For the following products:

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HC Lenses

HASSELBLAD

HC Lenses

All aspects of Hasselblad HC lenses, optics and related user software are continuously refined to maintain the worldwide leading position in modern medium format imaging.

So, congratulations on your new lens purchase. The following will explain why you have just made a decision you will not regret.

Photo: Chris Simpson © / Hasselblad Master

Your new Hasselblad HC lens represents the outstanding result of over fifty years of continuous refinements and improvements. The entire HC 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.

This booklet will explain some of the factors that make your purchase decision one you will not regret. Naturally, it is the quality of the images that you take with your new lens that will provide the final proof!

HC lenses

Hasselblad has produced the best medium format cameras in the world for over fifty years now. We have been able to reach and maintain this high standard thanks to the meticulous attention to detail we apply 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 HC lenses, we have utilized 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.

All HC lenses are engineered to ensure optimal performance and image quality, whether shooting film or digital. Hasselblad closely monitors production quality to ensure that our extremely high specifications are met. HC lenses have very accurate electronic shutter mechanisms that deliver sync flash at all speeds and a multi-coating treatment that results in efficient stray light elimination. An integral focus drive motor, instant access to manual focus without switching between manual and autofocus, and other functions add to the list of features. In order to ensure their reliability and durability year after year, Hasselblad lenses use metal, not plastic, wherever possible. In short, they are professional level lenses designed for professional level photographers.

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

So, in order to simplify matters, we use objective measurements, such as MTF curves, for example. 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, therefore, discusses how we at Hasselblad view these scientific measurements and the other related aspects that combine to produce the legendary Hasselblad image quality.

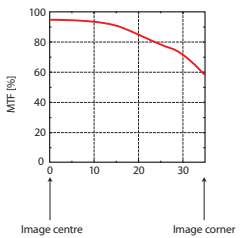
The advantage of a larger sensor

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 as 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, such a system, Modulation Transfer Function curves (MTF for short), does exist, 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 praxis, simple MTF comparisons can be, at best, confusing and, at worst, extremely misleading.

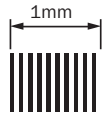
What is an MTF curve?

Simply put it 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 this:



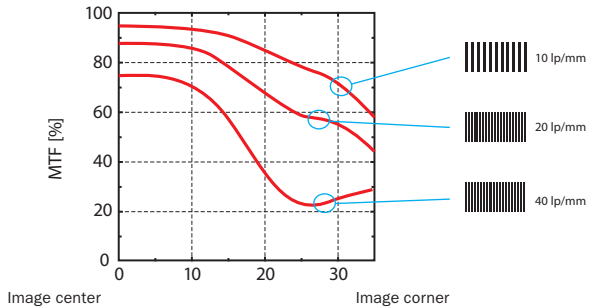
The left side of the diagram represents the central part of the image and the right hand side of the diagram represents the corner of the image. The higher up the diagram the curve is, the more contrast–and thereby sharpness–can be seen. So, from this diagram we see that the lens is very sharp near the 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:

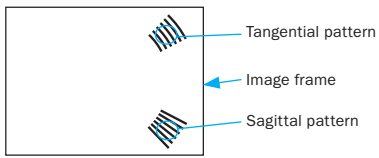


Example with
10 lp/mm

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:



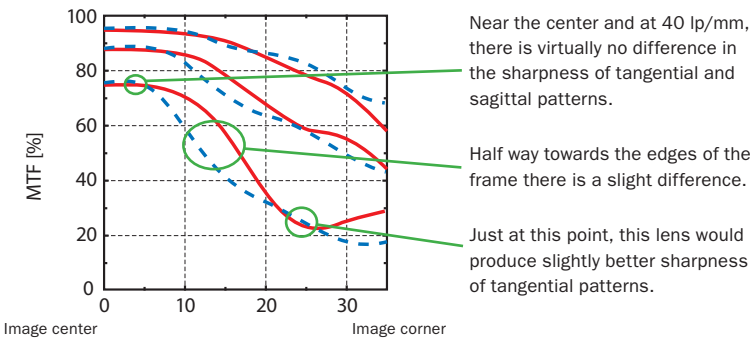
To expand the idea even further, other properties inherent in all optics are also taken into account. It involves the actual orientation of perceived patterns in regard to the lens and thereby final image representation. Patterns that appear to be streaming out from the center of the image are called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



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

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.



How do you read MTF diagrams?

From the final diagram above 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.

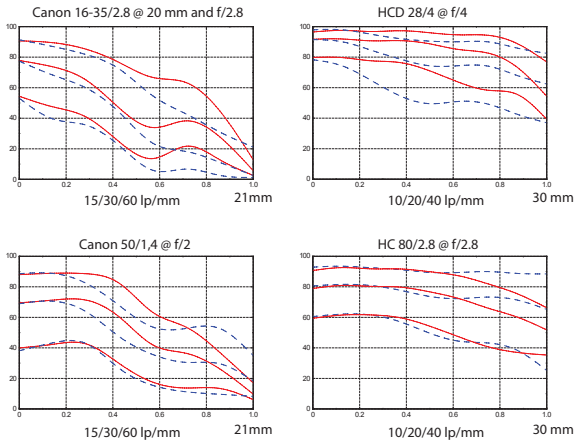
Simply put, if there was a 'perfect' lens, then all six curves would be high and flat and across the graph. Being able to read and understand the basics of MTF diagrams will help you compare different lenses and of course aid you in predicting the optimum settings for specific situations.

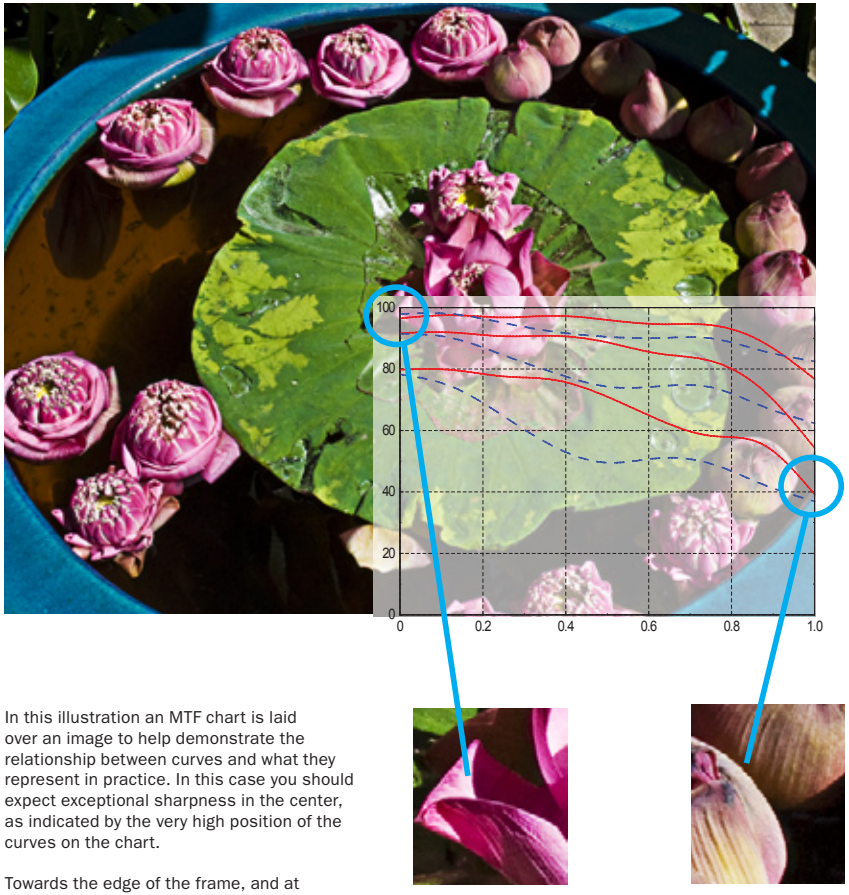
Comparing formats

When comparing MTF diagrams 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 H3D-II 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!

The smaller format needs higher magnification to produce a given image size compared to the larger format.

If you compare HC lenses with 35mm lenses with the above in formation in mind, you get the following MTF diagrams. Note that they are based on actual measured data.





In this illustration an MTF chart is laid over 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 center, 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 center. 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 39Mpixel H3D-II will sample an image with finer pitch than a 21 Mpix 35 DSLR as there are many more pixels. This means that the image reaching the H3D sensor, which is already of a 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 diagrams being just one part.

Conclusion

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?) so it's also down to each photographer to base their valuations on a balanced mix of scientifically correct data, practicalities that match specific requirements and aesthetic considerations.

