



# Master Primes

High Speed with Breathtaking Optical Performance



# 16 LENSES FOR ALL SHOOTING SITUATIONS

## Breathtaking Performance

Rapid progress in lens design and manufacturing technology has finally realized a cinematographer's dream: lenses that are fast and yet have an optical performance surpassing all other primes. The Master Primes, a complete set of 16 lenses borne of a close collaboration between ARRI and Zeiss, are a revolutionary and unique generation of high speed prime lenses with unprecedented resolution, incredible contrast and virtually no breathing.

## One Set of Lenses for all Situations

Whenever and wherever you want to shoot, the Master Primes open up new creative opportunities since they maintain their optical performance across the whole extended T-stop range from T1.3 to T22. Whether you shoot a day/exterior commercial with vibrant colors and high contrast, or a night/interior romantic candlelit dinner for a feature, the Master Primes are a truly universal set of lenses with just the right focal length for any situation.





Candlelight image created with a Master Prime 40 mm at T1.3 and an ARRIFLEX 435 camera. Actors and set were illuminated only with candles. Super 35 mm film frame scanned at 4K resolution with the ARRISCAN.



At T1.3 the Master Primes give the cinematographer one extra stop of light to work with and to control the depth of field.

## Realizing the Impossible

Creating a fast lens with excellent optical performance, a previously unattainable goal, has been made possible through new design and manufacturing techniques as well as exotic glass materials. A crucial factor is the use of aspherical glass surfaces which require ultra-high precision in design and manufacturing. A complex holographic measuring process had to be developed specifically for these lenses.

A widest stop of T1.3 allows shooting in low or available light for more natural-looking shots and a reduction of the lighting budget. In addition, a wide open stop creates the cinematic look of an extremely shallow depth of field.

## Breathtaking Performance Even Up Close

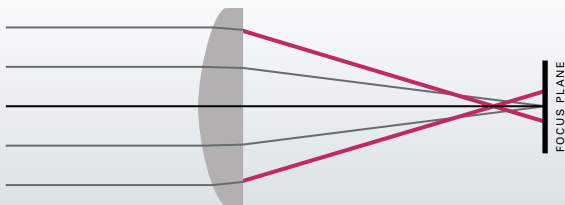
Additional features that were previously considered contradictory are good close focus performance and reduced breathing (an unwanted shift in image size when focus is changed). In the past, the close focus performance of a lens could be improved by utilizing a floating element. However, this made it more difficult to control breathing, so lens designers always had to compromise. By using the unique and patented Dual Floating Elements™ technology, Zeiss virtually eliminated breathing in the Master Primes while at the same time keeping the excellent close focus performance already established with the Ultra Primes. This unique combination of features allows for fresh angles and focus pulls that would have previously been impossible, creating new ways to block a scene and new image sequences for cinematographers to explore.

All these advances, combined with the improved T\* XP anti-reflex coating, strategically painted lens rims and special light traps, result in lenses with unsurpassed resolution, high contrast and low veiling glare. Even in the darkest corner at night the Master Primes can capture details other lenses simply cannot see.

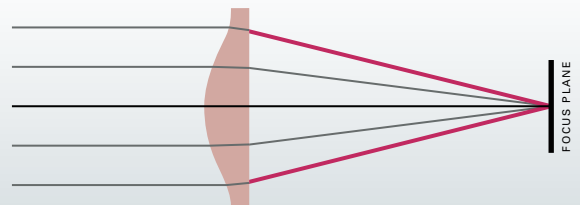


The improved T\* XP anti-reflex coating reduces veiling glare and internal reflexes and creates a pleasing, gentle color balance. Compared to conventional coatings it has a better transmission and a more uniform performance across the lens from optical center to the edges, resulting in higher contrast and deeper, richer blacks.

