

ASAHI
PENTAX
MANUAL

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Introduction

In the year nineteen hundred and nineteen the Asahi Optical Company Limited was formed and commenced manufacturing spectacle lenses. The name 'Asahi' which, incidentally, means 'Rising Sun' was selected as a characteristic symbol of hope and promise — a promise that over the years has been fully achieved.

In the year 1923 Asahi added to their production programme lenses for cine projectors, and certain other optical components which continued up to 1931 when the first camera lenses were manufactured. 1948 saw the first prism binocular production, which was followed later by equally high grade telescopes, soon to become deservedly world renowned.

The year 1951 was later to prove of paramount importance in that Asahi manufactured the Asahiflex 1, the first 35mm SLR camera to be made in Japan. Further intensive development continued, but it was not until 1954 that what may be regarded as a somewhat revolutionary development in SLR camera design was announced — the instant return mirror, allowing uninterrupted screen viewing.

In 1955 the Asahiflex 11a was introduced, differing only from the 11b in that it had positioned on the front of the camera a separate dial for the slow shutter speeds. Two years later the name Pentax appeared when the first Asahi Pentax camera was introduced, and it was at this stage that the new eye-level Pentaprism finder was incorporated. Indeed, this model of the new Asahi Pentax set the basic design and shape of the latest models that we know today.

1960 will undoubtedly be remembered as a year of very real significance when Asahi perfected a through-the-lens metering system which was eventually incorporated in the 1964 model and named the Asahi Pentax Spotmatic. Later

developments include a motor drive unit and many accessories, both simple and complex. It may be of interest to many and perhaps a surprise to some, to learn of the true derivation of the Asahi Pentax name 'Spotmatic'. When the prototype Spotmatic camera was introduced for the first time at Photokina in Cologne way back in 1960 the metering device was, quite literally, designed for use as a Spot Meter measuring a restricted area of the subject only. However, after intensive discussions and considerable testing in laboratory and field, the Asahi technicians finally decided — albeit with some regret — that the employment of the 'Spot' system would be too complex for the average user, from the actual operating point of view, and, to a lesser degree, the time factor involved.

Consequently, the averaging method employed in the Spotmatic as it is known today, was finally decided upon. Generally speaking, it was felt that this would help the user to achieve more consistent overall results.

Nevertheless, that very first appearance of the Asahi Pentax Spotmatic prototype, having caused such considerable and widespread interest (indeed, it was one of the major topics of conversation at the Fair) finally influenced Asahi to retain a name which was already becoming symbolic of a new evolutionary concept of the 35mm SLR camera with one of the world's first through-the-lens metering systems. (Another world's first — the now historic instant-return mirror, had already been evolved in the year 1954).

As enthusiasts know, the Spot metering system is now available in the shape of a highly sensitive and accurate accessory (Asahi Pentax Spotmeter Mk. II). So, through the undoubted wisdom and now, correctly adjudged, foresight of the

manufacturers, virtually the best of both worlds is available.

The underlying policy of the Asahi Optical Company is essentially one of evolution. This is not in any way to be confused with the present day tendency of some manufacturers to produce a 'new' model once or twice a year purely for sales and publicity purposes, be it cars, refrigerators, or cameras.

Their sincere belief is that if through experience gained over the years even one single operation can be made easier, one component more efficient, or by the introduction of completely new thinking and applied technology, the advancement of a whole new system, then no effort should be spared in order to ensure the successful incorporation of results into new and existing equipment.

Not only does this development programme depend on the successful presentation of new ideas, but also the ability to transmit such ideas from paper to machine stage. It is here that Asahi's constant expansion and the subsequent availability of sophisticated electronic equipment and computers has enabled them to become leaders in the development, production, and sales of cameras, lenses, and accessories.

Thus it will be seen that Asahi Optical Co. have been lens manufacturers from the very beginning of the formation of their Company which must, inevitably, provide a unique background of specialist knowledge, later broadened with their introduction of binocular and camera design which, undoubtedly, will account for the superb quality of their products today. This has permitted the rigid quality control of every stage of operation in the design and manufacture of lenses and equipment undertaken within the Asahi plants.

contents

Section 1

Introducing the Asahi Pentax Camera Range
A Chronological (illustrated)
Review of Asahi Cameras, with specifications
Asahiflex I
Asahiflex 1a
Asahiflex 11a
Asahiflex 11b
Pentax
Pentax S
Pentax K
Pentax S2
Pentax S3
Pentax S1a
Pentax SV
Spotmatic

Section 2

Asahi Pentax Spotmatic
Annotated diagram showing working parts
Description of various parts (illustrated)
User/handling technique
Film loading
Dial setting
Operating self-timer
Film wind and rewind
Operating shutter
Operating lens
Operating meter
Important notes
Bright field focusing
Depth of field scale
Micro-prism
Shutter
Mercury battery
Range of light measurement
Flash synchronisation
How to make deliberate double exposure
Infra-Red photography
Camera maintenance
Method of storage

Section 3

Model SL
Asahi Pentax SL is identical to the Spotmatic—minus Meter Specification
Illustrated annotated diagram showing working parts

Section 4

Asahi Pentax Spotmatic 500
Specification

Section 5

Asahi Pentax Spotmatic II
Specification

Annotated diagram showing working parts
Multicoated lenses
Information on Multicoating

Section 6

Asahi Pentax Motor Drive System
Introduction
Description and illustrations Set 3E
Description and illustrations Set 250
Major operating parts (annotated)
Specifications
Camera and lens operation
Exposure counter
Shutter release
Single frame exposure
Consecutive exposure
Power sources
Automatic switch-off
Operating technique
Asahi Pentax Spotmatic Motor Drive
Notes
250 exposure back
Multiple simultaneous photography
Remote control photography
A highly precise system—limitless versatility
Consecutive exposures
Automatic documentary photography
Single frame
List of accessories—all illustrated, with brief description
Battery checker
Charge pack
Film winder
Battery loader
Relay pack
Power pack
Timer
Radio control unit
M—bracket
10 metre cord
1 metre cord
Film cartridge
Attache case for Set 250
Kit bag for Set 3E
Soft leather case for Set 3E

Section 7

Asahi Pentax 6x7
Ideal format single lens reflex system
Illustration
The Ideal format: 6x7—the new Professional size

Brief history and introduction
Comparative formats
Illustrations, front, top, sides and back
Complete camera specification
Complete specification of Takumar lenses for Asahi Pentax 6x7
From 35mm Fish-eye to 1000mm Super-Telephoto, illustrated
Accessories for Asahi Pentax 6x7
Illustrated feature-by-feature review, including swing-back instant return mirror, double co-axial bayonet mounts, double Fresnel lenses, correction lenses, shutter cocking after film loading, easy 120/220 film switching, easy strainless film take-up, electronically controlled focal plane shutter
Interchangeable finders and focusing screens, including Pentaprism finder, folding focusing hood, rigid magnifying hood
Film loading and unloading
Lens system
Shutter
Instant return mirror

Section 8

Asahi Pentax NOCTA Camera for infra-red telephotography
Introduction
Complete specification with annotated illustrations
Handling technique
Notes on exposure focusing
Protection of image converter tube
Effective operating distance
Recommended film processing
Care of the battery pack
Recharging
Replacement of dry cells
Searchlight
Flashgun
Filters

Section 9

Takumar lenses for the Asahi Pentax
A definition of lens mount terminology
Lenses: Diaphragm
Manual
Pre-set diaphragm
Semi-Automatic (Auto-Takumar)
Fully Automatic

Image fidelity
Lens coating
Focal length
Speed and f/numbers
Lenses: depth of field
Optimum lens apertures
Care of lenses
Difference of angle: Takumar lenses
Specifications of Takumar lenses

Section 10

Wide angle lenses
Technical (sectional) drawing
Complete specification
Features
Principal uses
Super-Takumar Fish-eye
17mm f4
Super-Takumar 20mm f3.5
Super-Takumar 24mm f3.5
Super-Takumar 28mm f3.5
Super-Takumar 35mm f2
Super-Takumar 35mm f3.5

Section 11

Standard Lenses
Technical (sectional) drawing
Complete specification
Features
Principal uses
Super-Takumar 50mm f1.4
Super-Takumar 55mm f1.8
Super-Takumar 55mm f2

Section 12

Long Focus Lenses
Technical (sectional) drawing
Features
Principal uses
Super-Takumar 85mm f1.9
Super-Takumar 105mm f2.8
Super-Takumar 135mm f3.5
Super-Takumar 135mm f2.5
Super-Takumar 150mm f4

Section 13

Telephoto Lenses
Technical (sectional) drawing
Complete specification
Features
Principal uses
Super-Takumar 200mm f4
Tele-Takumar 200 f5.6
Super-Takumar 300mm f4
Tele-Takumar 300mm f6.3
Tele-Takumar 400mm f5.6
Takumar 500mm f4.5
Tele-Takumar 1000mm f8

Section 14

Specialist, Zoom and Macro Lenses
Technical (sectional) drawing
Complete specification
Features
Principal uses
Ultra-Achromatic 85mm
Super-Takumar
70mm-150mm f4.5
Macro-Takumar 50mm f4
Super-Macro Takumar
50mm f4
Bellows-Takumar
100mm f4

Section 15

Complete System of Asahi
Pentax accessories
Lens cap, front
Lens cap, rear
Body cover
Leica mount adapter
Asahi mount adapter
Lens hoods
Filters, 49mm
Asahi Pentax anti-glare filter
Asahi Pentax Filters, with description, application, size availability, etc.
Film cassette
Cable release
Asahi Pentax camera cases
90° Mirror
Right angle finder
Viewfinder accessories
Accessory clip 11
Correction lens adapter
Clip-on magnifier
Right-angle finder
Stereo adapter set
Extension tube set (1)
Auto-extension tube set
Helicoid extension tube
Lens reverse adapter
Bellows Unit 1
Bellows Unit 11
Slide copier
Auto-bellows and Slide-copier
Microscope adapter
Copipod
Copy Stand 1
Copy Stand 11
Superlite Electronic Flash
Clip-on meter, model II
Clip-on meter, model SL

Section 16

Asahi Pentax Clip-on meter
The history and introduction of Asahi Pentax Clip-on meter
Original Asahi Pentax Clip-on meter
Asahi Pentax Clip-on meter – Model I
Asahi Pentax Clip-on meter – Model II (Sta, SV)
Determining proper exposure
At the camera position
At the subject's position
Substitute hand method
Take several readings
How to use the meter – Model II
Annotated illustrations
Battery replacement
Zero adjustment
Attaching the meter to the camera
Clip-on meter – Model SL
Specification
Annotated illustrations
Attaching the meter to the camera
How to use the meter
Zero adjustment
Battery replacement
Caution

Section 17

Asahi Pentax Spot Exposure meter

Asahi Pentax Spotmeter – Model I
Introduction
Specification
Asahi Pentax Spotmeter – Model II
1°-21° Model III
Description
Specification
Use of
Operating instructions
IRE scale Inst. of Radio Engineers
Various methods of exposure readings
Other uses
Battery check and replacement
ASA and DIN scales
Zero adjustment
Colour correction
Conversion of LL values to candle power/foot lamberts
Asahi Pentax Spotmeter FL

Section 18

Complete system of Asahi Pentax Close-up photography (Macrophotography, Photomicrography, Microphotography)
Definition of terms
Close-up photography
Macro photography
Photo micrography
Micro photography
Close-ups – Introduction
Asahi Pentax Close-up lens
Description and table
Definition of terms (expanded) relating to near distance and close-up photography
Macro-photography
Supplementary lens or lens extension devices
Lens reverse adapter for macro-photography
Copipod
Introduction
Assembly and use
Annotated illustration
Working instructions
Copy-Stand Mark 11 and Table Clamp
Description
Annotated illustration
Helicoid extension tube
Close-up table for Helicoid extension tube
Close-up table for reverse lens position using lens reverse adapter
Microphotography
Reproduction ratio (magnification or reduction)
Standard extension tube set
Illustrated identification
Extension Tube close-up tables (S1)
Auto-Extension Tube Set (S3)
Illustrated identification
Extension Tube close-up tables (S3)
Bellows
Bellows Unit – Model 1
Introduction
Annotated illustration
Bellows Unit – Model 11
Introduction

Annotated illustration
Operation of Bellows 11
Relevant data and operating
tables
Slide Copier
Introduction
Annotated illustration
Operation of Slide Copier
Auto Bellows/ Slide Copier
Specification
Introduction
Annotated illustration
Auto-Bellows assembly
Scales
Double Cable Release
Reversing lenses
Slide Copier/assembly
Illustrated operating procedure
Determination of exposure
Explanation of close-up tables
Magnification
Lens extension
Picture area
Exposure factor
How to use close-up tables
When determining magnifica-
tion first
Focusing
Exposure determination
Determining picture area first
Determining film to subject
first
Depth of field – when using
Spotmatic
Illumination
Without close-up tables
Auto-Takumar lenses (dis-
continued)
Pre-set diaphragm lenses
Asahi Pentax mount Takumar
lenses
Copying on daylight type col-
our films
Close-up table data sheets
Photomicrography
Magnification in photomicro-
graphy
Microscope Adapter
Introduction
Annotated illustrations
A list of parts
Illustrated, annotated step-by-
step working instructions
Exposure and focusing

Section 19

Depth of field tables

Section 1
Asahi Pentax
Camera Range

Asahi Pentax Camera Range

Asahiflex 1 (1951)



Asahiflex 1a (1953)



Asahiflex 1 (1951)

This conventional style 35mm Single Lens Reflex camera was the first of its kind to be manufactured by the Asahi Optical Company. A somewhat complex focal plane shutter provided a speed range of 1/25 to 1/500 sec. and provision for X Flash synchronisation.