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

We wish you happy shooting with your new Hasselblad HC lens!

Photo: Chase Jarvis © / Hasselblad Master

General Information

- Rapid and accurate automatic focusing capability
- Central electronic shutter
- Instant manual focus override with natural friction
- Instant automatic-focus return capability
- Non-rotation of filter or accessory when focusing
- Non-rotation of lens barrel in automatic focusing mode
- Flash sync at shutter speeds from 32s to 1/800s
- Reversed lens shade serves as transportation protection
- Automatic detection of extension rings and converters

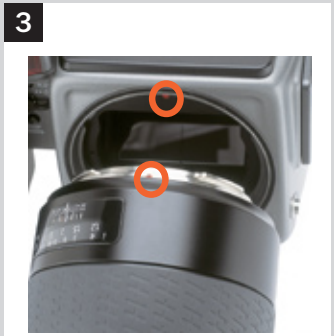
All HC lenses have been specially formulated for the H system to produce the extremely high performance expected from Hasselblad to meet the demands from conventional and digital photography alike. In addition to extreme sharpness, the design also incorporates a soft, pleasant looking boké (the visual quality of the out-of-focus areas of the image). All lenses feature an electronically controlled central shutter designed to extremely fine tolerances for supreme accuracy that also provides flash synchronization with all speeds from 32s to 1/800s. All lenses have a very rapid automatic focus capability with instant manual override. To ensure reliable and fast autofocus in low contrast and low light conditions, a focusing-assist light (on the grip) is automatically activated. Aperture and shutter control is set via the control wheels on the camera grip.

As a general rule, lens shades should always be fitted to achieve optimum performance. Protective filters (UV / Sky) should also be considered at least when working outdoors in harsh conditions.

1

2

3



Parts 1

A. Lens shade index
B. Manual focus ring
C. Focusing distance scales
D. Depth-of-field scales
E. Lens index

Attaching a lens 2, 3

Remove the front protective cover on the camera body by depressing the lens release button and keeping it depressed while turning the cover counter-clockwise. Remove the rear lens cap by unscrewing it in a counter-clockwise direction. Align the index on the lens with the index on the camera body and rotate the lens clockwise (bayonet fitting) until it clicks into place.

Removing a lens

Depress the lens release button and keep it depressed while rotating the lens counter-clockwise until it stops and lift it out. Replace protective caps on the lens immediately and on the camera body if necessary.
If you try to rotate the lens before you press the lens release button, it might lock. In this case, rotate the lens clockwise a little first and then re-attempt removal with the correct procedure: button first, then lens.

4

5

6

Front lens cap 4

Front lens caps are released for removal and attachment by inserting a thumb and index finger into the recesses and pinching in the direction of the arrows.

Filters

Filters have a screw thread fitting (67 / 77 / 95 mm, according to lens) and are screwed clockwise into place. As there is no rotation of the front section of the lens when focus is changed, filters do not rotate either. This is particularly useful when using polarizing or graduated filters where the orientation is normally critical.

Lens shades 5, 6

All lenses are supplied with lens shades that additionally provide extra protection for transport and storage when mounted in reverse. Lens shades have a bayonet fitting and are turned clockwise into place after ensuring the index on the lens shade aligns with the index on the front of the lens. When mounted in reverse, they are attached by matching the indexes and turning counter-clockwise.

Shutter and aperture control

Both the shutter and aperture are electronically controlled and are adjusted by the control wheels on the grip. There are no separate manual setting rings on the lenses or camera body. The chosen settings are displayed both on the grip LCD and in the viewfinder LCD. See the ‘Exposure Control’ chapter for a complete explanation.

7

8

Depth-of-field calculation 7

There are two distance scales (in feet and metres) visible through the focus distance window on the upper part of the lens barrel. There is also a central lens index mark and a depth-of-field scale. The focusing distance is read off the chosen scale from the central lens index.

Depth-of-field can be calculated as follows:

1. Focus the lens as required.
2. Make an exposure reading (auto or manual) and note the aperture setting.
3. Find the markings on either side of the central index that correspond to the chosen aperture.
4. From these two markings, read off on the required lens distance scale the two corresponding distances.
5. The depth-of-field (at that particular aperture and focus setting) will be the area included between these two distances.

In the example given here, the focusing distance is set at nearly 3 metres. At an aperture of f/22, the depth-of-field would therefore extend from just over 2 m to approximately 4.5 m.

Stop down / depth-of-field 8

A visual depth-of-field preview can be made by depressing the STOP DOWN button while viewing the image on the viewfinder screen.

9

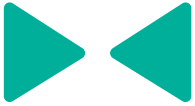
10

Lens focus setting too far beyond the distance of the subject framed by the central section in the viewfinder

11

Focus setting too close for the distance of the subject framed by the central section in the viewfinder

12



Focus setting correct

Infrared focus settings 9

As infrared rays form an image at a different plane to that formed by visible light, the normal focus settings do not apply. Proceed as follows in manual focus mode:

1. Focus the lens in the conventional manner until satisfied.
2. Note the distance setting against the central lens index.
3. Re-align this distance setting against the infrared mark (coloured red) instead of the central lens index.

Alternatively if you have already calculated the required distance, you can make a manual distance setting by using the distance scales together with the infrared mark instead of the central lens index.

Focus aid 10, 11, 12

As well as the conventional view on the focusing screen to ensure a sharp image, the H3D II also features LED focus aid capability appearing as two arrowheads to the right of the viewfinder display (except for lenses with a maximum aperture of f/6.7 or smaller). The arrowheads provide confirmation of a precision focus setting and are a useful aid when making a setting with eyesight alone.

Manual focus setting
When the left arrowhead alone appears it means the focus setting is too far beyond the chosen distance (the area framed within the central zone in the viewfinder) and when the right arrowhead alone appears it means the focus setting is too close. Focus is correct when both arrowheads appear together. If the focus cannot be established, then both arrowheads flash.

Automatic focus setting
Focus is correct when both arrowheads are visible together. Focus is incorrect if only one arrowhead is visible. If the focus cannot be established, then both arrowheads flash.

Photo: Chase Jarvis © / Hasselblad Master

Technical Specifications

Lists most of the user-level technical specifications for all models.

Please note that there is additional information for:

- HC 4/120
- HC 3.5/300
- HC 3.5-4.5/50-110 Zoom
- HC 4.0-5.6/35-90 Aspherical Zoom

HASSELBLAD
HCD 4/28

Product number: 3023028

The HCD 28mm lens has been designed to be compact and to deliver optimal performance when used with the 48x36mm sensor of the Hasselblad H3D. Image quality from the Hasselblad H3D is refined with integral use of Digital APO Correction which perfects the raw image by digitally removing any color aberration and distortion. The resulting raw images have perfect pixel definition optimal for image rendering.

GENERAL LENS DATA

Focal length	28.9 mm
Aperture range	4 - 32
Angle of view diag/hor/vert	95°/83°/66°
Length/diameter	102 mm/100 mm
Weight (incl. covers and lens shade)	850 g
Filter diameter	95 mm

CLOSE FOCUS RANGE DATA

Minimum distance object to film	0.35 m
Maximum image scale	1:7.3
Corresponding area of coverage	36 x 27 cm
Corresponding exposure reduction	0 f-stop

COMPATIBILITY

- The HCD 4/28 mm is designed for use on the Hasselblad H3D and the H2F camera.
- The HCD 4/28 mm lens is designed solely for digital use. This means that the lens is designed for a format of 37x49 mm and does not cover the film format (41.5x56mm). The function is therefor disabled when using a film magazine.
- The HCD 4/28 mm lens is not compatible with the converter 1.7x.

LENS DESIGN

12 elements in 9 groups

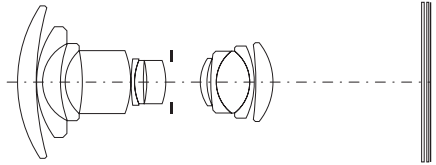
FOCUS TYPE

Rear focusing

ENTRANCE PUPIL POSITION

134 mm in front of the sensor plane
(at infinite focus setting)

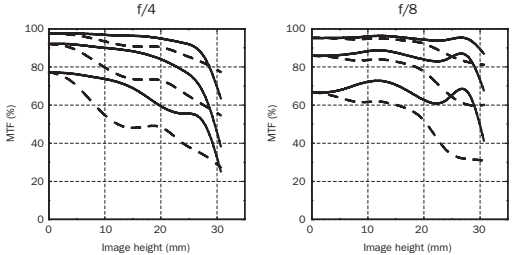
The entrance pupil position is the correct position of the axis of rotation when making a panorama image by combining individual images of a scene.



