However, once we mounted the Chameleons, the choice became clear – it was almost

a no-brainer.”

Elaborating on the selection process Mainl added, “We started looking for new glass after wrapping up *The Book Of Boba Fett* (2021-2022). Dave had a distinctive look in mind for the upcoming shows, but we had to make sure the lenses could perform in the StageCraft Volume as well. Moiré is always in the back of your mind when shooting in a virtual environment.”

The StageCraft Volume, with its massive LED wall set-up, presents unique challenges, such as managing moiré patterns and ensuring that lenses can adapt seamlessly to the intricate requirements of virtual backdrops. When asked how virtual production influenced their lens choices, Mainl emphasised the

role of Caldwell Chameleons.

“The Chameleon's design was key to working in this virtual environment. Their dual astigmatizers create a different moiré pattern than traditional Anamorphic lenses. This pattern is called a Pointcaré moiré and, unlike the more common Galilean moiré, it allows you to focus much closer to the Volume. This gained us a lot of real estate in terms of usable set space.”

Klein added, “The other advantage was putting the Standard Coverage Chameleons on an ARRI LF sensor and realising they would cover! That gave us a sweet fall-off at the edges, depending on the T-stop.”

The combination of the Chameleons and the LF sensor offered a balance of practical and artistic

Credit: Lucas films ltd



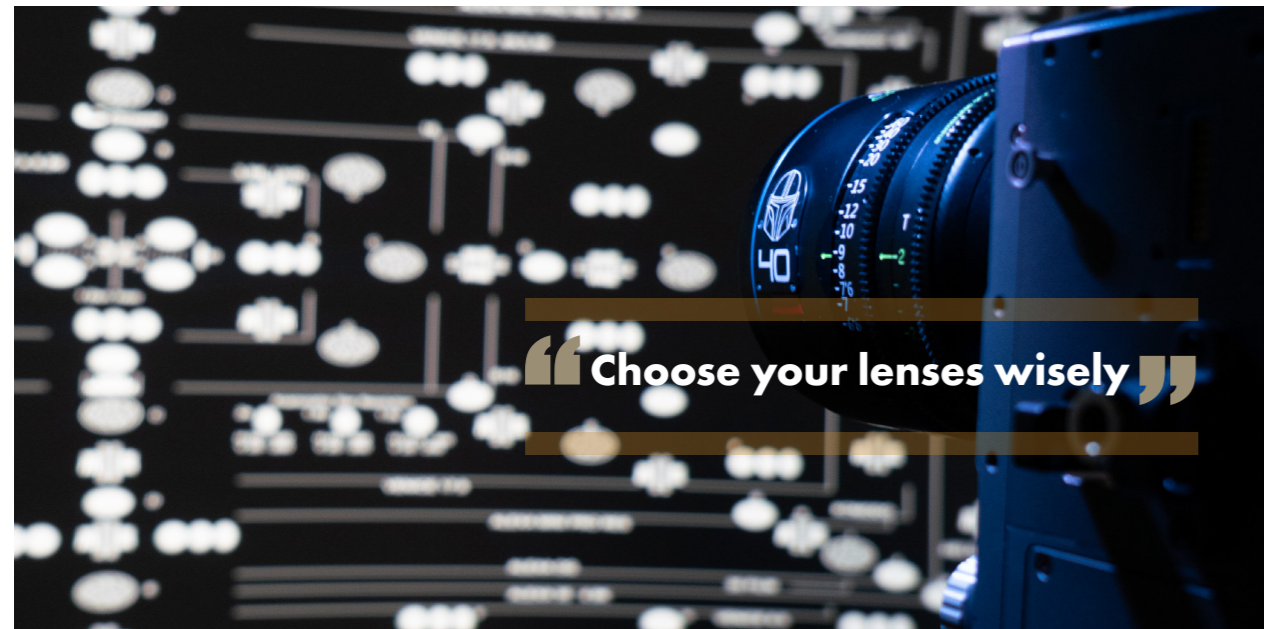


flexibility, enhancing both the visual and spatial possibilities within the Volume.