SPHERICAL LENS



ASPHERICAL LENS



The above illustration shows the basic principle of how an aspherical lens works. Spherical lenses are subject to „spherical aberration,“ which means that they cannot focus all light rays of a given color frequency onto the same plane. The further away a light ray is from the optical center, the more pronounced this aberration becomes, making this a crucial issue for fast lenses with their larger diameter elements. To compensate for spherical aberration, additional lens elements are needed that make the lens heavier and introduce other performance issues.

Aspherical lenses, on the other hand, are lenses with complex curved surfaces, offering excellent aberration correction and thereby providing superior resolution performance. Aspherical lenses can be made smaller, lighter and, in general, better than similar lenses which employ only spherical elements.

## From the Field

Cinematographer Stijn Van der Veken: „The Master Primes are the best lenses in the world! On the set, I love that they show no breathing. Having a lens without breathing gives you more freedom in what you can do. Once you get used to that, it is difficult to go back to lenses that show breathing. I found the Master Primes to have twice the resolution of older lenses and there is an enormous difference in the sharpness. Also they have much more contrast and much less flare.“



Cinematographer Stijn Van der Veken

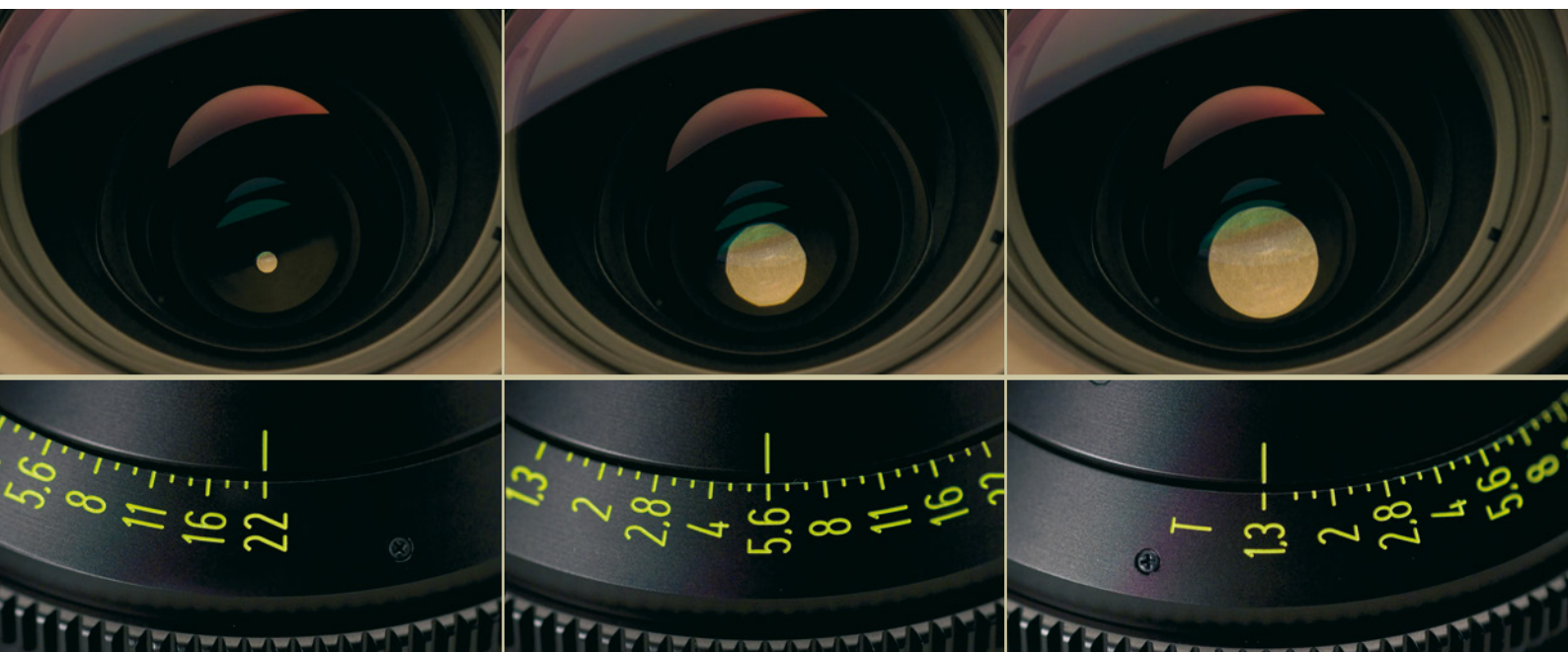
The Lens Data Display for Focus Puller (LDD-FP) can be used wired or wirelessly, showing accurate lens and camera information as well as an interactive depth of field bar graph.