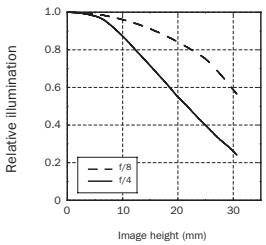
HASSELBLAD
HCD 4/28

MTF
Modulation Transfer as a function of image height at infinite focus setting.

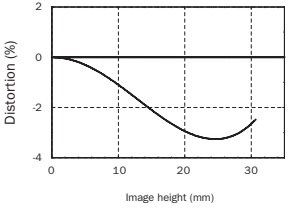
Sagittal slit orientation drawn with continuous line and tangential with dashed. White light. Spatial frequencies 10, 20 and 40 lp/mm



RELATIVE ILLUMINATION
Infinity setting



DISTORTION
Infinity setting



HASSELBLAD
HC 3.5/35

Product number: 3023035

GENERAL LENS DATA:

Focal length	35.8 mm
Aperture range	3.5 - 32
Angle of view diag/hor/vert	89°/78°/63°
Length/diameter	124 mm/100 mm
Weight	975 g
Filter diameter	95 mm

CLOSE FOCUS RANGE DATA:

Minimum distance object to film	0.50 m
Maximum image scale	1:9.6
Corresponding area of coverage	54 x 40 cm
Corresponding exposure reduction	0 f-stop

COMPATIBILITY

The HC3,5/35 mm lens is not compatible with the converter 1.7x.

LENS DESIGN

11 elements in 10 groups

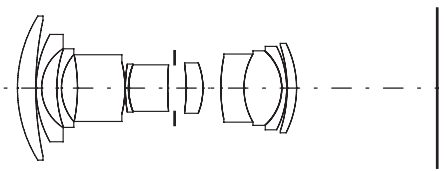
FOCUS TYPE

Rear focusing

ENTRANCE PUPIL POSITION

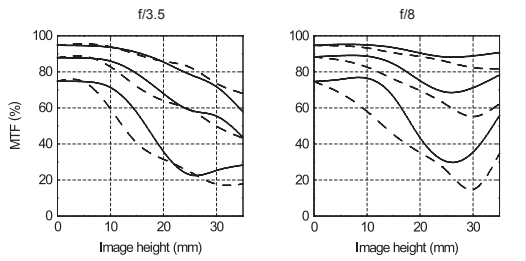
152 mm in front of the film plane
(at infinite focus setting)

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.

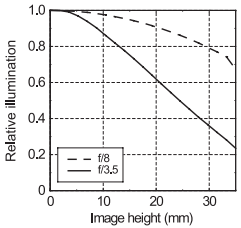
Sagittal slit orientation drawn with continuous line and tangential with dashed. White light. Spatial frequencies 10, 20 and 40 lp/mm



HASSELBLAD
HC 3.5/35

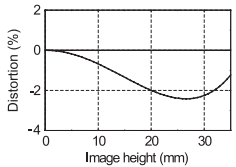
RELATIVE ILLUMINATION

Infinity setting



DISTORTION

Infinity setting



HASSELBLAD
HC 3.5/50

Product number: 3023050

GENERAL LENS DATA:

Focal length	50.3 mm
Aperture range	3.5 - 32
Angle of view diag/hor/vert	70°/59°/46°
Length/diameter	116 mm/85 mm
Weight	975 g
Filter diameter	77 mm

CLOSE FOCUS RANGE DATA:

Minimum distance object to film	0.6 m
Maximum image scale	1:8.9
Corresponding area of coverage	50 x 37 cm
Corresponding exposure reduction	0 f-stop

LENS DESIGN

10 elements in 9 groups

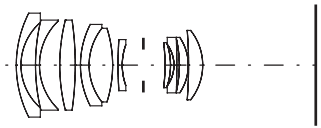
FOCUS TYPE

Rear focusing

ENTRANCE PUPIL POSITION

137 mm in front of the film plane
(at infinite focus setting)

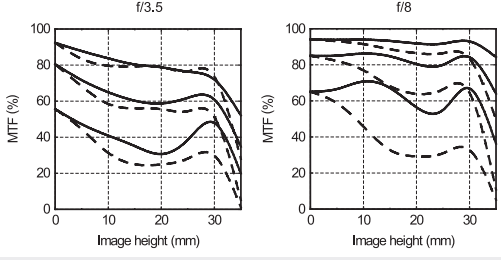
The entrance pupil position is the correct position of the axis of rotation when making a panorama image by combining individual images of a scene.



MTF

Modulation Transfer as a function of image height at infinite focus setting.

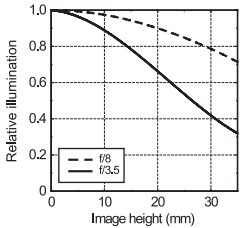
Sagittal slit orientation drawn with continuous line and tangential with dashed. White light. Spatial frequencies 10, 20 and 40 lp/mm



HASSELBLAD
HC 3.5/50a

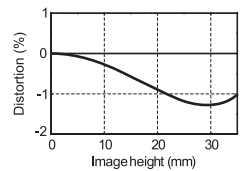
RELATIVE ILLUMINATION

Infinity setting



DISTORTION

Infinity setting



HASSELBLAD
HC 2.8/80

Product number: 3023080

GENERAL LENS DATA:

Focal length	82.3 mm
Aperture range	2.8 - 32
Angle of view diag/hor/vert	46°/38°/29°
Length/diameter	70 mm/84 mm
Weight	475 g
Filter diameter	67 mm

CLOSE FOCUS RANGE DATA:

Minimum distance object to film	0.70 m
Maximum image scale	1:6.5
Corresponding area of coverage	36 x 27 cm
Corresponding exposure reduction	0.3 f-stop

LENS DESIGN

6 elements in 6 groups

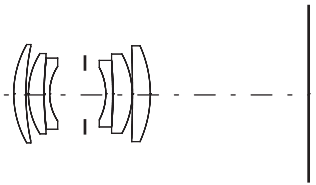
FOCUS TYPE

Full focusing

ENTRANCE PUPIL POSITION

79 mm in front of the film plane
(at infinite focus setting)

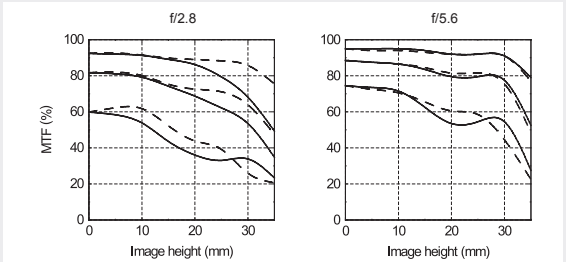
The entrance pupil position is the correct position of the axis of rotation when making a panorama image by combining individual images of a scene.



MTF

Modulation Transfer as a function of image height at infinite focus setting.

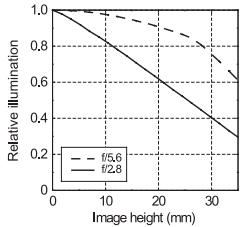
Sagittal slit orientation drawn with continuous line and tangential with dashed. White light. Spatial frequencies 10, 20 and 40 lp/mm



HASSELBLAD
HC 2.8/80

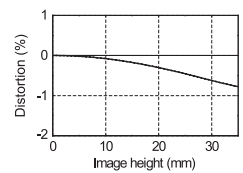
RELATIVE ILLUMINATION

Infinity setting



DISTORTION

Infinity setting



HASSELBLAD
HC 2.2/100

Product number: 3023100

GENERAL LENS DATA:

Focal length	100.0 mm
Aperture range	2.2 - 32
Angle of view diag/hor/vert	38°/31°/24°
Length/diameter	80.5 mm/87.5 mm
Weight	780 g
Filter diameter	77 mm

CLOSE FOCUS RANGE DATA:

Minimum distance object to film	0.90 m
Maximum image scale	1:7.2
Corresponding area of coverage	39 x 29 cm
Corresponding exposure reduction	0.4 f-stop

LENS DESIGN

6 elements in 5 groups

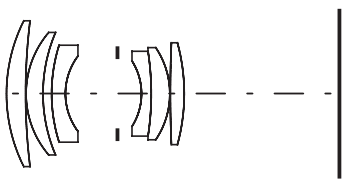
FOCUS TYPE

Full focusing

ENTRANCE PUPIL POSITION

68 mm in front of the film plane
(at infinite focus setting)

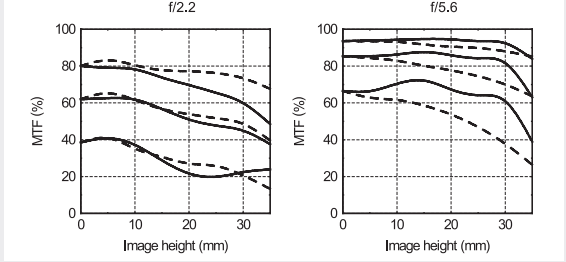
The entrance pupil position is the correct position of the axis of rotation when making a panorama image by combining individual images of a scene.



