HASSELBLAD

All Hasselblad lenses are engineered to ensure optimal performance and image quality, whether shooting film or digital. Production quality is closely monitored to ensure that our extremely high specifications are met. All current Hasselblad lenses have very accurate central lens shutter mechanisms that deliver flash sync at all speeds* and a multi-coating treatment that results in efficient stray light elimination. Additionally, an integral focus drive motor and instant manual focus overide add to the list of features. In order to ensure their reliability and durability year after year, Hasselblad lenses use metal, rather than plastic components, wherever possible. In short, they are professional level lenses designed to meet the needs of the most demanding photographers.

These are, however, merely technical details. The true test of any lens is image quality and to objectively define a standard, we carry out certain types of measurement. This also means that when comparing lenses, regardless of make, we must use the same types of measurement otherwise any comparisons are meaningless. As the saying goes, you can't compare apples with oranges.

In order to simplify matters, we use objective measurements, such as Modulation Transfer Function (MTF) curves. We still, however, must take into account certain subjective aspects, such as the quality of the blurred or out-of-focus areas of the image – the bokeh – for example. Subjective aspects are a matter of personal taste, but objective measurements are not.

This booklet discusses how we at Hasselblad view these scientific measurements and other related aspects that, when combined, produce the legendary Hasselblad image quality.

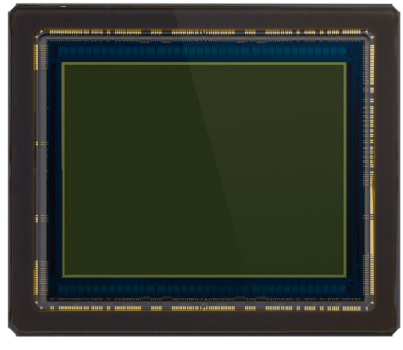
*Up to 1/2000th second depending on lens/camera body combination

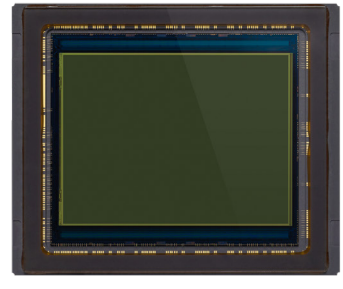
THE ADVANTAGE OF A LARGER SENSOR

When using film, there was a great quality advantage in using a larger format, as it required less magnification than smaller formats to reproduce any given size image. Simply put, film grain was enlarged less and was therefore less visible in the final image. This advantage is still relevant for digital capture, and for exactly the same reasons. It makes sense then, that modern professional format lens design is based on the same requirements. It also means that the same advantages of larger format lens design remain. To take just one example, since larger format lenses use smaller apertures to produce the same depth of field compared to smaller formats, you can get optimum quality at such settings much more often. Basically, a larger format enables easier design of extremely high quality lenses.

If you choose, however, to disregard all the practical and mechanical advantages and aspects of Hasselblad lenses, then the proof comes down to the technical data. To compare the technical aspects of larger format lenses with '35mm' lenses demands a common measurement system. Thankfully, the MTF system exists, but in order to be accurate, lenses must be measured according to firmly established laws of physics that take into account the reality of a given situation. Unfortunately, this isn't always the way such measurements are carried out and until there is a universal agreement regarding standards and practice, simple MTF comparisons can be, at best, confusing and, at worst, extremely misleading.

53 x 40mm
H6D-100c





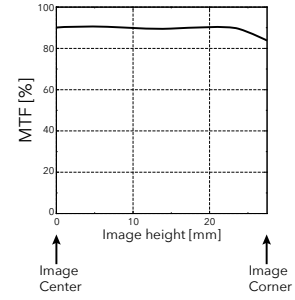
44 x 33mm
H6D-50c

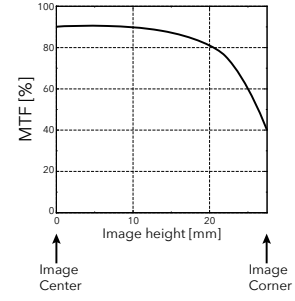
WHAT IS AN MTF CURVE?

An MTF curve is a graph that shows how sharp the lens is at various points across the image in relation to the level of detail in the subject. A simple MTF curve looks like the image on the right.

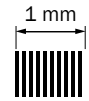
The left side of the diagram represents the central part of the image and the right hand side of the diagram represents the corner of the image. The higher up the diagram the curve is, the more contrast–and thereby sharpness–can be seen. So, from this diagram we see that the lens is very sharp near the central section of the image but drops away as we move out towards the corners – the most common situation.

To expand on this idea, three different evaluations are made that represent three levels of detail that could be present in any given subject. Standard practice (often emulated digitally nowadays) has been to use sets of black and white lines that produce patterns at specific lines per millimeter (lp/mm) measured at the image plane.



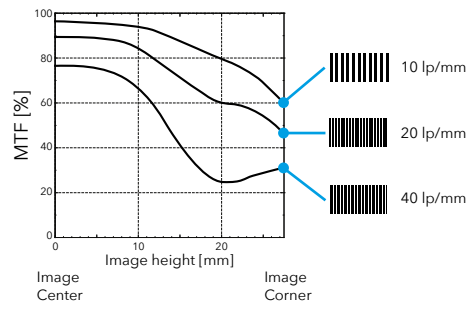


As the level of detail increases, the contrast decreases which in turn produces an apparent decrease in sharpness. So three curves now appear on the diagram, one for each of the three patterns.



Example with
10 lp/mm

To expand the idea even further, other properties inherent in all optics are also taken into account. It involves the actual orientation of perceived patterns in regard to the lens and thereby final image representation. Patterns that appear to be streaming out from the center of the image are called ‘sagittal’ and patterns that appear to be at right angles to the center are called ‘tangential’.



Normally, tangential patterns are not as sharply defined as sagittal patterns and so require a separate curve to provide a fair representation of a real world situation. As both tangential and sagittal valuations are taken from the same lp/mm pattern sets, they are grouped together on the diagram for easier comparative analysis.

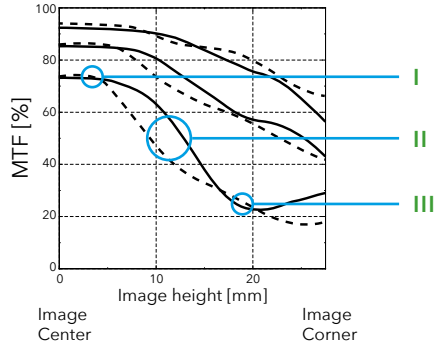
So now we have three sets of tangential/sagittal grouped curves. A tangential orientation normally causes less resolution than sagittal, and is often represented by a dashed line or different color on the diagram.

Examples of tangential and sagittal type patterns at the corners of the image.

HOW DO YOU READ MTF CHARTS?

From the final diagram on the right you can see how at 10 lp/mm the orientation of patterns in the image is not too significant for good perception of sharpness whereas for finer details at 40 lp/mm, the orientation of patterns in an image plays a larger part. You can also see that at a specific point on the 40 lp/mm curves, a tangential orientated pattern would actually produce a slightly sharper result than sagittal patterns.

Simply put, if there was a 'perfect' lens, then all six curves would be high and flat and across the graph. Being able to read and understand the basics of MTF diagrams will help you compare different lenses, and of course aid you in predicting the optimum settings for specific situations.