## Built-in Lens Data System

All 16 lenses have the Lens Data System (LDS) built-in, showing real-time lens status and depth of field information either on the video assist or on a dedicated Lens Data Display. The Lens Data System gives assistants an extra edge to work faster and more securely, especially when the camera is in remote situations like on a crane or Steadicam.

Special in-camera effects like speed/iris ramps or shutter/iris ramps can be performed much easier, since the camera already knows where all the T-stops are, and no time consuming lens tables are necessary.



SMARTER LENSES FOR  
SAFER & FASTER WORKING

## Consistent Performance

Most prime lenses are visibly darker in the corners, where they also lose resolution. The Master Primes exhibit an extremely even illumination across the whole Super 35 frame and retain high resolution all the way from the center to the edges. Even better, they can deliver this optical performance wide open and at their close focus setting. With this unique consistency across frame, aperture and focus range, cinematographers can concentrate on the images they want to create instead of having to adjust their style to the shortcomings of their lenses.

## Special Optical Effects

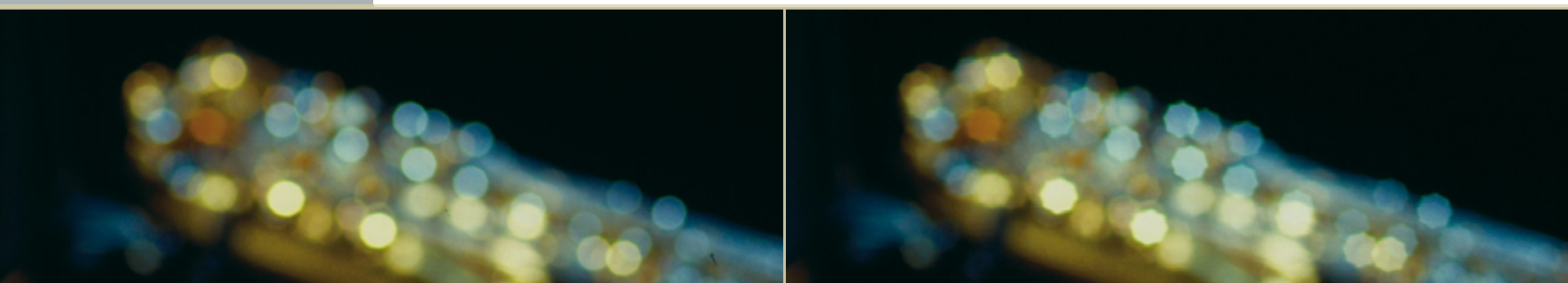
The use of aspherical elements and exotic glass types with anomalous partial dispersion, like fluor crown and barium dense flint, greatly reduces chromatic aberration (color fringes). This not only improves the overall image quality, but also leads to better chroma keys.

Since the Master Primes have almost no visible geometric distortion, they accurately reproduce object shapes - straight lines on the set produce straight lines on film. Thus their footage can be matched easier with computer generated imagery than footage created with conventional prime lenses.

## Color Matching and Iris Leaves

The whole set of Master Primes are Super Color Matched, so the cinematographer is able to concentrate on creating a look rather than matching lenses in post. Additionally, the iris opening of each Master Prime is created by at least nine high precision leaves, resulting in round and natural-looking out-of-focus highlights.