MTF

Modulation Transfer as a function of image height at infinite focus setting.

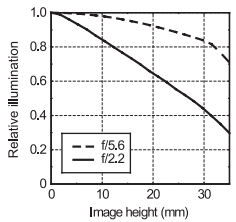
Sagittal slit orientation drawn with continuous line and tangential with dashed. White light. Spatial frequencies 10, 20 and 40 lp/mm



HASSELBLAD
HC 2.2/100

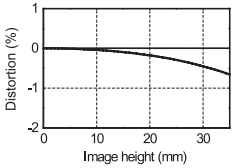
RELATIVE ILLUMINATION

Infinity setting



DISTORTION

Infinity setting



HASSELBLAD
HC Macro 4/120

Product number: 3023120

GENERAL LENS DATA:

Focal length	118.7 mm
Aperture range	4 - 45
Angle of view diag/hor/vert	33°/26°/21°
Length/diameter	166 mm/96 mm
Weight	1410 g
Filter diameter	67 mm

CLOSE FOCUS RANGE DATA:

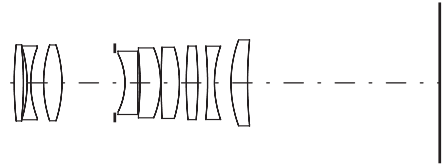
Minimum distance object to film	0.39 m
Maximum image scale	1:1
Corresponding area of coverage	56 x 41.5 mm
Corresponding exposure reduction	1.3 f-stop

COMPATIBILITY

When the HC Macro 120 is used together with the H1,7X converter, the autofocus function of the camera is disabled.

LENS DESIGN

9 elements in 9 groups



FOCUS TYPE

Front focusing

ENTRANCE PUPIL POSITION

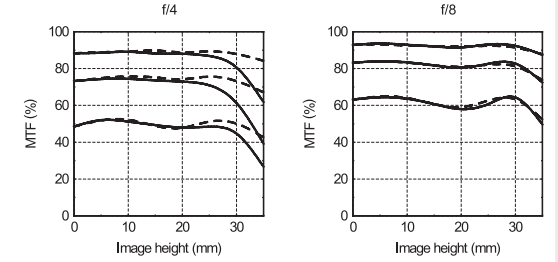
148 mm in front of the film plane
(at infinite focus setting)

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.

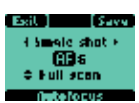
MTF

@ infinity setting
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

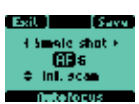


HASSELBLAD
HC 4/120



FULL SCAN

= 0.39 m – ∞



INF. SCAN

= 0.9 m – ∞

NEAR SCAN

= 0.39 m – 1m

In addition to the metres/feet scale, the 120 mm lens also displays magnification ratio scale (A). In the illustration, the scale shows a focusing distance of 1.27 feet / 0.39 metres which in turn produces a 1:1 (lifesize) magnification. With the 120mm lens mounted on the camera, addition screens will appear on the grip LCD when autofocus is chosen to signify a focus limit setting. Three are available – Full scan, Infinity scan and Near scan – accessed by the rear control wheel. This time-saving function is a form of presetting that restricts the scanning range of the lens to prevent it searching across the whole focus scale.

Simply make a rough assesment of the approximate focusing distance and then choose the most suitable of the three ranges. The lens will then be able to find the critical focus much faster.

HASSELBLAD
HC 3.2/150N

Product number: 3023150

GENERAL LENS DATA:

Focal length	150.2 mm
Aperture range	3.2 - 45
Angle of view diag/hor/vert	26°/21°/16°
Length/diameter	124 mm/86 mm
Weight	970 g
Filter diameter	77 mm

CLOSE FOCUS RANGE DATA:

Minimum distance object to film	1.30 m
Maximum image scale	1:6.8
Corresponding area of coverage	38 x 28 cm
Corresponding exposure reduction	0 f-stop

LENS DESIGN

9 elements in 8 groups

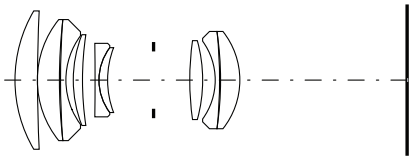
FOCUS TYPE

Internal focusing

ENTRANCE PUPIL POSITION

68 mm in front of the film plane (at infinite focus setting)

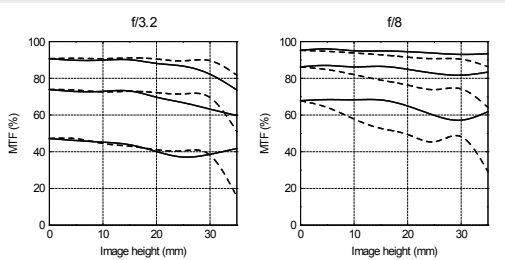
The entrance pupil position is the correct position of the axis of rotation when making a panorama image by combining individual images of a scene.



MTF

Modulation Transfer as a function of image height at infinite focus setting.

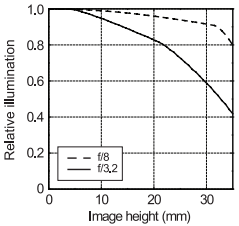
Sagittal slit orientation drawn with continuous line and tangential with dashed. White light. Spatial frequencies 10, 20 and 40 lp/mm



HASSELBLAD
HC 3.2/150N

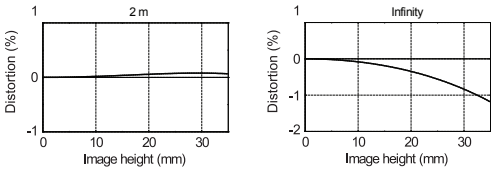
RELATIVE ILLUMINATION

Infinity setting



DISTORTION

2 meters and infinity setting



HASSELBLAD
HC 4/210

Product number: 3023210

GENERAL LENS data:

Focal length	211.1 mm
Aperture range	4 - 45
Angle of view diag/hor/vert	19°/15°/11°
Length/diameter	165 mm/85 mm
Weight	1320 g
Filter diameter	77 mm

CLOSE FOCUS RANGE DATA:

Minimum distance object to film	1.8 m
Maximum image scale	1:7.0
Corresponding area of coverage	39 x 29 cm
Corresponding exposure reduction	0 f-stop

LENS DESIGN

10 elements in 6 groups

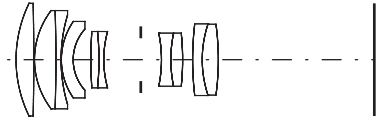
FOCUS TYPE

Internal focusing

ENTRANCE PUPIL POSITION

70 mm in front of the film plane
(at infinite focus setting)

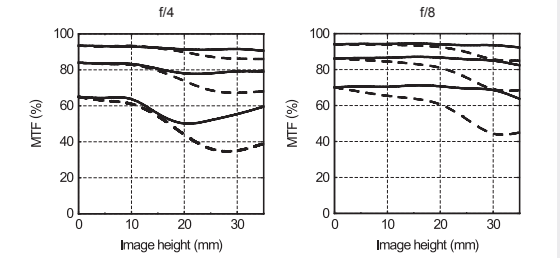
The entrance pupil position is the correct position of the axis of rotation when making a panorama image by combining individual images of a scene.



MTF

Modulation Transfer as a function of image height at infinite focus setting.

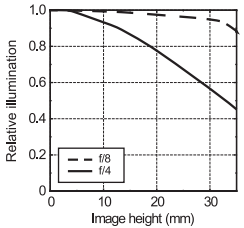
Sagittal slit orientation drawn with continuous line and tangential with dashed. White light. Spatial frequencies 10, 20 and 40 lp/mm



HASSELBLAD
HC 4/210

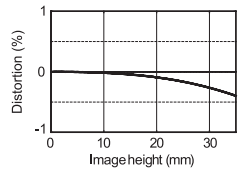
RELATIVE ILLUMINATION

Infinity setting



DISTORTION

Infinity setting



HASSELBLAD
HC 4.5/300

Product number: 3023300

GENERAL LENS DATA:

Focal length	292.0 mm
Aperture range	4.5 - 45
Angle of view diag/hor/vert	13°/11°/8°
Length/diameter	198 mm/100 mm
w. tripod mount	198 mm/139 mm
Weight	2120 g
Filter diameter	95 mm

CLOSE FOCUS RANGE DATA:

Minimum distance object to film	2.45 m
Maximum image scale	1:7.5
Corresponding area of coverage	41 x 31 cm
Corresponding exposure reduction	0 f-stop

COMPATIBILITY

When the HC300 is used together with the H1,7X converter, the autofocus function of the camera is disabled.