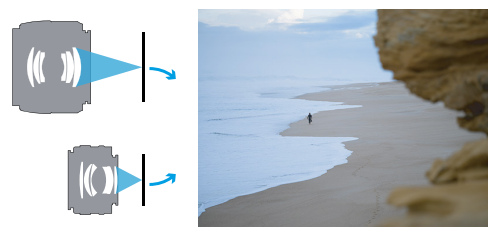
I Near the center and at 40 lp/mm, there is virtually no difference in the sharpness of tangential and sagittal patterns.

II Halfway towards the edges of the frame there is a slight difference.

III At this point, this lens would produce slightly better sharpness of tangential patterns.

COMPARING FORMATS

When comparing MTF charts representing different formats, cautious interpretation should be used. To make a scientifically correct comparison, test patterns (measured in lines per millimeter) would have to be 15, 30 and 60 lp/mm for 35mm format and 10, 20 and 40 lp/mm for the H System format to compensate for the difference in magnification. You therefore cannot directly compare the MTF diagrams for 35mm format to the diagrams from a larger format using the same test diagrams!



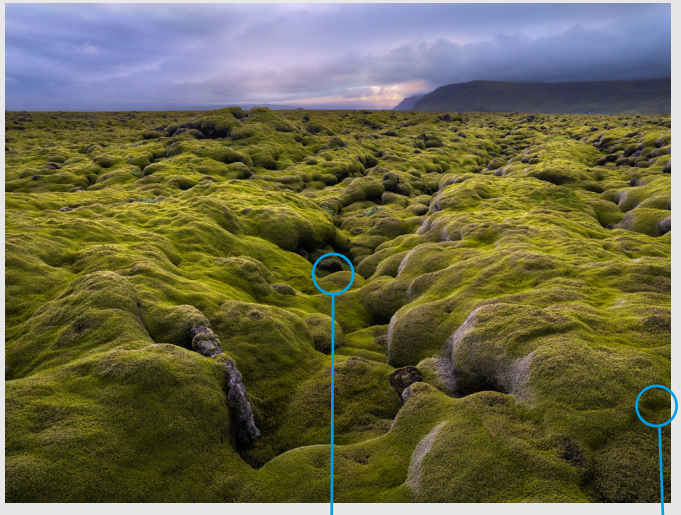
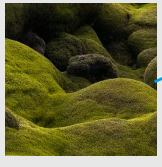
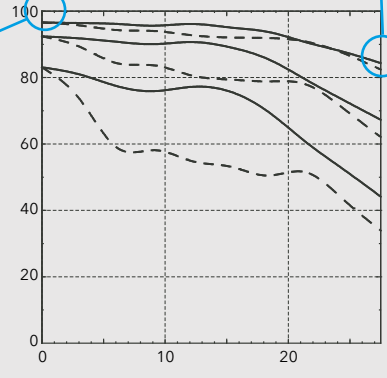
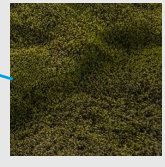


Photo: Hasselblad Master 2008 Hans Strand







Here an MTF chart is used in conjunction with an image to help demonstrate the relationship between curves and what they represent in practice. In this case you should expect exceptional sharpness in the centre, as indicated by the very high position of the curves on the chart.

Towards the edge of the frame, and at another aperture setting, the curves are lower down on the chart, indicating a slight decrease in sharpness compared to the centre. Nevertheless, the sharpness remains extremely good.

It should be emphasised though, that this difference is only noticeable under great magnification and in most practical situations is very difficult to perceive.

In addition, a Hasselblad image file, being significantly larger than a 35mm DSLR file, will sample an image with finer pitch as there are many more pixels. This means that the image reaching the sensor, which is already higher quality because of the lenses, is sampled with higher resolution and so provides a far superior image quality.

Comparing lenses, therefore, can involve a number of important factors; correctly produced and interpreted MTF charts being just one part.

As mentioned before, there are subjective considerations to add the final equation. Personal taste is impossible to quantify: *how sharp should a portrait lens be?* It's also down to each photographer to base their evaluations on a balanced mix of scientifically correct data, practicalities that match specific requirements and aesthetic considerations.

Browse through this booklet and you will certainly find a lens that would prove very useful. Your Hasselblad dealer will be glad to demonstrate it for you and perhaps arrange a test shoot. They are all extremely good, so expect tremendous results!

We wish you happy shooting with your new Hasselblad lens.

Visit www.hasselblad.com to download user manuals, datasheets, product brochures, technical information, technical articles, software and firmware updates etc., as well as news about the latest developments at Hasselblad.

H System Lenses

Hasselblad H System lenses are the culmination of over fifty years of continuous refinements and improvements. The entire H System lens line, including all lenses, optics and related user software, has been designed to maintain Hasselblad's leading global position in modern medium format imaging.

We apply this high standard and meticulous attention to detail to each and every Hasselblad product. Attention that is focused on ensuring the highest possible quality. And when we say attention to detail, we mean to all details, from start to finish, covering all aspects of design and production. Just as with all previous Hasselblad products, when designing the H System lenses, we have utilised the knowledge we have gained over the years by working with the world's top lens manufacturers, such as Carl Zeiss, Fuji, Kodak, Rodenstock and Schneider. The result is the best lens line available to photographers today.

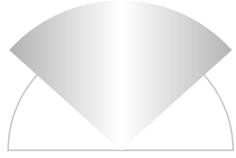
HCD 4,8/24

The HCD 24mm lens is an ultra-wide angle lens with an advanced optical design for outstanding performance and extreme corner to corner sharpness. With a 108° diagonal angle of view it is the most extreme wide-angle lens currently available for medium format.

GENERAL LENS DATA

Focal length	24.3mm
Equivalent 35mm focal length [1]	16.4mm
Aperture range	*ƒ*/4.8 - 32
Angle of view diag/hor/vert 53.4 x 40 format	108°/96°/79°
Angle of view diag/hor/vert 44 x 33 format	97°/84°/68°
Length/diameter	99mm/100mm
Weight (incl. covers and lens shade)	810g
Filter diameter	95mm [2]

[1] Diagonal coverage between 40 x 53.4 and 24 x 36 compared.
[2] Filter adapter to 105 and 112mm included.



96°
Horizontal angle of view

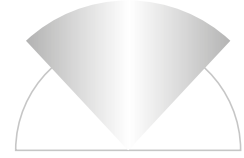
HCD 4/28

The HCD 28mm lens has been designed to be compact and to deliver optimal performance when used with the 48 x 36mm or smaller sensor of the H system digital cameras. Image quality is refined with integral use of Digital Lens Correction which perfects the raw image by digitally removing any colour aberration, vignetting and distortion. The resulting raw images have perfect pixel definition optimal for image rendering.

GENERAL LENS DATA

Focal length	28.9mm
Equivalent 35mm focal length [1]	19.5mm
Aperture range	*ƒ*/4 - 32
Angle of view diag/hor/vert 53.4 x 40 format	99°/86°/70°
Angle of view diag/hor/vert 44 x 33 format	87°/74°/59°
Length/diameter	102mm/100mm
Weight (incl. covers and lens shade)	850g
Filter diameter	95mm

[1] Diagonal coverage between 40 x 53.4 and 24 x 36 compared.