The Master Primes' iris opening stays consistently round and symmetrical over the whole T-stop range. This translates into natural and pleasing out-of-focus highlights and a smooth bokeh (left), here compared to a competing product (right).



## Lens Ergonomics Re-thought

Camera assistants will appreciate the cam driven optics for an extended focus scale with more space between focus marks for distant shots. In addition, all focus scales are individually calibrated and engraved with large fluorescent markings for better visibility in low light conditions. Torque (the amount of strength needed to rotate a lens ring) has been temperature stabilized and carefully set for the best combination of easy movement and a secure, smooth feel.

To allow assistants to work quickly and comfortably with the Master Primes, the shape of the lens housing has been optimized for the greatest number of lens motor combinations. All Master Primes use internal focusing and their focus and iris rings are in the same position. Matte box, follow focus and lens motors can remain in exactly the same position for each lens change. Except for the extreme focal lengths, all have a uniform front diameter of 114 mm/4.5 inches.

## Better Handling in Rental

Discussions with rental houses have led to further improvements. The focus ring of the Master Primes, for example, has highly accurate scales for both feet and meters engraved. By removing and reversing the focus ring, rentals can quickly switch between meters and feet.

Their rugged construction keeps the lenses functioning even under adverse environmental conditions, but if they should be damaged, serviceability has been improved. Various repairs can be performed without an optical re-adjustment, including exchanging the front ring, exchanging iris and focus rings and adjusting or exchanging LDS components. To avoid unsightly scratches, all gear surfaces have been specially hardened with a Permadur™ surface treatment, making them ten times harder than traditional gear rings.

## Master Diopters

The Master Primes are accompanied by a set of achromatic close focus diopters that allow the crew to quickly grab an extreme close-up or get a wide angle shot with shallow depth of field, all with unprecedented sharpness and contrast and without the optical aberrations of traditional diopters. The three Master Diopters (+0.5, +1 and +2) are optically matched to the Master Primes for optimal color, contrast and overall image quality. However, since their optical quality is far better than that of conventional diopters, they can also be used with most Ultra Primes, the Lightweight Zoom LWZ-1 and other lenses with excellent results.





An extended focus scale and individually calibrated and engraved bright fluorescent focus marks improve the ergonomics of focus pulling.

Both metric and imperial scales are engraved on a single focus ring which can be easily removed and reversed to switch between feet and meters.