LENS DESIGN

9 elements in 7 groups

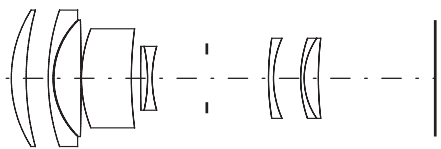
FOCUS TYPE

Internal focusing

ENTRANCE PUPIL POSITION

13 mm in front of the film plane (at infinite focus setting)

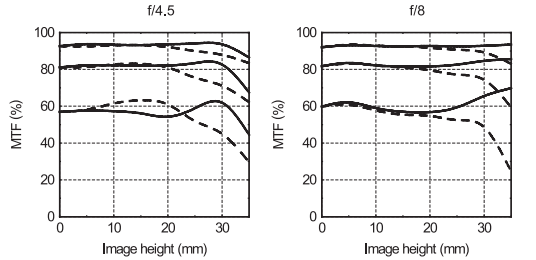
The entrance pupil position is the correct position of the axis of rotation when making a panorama image by combining individual images of a scene.



MTF

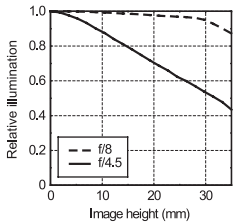
Modulation Transfer as a function of image height at infinite focus setting.

Sagittal slit orientation drawn with continuous line and tangential with dashed. White light. Spatial frequencies 10, 20 and 40 lp/mm



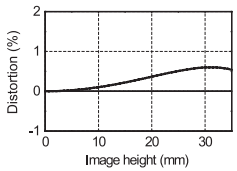
RELATIVE ILLUMINATION

Infinity setting



DISTORTION

Infinity setting



HASSELBLAD
HC 4.5/300

LANDSCAPE ORIENTATION

PORTRAIT ORIENTATION

When using a tripod with a 300mm you should use the (removable) tripod mounting bracket to provide optimum balance. This is attached via a sleeve so that the camera body can be rotated for landscape/portrait formats without altering the tripod head position.

The rotation is secured by a locking screw (A). Correct 90° orientation can be ensured by aligning white index markers (B) for both landscape and portrait orientations.

HASSELBLAD
HC 3.5-4.5/50-110

Product number: 3023511

GENERAL LENS DATA:

Focal length	51.5 (108.3) mm
Aperture range	3.5 (4.5) - 32
Angle of view diag/hor/vert	69°/58°/46° (35°/29°/22°)
Length/diameter	152 mm/103 mm
Weight	1650 g
Filter diameter	95 mm

CLOSE FOCUS RANGE DATA:

Minimum distance object to film	0.70 m
Maximum image scale	1:10.8 (1:5.2)
Corresponding area of coverage	60 x 45 (29 x 21) cm
Corresponding exposure reduction	0 f-stop

COMPATIBILITY

The HC3,5-4,5/50-110 mm lens is not compatible with the converter 1.7x.

LENS DESIGN

14 elements in 9 groups

FOCUS TYPE

Front focusing

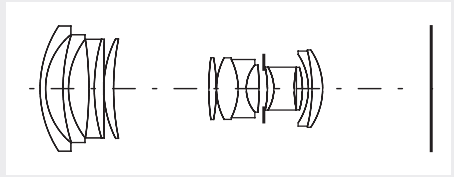
ENTRANCE PUPIL POSITION

50 mm setting: 164 mm
80 mm setting: 161 mm
110 mm setting: 173 mm

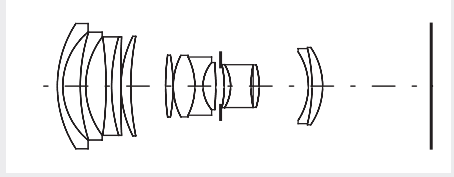
In front of the film plane
(at infinite focus setting)

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.

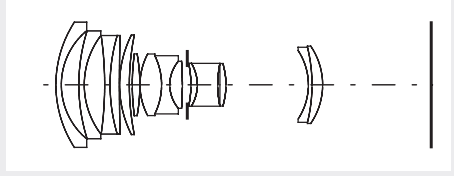
50 mm



80 mm



110 mm



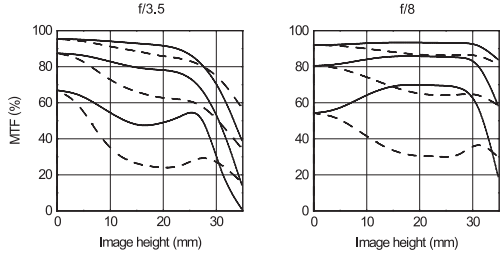
HASSELBLAD
HC 3.5-4.5/50-110

MTF

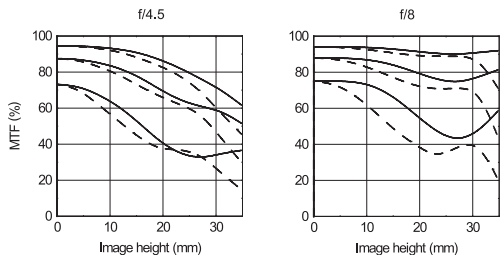
Modulation Transfer as a function of image height at infinite focus setting.

Sagittal slit orientation drawn with continuous line and tangential with dashed. White light. Spatial frequencies 10, 20 and 40 lp/mm

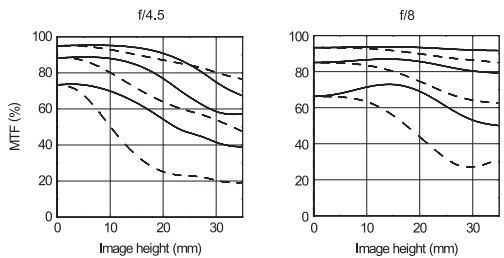
50 mm



80 mm



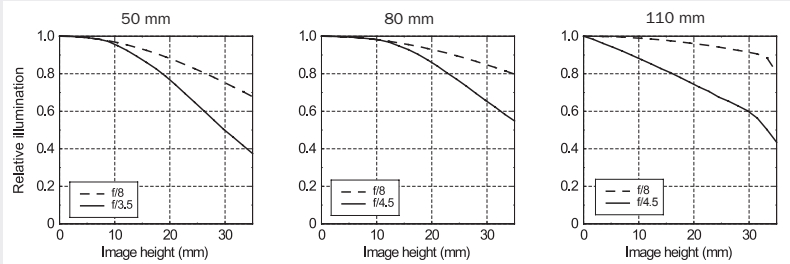
110 mm



HASSELBLAD
HC 3.5-4.5/50-110

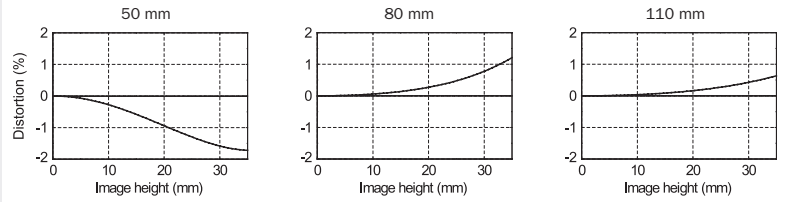
RELATIVE ILLUMINATION

Infinity setting

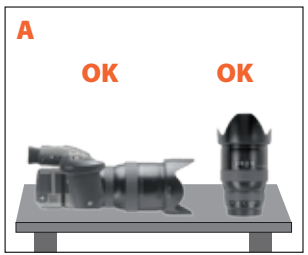


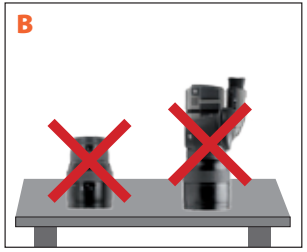
DISTORTION

Infinity setting



HASSELBLAD
Zoom lenses - Please Note!





Zoom lenses are ruggedly constructed professional level lenses made to very strict Hasselblad specifications.

However, by the nature of the necessary complex construction and weight, they can be subject to damage if handled in an unsuitable manner.