86°
Horizontal angle of view

HCD 4,8/24

CLOSE FOCUS RANGE DATA

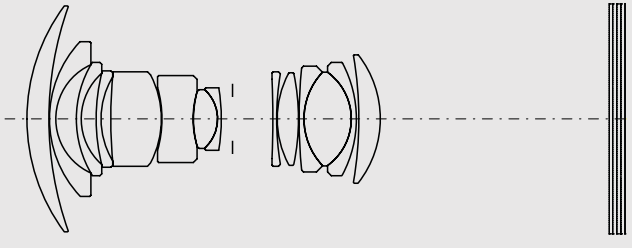
Minimum distance object to sensor plane	0.38m
Maximum image scale	1:9.7
Corresponding area of coverage	52 x 39cm
Corresponding exposure reduction	0 *f*/stop

LENS DESIGN
14 elements in 11 groups

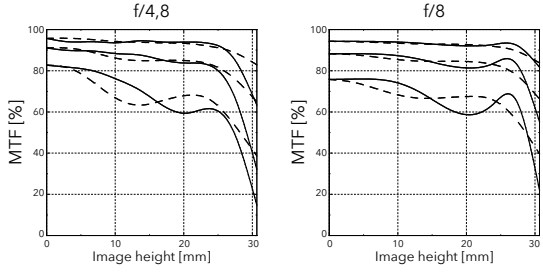
FOCUS TYPE
Rear focusing

ENTRANCE PUPIL POSITION
136mm in front of the sensor plane (at infinite focus setting).

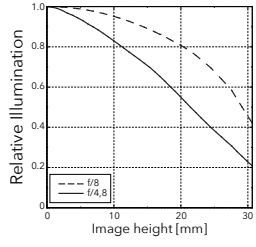
The entrance pupil position is the correct position of the axis of rotation when making a panorama image by combining individual images of a scene.



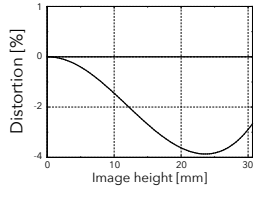
MTF
Modulation Transfer as a function of image height at infinite focus setting. Sagittal slit orientation drawn with continuous line and tangential with dashed. White light. Spatial frequencies 10, 20 and 40 lp/mm.



RELATIVE ILLUMINATION
Infinity setting



DISTORTION
Infinity setting



HCD 4/28

CLOSE FOCUS RANGE DATA

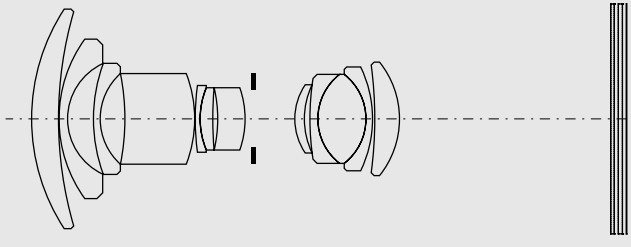
Minimum distance object to sensor plane	0.35m
Maximum image scale	1:7.3
Corresponding area of coverage	39 x 29cm
Corresponding exposure reduction	0 *f*/stop

LENS DESIGN
12 elements in 9 groups

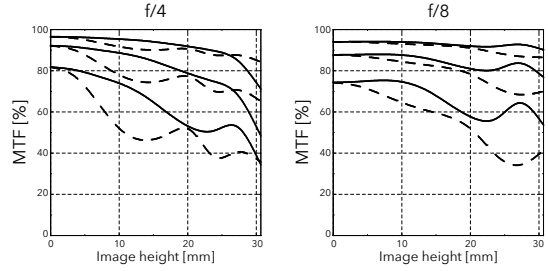
FOCUS TYPE
Rear focusing

ENTRANCE PUPIL POSITION
134mm in front of the sensor plane (at infinite focus setting).

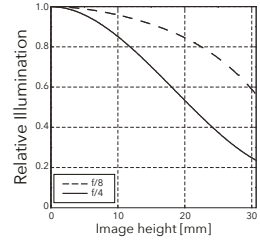
The entrance pupil position is the correct position of the axis of rotation when making a panorama image by combining individual images of a scene.



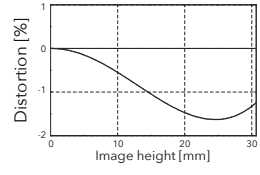
MTF
Modulation Transfer as a function of image height at infinite focus setting. Sagittal slit orientation drawn with continuous line and tangential with dashed. White light. Spatial frequencies 10, 20 and 40 lp/mm.



RELATIVE ILLUMINATION
Infinity setting



DISTORTION
Infinity setting



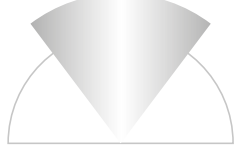
HC 3,5/35

A retrofocus lens with an 89° diagonal angle of view. This lens offers outstanding corner-to-corner sharpness, low dispersion glass, even illumination, and features an advanced optical design with rear focus mechanism to ensure high performance even at the close focusing range.

GENERAL LENS DATA

Focal length	35.8mm
Equivalent 35mm focal length [1]	24.1mm
Aperture range	*f*/3.5 - 32
Angle of view diag/hor/vert 53.4 x 40 format	86°/74°/59°
Angle of view diag/hor/vert 44 x 33 format	75°/63°/49°
Length/diameter	124mm/100mm
Weight (incl. covers and lens shade)	975g
Filter diameter	95mm

[1] Diagonal coverage between 40 x 53.4 and 24 x 36 compared.



74°
Horizontal angle of view

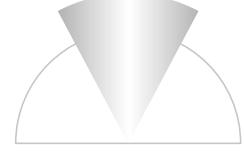
HC 3,5/50-II

An all-round, versatile lens, incorporating a moderate wide-angle effect, and featuring advanced optical design with rear focus mechanism. Corner-to-corner illumination is very even at all aperture settings, and distortion and stray light are extremely well controlled.

GENERAL LENS DATA

Focal length	50.7mm
Equivalent 35mm focal length [1]	34.2mm
Aperture range	*f*/3.5 - 32
Angle of view diag/hor/vert 53.4 x 40 format	67°/56°/44°
Angle of view diag/hor/vert 44 x 33 format	57°/47°/36°
Length/diameter	116mm/85mm
Weight (incl. covers and lens shade)	975g
Filter diameter	77mm

[1] Diagonal coverage between 40 x 53.4 and 24 x 36 compared.



56°
Horizontal angle of view

HC 3,5/35

CLOSE FOCUS RANGE DATA

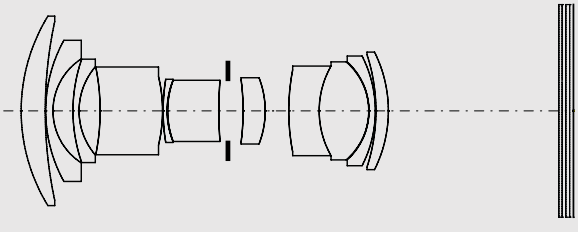
Minimum distance object to sensor plane	0.50m
Maximum image scale	1:9.6
Corresponding area of coverage	51 × 38cm
Corresponding exposure reduction	0 *f*/stop

LENS DESIGN
11 elements in 10 groups

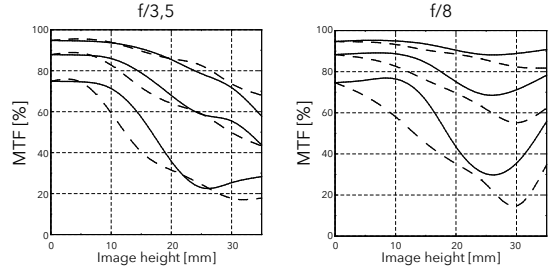
FOCUS TYPE
Rear focusing

ENTRANCE PUPIL POSITION
152mm in front of the film plane (at infinite focus setting).