Focusing and viewing was by means of a waist-level Finder Screen. An Optical Viewfinder was incorporated, sited next to the Viewfinder Screen. The standard optical equipment was a 50mm f3.5 Takumar lens with pre-set diaphragm. Altogether six interchangeable lenses were introduced ranging from 50mm (standard) - 500mm (long focus). It should be noted that the lenses manufactured at this time and, indeed, those made for the three subsequent models were supplied in different lens mounts to the lenses designed and manufactured for all later Asahi 35mm SLR cameras bearing the name Pentax. These early pattern

lenses can be used on Pentax model camera bodies by the use of a special lens mount adapter. However, it is not possible to use Pentax series lenses on the early original models described above.

Specification

35mm Single Lens Reflex Camera
24 x 36mm.
Waist-level reflex focusing.
Eye level optical viewfinder.
Focal plane shutter.
Speed range: 1/25-1/500 sec.
X Flash synchronisation.
Standard (non-return) reflex mirror.
Film transport knob.
Film exposure counter dial.
Lens mount: original pattern thread.
Standard lens: 50mm f3.5 Takumar (pre-set diaphragm).
Interchangeable Lenses: Six. 50mm-500mm.
Satin chrome trim.

Asahiflex 1a (1953)

This model remained virtually unchanged with the exception that a simplified and improved focal plane shutter was incorporated, the speed range remaining unchanged (1/25-1/500 sec.) but incorporating the added 'F' synchronisation.

Specification

35mm Single Lens Reflex Camera
24 x 36mm.
Waist-level reflex focusing.
Eye-level optical viewfinder.
Focal plane shutter (simplified).
Speed range: 1/25-1/500 sec.
X and F Flash Synchronisation.
Standard (non-return) reflex mirror.
Film transport knob.
Film exposure counter dial.
Lens mount: original pattern thread.
Standard lens: 50mm f3.5 Takumar (pre-set diaphragm).
Satin chrome trim.

Asahiflex IIb (1954)

For the very first time this Asahi model incorporated the world's first instant return mirror, a design unique to the manufacturers. Otherwise, the camera basically remained wholly unchanged from the earlier models.

However, some lens development had occurred and apart from the standard 50mm f3.5 there became available a newly developed 58mm f2.4 Takumar, which permitted focusing from infinity to a remarkable near distance of only 0.61m. Both this lens and the first mentioned had pre-set diaphragm.

Specification

35mm Single Lens Reflex Camera
24 × 36mm.

Waist-level reflex focusing.

Eye-level optical viewfinder.

Focal plane shutter.

Speed range: 1/25-1/500 sec. and B, and F. Flash synchronisation.

Instant return reflex mirror.

Film transport knob.

Film rewind knob.

Film exposure counter dial (additive).

Lens mount: original pattern thread.

Standard lens: 50mm f3.5 Takumar (pre-set diaphragm adjusting ring).

Satin chrome trim.

Asahiflex IIa (1955)

New design features evident in this model again primarily concerned with a re-distributed shutter speed range, and the splitting up of the control knobs for same. The slow speed dial situated on the top front of the body controlled the speeds from 1/25- $\frac{1}{2}$ sec. and T, whilst the fast speeds 1/50-1/500 sec. were contained and governed by the speed dial situated on the top upper deck of the camera. As with the Asahiflex 11b all earlier lenses were available, including the standard 50mm f3.5 Takumar with pre-set diaphragm, or the optional choice 58mm f2.4 Takumar, also with pre-set diaphragm.

Specification

35mm Single Lens Reflex Camera
24 × 36mm.

Waist-level reflex focusing.

Eye-level optical viewfinder.

Focal plane shutter.

Speed range: $\frac{1}{2}$ -1/25 sec. (separate speed dial in front of camera body) 1/50-1/500 sec. and B, & T.

X & F Flash synchronisation.

Instant return reflex mirror.

Film transport knob.

Film rewind knob.

Film counter exposure dial (additive).

Lens mount: original pattern thread.

Standard lens: 58mm f2.4 Takumar (pre-set diaphragm adjusting ring).

Satin chrome trim.

Asahi Pentax (1957) (Original)

The evolution of the Asahi SLR camera range was far more pronounced in this new model than at any previous stage and indeed the designation Pentax refers to a completely new body design with many important and major features. First, the new body housed the all important built-in, eye-level viewing and focusing Pentaprism, beneath the top cover. Second, a new lens mount designed to accommodate a larger thread. Other new features included a rapid wind lever wind and a folding rewind crank. The shutter speeds again controlled by two separate speed dials ranged from 1 sec.-1/500 sec. and B & T. Flash sockets were provided for both FP and X synchronisation. Incorporated in the eye-level Pentaprism viewfinder and focusing screen was a Fresnel lens. The Prism assembly provided a life size image when using the standard 58mm lens. Initially a 50mm f3.5 lens was offered as the basic standard optic, but, soon after, wider aperture lenses became more freely available, the user being able to select from a choice of three. Therefore, apart from the 50mm f3.5 there was the optional choice of 58mm f2 Takumar, 55mm f2.2 Takumar, or the 58mm f2.4 Takumar. All three lenses had pre-set diaphragms.

Specification

35mm Single Lens Reflex Camera.
24 × 36mm.

Permanently housed eye-level Pentaprism finder incorporating Fresnel lens for focusing.

Focal plane shutter.

Speed range: 1-1/500 sec. and T, & B. (two shutter speed dials).

X & FP Flash synchronisation.

Instant return reflex mirror.

Film transport rapid wind lever.

Film rewind folding crank.

Film exposure counter dial (additive).

Lens mount (new, with larger threads).

Standard lenses: 55mm f2.2 Takumar. 58mm f2.4 Takumar. 58mm f2 Takumar. All pre-set diaphragms.

New camera body.

Satin chrome trim.

Asahi Pentax S (1957)

A few months after the initial introduction of the Asahi Pentax (1957) we were to see the Asahi Pentax S. This model was identical, other than again an improved shutter mechanism¹ resulted in the revising of the actual shutter speeds in a more practical form of arithmetical progression.

The speeds ran thus: 1, 1/2, 1/4, 1/8, 1/15, 1/30, 1/60, 1/125, 1/250, 1/500 sec. compared to the previously designated speed range

1, 1/2, 1/5, 1/10, 1/25, 1/50, 1/100, 1/200 and 1/500 sec.

A new standard 55mm f1.8 Takumar lens became available, fitted as its predecessors, with pre-set diaphragm. Also at this stage the additional range of interchangeable lenses had been increased to seven by the addition of a new 35mm Wide-angle and a new 1000mm Long focus.

Specification

35mm Single Lens Reflex Camera.
24 × 36mm.

Permanently housed eye-level Pentaprism finder incorporating Fresnel lens for focusing.

Focal plane shutter.

Speed range: 1-1/500 sec. and T, & B. (revised arithmetical sequence).

X & FP Flash synchronisation.

Instant return reflex mirror.

Film transport single stroke rapid wind lever.

Film rewind folding crank.

Film exposure counter dial (additive).

Film type indicator dial.

Current lens mount.

Standard lenses: 55mm f1.8 Takumar (pre-set) 55mm f2.2 Takumar (pre-set).

Satin chrome trim.

Asahi Pentax K (1958)

Basically this new K series model remained in many ways identical to the previous model S, but nevertheless incorporated one or two most important new design features, not the least being an actuating pin incorporated in the camera body towards the lower part of the lens mount, the pin being coupled to the shutter release. Thus the newly designed lens with the automatic diaphragm mechanism (55mm f1.8 Auto-Takumar) was actuated via the firing pin coupled to the shutter release, truly a major development as any user of SLR equipment will confirm. A second new and important addition was the central microprism focusing grid incorporated in the middle of the Fresnel lens.

Lastly, again constant attention and development of the Asahi shutter mechanism permitted the re-introduction of a new top speed of 1/1000 sec. For the first time an all black version of the Pentax K body was made available as an optional choice to the standard satin chrome trim.

Specification

35mm Single Lens Reflex Camera
24 × 36mm.

Permanently housed eye-level Pentaprism finder incorporating a central Microprism focusing grid in centre of Fresnel lens.

Focal plane shutter.

Asahiflex IIb (1954)



Asahi Pentax S (1957)



Asahiflex IIa (1955)



Asahi Pentax K (1958)



Asahi Pentax (1957)



Asahi Pentax S2 (1959)



Asahi Pentax Camera Range

Current lens mount.

Standard lens: 55mm f2 Auto-Takumar (semi-automatic).

Standard satin chrome trim or full black version.

Asahi Pentax S3 (1960)

Again comparatively minor modifications concerning the camera body but with the introduction of the first of the Super-Takumar lenses equipped with fully automatic iris diaphragm control, thus eliminating the manual pre-setting of the diaphragm as was necessary with the earlier type semi-automatic lens mechanism. This all important evolution in design meant even simpler and faster operation allowing complete concentration on vital matters concerning viewing/focusing etc. The standard lens was, in fact, a 55mm f1.8 Super-Takumar which, as stated above, was fully automatic, although it is worth noting that a small number of early pattern lenses of this specification were designated 'Auto-Takumar' albeit that these lenses were, in fact, identical to the fully automatic Super-Takumar. Improvements were also made in the Fresnel lens of the Pentaprism and a new top shutter speed of 1/1000 sec. Again a full black trim body version available as optional choice from standard satin chrome.

Specification

35mm Single Lens Reflex Camera 24 x 36mm.

Permanently housed eye-level Pentaprism finder incorporating a central Microprism focusing grid in centre of Fresnel lens.

Focal plane shutter.

Speed range: 1-1/1000 sec. and T. & B.

X & FP synchronisation.

Instant return reflex mirror.

Film transport single stroke rapid wind lever.

Film rewind crank.

Film exposure counter dial.

Film type indicator dial.

Current lens mount.

Standard lenses: 55mm f1.8 Takumar (fully automatic).

Red dot shutter 'cocking' indicator.

Standard satin chrome trim or full black version.

Asahi Pentax S1a (1961)

Several comparatively minor new features and improvements were to be found in the S1a series. When the camera back is opened for removal of the exposed film an exposure counter incorporated in the body automatically resets to zero. Top shutter speed 1/500 sec. and the standard lens for this

Series S1a body is the 55mm f2 Super-Takumar with fully automatic diaphragm.

Specification

35mm Single Lens Reflex Camera 24 x 36mm.

Permanently housed eye-level Pentaprism finder incorporating a central Microprism focusing grid in centre of Fresnel lens.

Focal plane shutter.

Speed range: 1-1/500 sec. and T. & B.

X & FP synchronisation.

Instant return reflex mirror.

Film transport: single stroke rapid wind lever.

Red dot shutter 'cocking' indicator.

Film rewind rapid crank.

Automatic film exposure counter dial.

Film type indicator dial.

Current lens mount.

Standard lens: 55mm f2 Super-Takumar (fully automatic).

Satin chrome trim.

Asahi Pentax SV (1962)

This model featured for the first time a built-in self-timer device providing a ten second pre-exposure delay by turning a knurled ring situated below the film type reminder dial. The timer is released by depressing a small button on the top deck on the right-hand side of the knurled ring. Once again shutter modifications see the re-introduction of a top shutter speed 1/1000 sec. 'T' & 'B'. The standard lens is a 55mm f1.8 Super-Takumar with fully automatic instant open diaphragm. Otherwise the camera is unchanged from the previous model. A full satin black trim was available as an optional extra.

Specification

35mm Single Lens Reflex Camera 24 x 36mm.

Permanently housed eye-level Pentaprism finder incorporating a central Microprism focusing grid in centre of Fresnel lens.

Focal plane shutter.

Speed range: 1-1/1000 sec. and T. & B.

X & FP flash synchronisation.

Instant return reflex mirror.

Film transport: single stroke rapid wind lever.

Red dot shutter 'cocking' indicator.

Film rewind rapid crank.

Film exposure counter automatic dial.

Film type indicator dial.

Current lens mount.

Standard lens: 55mm f1.8 Super-Takumar (fully automatic).

Self timer: built-in knurled ring below film type indicator. Button on top deck.

Satin chrome trim. Black trim as an extra.

Speed range: 1-1/1000 sec. and T. & B.

X & FP Flash synchronisation.

Instant return reflex mirror.

Film transport single stroke rapid wind lever.

Film rewind crank.

Film exposure counter dial.

Film type indicator dial.

Current lens mount.

Standard lenses: 55mm f1.8 Auto-Takumar, with automatic diaphragm; pin on lens actuated by internal link in camera body.

Satin chrome trim.

Asahi Pentax S2 (1959)

Only minor modifications and improvements were to be found on this latest S2 version these primarily being confined to the incorporation of all the shutter speed settings on a single dial located on the top deck. In addition the dial is of the non-revolving type during exposure and the speed range 1 sec.-1/500 sec. 'T' & 'B'. A further small but undeniably useful new feature comprised a small indicator window near the shutter release in which appeared a red dot after the camera shutter was cocked and made ready for exposure. The standard lens was the Auto-Takumar 55mm f2. As with the K series a black body was also available as optional choice to the satin chrome.

Specification

35mm Single Lens Reflex Camera 24 x 36mm.

Permanently housed eye-level Pentaprism finder incorporating a central Microprism focusing grid in centre of Fresnel lens.

Focal plane shutter.

Speed range: 1-1/500 and T. & B. (all on one dial on top deck. Non-revolving speed dial).

X & FP Flash synchronisation.