When using the lens shade, it becomes natural to place the lens/camera combination down on a surface in the correct manner, that is, in a horizontal orientation. Similarly, the lens on its own can placed vertically but still in a safe orientation as in illustration (A). This virtually avoids all risk of damage.

However, placing the lens or lens/camera combination down in a vertical orientation on a surface as in illustration (B) – that is, resting on the front of the lens – should be avoided at all times.

HASSELBLAD
HC 4.0-5.6/35-90 Aspherical

Product number:
3023590

General lens data:

Focal length	36,3 (87) mm
Aperture range	4,0 (5,6) - 32
Angle of view diag/hor/vert	83°/70°/55° (39°/31°/24°)
Length/diameter	167 mm/102,5 mm
Weight 1410 g	
Filter diameter	95 mm

Close focus range data:

Minimum distance object to image plane	0.65 m
Maximum image scale	1:13 (1:5,4)
Corresponding area of coverage	64 x 48 (26 x 20) cm
Corresponding exposure reduction	0 f-stop

Compatibility

The HCD 4,0-5,6/35-90 mm lens is not compatible with the converter H1.7x and the HTS 1.5 Tilt/Shift adapter.

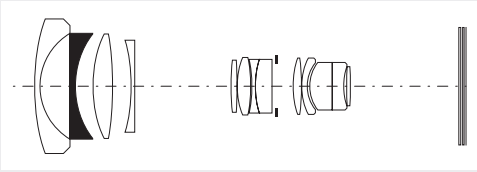
Lens Design

13 elements in 11 groups
1 Aspherical surface

Focus Type

Internal focusing

35 mm

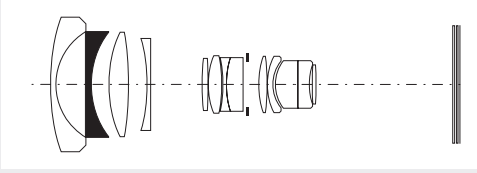


Entrance Pupil Position

35 mm setting: 187 mm
50 mm setting: 178 mm
90 mm setting: 193 mm

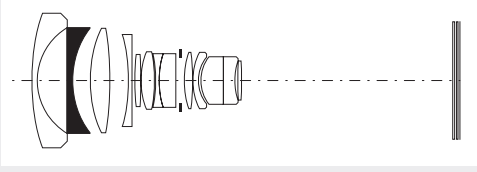
In front of the image plane
(at infinite focus setting)

50 mm



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.

90 mm

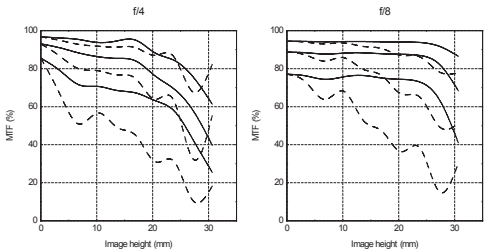


MTF

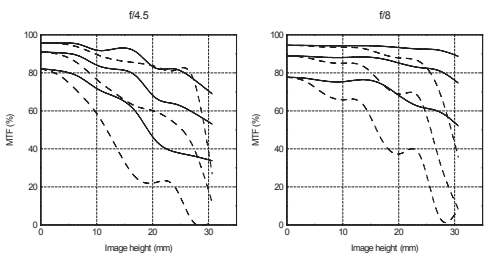
Modulation Transfer as a function of image height at infinite focus setting.

Sagittal slit orientation drawn with continuous line and tangential with dashed. White light. Spatial frequencies 10, 20 and 40 lp/mm

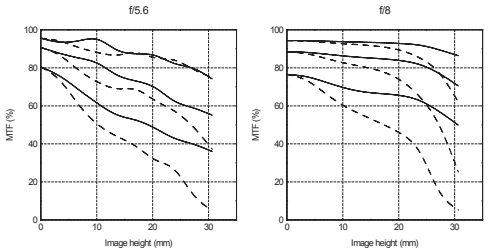
35 mm



50 mm



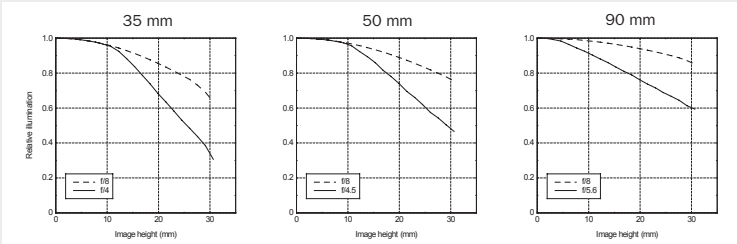
90 mm



HASSELBLAD
HC 4.0-5.6/35-90 Aspherical

Relative Illumination

Infinity setting



Distortion

Infinity setting

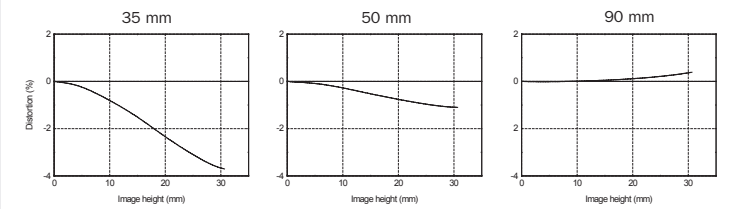


Photo: Chris Simpson © / Hasselblad Master

Related Accessories

HASSELBLAD
H 1.7X Converter

Product number: 3023717

GENERAL LENS DATA:

Focal length conversion factor	1.7x
Aperture reduction	-1.5 stops
Length/diameter	56 mm/85 mm
Weight	465 g

COMPATIBILITY

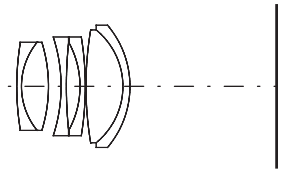
The converter 1.7x can be combined with all HC lenses except for the following:

- HC 3,5/35 mm
- HC 3,5-4,5/50-110 mm

When the H1,7X converter is used together with the HC Macro 120 mm or the HC300 mm lens, the autofocus function of the camera is disabled.

LENS DESIGN

6 lenses in 4 groups



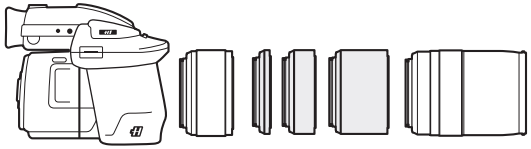
HASSELBLAD

H 13mm *Product number: 3053513*
H 26mm *Product number: 3053526*
H 52mm *Product number: 3053552*

These fully-automatic extension tubes provide a practical and economical solution for close-up requirements. Can be used together in any combination and together with a converter.
Complete data for all lens / extension tube combinations regarding magnification, exposure reduction, area of coverage etc. available.

EXTENSION TUBES & CONVERTER

When the extension tubes are used together with a converter, they should be mounted between the converter and the lens for optimum performance.



PHYSICAL DATA:	H 13mm	H 26mm	H 52mm
Extension	0.51 in	1.0 in	2.1 in
Weight (including covers)	4.41 oz	5.29 oz	6.88 oz
External dimensions (including covers)	3.3 x 1.3 in	3.3 x 1.8 in	3.3 x 2.9 in

HASSELBLAD H SYSTEM
CF Lens Adapter

Product number: 3043500

The Hasselblad H System CF Lens Adapter allows the use of all C-type lenses from the V-system on H cameras. Integral processors for data conversion bridge the two systems to access a number of the H-display and lens-control functions. The adapter allows:

- light metering at full aperture.
- electronic focus confirmation on viewfinder display.
- exploitation of databus connection with CFE lenses.
- access to shutter speeds (manually set on lens) from 1s-1/500s including B and T mode.

Restrictions regarding autofocus, continuous drive, light metering and aperture/shutter controls, as well as certain lenses or combinations of lenses/converters apply.

PHYSICAL DATA:	
Dimensions	approx. 86 x 112 x 20 mm
Weight (including covers)	135 g

HASSELBLAD HTS 1.5

Product number: 75020359

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 HCD28mm, HC35mm, HC50mm, HC80mm and the HC100mm 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 can also be used for close-up work.

This simple device solves not only technical challenges, but also provides exciting opportunities for creative solutions as well. The combination of well-known optical principles combined with the latest in digital image control, provides a powerful package that will expand photographic expression to new levels. Hasselblad holds a patent pending on the HTS 1.5.