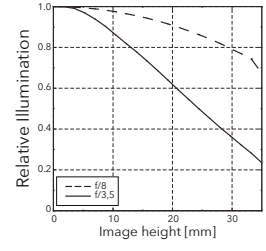
The entrance pupil position is the correct position of the axis of rotation when making a panorama image by combining individual images of a scene.



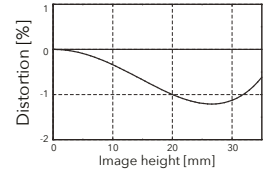
MTF
Modulation Transfer as a function of image height at infinite focus setting. Sagittal slit orientation drawn with continuous line and tangential with dashed. White light. Spatial frequencies 10, 20 and 40 lp/mm.



RELATIVE ILLUMINATION
Infinity setting



DISTORTION
Infinity setting



HC 3,5/50-II

CLOSE FOCUS RANGE DATA

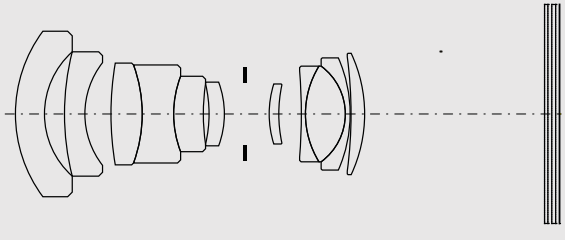
Minimum distance object to sensor plane	0.60m
Maximum image scale	1:8.8
Corresponding area of coverage	47 x 35cm
Corresponding exposure reduction	0 *f*/stop

LENS DESIGN
11 elements in 7 groups

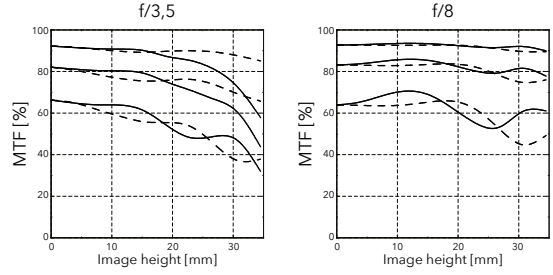
FOCUS TYPE
Rear focusing

ENTRANCE PUPIL POSITION
134mm in front of the sensor plane (at infinite focus setting).

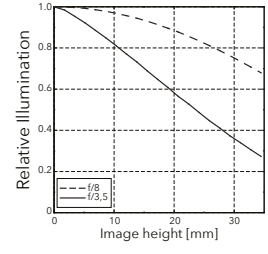
The entrance pupil position is the correct position of the axis of rotation when making a panorama image by combining individual images of a scene.



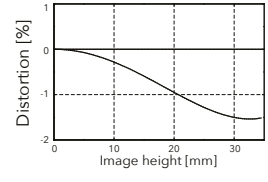
MTF
Modulation Transfer as a function of image height at infinite focus setting. Sagittal slit orientation drawn with continuous line and tangential with dashed. White light. Spatial frequencies 10, 20 and 40 lp/mm.



RELATIVE ILLUMINATION
Infinity setting



DISTORTION
Infinity setting



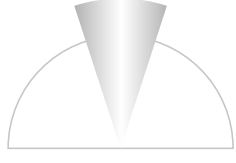
HC 2,8/80

The 80mm is the standard lens for the H system. The high-performance design ensures great colour correction, a flat image plane, and low distortion. The large aperture facilitates photography in poor light and provides a bright viewfinder image. A lens suited for almost any task in general photography.

GENERAL LENS DATA

Focal length	82.3mm
Equivalent 35mm focal length [1]	55.5mm
Aperture range	*f*/2.8 - 32
Angle of view diag/hor/vert 53.4 x 40 format	45°/36°/28°
Angle of view diag/hor/vert 44 x 33 format	37°/30°/23°
Length/diameter	70mm/84mm
Weight (incl. covers and lens shade)	475g
Filter diameter	67mm

[1] Diagonal coverage between 40 x 53.4 and 24 x 36 compared.



36°
Horizontal angle of view

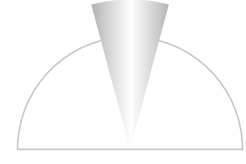
HC 2,2/100

The 100mm is a fast lens particularly suited to low-light situations or for action shots where higher shutter speeds are required. The slightly longer than standard length coupled with its shallower depth-of-field makes it a perfect choice for striking portraits too.

GENERAL LENS DATA

Focal length	100mm
Equivalent 35mm focal length [1]	67.4mm
Aperture range	*f*/2.2 - 32
Angle of view diag/hor/vert 53.4 x 40 format	37°/30°/23°
Angle of view diag/hor/vert 44 x 33 format	31°/25°/19°
Length/diameter	80.5mm/87.5mm
Weight (incl. covers and lens shade)	780g
Filter diameter	77mm

[1] Diagonal coverage between 40 x 53.4 and 24 x 36 compared.



30°
Horizontal angle of view

HC 2,8/80

CLOSE FOCUS RANGE DATA

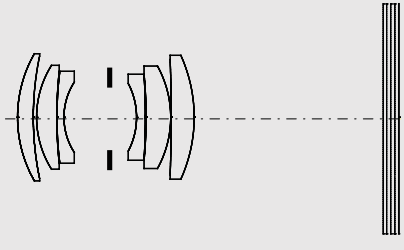
Minimum distance object to sensor plane	0.70m
Maximum image scale	1:6.5
Corresponding area of coverage	35 × 26cm
Corresponding exposure reduction	0.3 *f*/stop

LENS DESIGN
6 elements in 6 groups

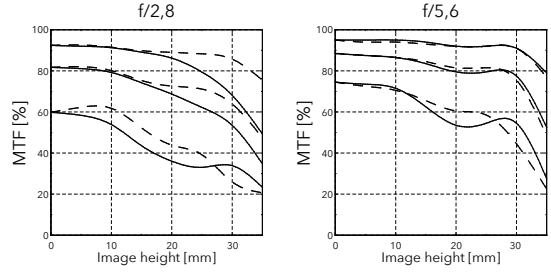
FOCUS TYPE
Full focusing

ENTRANCE PUPIL POSITION
79mm in front of the film plane (at infinite focus setting).

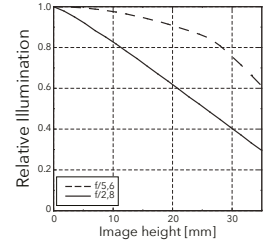
The entrance pupil position is the correct position of the axis of rotation when making a panorama image by combining individual images of a scene.



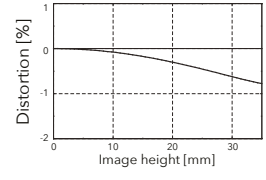
MTF
Modulation Transfer as a function of image height at infinite focus setting. Sagittal slit orientation drawn with continuous line and tangential with dashed. White light. Spatial frequencies 10, 20 and 40 lp/mm.



RELATIVE ILLUMINATION
Infinity setting



DISTORTION
Infinity setting



HC 2,2/100

CLOSE FOCUS RANGE DATA

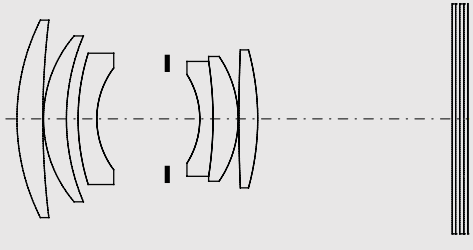
Minimum distance object to sensor plane	0.90m
Maximum image scale	1:7.2
Corresponding area of coverage	38 x 29cm
Corresponding exposure reduction	0.4 *f*/stop

LENS DESIGN
6 elements in 5 groups

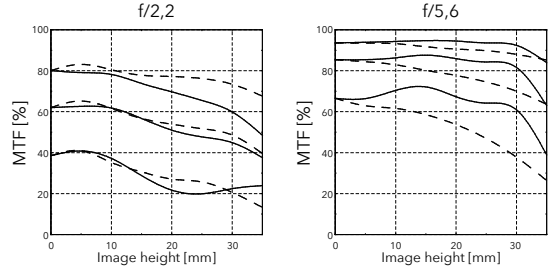
FOCUS TYPE
Full focusing

ENTRANCE PUPIL POSITION
68mm in front of the film plane (at infinite focus setting).