Instant return reflex mirror.

Film transport single stroke rapid wind lever.

Red dot shutter 'cocking' indicator.

Film rewind crank.

Film exposure counter dial.

Film type indicator dial.

Asahi Pentax S3 (1960)

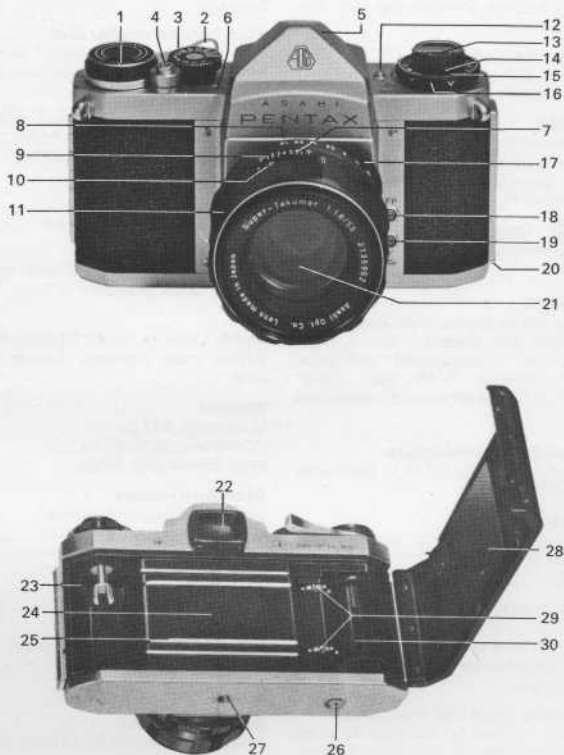


Asahi Pentax S1a (1961)



Asahi Pentax SV (1962)

- 1 Film exposure counter with automatic reset
- 2 Rapid film advance: single stroke cocks shutter and advances film
- 3 Single, non-rotating shutter speed dial; 1-1/1000 sec., plus Time and Bulb
- 4 Shutter release
- 5 Pentaprism housing
- 6 'Cocked' indicator
- 7 Distance and diaphragm index
- 8 Diaphragm ring
- 9 Depth-of-field scale
- 10 Distance scale
- 11 Focusing ring
- 12 Self-Timer start button
- 13 Rapid rewind crank (unfolds to crank position)
- 14 Rewind knob
- 15 Film type reminder dial: colour-coded for different films
- 16 Self-Timer winding knob. Timer provides up to 10 seconds delay.
- 17 Preview lever: affords visual check of exact depth of field
- 18 FP flash terminal (for focal plane lamps)
- 19 X flash terminal (for electronic flash; F & M lamps)
- 20 Back lock
- 21 Fully corrected, 6-element Super-Takumar 55mm f/1.8 lens with fully automatic instant-open diaphragm. Minimum aperture f/16; minimum focusing distance 1.5 ft.; 43° angle of view; helicoidal lens mount; detent f/stops with intermediate settings
- 22 Viewfinder
- 23 Film cassette chamber
- 24 Focal plane shutter blinds
- 25 Film rail
- 26 Film rewind release button: remains depressed without finger pressure while film is being rewind
- 27 Tripod socket
- 28 Film pressure plate
- 29 Film perforation sprockets
- 30 Take-up spool



Asahi Pentax Spotmatic (1964)



Type

35mm Single lens reflex camera, with built-in through-the-lens Exposure Meter.

Film and picture size

35mm film (20 or 36 exposures)
24 x 36mm.

Finder

Permanently housed eye-level Pentaprism finder incorporating a central Microprism focusing grid in centre of Fresnel lens.

0.88x magnification with 50mm lens. Approx. life size with 55mm lens.

Shutter

Focal plane shutter with single non-rotating dial, speeds 1 sec.-1/1000 sec. and incorporated self-timer with variable 5-13 sec. delay. Shutter blinds of special rubberised silk.

Flash Synchronisation

Synchronised for FP & X. Electronic at 1/60 sec.

Reflex mirror

Instant return mirror with special shock absorbers for minimum vibration.

Film transport

Ratchet type rapid wind lever (for film advance and shutter cocking). 10° pre-advance and 160° advancing angle.

Shutter 'cocking' indicator

When 'cocked' a red disc appears alongside the shutter release button, and blacks out when released.

Film exposure counter

Automatic re-set type. Exposure counter automatically resets to -2 when back is opened.

Film rewind

Rapid rewind crank for fast film take-up.

Film type reminder dial

Film type indicator under rewind knob with ASA rating window.

Accessory clip

Grooves located on either side of the viewfinder window frame. Accepts 90° finder, magnifier and other accessories.

Lens mount

42mm threaded lens mount.

Dimensions

Width 143mm; height 92mm; depth 87mm with standard 50mm f1.4 lens.

Width 143mm; height 92mm; depth 87mm with standard 55mm f1.8 lens.

Weight

Body only: 621g.
With 50mm lens: 851g.
With 55mm lens: 836g.

Standard lenses

50mm f1.4 Super-Takumar.
55mm f1.8 Super-Takumar.
with fully automatic diaphragm.
Filter and lens hood size: 49mm.
Equipped with diaphragm preview lever affording visual check of depth of field.
Distance scale: 45cms - infinity.

Finish

Satin chrome or black trim.

Exposure meter

Built-in. Measures brightness of the ground glass and is coupled directly to shutter and film speed settings. Film speed ASA setting ranges from 20-1600 (LV 1 - 18 for ASA 100 film with standard lens).
Powered by mercury battery.

Asahi Pentax Spotmatic body

Reference alongside will provide at of this camera, but here it is intended to show more fully the actual breakdown and user-handling technique. Further reference to the annotated diagram will provide instant part-by-part recognition and identification.

It is interesting to note the unusually high degree of original thought and effort that has been put into the production of this model and at this stage it would seem appropriate that some of these features are examined in somewhat greater detail.

The body casting, as with the Pentax S1a and Pentax SV is made from a high pressure magnesium alloy. The mirror support box is of aluminium alloy, significant not only from the point of view of total weight, but also that Asahi technicians considered this the most suitable material to withstand the inevitable shock during travel and arrest of the fast moving mirror assembly. Foam rubber cushioning of nearly all vibration, vitally necessary when considering the movement synchronisation of the mirror when using shutter speeds up to 1/1000 sec. Most internal mechanism is in high grade steel, or brass, as far as some of the gears are concerned. Further protection against internal corrosion is effected by means of a black anodised finish to all steel surfaces. Thin gauge pressed sheet steel is used for the body covering which, in turn, is covered in a rexine material other than where exposed areas are finished in satin chrome or black.

Of particular interest is the fact that the film tracks on this latest Pentax

are 3mm wide as compared to an earlier standard of 1.75mm thus really ensuring that the film lies perfectly flat. Similarly, earlier models of the Pentax utilised a film pressure plate of 47mm width, whereas on this current model the plate has been extended to a full 55mm. It goes without saying that this combination of wider film track and larger surface area of the pressure plate must inevitably provide a very much higher standard of overall accuracy, so ensuring the maximum possible resolution from the Takumar optics. Returning for a moment to the question of possible vibration caused by movement of the instant return mirror mechanism, a further refinement has been incorporated in the form of a small brake spring situated beneath the screen. This introduces a deceleration prior to the mirror tray actually touching the foam rubber cushioning thereby absorbing and virtually eliminating the effect of mirror shake and its possible deleterious effect on overall definition. Rubberised silk is employed in the manufacture of the focal plane shutter which assists in maintaining an extremely high degree of consistent accuracy. So far, it has been established that the Asahi Pentax Spotmatic is a compact, lightweight, high grade SLR with a prodigious range of lenses and accessories. Elsewhere in this data book very full technical and user application details appear concerning these, but first let us examine in a broader concept the advantages of the SLR system and in particular those of the Asahi Pentax.

The image seen in the Pentaprism viewfinder is brilliant and ensures fast and accurate focusing.

In order to ensure perfect sharpness in the resultant picture it is necessary simply to focus by turning the helical focusing (distance) ring on the lens barrel, at the same time closely observing the screen image.

The many concentric rings covering most of the screen surface represent the Fresnel lens which is one of several contributing factors resulting in the overall screen brightness. In the centre, however, is the Microprism and it is this area of the focusing screen that ensures precise focusing. If the lens is correctly focused then the screen image will appear absolutely sharp within the circle of the Microprism. If slightly off focus then the Microprism automatically breaks up the image into a series of minute black dots similar to an engraver's screen. Nevertheless, when, in special circumstances, it may for whatever reason not be practical or convenient to focus in the dead centre of the screen any part of the screen may be utilised for focusing purposes.

Pentaprism – the focusing and viewfinder assembly

It is almost impossible to visualise or conceive a more perfect combination of these two all important features.

Let us first consider that which one might feel would constitute an ideal theoretical list of basic requirements.

A natural easy to hold eye-level viewing position, whether vertical or horizontal picture format.

A brilliant screen image.

A rapid accurate and positive focusing system.

A right way up and laterally non-reversed image.

Ability to observe actual depth of field at any selected lens aperture.

Uninterrupted viewing of screen image before and after exposure.

Ability to observe exposure meter reading without disruption of viewing.

The image seen through the viewfinder is, in fact, 93% of the actual recorded picture area.

Needless to say, this is completely intentional and allows for the marginal area 'lost' when colour transparencies are frame mounted for projection purposes.

The Asahi Pentax designers and technicians have virtually provided every single one of these requirements.

Within the metal housing is the Pentaprism - proper, consisting of nearly two ounces of finest quality optical glass. The five-sided Prism is precision ground, and polished to extremely fine tolerance, having no fewer than 25 actual planes or surfaces.

Under the prism is a thin condenser lens, the base of which is finely ground. Completing the 'sandwich' as it were, is a thin plastic fresnel lens forming a number of fine concentric rings with microprism centre, which is positioned immediately beneath and in contact with the focusing screen. The Pentaprism assembly as a whole is the means of producing the brilliant right-way up and laterally non-reversed screen image which provides fast and accurate focusing/viewing. The sheer brilliance of the screen image is due, primarily, to the superb optical quality and combined precision craftsmanship that goes into the design and production of the Pentaprism assembly.

Asahi Pentax cameras have a Fresnel lens with a microprism centre underneath the ground glass. On looking through the finder it will be noticed that the Fresnel lens consists of many concentric rings which provide the brightest possible image on the ground glass.

The microprism is the centre portion of the screen. When the subject is in focus, the image in the micro-

prism will be sharp and perfectly clear. If the subject is not in focus, the microprism will break the image up into many small dots, much like an engraver's screen. (A number of parallel diagonal lines will appear in the microprism of the SLR, also breaking up the subject's image). Focusing can be on any portion of the ground glass.

Accurate and instant-focus cross-microprism Fresnel lens

The cross-microprism centre of the Fresnel lens in the Asahi Pentax viewfinder system break up the image of the subject, when the subject is not in focus.

In focus, the Fresnel screen snaps into a brilliant, clearly defined image

TTL Meter

Like most things automation one appreciates more fully the true significance of automation or technical improvement only by comparison and/or more specifically through being thoroughly acclimatised or accustomed to the earlier system. The SLR camera must have seemed to many of us the ultimate in camera design and operation with the many unique functions that such a system affords. However, the quest of exposure has constantly been at best a compromise, at worst a hazard. True, for a comparatively large number of subjects it is hard to beat sheer experience on the part of the photographer in conjunction with an accurate exposure meter in the form of an accessory, but how far can one go and how accurate the exposure assessment depends understandably on the type of exposure meter in use. The Asahi Pentax Spotmeter Mk.3 is an excellent example of an extremely high grade spot reading professional meter where a wide range measurement for critical exposure/brightness is required. But for most normal and some specific types of work the inbuilt Spotmatic metering system is almost too good to be true. First of all there is the sheer luxury and convenience of having the whole assembly inbuilt, and instantly one will think of minimum bulk and weight coupled with instant combined viewfinder/exposure meter assessment reading. However, high speed operating technique is one thing, indeed a highly desirable feature, but let us not forget the wonderful degree of freedom from difficult and indeed at times, highly complex exposure calculation that has to be taken into consideration when using certain specialist accessories, such as copying devices, extension tubes, bellows, etc. Filter factors are another outstanding example where TTL metering is of

enormous and untold value, but not necessarily through difficulty in allowing or interpreting the adjusted exposure necessary through the introduction of filters over the lens but the very real possibility of forgetting to do this, especially when perhaps using several of the interchangeable lenses with and without filters, or filters of varying times exposure factor. In principle the twin CdS cells react precisely to what the eye observes through the viewfinder which is an integrated light measurement. There are, of course, times when like any other automatic system the meter will not or cannot interpret certain factors outside its control, i.e. certain types of reflected or direct frontal lighting. Again, a little practical experience, fully compensates for the rare occasion when 100% reliability is, through circumstances not fully attainable.

Normally, however, the Asahi TTL system provides an extremely high degree of accuracy.

Some important factors

Beginners should be helped to understand that the meter is, if used intelligently, an extremely accurate and valuable aid to successful picture making.

Quite obviously, they will need guidance in the very early stages when, for instance, it is realised that either shutter speed or lens aperture can initially be selected for the purpose of calculating exposure.

It can be argued that the Spotmatic is, in any case, a far too sophisticated piece of equipment for any beginner to handle, but, nevertheless, used under guidance, the beginner can, understandably, also be expected to produce first class results! Consequently, that is why one, naturally, would advise on the use of a medium speed fine grain film (or colour equivalent) to generally use the shutter speed as the 'known' factor, i.e. an operating speed fast enough to eliminate camera shake not too fast to force the use of over-wide apertures with consequent danger-

ously shallow depth of field e.g. 1/125 sec. or possibly 1/30 sec. or thereabout when shooting indoors.