“Shift” is the moving of a lens, up and down or to the sides, from its central position while retaining its perpendicular orientation to the film plane. Simply put, the adapter expands the diameter of the projected image circle at the film plane. This allows for much greater freedom in “placing” the image area within the now much broader circle before vignetting takes effect. And most importantly, all this happens without moving the orientation of the camera in relation to the subject. So if verticals, for example, are acceptable in the viewfinder, they will remain so whatever the amount of shift to include the “hidden” parts of the image. Simple but ingenious.

“Tilt” differs from shift in that the normal perpendicular orientation of the lens to the film plane is changed resulting in a change in the plane of focus. This means that at any given aperture/focus setting, the depth of field in the subject will not remain as simply the space between two measured points from the camera as is normally the case, but increased or decreased. This amount is user controlled. Once again, simple but ingenious.

By combining these two laws of physics, the doors of creative solutions are thrown wide open. The list of situations that could advantageously exploit tilt and shift is probably longer than it might first appear to be. For some professional photographers it could rapidly become an essential item for all work.

But the story doesn’t end there. Large-format users have been using tilt and shift for many years, partly because they could, but partly because they had to. Some photographic solutions unfortunately, have also created problems, lens edge performance, for example, being one of them. The dilemma that arose forced photographers to find a compromise, between the “illness” and the “cure”. Hasselblad has now eradicated this dilemma.

With the introduction of automatic chromatic aberration correction computation (DAC), significant improvements strike the viewer immediately. All calculations and adjustments take place in the background monitored and governed by sensors in the adapter. The sharpness at the edge of the frame, despite the fact that the lens is pushed to its limits, remains stunning.

On the creative front, it has long been standard practice for photographers to break the rules in order to produce images that show something just a little different. Large-format users were well-acquainted with the imaginative possibilities that arose from making the “wrong” camera or lens movements. And now Hasselblad users can enjoy this stimulating freedom as well. Fascinating and captivating images are easily conjured up and controlled with just a few slight movements. The combination of large sensors and razor sharp lenses – and now tilt and shift possibilities – Hasselblad has brought some of the creative aspect of former large-format world to the digital medium format.

Take a look at this revolutionary accessory at your nearest Hasselblad dealer. Try it yourself out to see how this new product could rapidly become an essential part of your photography toolkit. The powerful combination of tilt, shift and DAC can bring new perspectives to your photographic vision and provide a marked change in both the technical and creative aspects of your work.

Front view

Rear view

HASSELBLAD HTS 1.5

GENERAL LENS DATA:

Focal length conversion factor	1.5x
Aperture reduction	-1.3 stops
Width/Height/Depth	140 mm / 146 mm / 77 mm
Weight	750 g

LENS DESIGN

6 elements in 5 groups

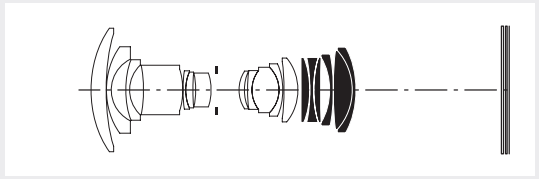
ENTRANCE PUPIL POSITION

W. HCD 28mm:	175 mm
W. HC 35mm:	192 mm
W. HC 50 mm:	177 mm
W. HC 80mm:	119 mm
W. HC 100mm:	109 mm

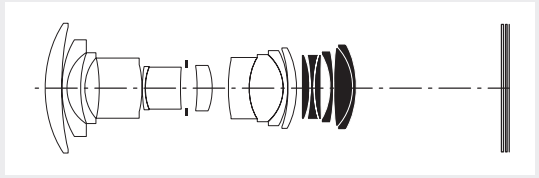
In front of the image plane (at infinity focus setting)

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.

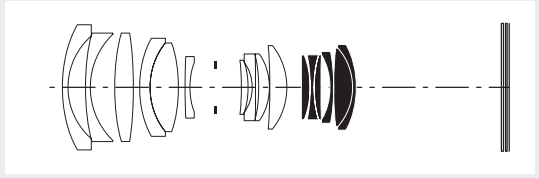
HCD28



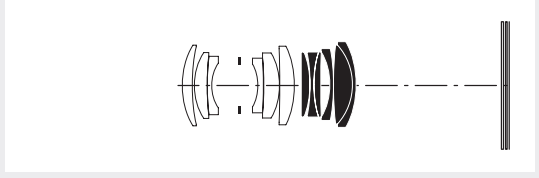
HC 35



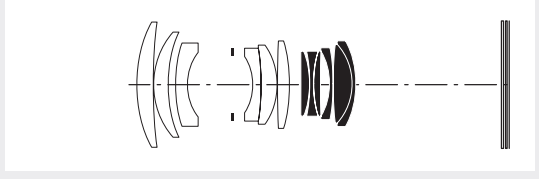
HC 50



HC 80



HC 100



CLOSE FOCUS RANGE DATA

Lens	Minimum distance	Maximum image scale	Coverage	Exp.reduction
HCD 4/28 mm	0.39 m	1:4.7	23 cm × 17 cm	0 EV
HC 3,5/35 mm	0.54 m	1:6.2	30 cm × 23 cm	0 EV
HC 3,5/50 mm	0.64 m	1:5.7	28 cm × 21 cm	0 EV
HC 2,8/80 mm	0.74 m	1:4.2	21 cm × 15 cm	0.3 EV
HC 2,2/100 mm	0.94 m	1:4.6	22 cm × 17 cm	0.5 EV

COMPATIBILITY

The HTS 1.5 adapter is compatible with all H System cameras. Support for digital image corrections only with Hasselblad CF card based digital capture products. The HTS 1.5 adapter is optimally designed for the following lenses:

Lens	Equivalent lens with the HTS 1.5	Angle of view diag/hor/vert
HCD 4/28 mm	6,3/45 mm	71°/59°/45°
HC 3,5/35 mm	5,6/55 mm	59°/49°/37°
HC 3,5/50 mm	5,6/75 mm	44°/35°/27°
HC 2,8/80 mm	4,5/128 mm	27°/22°/16°
HC 2,2/100 mm	3,5/155 mm	23°/18°/14°

The HC150, HC210 and the HC300 will fit onto the adapter but handling and performance can be compromized.

The HTS 1.5 is ***not compatible*** with:

The H1,7X converter
The CF lens adapter
HC 50-110 mm
HCD 35-90 mm
HC 120 mm
Autofocus / focus confirmation (disabled)

HASSELBLAD HTS 1.5

COMPATIBLE LENSES AND EXTENSION TUBES

HCD28, HC35, HC50, HC80 and HC100

Extension tube 13mm, 26mm and 52mm

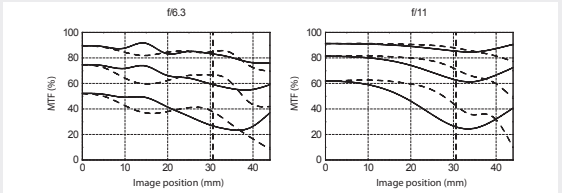
HC35 + HTS 1.5 at f/16, 5 degrees tilt

MTF PERFORMANCE

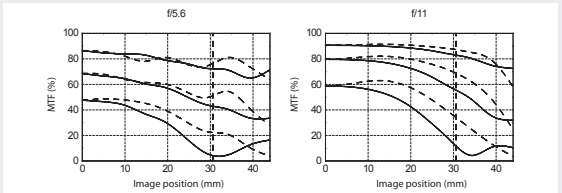
10, 20 and 40 lp/mm

The diagram shows lens perfomance over the full enlarged image circle.
Vertical dashed line show the basic sensor format (36×.48 mm).
Dashed lines in the diagrams shows the tangetial performance.

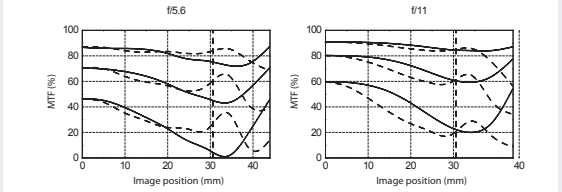
HCD 28mm @ infinity



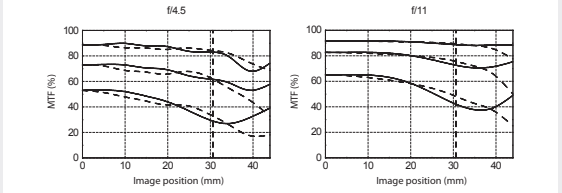
HC 35mm @ infinity



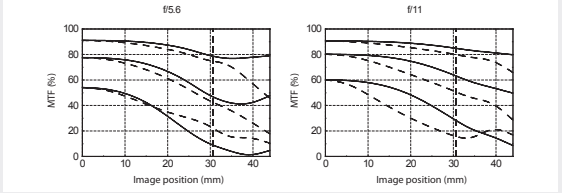
HC 50mm @ infinity



HC 80mm @ 2m



HC 100mm @ 2m



HASSELBLAD HTS 1.5

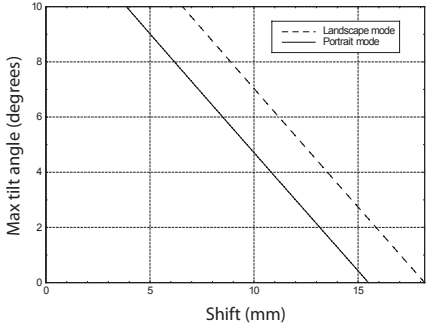
MOVEMENTS

The lens can be shifted 18 mm, either upwards or downwards, and it can be tilted 10 degrees up or down. Tilt and shift can be combined according to the diagram.