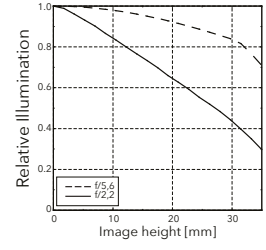
The entrance pupil position is the correct position of the axis of rotation when making a panorama image by combining individual images of a scene.



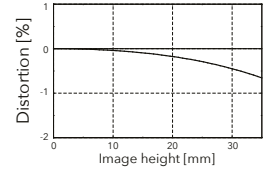
MTF
Modulation Transfer as a function of image height at infinite focus setting. Sagittal slit orientation drawn with continuous line and tangential with dashed. White light. Spatial frequencies 10, 20 and 40 lp/mm.



RELATIVE ILLUMINATION
Infinity setting



DISTORTION
Infinity setting



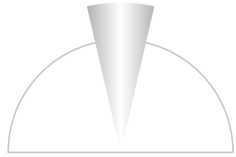
HC MACRO 4/120 - II

The 120mm Macro has exceptionally high performance making it a very versatile lens not only for close-up work but general applications too where a slightly longer lens is required.

GENERAL LENS DATA

Focal length	118.7mm
Equivalent 35mm focal length [1]	80.0mm
Aperture range	*f*/4 - 45
Angle of view diag/hor/vert 53.4 x 40 format	32°/26°/20°
Angle of view diag/hor/vert 44 x 33 format	26°/21°/16°
Length/diameter	166mm/96mm
Weight (incl. covers and lens shade)	1410g
Filter diameter	67mm

[1] Diagonal coverage between 40 x 53.4 and 24 x 36 compared.



26°
Horizontal angle of view

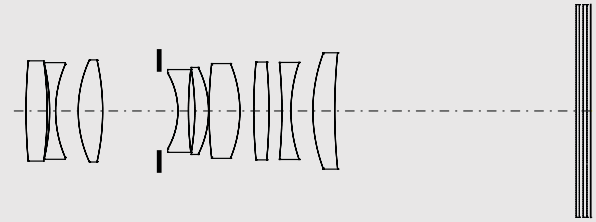
CLOSE FOCUS RANGE DATA

Minimum distance object to sensor plane	0.39m
Maximum image scale	1:1
Corresponding area of coverage	53 × 40cm
Corresponding exposure reduction	1.3 *f*/stop

LENS DESIGN
9 elements in 9 groups

FOCUS TYPE
Front focusing

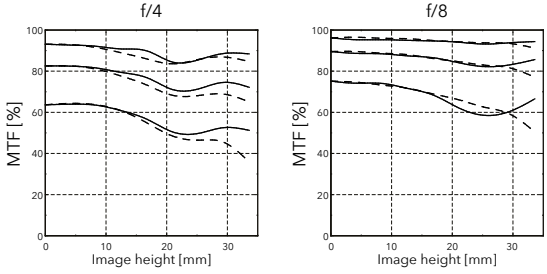
ENTRANCE PUPIL POSITION
149mm in front of the image plane (at infinite focus setting). The entrance pupil position is the correct position of the axis of rotation when making a panorama image by combining individual images of a scene.



HC MACRO 4/120 - II

MTF

Modulation Transfer as a function of image height at infinite focus setting. Sagittal slit orientation drawn with continuous line and tangential with dashed. White light. Spatial frequencies 10, 20 and 40 lp/mm.



Infinity setting

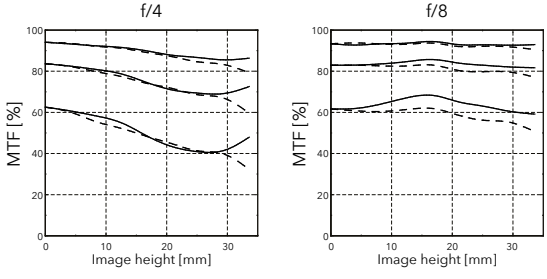
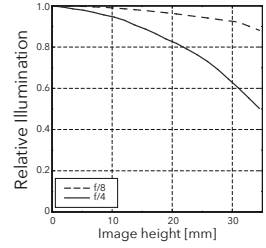
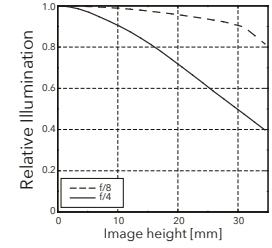


Image scale 1:2

RELATIVE ILLUMINATION

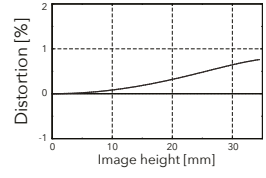


1:2

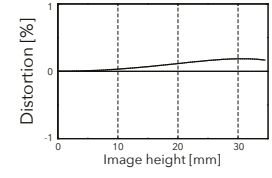


infinity setting

DISTORTION



1:2



infinity setting

HC 3,2/150N

A portrait lens providing the ideal perspective for head and shoulder portraits. Also very suitable for landscape photography where a flattening of the perspective is required.

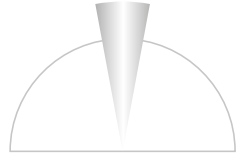
GENERAL LENS DATA

Focal length	150.2mm
Equivalent 35mm focal length [1]	101.3mm
Aperture range	*f*/3.2 - 45
Angle of view diag/hor/vert 53.4 x 40 format	26°/21°/16°
Angle of view diag/hor/vert 44 x 33 format	21°/17°/13°
Length/diameter	124mm/86mm
Weight (incl. covers and lens shade)	970g
Filter diameter	77mm

[1] Diagonal coverage between 40 x 53.4 and 24 x 36 compared.

CLOSE FOCUS RANGE DATA

Minimum distance object to sensor plane	1.30m
Maximum image scale	1:6.8
Corresponding area of coverage	36 × 27cm
Corresponding exposure reduction	0 *f*/stop

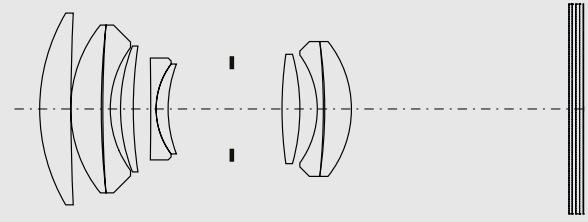


21°
Horizontal angle of view

LENS DESIGN
9 elements in 8 groups

FOCUS TYPE
Internal focusing

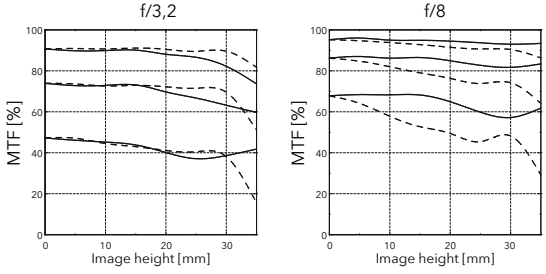
ENTRANCE PUPIL POSITION
68mm in front of the film plane (at infinite focus setting). The entrance pupil position is the correct position of the axis of rotation when making a panorama image by combining individual images of a scene.