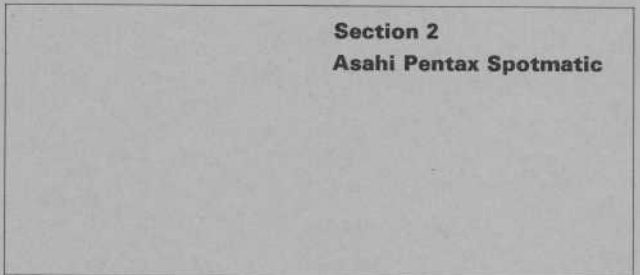
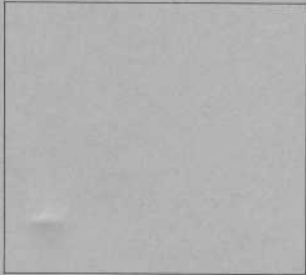
They should be made conversant with the tables of maximum/minimum operating extent, and shown how to check the small triangular indicator adjacent to and on the left of the shutter speed dial assembly, which will have changed from black to red if the meter just cannot cope, due to insufficient light. Then the decision must be theirs if they decide to risk camera shake using a slow shutter speed, rather than miss out altogether on the chances of obtaining some record, under difficult circumstances. Nevertheless, providing just elementary guidance is given, and a little common-sense used, then the Spotmatic, even in relatively unskilled hands, will produce technically good negatives or transparencies. Choice of actual subject matter is still left to the full discretion of the photographer, so even Asahi Spotmatic can make no claims in this direction!

Spotmatic in chrome finish with Super-Takumar 50mm f1.4



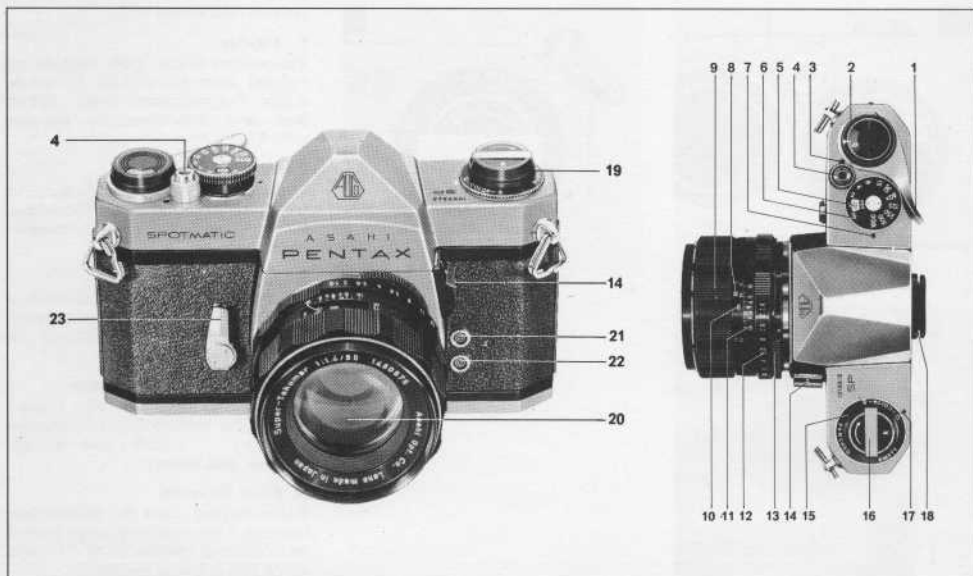
Spotmatic in black finish with Super-Takumar 50mm f1.4



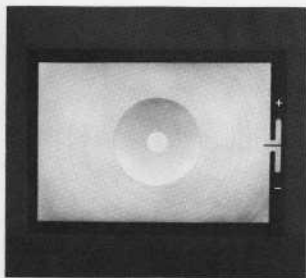


Section 2
Asahi Pentax Spotmatic

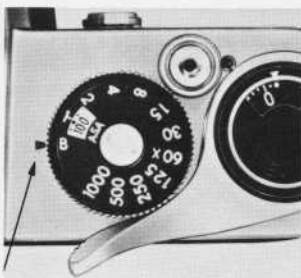
Asahi Pentax Spotmatic



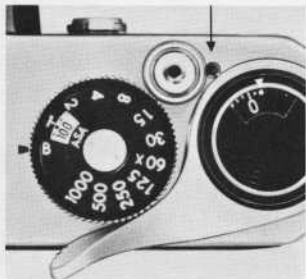
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|----|---|----|---|----|--|
| 1 | Ratchet type rapid-wind lever for film transport and shutter cocking. | 12 | Diaphragm ring with intermediate click stops. | 16 | Film rewind crank. |
| 2 | Automatic re-set type exposure counter resets at -2 when the back cover is opened for film loading/unloading. | 13 | Depth-of-field preview lever. When it is down in 'A' (automatic) position, the diaphragm is fully automatic. When it is up in 'M' (manual) position, the diaphragm is manual. Slide it up for manual operation for depth-of-field check only. Keep it down for automatic operation for viewing and focusing. When the meter switch is turned on, the diaphragm automatically changes to manual operation for coupling with the built-in meter. When the shutter is released, the meter switch is automatically turned off, and the diaphragm returns automatically to its automatic position. | 17 | Index for loaded film reminder dial. |
| 3 | "Cocked" indicator. | 14 | Meter switch. Slide it up to turn it on. | 18 | Viewfinder frame accepts Asahi Pentax 90° finder, accessory clip, correction lens adapter and magnifier. |
| 4 | Shutter release button | 15 | Loaded film reminder dial for three positions: 'Panchro' (black-and-white), 'Colour' and 'Empty'. | 19 | Film rewind knob. |
| 5 | ASA window with index alongside the figure 1 of the shutter dial (ASA20 to 1600). | 20 | Seven element Super Takumar 50mm f1.4 lens with internally coupled fully automatic diaphragm; diaphragm calibration from f1.4 to f16; focusing distance from 45cm to infinity; angle of view 46°; filter and lenshood size - 49mm; with infra-red mark. | 21 | FP flash contact. |
| 6 | Non-rotating shutter dial with speeds from B (Bulb) 1 to 1/1000sec. Lift the outer ring and turn it to set the ASA rating of the loaded film. | 21 | FP flash contact. | 22 | X flash contact. |
| 7 | Shutter speed index. | 22 | X flash contact. | 23 | Self-timer cocking lever (Release button is hidden underneath the lever). |
| 8 | Distance scale. | | | | |
| 9 | Distance scale and focusing ring. | | | | |
| 10 | Distance and diaphragm index. | | | | |
| 11 | Depth-of-field guide. | | | | |



1



2



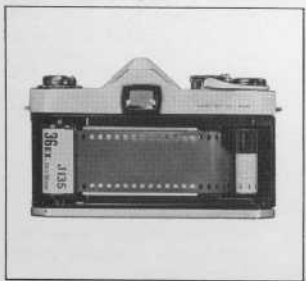
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4



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Standard Lenses

Super-Takumar 50mm f1.4 or 55mm f1.8 with fully automatic diaphragm. Filters and lenshood size: 49mm. Equipped with diaphragm preview lever which affords visual check of depth of field. Distance scale: 45cm to infinity.

Shutter

Focal plane shutter with single non-rotating dial. Speeds: B, 1-1/1000 sec. Film speed (ASA) setting dial and window on shutter speed dial. Built-in self-timer releases shutter in 5-13 seconds. Shutter curtains of special rubberised silk.

1. Finder

Pentaprism finder with microprism Fresnel lens for instant focusing: 0.88x magnification with 50mm lens and approximately life-size with 55mm lens.

2. Warning Signal

The index of shutter speeds turns to red when the shutter and film speed settings are off the meter's measurability range.

3. 'Cocked' Indicator

A red disc appears in a small window alongside the shutter release when the shutter is cocked, and blacks out when it is released.

4. Loaded Film Indicator

Loaded film reminder dial underneath film rewind knob is marked 'Panchro' (black - and - white), 'Colour' and 'Empty'.

5. Film Rewind

Rapid rewind crank for speedy film take-up. Film rewind release button on bottom of camera body - rotates while film is being rewound.

Film loading

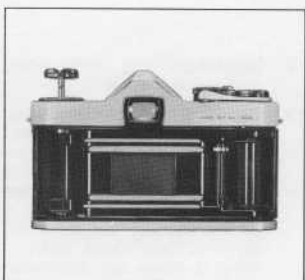
Avoid direct sunlight when loading film.

Open the back by pulling out the rewind knob until back cover snaps open.

Place the film cassette into the cassette chamber and push back the rewind knob. Draw out the film leader and crease across one or two perforations back from the end of the leader. Insert the creased portion into slot of the take-up spool.

Advance the film by alternately turning the rewind lever and releasing the shutter until both sprockets have properly engaged the film perforations.

Close the back by pressing it firmly. If the film is properly loaded, the rewind knob will turn counter-clockwise when the film is advanced by turning the rapid wind lever.



Film type reminder dial

Use the film type dial to show what type of film is in the camera. Simply turn the dial so that the type of film in the camera is opposite the mark. To check whether the camera is loaded turn the film rewind knob clockwise. If it turns freely, the camera is not loaded.

Setting ASA film speed

The ASA film speed rating of all 35mm films is given in the data sheet packed with each roll of film.



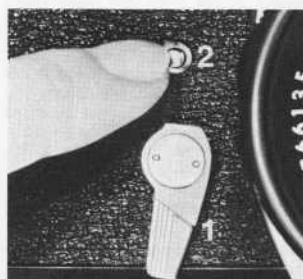
The higher the ASA number the more sensitive the film. Lift the outer ring of the shutter speed dial and rotate it until the ASA number of the film is opposite the red index mark. Be sure to set the film speed on the shutter speed dial because the dial is connected to the exposure meter system.

Self-timer

Depending upon how far down the self-timer cocking lever is turned (1) it will release the shutter in 5-13



seconds. When operating the self-timer always depress the self-timer release button (2) to release the shutter. Do not depress the shutter button this will immediately release the shutter without delayed action. The self-timer cocking lever should be turned down at least 90° or the release button will not operate.



Film wind and re-wind

Before turning the rapid wind lever slowly turn the film rewind knob clockwise until a slight resistance is felt. This prevents loosening or warping of the film.

The first portions of the film cannot be used for picture taking as they have already been exposed to light. Generally, two blank exposures should be made before taking the first picture. Cock the rapid wind lever until it stops. Watch to see that the film rewind knob automatically turns counter-clockwise indicating that the film is moving from cassette to take-up spool. Fire the shutter. Cock the rapid wind lever

for the first picture: the exposure counter automatically turns to '1' indicating that the first picture is ready to be taken.

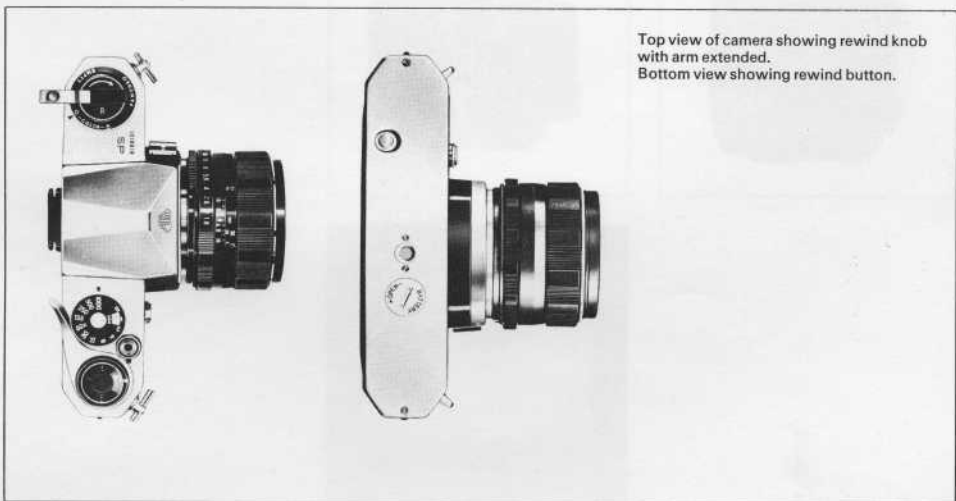
After the final picture on the roll (20 or 36 exposures) has been taken, the rapid wind lever may not turn all the way and must in no circumstances be forced. It simply indicates that the final picture has been taken and that the film is ready for rewinding. Obviously, the back of the camera must not be opened, or all exposed frames will be ruined. Unfold the film rewind crank.

Depress the film rewind release button. Turn the rewind crank to rewind the film into the film cas-

sette. The film rewind crank permits rewinding at a smooth even rate. (Under certain atmospheric conditions erratic or too rapid rewinding will cause static electricity marks on the film).

The tension on the rewind crank will lessen as the leader end of the film slips off the take-up spool. Stop rewinding when this is felt to happen. Avoid direct sunlight when unloading the film. (The rewind release button will return to normal position as the next film is loaded and the rapid wind lever turned).

Pull out the film rewind knob (the back will open automatically) and remove the film cassette.



Top view of camera showing rewind knob with arm extended.

Bottom view showing rewind button.

Bright Field Focusing

1. One can start viewing and focusing before or after cocking the rapid wind lever. When the preview lever is in 'A' (automatic) position and the meter is at 'Off' the diaphragm is fully open except for the moment of exposure.