## Technical Data

Name	Lens Mount <sup>(1)</sup>	Aperture	Close Focus <sup>(2)</sup>	Magnification Ratio <sup>(3)</sup>	Length <sup>(4)</sup>	Front Diameter <sup>(5)</sup>	Maximum Housing Diameter
Master Prime 12	PL LDS	T1.3 - T22	0.40 m / 16"	1:16.5	197 mm / 7.8"	156 mm / 6.1"	159 mm / 6.3"
Master Prime 14	PL LDS	T1.3 - T22	0.35 m / 14"	1:11.7	172 mm / 6.8"	114 mm / 4.5"	128 mm / 5"
Master Prime 16	PL LDS	T1.3 - T22	0.35 m / 14"	1:11.8	153 mm / 6"	114 mm / 4.5"	128 mm / 5"
Master Prime 18	PL LDS	T1.3 - T22	0.35 m / 14"	1:11.0	153 mm / 6"	114 mm / 4.5"	128 mm / 5"
Master Prime 21	PL LDS	T1.3 - T22	0.35 m / 14"	1:9.5	153 mm / 6"	114 mm / 4.5"	128 mm / 5"
Master Prime 25	PL LDS	T1.3 - T22	0.35 m / 14"	1:8.6	153 mm / 6"	114 mm / 4.5"	128 mm / 5"
Master Prime 27	PL LDS	T1.3 - T22	0.35 m / 14"	1:7.8	153 mm / 6"	114 mm / 4.5"	128 mm / 5"
Master Prime 32	PL LDS	T1.3 - T22	0.35 m / 14"	1:7.1	153 mm / 6"	114 mm / 4.5"	128 mm / 5"
Master Prime 35	PL LDS	T1.3 - T22	0.35 m / 14"	1:6.4	153 mm / 6"	114 mm / 4.5"	128 mm / 5"
Master Prime 40	PL LDS	T1.3 - T22	0.40 m / 16"	1:7.0	153 mm / 6"	114 mm / 4.5"	128 mm / 5"
Master Prime 50	PL LDS	T1.3 - T22	0.50 m / 20"	1:7.0	153 mm / 6"	114 mm / 4.5"	128 mm / 5"
Master Prime 65	PL LDS	T1.3 - T22	0.65 m / 2'3"	1:8.2	153 mm / 6"	114 mm / 4.5"	128 mm / 5"
Master Prime 75	PL LDS	T1.3 - T22	0.80 m / 2'9"	1:8.9	153 mm / 6"	114 mm / 4.5"	128 mm / 5"
Master Prime 100	PL LDS	T1.3 - T22	1.00 m / 3'6"	1:8.9	153 mm / 6"	114 mm / 4.5"	128 mm / 5"
Master Prime 135	PL LDS	T1.3 - T23	0.95m / 3'3"	1:6.6	172 mm / 6.8"	114 mm / 4.5"	128 mm / 5"
Master Prime 150	PL LDS	T1.3 - T22	1.50 m / 4'11"	1:10.3	210 mm / 8.3"	134 mm / 5.3"	137 mm / 5.4"

Operation Temperature: -20°C to +40°C / -4°F to +104°F

Storage/Transport Temperature: -40°C to +70°C / -40°F to +158°F

<sup>(1)</sup> Positive locking (PL) 54 mm stainless steel lens mount with Lens Data System (LDS) contacts

<sup>(2)</sup> Close focus is measured from the film/sensor plane

<sup>(3)</sup> Magnification ratio is the relationship of the size of an object on the film/sensor plane (first number) to the size of that object in real life (second number) at the close focus setting

<sup>(4)</sup> Lens length is measured from the lens mount to the front of the lens housing

<sup>(5)</sup> Diameter of the lens/matte box interface

## From the Field

Cinematographers who have used the Master Primes are enthusiastic. Bill Bennett, ASC, put it like this: „These are spectacular lenses, especially considering how fast they are. You guys have done the impossible; you have made them faster and at the same time improved the optical quality! People are going to be shocked because of how good and fast these lenses are. In my tests they looked optically better at T1.3 than other primes at T2!“



Cinematographer Bill Bennett, ASC (Photo: Michael Helms)