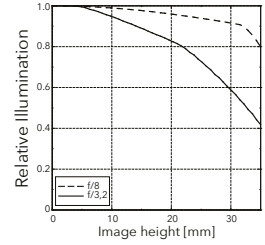
HC 3,2/150N

MTF

Modulation Transfer as a function of image height at infinite focus setting. Sagittal slit orientation drawn with continuous line and tangential with dashed. White light. Spatial frequencies 10, 20 and 40 lp/mm.

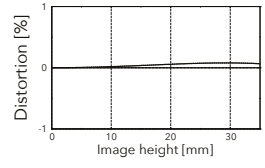


RELATIVE ILLUMINATION

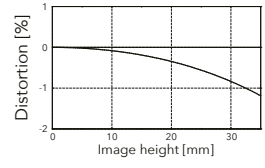


infinity setting

DISTORTION



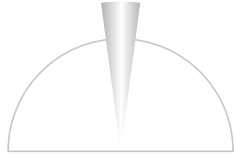
2m setting



infinity setting

HC 4/210

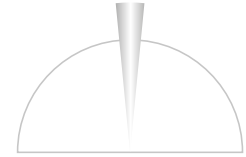
A universal telephoto lens with outstanding performance. The longer focal length is excellent for tightly framed shots, giving a shallow depth-of-field to make the main subject stand out noticeably.



15°
Horizontal angle of view

HC 4,5/300

The 300mm lens is the longest lens in the present HC lens range. It has a fast autofocus reaction making it suitable for sports and wildlife applications.



11°
Horizontal angle of view

HC 4/210

GENERAL LENS DATA

Focal length	211.1mm
Equivalent 35mm focal length[1]	142.3mm
Aperture range	*f*/4 - 45
Angle of view diag/hor/vert 53.4 x 40 format	18°/15°/11°
Angle of view diag/hor/vert 44 x 33 format	15°/12°/9°
Length/diameter	124mm/86mm
Weight (incl. covers and lens shade)	1320g
Filter diameter	77mm

[1] Diagonal coverage between 40 x 53.4 and 24 x 36 compared.

CLOSE FOCUS RANGE DATA

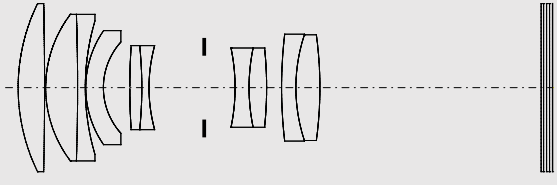
Minimum distance object to sensor plane	1.80m
Maximum image scale	1:7.0
Corresponding area of coverage	37 × 28cm
Corresponding exposure reduction	0 *f*/stop

LENS DESIGN
10 elements in 6 groups

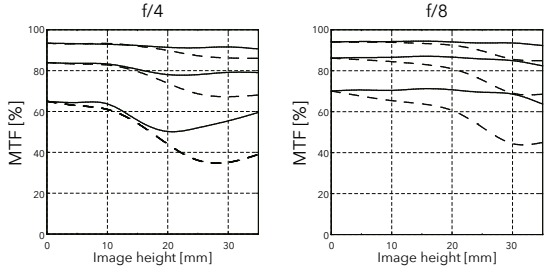
FOCUS TYPE
Internal focusing

ENTRANCE PUPIL POSITION
68mm in front of the film plane (at infinite focus setting).

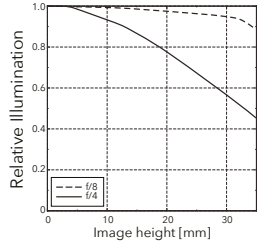
The entrance pupil position is the correct position of the axis of rotation when making a panorama image by combining individual images of a scene.



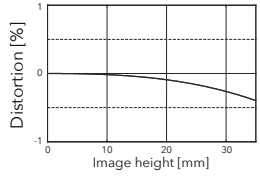
MTF
Modulation Transfer as a function of image height at infinite focus setting. Sagittal slit orientation drawn with continuous line and tangential with dashed. White light. Spatial frequencies 10, 20 and 40 lp/mm.



RELATIVE ILLUMINATION
Infinity setting



DISTORTION
Infinity setting



HC 4,5/300

GENERAL LENS DATA

Focal length	292.0mm
Equivalent 35mm focal length [1]	196.9mm
Aperture range	*f*/4.5 - 45
Angle of view diag/hor/vert 53.4 x 40 format	14°/11°/8°
Angle of view diag/hor/vert 44 x 33 format	11°/9°/6°
Length/diameter	198mm/100mm
Weight (incl. covers and lens shade)	2120g
Filter diameter	95mm

[1] Diagonal coverage between 40 x 53.4 and 24 x 36 compared.

CLOSE FOCUS RANGE DATA

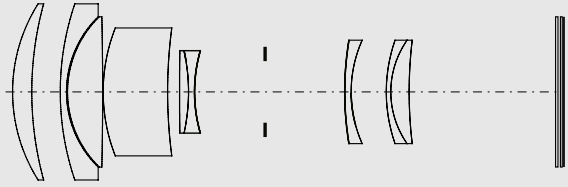
Minimum distance object to sensor plane	2.45m
Maximum image scale	1:7.5
Corresponding area of coverage	40 x 30cm
Corresponding exposure reduction	0 *f*/stop

LENS DESIGN
9 elements in 7 groups

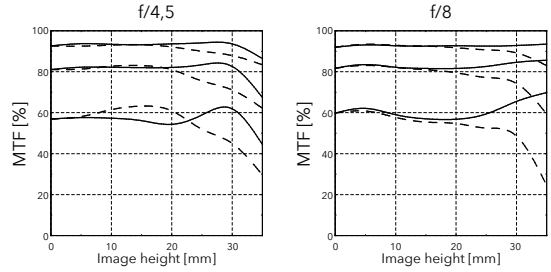
FOCUS TYPE
Internal focusing

ENTRANCE PUPIL POSITION
13mm in front of the film plane (at infinite focus setting).

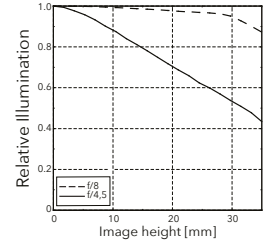
The entrance pupil position is the correct position of the axis of rotation when making a panorama image by combining individual images of a scene.



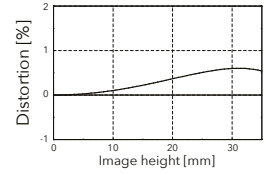
MTF
Modulation Transfer as a function of image height at infinite focus setting. Sagittal slit orientation drawn with continuous line and tangential with dashed. White light. Spatial frequencies 10, 20 and 40 lp/mm.



RELATIVE ILLUMINATION
Infinity setting

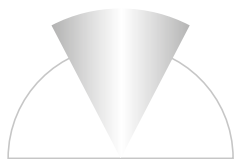


DISTORTION
Infinity setting



HC 3,5 - 4,5/50 -110

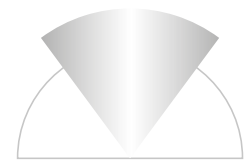
The HC 50-110mm zoom lens has a range from wideangle to short telephoto. This lens boasts exceptionally high image quality at all focal length settings, whether shooting film or digital, and is comparable in quality with corresponding fixed focal length lenses.