2. Turn the distance scale ring until the subject image is clearly in focus.

It is not always necessary to view and focus with the diaphragm fully open. In bright sunlight one can easily focus with the diaphragm closed to f5.6 or f8 and still observe the depth of field. It is easier, however, to focus with the diaphragm fully open as the subject image is much brighter and also due to the fact that the visible depth of field is minimal.

When the letter 'M' appears beside the lever, the lens is in manual position; when 'A' appears, it is in automatic position.

Depth of field scale

Full and adequate depth of field data for all lenses will be found on pages DF1 to DF11 but a useful visual reference is incorporated on the actual lens mount. To know how great the depth of field is at any given aperture, refer to the depth of field scale on the lens.

In the illustration, the distance scale is set at 15ft, showing the lens is focused on a subject 15ft away.

The calibrations on either side of the distance index correspond to the diaphragm's setting and indicate the area in focus for different lens apertures. For example, if a lens aperture of f8 is to be used the range covered on the distance scale ring either side of the figure 8 indicates the area in focus, which ranges from approximately 10 to 25 ft.

Note that as the lens apertures change, the effective depth of field changes also.

Depth of field is the range between the nearest and farthest distances which are in focus at different lens apertures.

Microprism

Asahi Pentax cameras have a Fresnel lens with a microprism centre underneath the ground glass. Looking through the finder one will see that the Fresnel lens consists of many concentric rings which provide the brightest possible image on the ground glass.

The microprism is the centre portion of this diagram. When the subject is in focus, the image in the microprism will be sharp and perfectly clear. If the subject is not in focus, the microprism will break the image

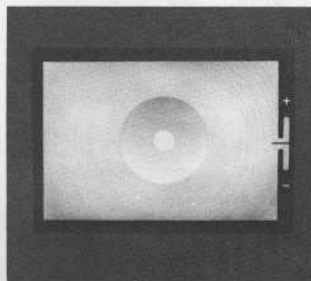
up into many small dots, much like an engraver's screen. One can also focus the subject on any portion of the ground glass.

Shutter

Turn the shutter speed dial clockwise or counter-clockwise to the shutter speed desired. The shutter speed may be set either before or after cocking the rapid wind lever. As the shutter is cocked by turning the rapid wind lever, the 'cocked' indicator turns red showing that the shutter is cocked.

The indicator window blacks out when the shutter button is fired. For use of the X setting on the shutter speed dial, refer to page SP5. With the shutter speed dial set on B (bulb) the shutter will stay open as long as the shutter button is depressed. On removing the finger from the shutter button, the shutter closes. When a long exposure is desired while using the B setting attach a shutter release cable with a locking device to the shutter button. This will permit a 'Time' exposure. At slow speeds - slower than 1/30 sec. support the camera rigidly or use a tripod to prevent movement of the camera.

To protect the shutter mechanism, trip the shutter release before putting the camera out of use for any extended period.



Flash synchronisation

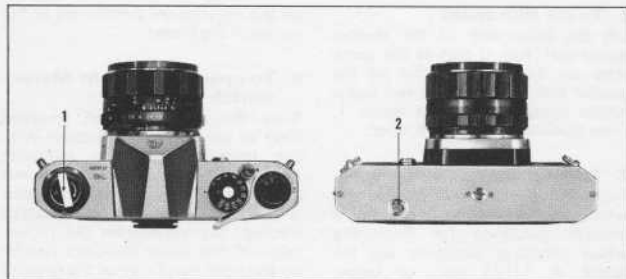
The Asahi Pentax has two sets of terminals – FP and X. The table shows which flash contact, which shutter speed and which flash bulb may be combined for maximum lamp efficiency.

Unless these combinations are rigidly followed, there will be a failure in flash synchronisation. Note the 'X' setting is exactly at the 60 marked on the speed dial. This indicates the highest shutter speed at which electronic flash units may be used.

Flash Terminal	Shutter Speed										
	1/1000	1/500	1/250	1/125	1/60	1/30	1/15	1/8	1/4	1/2	1
FP	FP Class (Screw Base)										
	FP Class (Bayonet Base)										
X								F Class			
								M Class & MF Class			
								Electronic Flash			

Deliberate & double exposure

For deliberate double exposures, make the first exposure in the normal way. Then tighten the film by turning the rewind knob (1) and keep hold of the rewind knob. Depress the film rewind button (2) and cock the rapid wind lever. This tensions the shutter without advancing the film. Finally, release the shutter to make the second exposure. Then make one blank exposure before taking the next picture, to avoid overlapping.



Infra-red photography

To take infra-red photographs, remember to use the small 'R' index marked on the depth-of-field guide. Some of the Takumar lenses, however, like the picture right of Super-Takumar 50mm f/1.4 do not have the 'R' mark, but the index is just a short orange line.

First, focus the lens on the subject, noting the distance from the engraved focusing scale. Then re-adjust by turning the actual distance mark to the engraved 'infra-red' index.

The 'R' index marking on the Takumar lenses is based on the lens setting at infinity and on the infra-red wavelength band of 750m of Japanese infra-red films. When using European infra-red films which cover the 850m wavelength band, the existing 'R' index should be moved roughly one-scale distance farther to the left. This, however, is just an approximate guide, but, due to the film latitude and the depth of field at closed diaphragm setting, correct exposures will be obtained.

55mm f/1.8

50mm f/1.4



Handling the camera

1. To set film speed

Lift the outer ring of the shutter speed dial, turn it and at the same time set the ASA number of the loaded film to the small red index which appears alongside figure 1. Then cock the rapid wind lever.

2. To set shutter speed

Turn the shutter speed dial and select the speed required. As a general guidance for beginners when shooting outdoors set the speed at 1/125 sec. or faster, depending on lighting and film speed. Indoors set the dial at 1/30 sec. or thereabouts.

Obviously special subjects and/or circumstances will necessarily require changes to be made according to the meter reading and in relation to the f number required.

3. Compose and focus

View the subject through the Viewfinder and focus by turning the distance scale ring on the lens with thumb and index finger until the image of the subject appears sharp



on the microprism positioned in the centre of the finder.

4. To operate the Light Meter switch

Slide the switch button (marked SW) in an upwards direction with the thumb when the indicator inside the small round window will appear red, showing that the meter is switched on. Next, observe through the Viewfinder the movement of the meter indicator needle on the right hand side of the ground glass.

Important. Be sure to turn off the meter switch immediately after taking a reading, if an exposure is not made.

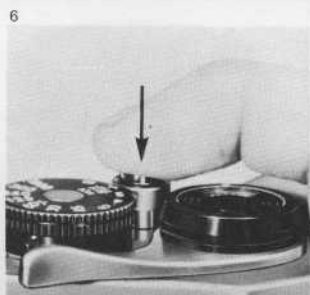
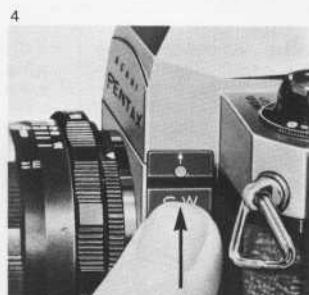
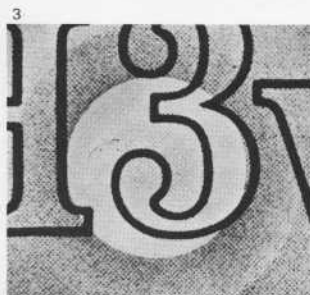
5. Rotation of the Diaphragm Ring

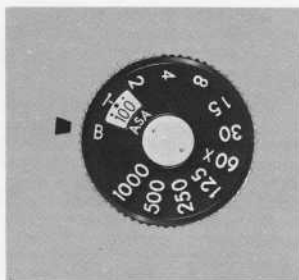
When the diaphragm ring is turned the indicator needle will be seen to move up and down. Correct exposure is automatically obtained once the needle is centrally positioned. Should the needle not reach the centre, irrespective of how far the

diaphragm ring is turned, then the shutter speed must be changed. Over exposure will result if the needle is off centre but close to the (+) mark, therefore a faster shutter speed must be used. Alternatively, under-exposure will result if the needle is nearer the (-) mark, and the shutter speed must necessarily be adjusted to a slower setting.

6. To release shutter

Hold the camera firmly and fire the shutter. When the shutter is released the meter switch is automatically turned off, and the indicator needle will remain in a fixed position towards the (-) mark. NB. On some early Spotmatic models the meter needle retains a central position. The diaphragm will automatically reopen to full aperture and, consequently the overall screen image will appear very bright. Cock the rapid wind lever ready for the next exposure. (When taking a series of pictures under the same lighting conditions it is not necessary to repeat instructions 4 and 5).



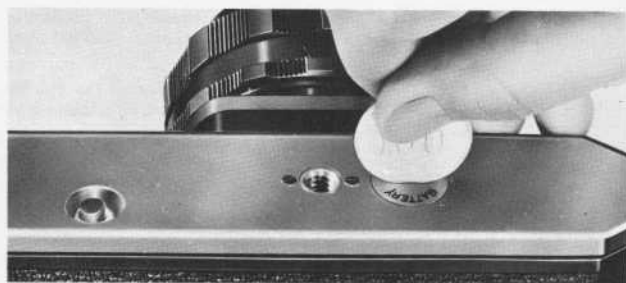


Over and Under Exposure

If the meter needle remains close to the (+) mark no matter in which direction the diaphragm ring is turned, it indicates over-exposure. Change the shutter speed to a faster setting.

If the meter needle remains close to the (—) mark no matter in which direction the diaphragm ring is turned it indicates under-exposure. Change the shutter speed to a slower setting.

The meter needle always stays fixed off and underneath the centre of the index when the meter is switched off. When taking exposure readings make sure the meter is switched on.



Mercury Battery

How to check it.

1. Set the shutter speed dial to B (bulb) position.
2. Turn the ASA dial to ASA 100.
3. Push the meter switch to 'on' position.

Look at the meter's needle through the viewfinder. If the needle rapidly drops, the meter battery has sufficient capacity; if it does not, replace the mercury battery.

How to replace it:

Open the battery housing cover on the bottom cover plate with a coin. Remove old battery and insert new

battery with (+) side towards the top of the camera. For replacement, use Mallory PX400 or equivalent.

Caution

1. Keep the battery dry. Do not touch it with the fingers unnecessarily. Wipe the surface completely with a dry cloth before inserting it into the battery housing.
2. Do not try to charge the battery, or it will deteriorate.
3. Do not short circuit the battery. Do not throw a used battery on to a fire. It may explode!
4. If the meter is not to be used for some length of time, the battery should be removed from the housing.

Range of Light

The exposure meter of the Spotmatic measures the brightness of the ground glass. Therefore, the meter should be turned on after having focused the subject on the ground glass. The following table shows the range of the meter's light measurement, and should not be interpreted as the camera's total range of f/stop-shutter speed combinations.

As will be noted from the table right, with an ASA 100 film, use any shutter speed from 1 sec. to 1/1000 sec. in combination with any aperture that will bring the meter needle to midpoint in the viewfinder. The total range of the aperture settings is, of course, determined by the minimum and maximum apertures of the lens being used. For example, with the 50mm f1.4 lens and ASA 100 film, an aperture from f1.4 (the maximum aperture of this lens) to f16 (the minimum aperture) may be used with any shutter speed from 1 sec. to 1/1000 sec. that will bring the meter needle to midpoint.

Shutter Speeds	B	1	1/2	1/4	1/8	1/15	1/30	1/60	1/125	1/250	1/500	1/1000
ASA												
20	A											
• (25)												
32												
• (40)												
• (50)												
64												
• (80)												
100												
• (125)												
• (160)												
200												
• (250)												
• (320)												
400												
• (500)												
• (640)												
800												
• (1000)												
• (1250)												
1600												

The area A indicates the reading range of the meter. The area B indicates that although the shutter speed index is black and the meter needle moves, the meter is not operating properly.

Important Notes

1. The mercury battery for the light meter is packed separately in the camera carton.
2. Always keep the meter switched off when not actually taking readings. Leaving the meter switched on will rapidly exhaust the battery. It is also necessary to keep the meter switched off when mounting a Super-Takumar lens on the Spotmatic camera body. If it is switched on, the tip of the automatic diaphragm release pin of the lens will hit the pin release plate inside the camera body - and it may get damaged.
3. When the index of the shutter speeds turns to red, it indicates that the shutter and film speed settings are off the meter's measurability range. Change the shutter speed setting to a faster or slower setting.
4. When the meter is switched on, the lens (any Super-Takumar lens) is in its manual position even when the diaphragm preview lever is in 'A' (automatic) position. When the meter is switched off manually or automatically after shutter release, the lens returns to its automatic position when it is set in 'A' position.
5. Do not use the Asahi Super-Takumar 50mm f1.4 lens with any other camera or any other Asahi Pentax model except with models

SV and S1a, having orange-coloured 'R' marking on the film rewind knob, or you will damage the rear element of the lens.

6. The length of the tripod's screw should not exceed the normal length of 3/16 in (4.5mm). Do not extend it longer than this length when mounting the camera on a tripod. Forcing longer screws into the tripod socket of the camera will damage the mechanism.

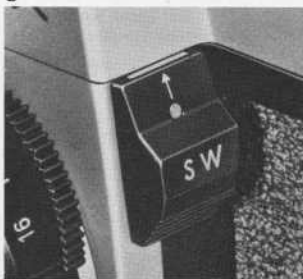
When removing the Super-Takumar 50mm f1.4 lens from the camera body, do not place it with the threaded end down without the rear mount cap in place or the rear element lens will be damaged.

Exposure increase factors when taking pictures with filters, close-ups, macro and micro-photos, are applied automatically with the Spotmatic.