Weight	Angle of View H - V - D			Entrance Pupil <sup>(6)</sup>	Notes
	Normal 35 <sup>(6)</sup> ID = 27.20 mm <sup>(7)</sup>	DIN Super 35 <sup>(6)</sup> ID = 30.00 mm <sup>(7)</sup>	ANSI Super 35 <sup>(10)</sup> ID = 31.14 mm <sup>(7)</sup>		
2.9 Kg / 6.4 lb	83.87° - 66.44° - 96.13°	88.85° - 72.70° - 101.97°	90.98° - 74.78° - 104.26°	-208.3 mm / -0.683"	support post included
2.4 Kg / 5.3 lb	76.42° - 59.41° - 88.52°	81.24° - 65.39° - 94.07°	83.44° - 67.49° - 96.33°	241.3 mm / 0.792"	
2.2 Kg / 4.8 lb	70.07° - 53.79° - 81.76°	74.85° - 59.56° - 87.24°	76.87° - 61.50° - 89.33°	210.8 mm / 0.692"	
2.2 Kg / 4.8 lb	63.98° - 48.60° - 75.29°	68.56° - 53.97° - 80.52°	70.53° - 55.80° - 82.48°	207.0 mm / 0.679"	
2.4 Kg / 5.3 lb	55.96° - 42.05° - 66.60°	60.22° - 46.85° - 71.70°	62.07° - 48.50° - 73.66°	201.3 mm / 0.660"	
2.6 Kg / 5.1 lb	48.12° - 35.79° - 57.97°	52.01° - 40.00° - 62.89°	53.72° - 41.45° - 64.81°	188.0 mm / 0.617"	
2.2 Kg / 4.8 lb	43.82° - 32.45° - 53.08°	47.45° - 36.31° - 57.80°	49.06° - 37.64° - 59.66°	188.7 mm / 0.619"	
2.3 Kg / 5.1 lb	38.84° - 28.74° - 47.10°	42.07° - 32.16° - 51.31°	43.51° - 33.35° - 52.98°	180.5 mm / 0.592"	
2.2 Kg / 4.8 lb	35.04° - 25.82° - 42.64°	38.01° - 28.94° - 46.52°	39.33° - 30.02° - 48.04°	178.9 mm / 0.587"	
2.3 Kg / 5.1 lb	30.91° - 22.75° - 37.68°	33.55° - 25.51° - 41.15°	34.73° - 26.46° - 42.52°	171.6 mm / 0.563"	
2.7 Kg / 5.9 lb	25.02° - 18.27° - 30.81°	27.26° - 20.53° - 33.88°	28.26° - 21.32° - 35.13°	188.2 mm / 0.617"	
2.6 Kg / 5.7 lb	19.27° - 14.06° - 23.72°	20.99° - 15.80° - 26.08°	21.59° - 16.58° - 27.00°	159.4 mm / 0.523"	
2.8 Kg / 6.2 lb	16.66° - 12.17° - 20.51°	18.15° - 13.67° - 22.56°	18.82° - 14.20° - 23.39°	154.6 mm / 0.507"	
2.9 Kg / 6.4 lb	12.60° - 9.17° - 15.56°	13.74° - 10.32° - 17.14°	14.25° - 10.72° - 17.79°	109.3 mm / 0.359"	
2.8 Kg / 6.2 lb	9.49° - 6.91° - 11.72°	10.35° - 7.77° - 12.91°	10.73° - 8.07° - 13.40°	29.9 mm / 0.098"	
4.0 Kg / 8.8 lb	8.53° - 6.22° - 10.53°	9.30° - 6.99° - 11.59°	9.65° - 7.26° - 12.03°	-37.1 mm / -0.112"	support post included

<sup>(6)</sup> The distance from the entrance pupil to the film/sensor plane. Positive numbers indicated an entrance pupil in front, negative numbers indicated an entrance pupil behind the film/sensor plane. The entrance pupil (often mistakenly called "nodal point") is the center of perspective; moving the camera/lens system around the center of the entrance pupil prevents parallax errors. While largely irrelevant for live action, this measurement is important for special effects work.

<sup>(7)</sup> The image diameter (ID) is the diameter of the image circle needed for the respective format. These lenses are designed for the largest ID given here.

<sup>(8)</sup> Horizontal (H), vertical (V) and diagonal (D) angles of view for a Normal 35 Academy camera aperture (aspect ratio 1.37:1, dimensions 22mm x 16mm / 0.8661" x 0.6299")

<sup>(9)</sup> Horizontal (H), vertical (V) and diagonal (D) angles of view for a DIN Super 35 Silent camera aperture (aspect ratio 1.33:1, dimensions 24mm x 18mm / 0.944" x 0.7087")

<sup>(10)</sup> Horizontal (H), vertical (V) and diagonal (D) angles of view for an ANSI Super 35 Silent camera aperture (aspect ratio 1.33:1, dimensions 24.9mm x 18.7mm / 0.980" x 0.7362")



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