HTS SETTINGS ARE PRESENTED ON CAMERA GRIP LCD AND ARE ALSO EMBEDDED IN THE IMAGE FILE.

MAXIMUM TILT

The graph shows the maximum amount of tilt that can be used without vignetting as a function of the amount of shift used.
Format 36×48mm.



MOVEMENTS - ROTATION

The HTS 1.5 adapter can be rotated 90 degrees to the left or right to enable free placement of sharpness plane and shift direction.

HASSELBLAD HTS 1.5

HC80 + HTS 1.5 at f/11, 10 degrees tilt

USE OF SHIFT

For perfect parallel vertical lines in the image, the camera needs to be parallel to the subject. Tilting the whole camera would produce converging parallel lines. But by shifting the lens parallel to the image plane, you can raise or lower the view without tilting the camera. If the subject is a building as in this example, the camera should be placed level.

Camera positioned level. The roof of the building is outside the area projected onto the sensor (HC28 + HTS).

The complete camera tilted upwards to include the top of the building results in converging vertical lines in the image.

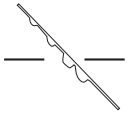
The camera positioned level again with an upward lens shift of 9 mm applied results in parallel verticals.

HASSELBLAD HTS 1.5

USE OF TILT

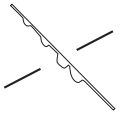
By tilting the lens in relation to the image plane, you can effectively tilt the plane of sharpness in the subject. Depending on your idea of the final image you can either use tilt to enlarge the apparent depth of field or reduce it.

The full image



HCD28 + HTS 1.5 at f/11
No lens tilt produces some lack of sharpness in the foreground and background, partly due to insufficient depth of field.

Lens tilted a few degrees to the right produces an image with perfect sharpness from the foreground to the background.



Lens tilted a few degrees to the left produces an image with an apparent shallow depth of field.

HASSELBLAD HTS 1.5

STITCHING

The HTS 1.5 lends itself extremely well to automatic stitching to create a panoramic image in super high quality. With most subjects it will be impossible to detect any dividing line between the separate images. The main reasons for this are:

- The lens is shifted sideways and therefore does not produce any distortion of the subject
- The DAC lens correction for distortion and vignetting ensures perfect images that can easily be stitched together

The resulting image can be created in any high-end stitching software, e.g. the “Photomerge” function in Adobe Photoshop CS3 or later.

PROCEDURE

Place the camera on a tripod and aim it at a subject. Then set the HTS 1.5 in the normal position with no tilt or shift. Rotate the HTS 1.5 with the controls facing up to allow for sideways shift. Make the first exposure in the mid position. Shift to both end positions and make an exposure in each position. Develop the three images with DAC turned on. Import the images into the stitching software and follow the instructions.

IN THE CASE OF ADOBE PHOTOSHOP CS3, USE THE FOLLOWING PROCEDURE:

- open the three images
- Go to menu: “File - Automate - Photomerge”
- Click on “add open files” and check “interactive layout”
- Click OK
- In the preview that appears you can choose to modify the layout, but in most cases there will be no need for any manual interaction.
- Finally click OK and the final stiched image will be processed.

If the stitch is not perfect, you can modify the layer masks for each layer.

HCD28 and HTS 1.5 – The three images above have been merged into one image using Adobe Photoshop CS3 “Photomerge”. Even at 100% it is almost impossible to see any stitch lines.

HASSELBLAD H SYSTEM
Proshade V/H 60-90 *Product number: 3040740*

The Proshade V/H 60-95 is an adjustable bellows lens shade that provides highly fficient protection against stray light. Its compact, flat folding design saves space in the equipment case. By using the Proshade adapters, this shade can be fitted to all Hasselblad H-system lenses as well as all V-system lenses except the Distagon CFi 30 mm and Tele-Superachromat FE 300 mm.
The shade features a filter holder for glass, gelatin, or plastic filters. The bellows folds down for easy access to the filter holder or for viewing without filter. The Hasselblad Proshade V/H 60 - 95 is supplied with a Proshade mask 6093/250 (3040312). Optional masks and adapters also available (please see website for details).

UV-sky filters

Absorbs UV radiation and reduces blue haze without affecting colors. Protects the front lens surface.

UV-sky 67 mm *(Product number: 3053470)*

UV-sky 77 mm *(Product number: 3053474)*

UV-sky 95 mm *(Product number: 3053478)*

Polarizing filters

Reduces reflection and increases color saturation in e.g. green foliage or a blue sky.

C-pola 67 mm *(Product number: 3053482)*

C-pola 77 mm *(Product number: 3053486)*

C-pola 95 mm *(Product number: 3053490)*

ENG Disposal of Waste Equipment by Users in Private Households in the European Union

This symbol on the product or on its packaging indicates that this product must not be disposed of with your other household waste. Instead, it is your responsibility to dispose of your waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact your local city office, your household waste disposal service or the shop where you purchased the product.

DE Entsorgung von Altgeräten aus privaten Haushalten in der EU

Das Symbol auf dem Produkt oder seiner Verpackung weist darauf hin, dass das Produkt nicht über den normalen Hausmüll entsorgt werden darf. Benutzer sind verpflichtet, die Altgeräte an einer Rücknahmestelle für Elektro- und Elektronik-Altgeräte abzugeben. Die getrennte Sammlung und ordnungsgemäße Entsorgung Ihrer Altgeräte trägt zur Erhaltung der natürlichen Ressourcen bei und garantiert eine Wiederverwertung, die die Gesundheit des Menschen und die Umwelt schützt. Informationen dazu, wo Sie Rücknahmestellen für Ihre Altgeräte finden, erhalten Sie bei Ihrer Stadtverwaltung, den örtlichen Müllentsorgungsbetrieben oder im Geschäft, in dem Sie das Gerät erworben haben.

ES Eliminación de residuos de equipos eléctricos y electrónicos por parte de usuarios particulares en la Unión Europea

Este símbolo en el producto o en su envase indica que no debe eliminarse junto con los desperdicios generales de la casa. Es responsabilidad del usuario eliminar los residuos de este tipo depositándolos en un "punto limpio" para el reciclado de residuos eléctricos y electrónicos. La recogida y el reciclado selectivos de los residuos de aparatos eléctricos en el momento de su eliminación contribuirá a conservar los recursos naturales y a garantizar el reciclado de estos residuos de forma que se proteja el medio ambiente y la salud. Para obtener más información sobre los puntos de recogida de residuos eléctricos y electrónicos para reciclado, póngase en contacto con su ayuntamiento, con el servicio de eliminación de residuos domésticos o con el establecimiento en el que adquirió el producto.

FR Elimination des appareils mis au rebut par les ménages dans l'Union européenne

Le symbole apposé sur ce produit ou sur son emballage indique que ce produit ne doit pas être jeté avec les déchets ménagers ordinaires. 11 est de votre responsabilité de mettre au rebut vos appareils en les déposant dans les centres de collecte publique désignés pour le recyclage des équipements électriques et électroniques. La collecte et le recyclage de vos appareils mis au rebut indépendamment du reste des déchets contribue à la préservation des ressources naturelles et garantit que ces appareils seront recyclés dans le respect de la santé humaine et de l'environnement. Pour obtenir plus d'informations sur les centres de collecte et de recyclage des appareils mis au rebut, veuillez contacter les autorités locales de votre région, les services de collecte des ordures ménagères ou le magasin dans lequel vous avez acheté ce produit.

IT Smaltimento delle apparecchiature da parte di privati nel territorio dell'Unione Europea

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NL Verwijdering van afgedankte apparatuur door privégebruikers in de Europese Unie

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SE Bortskaffande av avfallsprodukter från användare i privathushåll inom Europeiska Unionen

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