1



2



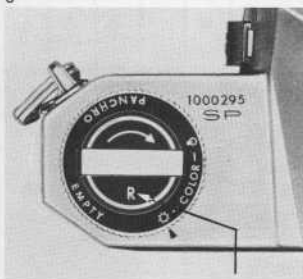
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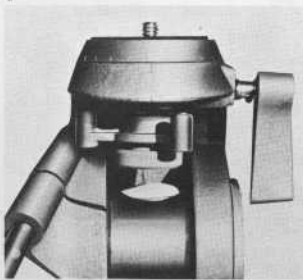
4



5



6



Camera maintenance

Much emphasis has been placed on the fact that the Asahi camera body, lenses, and accessories are the result of precision mechanical and optical engineering of the highest calibre. As a result of this, it is self-evident that equipment of this nature must be used intelligently. Furthermore, it is just not good enough to stow it away and forget about it for months on end during, say, a winter period. All high precision mechanical instruments should be 'used' periodically, whether under actual working conditions or simply to exercise springs and keep moving parts and lubricants from stiffening.

In extremely hot weather try to keep the camera in a cool place. Do not put it in the glove compartment or on the rear window sill of the car, conversely when extremely cold try to keep the camera in the warm. To remove grit or dirt from the camera body use a soft brush or a

dry, soft piece of cloth. For the lens, use only a camel hair brush or soft lens tissue moistened with a few drops of a well-known proprietary lens cleaning fluid. Another safe method is to blast off any dust particles with a rubber ear syringe, or similar article made specifically for photographic use.

For the reflex mirror, again the use of a syringe or very soft camel hair brush. On no account touch the mirror or lens surface with cloth. Never use oil on the camera, and avoid touching the shutter blinds. Should the camera ever need repair or attention, return it at once to an authorised Asahi Pentax Dealer or Agent.

Method of storage

Temperature is an important consideration and obviously, extremes in either direction should be avoided. Just as obviously, one should take care to avoid any degree of dampness.

A slightly ventilated polythene bag is a useful form of container.

Batteries should be removed over any reasonable period of 'non-use' as even the best quality 'non-leak' can occasionally become faulty and cause damage through corrosion.

Generally speaking, it is sufficient if the camera is removed from storage, say, once every four or five weeks and the spring mechanism given attention. Wind and fire off the film transport / shutter mechanism, changing the speeds from fast to slow and also release the delayed action (self-timer) mechanism a few times.

Better still, learn to use and appreciate the value of the camera over a full twelve month period. Unless conditions just do not permit through sheer lack of time or opportunity there is an abundance of wonderful subject matter indoors and out waiting to be photographed.

Section 3
Asahi Pentax SL

Asahi Pentax SL



The Asahi Pentax SL is identical to the Spotmatic. It accepts the same superb Takumar interchangeable lenses and accessories.

It has the same brilliant micro-prism focusing system.

In fact, just check these features

Identical high precision shutter

Identical instant return mirror.

Identical automatic diaphragm mechanism.

Identical rapid windlever for film transport/shutter cocking.

Identical auto-reset film counter.

Identical flash synchronisation (incorporating white gold contacts for maximum efficiency).

Identical durability and reliability to meet exacting professional standards.

Identical mechanical and optical quality.

and the same easy method of operation.

Compact, lightweight (even lighter than the Spotmatic) and it handles superbly.

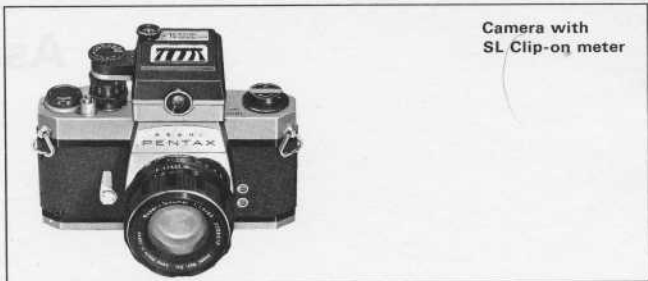
Lighter than the Spotmatic? Yes, due to the fact that the Asahi Pentax SL has no built-in exposure meter, which reduces not only the weight, but the cost. However, the Asahi Pentax clip-on Meter (model SL) can be instantly fitted to the SL

shutter speed dial.

Therefore, everything that has gone into the making of the Asahi Pentax Spotmatic – is contained in this fine instrument and it is eminently suited for those with tight budget schedules or specialist workers preferring to rely on Spot-meter III accessory, where the highest possible degree of accuracy is called for. Other users requiring additional camera bodies as a convenient means of carrying a readily available choice of film emulsion, i.e. high speed/low speed /monochrome/colour or negative/reversal colour, will doubtless welcome the introduction of SL, for obvious reasons.

Asahi Pentax SL Specification

Camera with
SL Clip-on meter



Type

35mm single lens reflex camera.

Film and picture size

35mm film (20 or 36 exposures)
24 x 36mm.

Finder

Permanently housed eye-level Pentaprism finder incorporating a central micro prism focusing grid in centre of Fresnel lens.

0.88x magnification with 50mm lens.

Approx. life size with 55mm lens.

Shutter

Focal plane shutter with single non-rotating dial, speeds 1 sec.-1/1000 sec. and incorporated self timer with variable 5-13 sec. delay. Shutter blinds of special rubberised silk.

Flash synchronization

Synchronised for FP and X. Electronic at 1/60 sec.

Reflex mirror

Instant return mirror with special shock absorbers for minimum vibration.

Film Transport

Ratchet type rapid wind lever (for film advance and shutter cocking). 10° pre-advance and 160° advancing angle.

Shutter 'cocking' indicator

When 'cocked' a red disc appears alongside the shutter release button, and blacks out when released.

Film exposure counter

Automatic re-set type. Exposure counter automatically resets to -2 when back is opened.

Film rewind

Rapid rewind crank for fast film take-up.

Film type reminder dial

Film type indicator under rewind knob with ASA rating window.

Accessory clip

Grooves located on either side of the Viewfinder window frame. Accepts the Asahi Pentax Clip-on Meter SL, 90° finder, Magnifier and other accessories.

Lens mount

42mm threaded lens mount.

Dimensions

Width 143mm; height 92mm; depth 88mm; with standard 50mm f1.4 lens.

Width 143mm; height 92mm; depth 87mm; with standard 55mm f1.8 lens.

Weight

Body only: 598g.

With 50mm lens: 836g.

With 55mm lens: 798g.

Standard lenses

50mm f2 Super-Takumar

50mm f1.4 Super-Takumar

55mm f1.8 Super-Takumar

with fully automatic diaphragm

Filter and lens hood size: 49mm.

Equipped with diaphragm preview lever affording visual check of depth of field.

Distance scale: 45cms - infinity.

Finish

Satin chrome or black trim.

Asahi Pentax SL with Super-Takumar 50mm f1.4

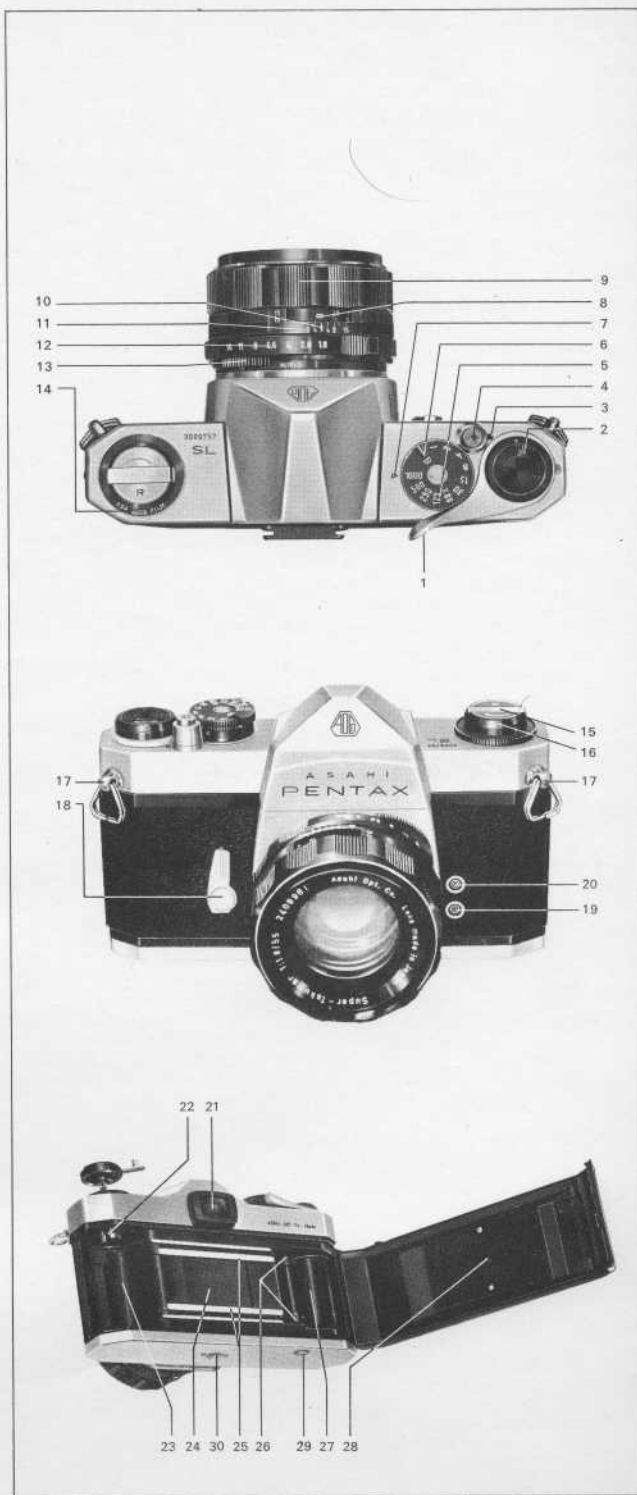


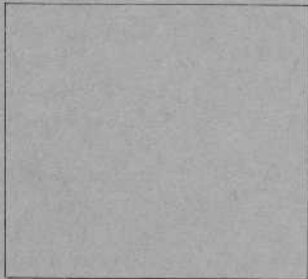
Asahi Pentax SL with Super-Takumar 55mm f1.4



Major working parts of Asahi Pentax SL

- 1 Ratchet-type Rapid Wind Lever advances film and cocks shutter
- 2 Exposure Counter automatically resets to -2 when back is opened
- 3 Cocked Indicator shows red when shutter is cocked
- 4 Shutter Release Button threaded for use with cable release
- 5 Shutter Speed Dial Setting for Bulb, Electronic flash, 1 to 1/1000 sec.
- 6 Groove for coupling SL clip-on exposure meter
- 7 Shutter Speed Index Mark
- 8 Distance Scale in feet and metres
- 9 Focusing Ring/Distance Scale
- 10 Diaphragm and Distance Index Mark
- 11 Depth-of-Field Scale
- 12 Diaphragm Ring with intermediate click stops for selecting aperture settings
- 13 Preview Lever manually closes diaphragm for checking exact depth of field
- 14 Film Type Reminder Dial with ASA rating window
- 15 Film Rewind Crank
- 16 Film Rewind Knob opens back automatically when pulled up
- 17 D-ring Lug
- 18 Self-timer Cocking Lever (Release Button is under the lever)
- 19 X Flash Terminal for electronic flash synchronization at 1/60 sec.
- 20 FP Flash Terminal for flash bulb synchronization
- 21 Viewfinder Frame accepts clip-on meter and eyepiece accessories
- 22 Film Rewind Shaft
- 23 Film Cassette Chamber
- 24 Focal Plane Shutter blinds of special rubberized silk
- 25 Film Rail for flat film travel
- 26 Film Sprockets
- 27 Take-up Spool
- 28 Film Pressure Plate
- 29 Film Rewind Release Button
- 30 Tripod Mounting Receptacle





Section 4
Asahi Pentax Spotmatic 500
Asahi Pentax SP 1000

Asahi Pentax Spotmatic 500

Introduced during the early part of 1971, the Asahi Pentax Spotmatic 500 is very similar in specification to the Spotmatic. As the name implies, it has a top shutter speed of 1/500 second instead of the 1/1000 second found on the Spotmatic.

The standard lens is a 55mm f/2 Super Takumar and as with other Pentax cameras, the Spotmatic 500 has a 42mm threaded lens mount which will accept any of the lenses in the Asahi range.

Apart from the absence of a self timer, this camera carries the same features as the Spotmatic. Reference should be made to the annotated illustrations in the Spotmatic section for information on the major working parts of the Spotmatic 500.

All the accessories designed for the 35mm Pentax cameras can be used with this model.



Specification

Type

35mm single-lens reflex with built-in light meter.

Film and picture size

35mm film (20 or 36 exposures), 24mm x 36mm.

Standard lens

Super-Takumar 55mm f/2 with fully automatic diaphragm. Filters and lenshood size: 49mm. Equipped with diaphragm preview lever which affords visual check of depth of field. Distance scale: 45cm (18") to infinity.

Shutter

Focal plane shutter, with single non-rotating dial. Speeds: B, 1-1/500 sec. Film speed (ASA) setting dial and window on shutter speed dial. Shutter curtains of special rubberized silk.

Warning signal

The index of shutter speeds turns to red when the shutter and film speed settings are off the meter's measurability range.

Finder

Pentaprism finder with microprism Fresnel lens for instant focusing; approximately life-size magnification with 55mm lens.

Focusing

Turn the distance scale ring until the subject image on the ground glass comes into focus.

Reflex mirror

Instant return type with special shock absorbers for minimum vibrations.