55° (28°)
Horizontal angle of view

HCD 4-5,6/35 - 90

The result of our constant striving for ultimate performance, the HCD 35-90mm zoom lens combines our advanced optical design models with a new aspheric lens element design to create what we think is the highest performing zoom lens on the market today.



73° (35°)
Horizontal angle of view

HC 3,5 - 4,5/50 -110

GENERAL LENS DATA

Focal length	51.6 (108.3)mm
Equivalent 35mm focal length [1]	33.5 (70.2)mm
Aperture range	*f*/3.5 (4.5) - 32
Angle of view diag/hor/vert 53.4 X 40 format	66°/55°/43° (35°/28°/21°)
Angle of view diag/hor/vert 44 x 33 format	56°/46°/35° (28°/23°/17°)
Length/diameter	152mm/103mm
Weight (incl. covers and lens shade)	1650g
Filter diameter	95mm

[1] Diagonal coverage between 40 x 53.4 and 24 x 36 compared.

CLOSE FOCUS RANGE DATA

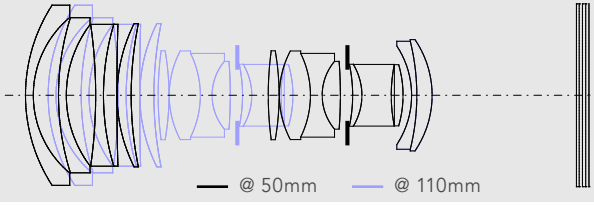
Minimum distance object to film	0.70m
Maximum image scale	1:10.8 (1:5.2)
Corresponding area of coverage	58 × 43 (28 × 21)cm
Corresponding exposure reduction	0 *f*/stop

LENS DESIGN
14 elements in 9 groups

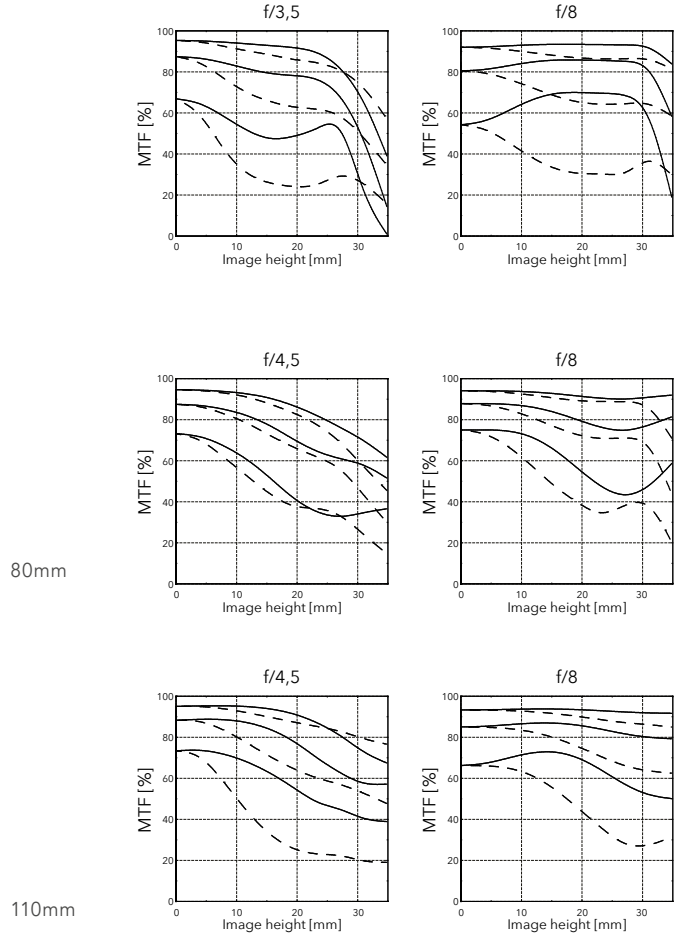
FOCUS TYPE
Front focusing

ENTRANCE PUPIL POSITION
50mm setting: 164mm | 80mm setting: 161mm | 110mm setting: 173mm
In front of the film plane (at infinite focus setting).

The entrance pupil position is the correct position of the axis of rotation when making a panorama image by combining individual images of a scene.

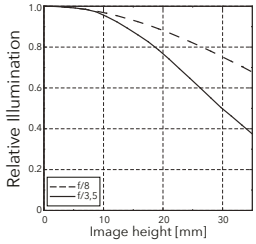


MTF
Modulation Transfer as a function of image height at infinite focus setting. Sagittal slit orientation drawn with continuous line and tangential with dashed. White light. Spatial frequencies 10, 20 and 40 lp/mm.

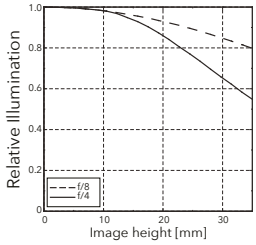


RELATIVE ILLUMINATION

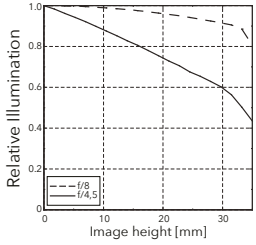
Infinity setting



50mm



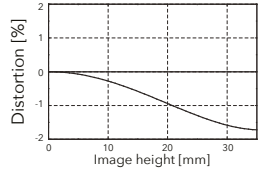
80mm



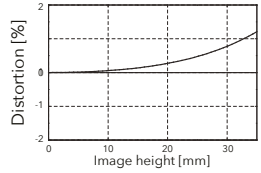
110mm

DISTORTION

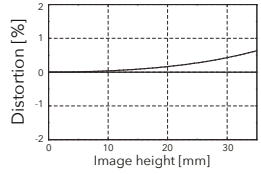
Infinity setting



50mm



80mm



110mm

HCD 4-5,6/35 - 90

GENERAL LENS DATA

Focal length	36.3 (87)mm
Equivalent 35mm focal length [1]	23.5 (56.4)mm
Aperture range	*f*/4.0 (5.6) - 32
Angle of view diag/hor/vert 53.4 X 40 format	86°/73°/58° (42°/35°/26°)
Angle of view diag/hor/vert 44 x 33 format	74°/62°/49° (35°/23°/21°)
Length/diameter	167mm/102,5mm
Weight (incl. covers and lens shade)	1410g
Filter diameter	95mm

[1] Diagonal coverage between 40 x 53.4 and 24 x 36 compared.