Klein also noted, "We liked the look of SC Chameleons on the LF sensor, so that was an easy sell. Plus, we wanted to shoot 4K, so we had limited camera choices back when we started to shoot *The Mandalorian* S3."

As virtual production technology advances, Klein foresees a growing impact on lens choices.

"The more realistic the Volume content looks, the better. Lenses that give you that freedom of moving around in the limited set space will make that possible, and I personally have yet to find another lens set that will give you that much freedom and flexibility. Choose your lenses wisely."



“Choose your lenses wisely”

When discussing apertures and format size, Mainl noted Klein's preference.

"Dave likes to shoot as close to wide open as possible. I don't think he knows lenses go to a T4 (laughs). That being said, it's achieving the look he wants, so there you go." Klein responded with his own humour: "Shooting wide open on an LF sensor. It's a great look. Don't listen to Dom, lenses don't go to a T4. That's a myth."

Regarding camera set-ups and equipment selection, Mainl highlighted their need for versatility. "We need to be ready for anything, whether that's Steadicam, crane, handheld, etc., and, if possible, quickly! Plus, we're dealing with the equipment that the Volume control team implements (as we are tethered

to the Volume) and on occasion N-Cam (the previz system now owned by Zeiss). That's a lot of stuff mounted on that little camera. I'm just happy that the lenses are the same size, so that's one variable less I have to deal with.

"I like to build the camera in a way that it's really quick to switch between modes and external requirements – i.e., N-Cam or IR systems or whatever needs to be added. That way the DP has the camera back quickly and can do their job lighting."

Regarding their experience shooting with Caldwell Chameleons, Mainl praised their design.

"The design is great. The same front diameter, and almost the same weight across the range. Great minimum focus for Anamorphic glass in the 2'6" range. All making them easy to work with. We made our own, personalised focus scales. Now we have cool-looking laser-engraved *Star Wars* focus scales!"

Klein and Mainl's approach combined artistic vision with a meticulous technical process, ensuring that their lens choices not only met the creative goals of *The Mandalorian* but also overcame the practical hurdles of virtual production. The latest instalment of *The Mandalorian*, officially titled *The Mandalorian And Grogu*, began filming in June and wrapped in December 2024. Details about

The crew created the lens badges with different characters to distinguish the different camera units. In total 4 different badges were used to distinguish each set of lenses for the 4 different camera units.



the production remain heavily-guarded and under strict NDAs.

Klein and Mainl dedicated six intense months to the project, which is one of the most eagerly-anticipated entries in the *Star Wars* saga. The film is scheduled for release on May 22, 2026, marking the first *Star Wars* movie since 2019's *The Rise Of Skywalker*.

“Moiré is always in the back of your mind when shooting in a virtual environment”

Directed by Jon Favreau and produced by Favreau, Kathleen Kennedy, and Dave Filoni, the movie will bring Din Djarin (*The Mandalorian*) and Grogu to the big screen, continuing their epic journey and



expanding the rich narrative universe of *Star Wars*.

Aspect Ratio: While the aspect ratio is always a critical decision on a project like this, we have to postpone the specifics of that discussion due to the IMAX sequences and the restrictions of our NDA. More details will be shared down the road.

Acknowledgments from David Klein and Dominik Mainl: "We extend a huge thank you to the phenomenal team at Otto Nemenz International. Their unmatched service and support played an integral role in our success. Dan Lopez and his team handled all the lens tuning in-house, tailored to our exact specifications, ensuring the lenses performed flawlessly."

"We're also immensely grateful to the talented camera team – your work was the backbone of this production. A special shout-out goes to key grip Bud Scott, gaffer Jeff Webster ICLS, and the entire Volume Control Team, especially Justin Talley."



Navigating the complexities of ground-breaking technology like the Volume, while accommodating IMAX and N-Cam requirements, was no small feat. But with this crew, it felt seamless. Thank you all for your incredible work and dedication. It made a galaxy far, far away feel close to home."



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