Film transport

Ratchet-type rapid wind lever (for film advance and shutter cocking), 10° pre-advancing and 160° advancing angle.

"Cocked" indicator

A red disc appears in a small window alongside the shutter release button when the shutter is cocked, and blacks out when it is released.

Film exposure counter

Automatic re-set type.

Lens mount

42mm threaded lens mount.

Flash synchronization

Equipped with FP and X flash terminals. Electronic synchronization at 1/60 sec.

Exposure meter

Built-in meter measures the brightness of the ground glass, and couples directly to shutter and film speed settings. Film speed (ASA) setting ranges from 20 to 1600 (LV1-18 for ASA-100 film with standard lens). Meter is powered with a mercury battery.

Film rewind

Rapid rewind crank for speedy film take-up. Film rewind release button on bottom of camera body rotates while film is being rewound.

Loaded film indicator

Loaded film reminder dial underneath film rewind knob is marked "Panchrom" (black-and-white), "Colour" and "Empty".

Dimensions

Width 143mm x height 92mm x thickness 88mm.

Weight

820 grams (1 lb. 13 oz.) with standard lens. Body alone: 610 grams (1 lb 6 oz.).

Asahi Pentax SP1000



The successor to the SP500, the SP1000, was introduced during the latter part of 1973. As the designation suggests, the top shutter speed has been increased to one thousandth of a second.

The only visible difference from the SP500 is the restyled focusing ring on the standard 55mm f/2 Super Multi-Coated Takumar lens. All the lenses and accessories produced for the 35mm Pentax

cameras can be used with this model. The operating instructions are the same as for the Spotmatic which can be found on page SP1.

Type

35mm single-lens reflex with built-in light meter.

Film and Picture Size

35mm film (20 or 36 exposures). 24mm x 36mm.

Standard Lens

SMC Takumar 55mm f/2 with fully automatic diaphragm. Filter and lenshood size: 49mm. Equipped with diaphragm preview lever which affords visual check of depth of field. Distance scale: 45cm (18") to infinity.

Shutter

Focal plane shutter, with single non-rotating dial. Speeds: B, 1-1/1000 sec. Film speed (ASA) setting dial and window on shutter speed dial. Shutter curtains of rubberised silk.

Warning Signal

The index of shutter speeds turns to red when the shutter and film speed settings are off the meter's measurability range.

Finder

Pentaprism finder with microprism Fresnel lens for instant focusing; approximately life-size magnification with 55mm lens.

Focusing

Turn the distance scale ring until the subject image on the ground glass comes into focus.

Reflex Mirror

Instant return type with special shock absorbers for minimum vibration.

Film Transport

Ratchet-type rapid wind lever (for film advance and shutter cocking) 10° pre-advancing and 160° advancing angle.

"Cocked" Indicator

A red disc appears in a small window alongside the shutter release button when the shutter is cocked, and blacks out when it is released.

Film Exposure Counter

Automatic re-set type.

Lens Mount

42mm threaded lens mount.

Flash Synchronisation

Equipped with FP and X flash terminals. Electronic synchronisation at 1/60 sec.

Exposure Meter

Built-in meter measures the brightness of the ground glass, couples directly to shutter and film speed settings. Film speed (ASA) setting ranges from 20 to 1600 (LV1-18 for ASA-100 film with standard lens). Meter is powered with a mercury battery.

Film Rewind

Rapid rewind crank for speedy film take-up. Film rewind release button on bottom of camera body rotates while film is being rewound.

Loaded Film Indicator

Loaded film reminder dial underneath film rewind knob is marked "PANCHRO" (black-and-white), "COLOR" and "EMPTY".

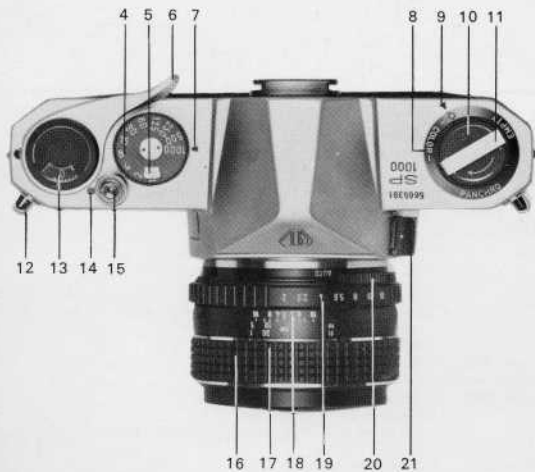
Dimensions

Width 143mm x height 92mm x thickness 88mm.

Weight

820 grams (1 lb. 13oz.) with standard lens. Body alone: 610 grams (1 lb. 6 oz.).

Asahi Pentax SP 1000



- | | | | |
|----|------------------------------|----|----------------------------------|
| 1 | Depth-of-field preview lever | 12 | Strap ring lug |
| 2 | X flash terminal | 13 | Automatic reset exposure counter |
| 3 | FP flash terminal | 14 | "Cocked" indicator |
| 4 | Shutter speed dial | 15 | Shutter release button |
| 5 | ASA film speed setting | 16 | Focusing ring |
| 6 | Rapid wind lever | 17 | Distance scale |
| 7 | Shutter speed index | 18 | Diaphragm and distance index |
| 8 | Film type reminder dial | 19 | Depth-of-field guide |
| 9 | Film type index | 20 | Diaphragm ring |
| 10 | Rewind knob | 21 | Exposure meter switch |
| 11 | Rewind crank | | |

Asahi Pentax Spotmatic F

Introduced at the end of 1973, the Spotmatic F is an open aperture metering version of the Spotmatic II. The specifications of the two cameras are identical apart from the metering system, the shutter release lock, and the styling of the lens focusing ring.

The meter of the Spotmatic F, which has a CdS cell fitted internally on each side of the viewfinder eyepiece, operates as soon as the lens cap is removed. Light measurement is continuous while the lens is uncapped. Should the lens cap be lost or misplaced the

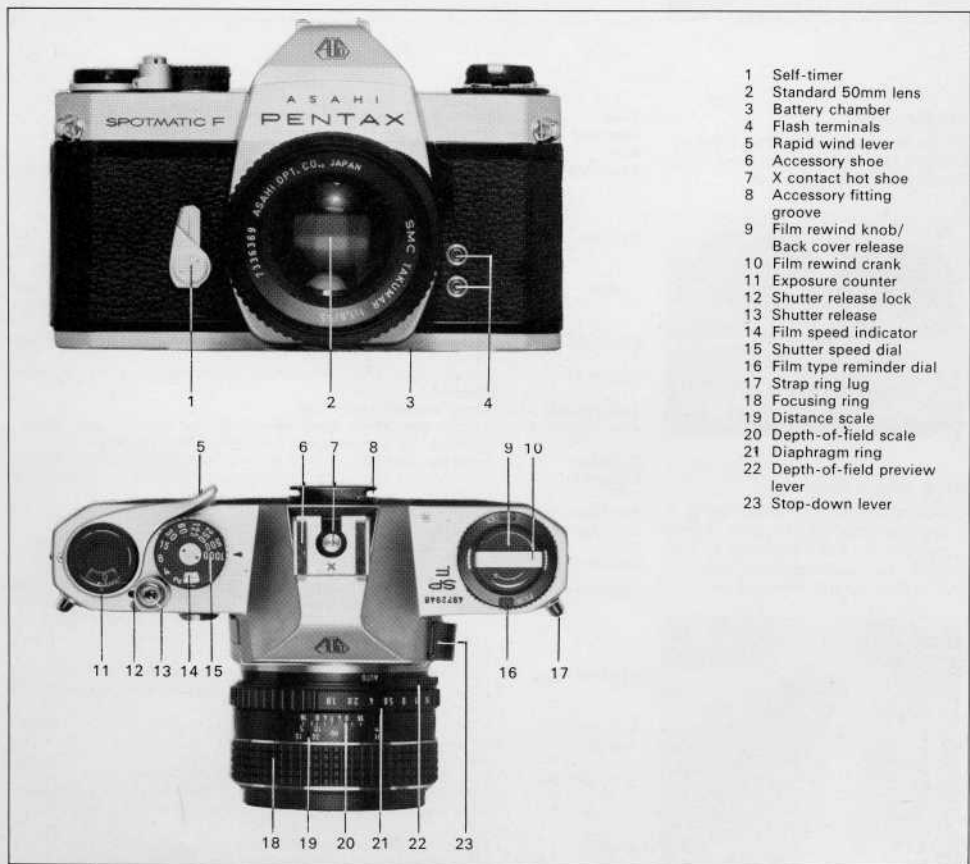
metering system can be switched off by keeping the camera case closed. The lens cap should be replaced as soon as possible.

Full aperture readings can be obtained with all the Super Multi-Coated Takumar lenses up to 300mm, with the exception of the Zoom 85-210. With the earlier Super Takumars, exposure is measured by the stop-down metering method, which makes it necessary to push the stop-down lever upwards to obtain a correct reading.

The Spotmatic F is supplied with a standard microprism fresnel screen.

There are five alternative screens which can be used for more critical focusing but these must be fitted by trained service personnel. Details of the various screens can be found on page PA11 of this manual.

The shutter release lock prevents accidental shutter tripping and can also be used to lock the release button down when making time exposures. The Spotmatic F accepts all the lenses and accessories designed for 35mm Pentax cameras.

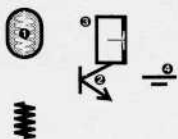
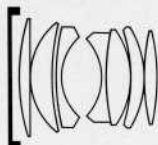


Exposure Meter turns itself on and off automatically

Remove the lens cap, and the light meter is switched on. Replace the cap or close the camera case or move it into a dark room, and the meter is switched off. This saves battery power and the bother of operating a meter switch.

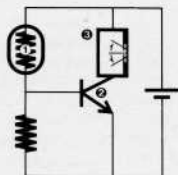
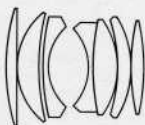


Lens cap on



- 1 No light reaches CdS cell. CdS cell remains nonconductive — no electric current can flow through it.
- 2 No electricity reaches base of switching transistor. Transistor is non-conductive — no current can flow through it.
- 3 As transistor lets no electricity pass, no current can flow through light meter circuit. Circuit is off.
- 4 Therefore: no battery drain.

Lens cap off



- 1 Light reaches CdS cell. CdS cell becomes conductive — current can flow.
- 2 Electricity reaches base of transistor, making transistor conductive. Current can flow from collector to emitter of transistor.
- 3 Current can now flow through light meter circuit. Light meter operates.

Shutter lock

Prevents accidental shutter tripping, but can also lock the shutter button down for a Time exposure.



Stop-down lever

Push this lever up when using a Super-Takumar lens or other special accessory on the Spotmatic F. This permits accurate exposure metering by the stop-down metering method.



Type	35mm single-lens reflex with built-in TTL light meter.
Film and Picture Size	35mm film (20 or 36 exposures) 24mm x 36mm.
Standard Lenses	SMC Takumar 50mm f/1.4 or 55mm f/1.8 with fully automatic diaphragm. Filter and lenshood size: 49mm. Distance scale: 0.45 (1.5 feet) to infinity. Focal plane shutter. Speeds: B, 1-1/1000 sec. Film speed (ASA) setting dial and window on shutter speed dial. Built-in self-timer releases shutter in 6-12 seconds. Shutter button lock provided.
Shutter	Pentaprism finder with micropism Fresnel lens for instant focusing; 0.89 x magnification with 50mm lens and life-size with 55mm lens. -1.0 diopter. 93% viewfinder coverage.
Finder	Turn the distance scale ring until the viewfinder image comes into focus.
Focusing	Instant return type with special shock absorbers for minimum vibration.
Reflex Mirror	42mm threaded lens mount.
Lens Mount	Ratchet-type rapid wind lever (for film advance and shutter cocking). 10° preadvancing and 160° advancing angle.
Film Advance	A red disc appears in a small window alongside the shutter release button when the shutter is cocked, and blacks out when it is released.
“Cocked” Indicator	Automatic re-set type.
Film Exposure Counter	FP+X contacts for conventional flash cord connection. X contact on hot shoe for convenient flash cordless connection.
Flash	
Synchronisation	
Exposure Meter	TTL CdS meter measures the average brightness of the ground glass at full lens aperture, and couples directly to shutter and film speed settings. Film speed (ASA) from 20 to 3200. LV3-18 for ASA 100 film with 50mm lens. Powered with one 1.3V mercury battery.
Film Rewind	Rapid rewind crank for speedy film take-up. Film rewind release button on bottom of camera body rotates while film is being rewound.
Loaded Film Indicator	Loaded film reminder dial underneath film rewind knob is marked 20 and 36 (Exposures), for color daylight type, for color tungsten type, and for black and white.
Dimensions	With SMC Takumar 50mm f/1.4: width 143mm (5.6”) x height 93mm (3.7”) x depth 91mm (3.6”). With SMC Takumar 55mm f/1.8: width 143mm (5.6”) x height 93mm (3.7”) x depth 90mm (3.4”).
Weight	894g (1lb. 13oz.) with 50mm lens. 842g (1lb. 11oz.) with 55mm lens. 642g (1lb. 5oz.) body only.

Asahi Pentax Spotmatic F Motor Drive

Combining the features of the Spotmatic F and the Motor Drive Unit I I. This camera offers a motor driven film wind system together with full aperture, through-the-lens metering.

The motor drive can be used for both single frame and continuous shooting. Switching from one to the other is quickly done by rotating a selector dial. Continuous exposures can be made at the rate of three frames a second at a shutter speed of 1/1000 second.