CLOSE FOCUS RANGE DATA

Minimum distance object to film	0.65m
Maximum image scale	1:13 (1:5.4)
Corresponding area of coverage	69 × 52 (29 × 22)cm
Corresponding exposure reduction	0 *f*/stop

LENS DESIGN

13 elements in 11 groups, 1 Aspherical surface

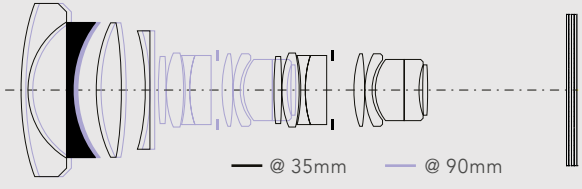
FOCUS TYPE

Internal focusing

ENTRANCE PUPIL POSITION

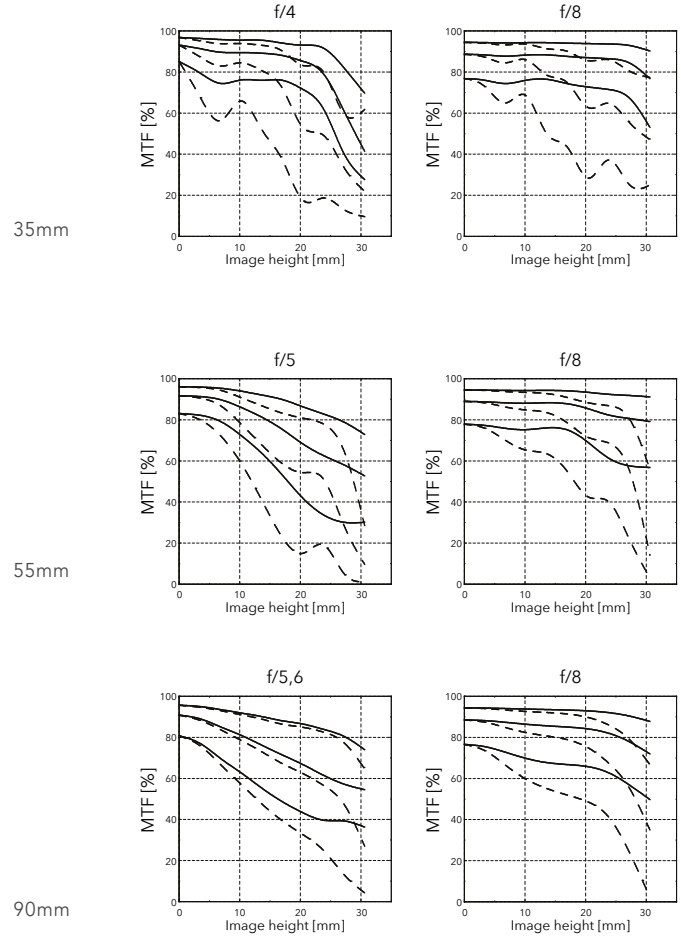
35mm setting: 187mm | 50mm setting: 178mm | 90mm setting: 193mm
In front of the film plane (at infinite focus setting).

The entrance pupil position is the correct position of the axis of rotation when making a panorama image by combining individual images of a scene.



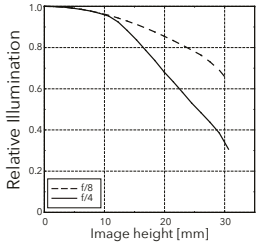
MTF

Modulation Transfer as a function of image height at infinite focus setting. Sagittal slit orientation drawn with continuous line and tangential with dashed. White light. Spatial frequencies 10, 20 and 40 lp/mm.

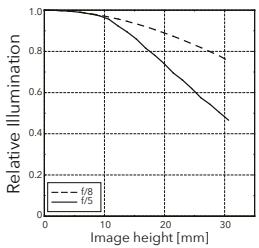


RELATIVE ILLUMINATION

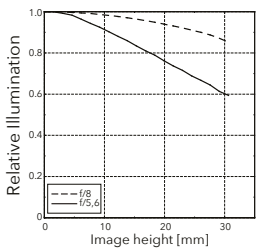
Infinity setting



35mm



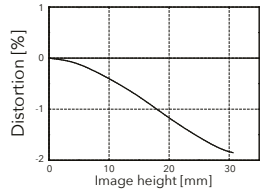
55mm



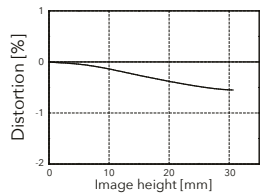
90mm

DISTORTION

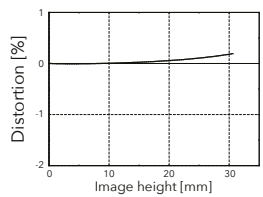
Infinity setting



35mm



55mm



90mm

35MM FOCAL LENGTH EQUIVALENTS FOR HASSELBLAD LENSES[1]

SENSOR DIMENSIONS	53.7 X 40.2MM	49.1 X 36.7MM	43.8 X 32.9MM	53.4 X 40MM
H System lens focal length	60MP CCD	50MP CCD	31/40MP CCD & 50MP CMOS	100MP CMOS
24	16	17	19	16
28	19	20	23	19
35	23	25	28	23
50	33	36	40	33
80	53	58	65	53
100	64	71	79	65
120	77	84	94	77
150	97	106	119	97
210	136	149	167	137
300	188	206	231	189
35-90	23-56	26-61	29-69	24-56
50-110	33-70	36-76	41-86	34-70

SENSOR DIMENSIONS	43.8 X 32.9MM
X System lens focal length	50MP CMOS
30	24
45	35
90	71
120	95

[1] Based on diagonal measurement comparison

HTS 1,5

The revolutionary HTS 1,5 is a tilt and shift adapter that can provide a pivotal step-up for many Hasselblad photographers. Designed for the HCD 24mm, HCD 28mm, HC 35mm, HC 50mm, HC 80mm and the HC 100mm lenses it, in effect, adds five different "tilt and shift lenses" to the range. With the extension tubes, H13, H26 or H52, the HTS 1,5 Tilt/Shift adapter can also be used for close-up work.

LENS	MINIMUM DISTANCE	MAXIMUM IMAGE SCALE	COVERAGE	EXPOSURE REDUCTION
HCD 4,8/24	0.42m	1:6.3	31cm × 23cm	0 EV
HCD 4/28	0.39m	1:4.7	23cm × 17cm	0 EV
HC 3,5/35	0.54m	1:6.2	30cm × 23cm	0 EV
HC 3,5/50 II	0.64m	1:5.7	28cm × 21cm	0 EV
HC 2,8/80	0.74m	1:4.2	21cm × 15cm	0.3 EV
HC 2,2/100	0.94m	1:4.6	22cm × 17cm	0.5 EV

LENS	EQUIVALENT LENGTH WITH THE HTS 1,5	ANGLE OF VIEW DIAG/HOR/VERT
HCD 4,8/24	37mm	81°/68°/53°
HCD 4/28	45mm	71°/59°/45°
HC 3,5/35	55mm	59°/49°/37°
HC 3,5/50 II	75mm	44°/35°/27°
HC 2,8/80	128mm	27°/22°/16°
HC 2,2/100	155mm	23°/18°/14°

CONVERTER H 1,7X

The Converter H 1,7x increases the focal length of a lens by a factor of 1,7x. It features the same outstanding optical and mechanical quality as the elements in the Hasselblad H lens series.

TECHNICAL SPECIFICATIONS

Focal length conversion factor	1,7x
Aperture reduction	- 1.5 stops
Length/diameter	56 x 85mm
Weight	465g
Optical design	6 elements / 4 groups

HVM VIEWFINDER

The waist level viewfinder for the H System cameras, providing the same convenient viewing angle that has been available for the V System. The bright and large viewfinder image is ideal for creative composing. The photographer can maintain eye contact with the model and full impact from shooting at a lower point than eye-level can be creatively used.

TECHNICAL SPECIFICATIONS

Magnification	3.25x at 0 dioptre
Dimensions (W x H x D)	78 x 89 x 69mm
Weight including bottom cover	140g
Height incl. camera	169mm
Compatibility	All H System cameras

CF ADAPTER

The CF Lens Adapter for the H System allows photographers to use all Carl Zeiss C-Type lenses from the V System on any H series camera. Integral processors for data conversion bridge the two systems to access a number of the H series display and lens-control functions.

TECHNICAL SPECIFICATIONS

Dimensions (W x H x D)	98 × 86 × 22mm
Weight	140g 180g (incl. covers)
Compatibility	All C-Type lenses