The Spotmatic F Motor Drive is available in two versions:

Set 36 is the standard unit with a normal back for 20 or 36 exposure cassettes.

Set 250 is fitted with a bulk film magazine which has a 10 metre film capacity giving a maximum of 250 exposures. The film is transported from cassette to cassette, which eliminates film rewinding. The magazine also incorporates a subtractive film counter and automatic stop mechanism which is activated when the counter reaches zero. It is worth noting that the bulk film magazines of the Spotmatic F MD,

and the ES11 MD, have different gearing locations and so cannot be interchanged.

The camera handgrip accepts one 12v NiCad rechargeable battery, which will power a maximum of 2000 exposures when fully charged. With accessories, the battery grip will also work off other power

sources such as eight penlight dry batteries, a 12v car battery, or AC mains.

Details of accessories and further information on the Motor Drive Unit can be found in Section 6 of this Manual. A specification of the Spotmatic F will be found on the previous pages of this section.

Specification

Camera	Asahi Pentax Spotmatic F Motor Drive.
Lens mount	Asahi Pentax/Takumar lens mount.
Film	35mm film.
Power source	12v NiCad rechargeable battery giving 2000 exposures at normal taking speed. 8 penlight dry batteries (on Battery Loader). Other 12v DC sources. AC mains (with Power Pack).
Exposure	Single-frame exposure at shutter speeds 1 second to 1/1000 + B. Continuous shooting at shutter speeds 1/60 to 1/1000 (Maximum of 3 frames a second at 1/1000). 20 or 36 exposures (Set 36). 250 exposures (Set 250).
Dimensions	Set 36 with SMC Takumar 50mm f/1.4. Width 143mm x Height 276mm x Depth 95mm. Set 250 with SMC Takumar 50mm f/1.4. Width 289mm x Height 276mm x Depth 99mm.
Weight	Set 36: 1.78kg. Set 250: 2.28kg.



Asahi Pentax Spotmatic F Data II Camera

Asahi Pentax Spotmatic F Motor Drive Data II Camera

Asahi Pentax Spotmatic F Data II Camera

The Asahi Pentax Spotmatic F Data II Camera has all the features of the Spotmatic F, with the addition of a Data II Recording Unit fitted to the back. It is a useful camera for those engaged in experimental, research, construction, or nature photography.

The Data Unit houses a three handed timepiece, circuit check pilot lamp, battery compartment, data plate, projection lamp, and a 6.3mm f/3.5 image projection lens. The information to be recorded, such as date, place, or description of subject, is handwritten on the data plate. The image projection lens is focused on either the face of the watch or the written data, which is then projected to an area 3.2mm in diameter in the top left hand corner of the film. The unit is powered by one 6v silver oxide battery, Ever-Ready 544 or equivalent, which will provide enough energy to properly expose data on films 50ASA to 800ASA.

The Data Unit can be detached from the camera, and when removed, the receptacle part is automatically light sealed, allowing the camera to be used as a standard Spotmatic F. The camera is supplied with a SMC Takumar 50mm f/1.4, but can, of course, be used with other lenses in the range.

Asahi Pentax Spotmatic F Motor Drive Data II Camera

This is a further adaption of the Spotmatic F, combining the facilities of the Data II, and Set 36 Motor Drive versions. The camera incorporates an open aperture, through-the-lens metering system, a motor driven film transport/shutter cocking system, and a data recording unit.

It is advisable to use the data unit only for single frame shooting, otherwise the recorded information is liable to be blurred. Even so, it is possible to make exposures at the rate of one frame a second.

The Spotmatic F Motor Drive Data II Camera will accept all the SMC Takumar lenses and can be used with the Asahi Pentax 35mm camera accessories.



Section 5
Asahi Pentax
Spotmatic II

Asahi Pentax Spotmatic II

The introduction of the Asahi Pentax Spotmatic II during the spring of 1971 marked another notable first for the Asahi Company. It was the first camera to be supplied with multi-coated lenses as standard. One of the refinements was the addition of a hot accessory shoe for a cordless flashgun, the shoe becoming live when the flashgun is fitted. The FP/X syncro switch under the rewind knob selects the correct delay for the particular flashbulb which is being used through the hot shoe. The camera also incorporates standard 3mm FP and X syncro outlets beside the lens mount. The self-timer mechanism has been redesigned with delay from 5 to 13 seconds. The camera is also fitted with an easy loading spool, once the film leader has been tucked into the spool it is gripped ready to be wound on. The die-cast body, which is finished in satin chrome and black, has a 42mm lens mount which will accept all the Takumar lenses from 17mm to 1000mm. A black finished body is also available. All the Asahi Pentax accessories can be used with the Spotmatic II.

Type

35mm single-lens reflex with built-in light meter.

Film and Picture Size

35mm film (20 or 36 exposures).
24mm x 36mm.

Standard Lenses

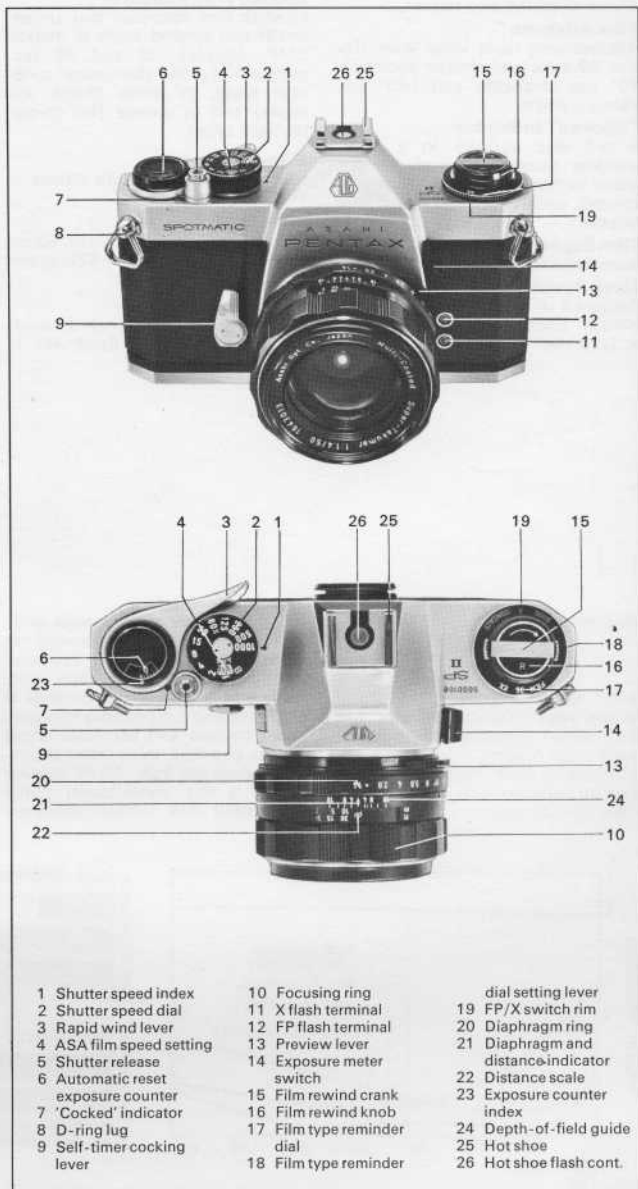
Super-Multi-Coated Takumar 50mm f1.4 or 55mm f1.8 with fully automatic diaphragm. Filters and lens-hood size: 49mm. Equipped with diaphragm preview lever which affords visual check of depth of field. Distance scale: 45cm (18") to infinity.

Shutter

Focal plane shutter, with single non-rotating dial. Speeds: B, 1-1/1000 sec. Film speed (ASA) setting dial and window on shutter speed dial. Built-in self-timer releases shutter in 5-13 seconds. Shutter curtains of special rubberized silk.

Warning Signal

The index of shutter speeds turns to red when the shutter and film speed settings are off the meter's measurability range.



Finder

Pentaprism finder with microprism Fresnel lens for instant focusing; 0.88x magnification with 50mm lens and approximately life-size with 55mm lens.

Focusing

Turn the distance scale ring until the subject image on the ground glass comes into focus.

Reflex Mirror

Instant return type with special shock absorbers for minimum vibration.

Lens Mount

42mm threaded lens mount.

Film Advance

Ratchet-type rapid wind lever (for film advance and shutter cocking), 10° pre-advancing and 160° advancing angle.

"Cocked" Indicator

A red disc appears in a small window alongside the shutter release button when the shutter is cocked, and blacks out when it is released.

Film Exposure Counter

Automatic re-set type.

Flash Synchronization

Equipped with FP and X flash terminals. Electronic synchronization at 1/60 sec.

Exposure Meter

Built-in meter measures the brightness of the ground glass, and couples directly to shutter and film speed settings. Film speed (ASA) settings ranges from 20 to 3200 (LV1-18 for ASA-100 film with standard lens.) Meter is powered with a mercury battery.

Film Rewind

Rapid rewind crank for speedy film take-up. Film rewind release button on bottom of camera body rotates while film is being rewound.

Loaded Film Indicator

Loaded film reminder dial underneath film rewind knob is marked EMP. (empty), 20 and 36 (exposures) in green (for colour; tungsten type), in white (black and white) and in orange (for colour; daylight type).

Dimensions

Width 143mm × height 93mm × thickness 88mm.

Weight

853 grams (1 lb. 11 oz.) with 50mm f1.4 lens. Body alone: 622 grams (1 lb. 4 oz.)

Multi-coated lenses

The following multi-coated lenses are available for the Spotmatic II.

Super Multi-coated Takumar 50mm f1.4

A high speed 7 element lens Super Multi-coated for higher light transmission. It gives improved contrast and richer colours and eliminates ghost images or flare when shooting against the light. This is an ideal lens for colour photography.

Lens elements	7 in 6 groups
Maximum aperture	F1.4
Minimum aperture	F16
Minimum focusing distance	0.45m
Angle of view	46°
Weight	250g

Super Multi-coated Takumar 55mm f1.8

As with the f1.4, this lens reduces flare and boosts contrast to a degree far beyond that which was previously possible in optical technology. The tougher coating makes this lens and the f1.4 more scratch-resistant and durable.

Lens elements	6 in 5 groups
Maximum aperture	F1.8
Minimum aperture	F16
Minimum focusing distance	0.45m
Angle of view	43°
Weight	239g

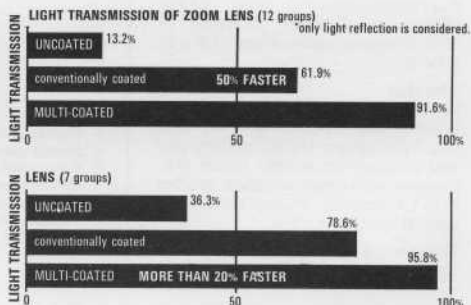
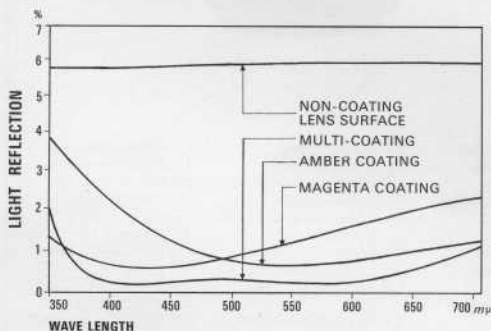
Multi-coating

With the introduction of these lenses Asahi Optical became the first camera manufacturer to adapt multi-layer coating on camera lenses. Hitherto, multi-coating was used only for high precision machines and other special technical applications.

The multiple layers of special anti-reflective agents has resulted in higher light transmission, reducing the light reflection on each glass surface to 0.3%. Picture contrast is improved and it is possible to obtain richer colours and eliminate ghost images and flare, even when shooting against the light. Multi-coating allows a flat transmission curve throughout the visible spectrum

ensuring that all colours pass with equal intensity, resulting in better colour balance. UV filters are unnecessary because ultra-violet light is reflected and not passed through to the film.

The charts illustrate graphically the difference in reflectance and light transmission between uncoated, conventionally coated and multi-coated lenses.



Section 5A
Asahi Pentax ES

Asahi Pentax ES

The Pentax ES provides a complete new phase in photography. The truth is that many professional photographers or even advanced amateurs who really know their equipment have, understandably, felt reluctant in the past to show interest in any previous form of automatic exposure system.

Indeed, those whose professional skills are so categorised, understandably wish to be in complete control of the system and all ensuing points relating, up to, and culminating in the final exposure. The Pentax ES can truly be said to offer the 'best of both worlds', the significance being in the distinct choice that is available, i.e. fully automatic exposure by means of the electronically controlled shutter, in conjunction with lens aperture pre-selection and manual over-ride, or the utilisation of the mechanical or manually operated shutter speeds.

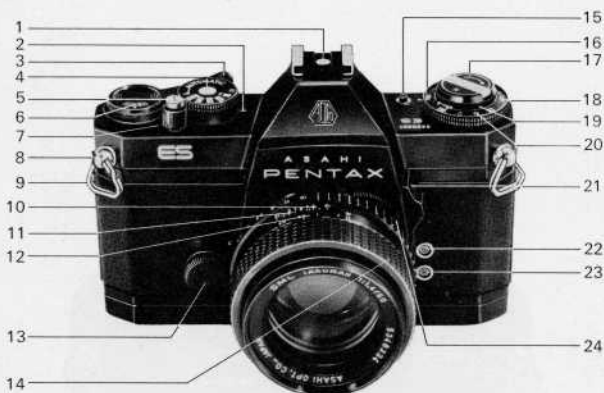
First then, let us discuss and examine the essential differences between the Asahi Pentax ES and Pentax Spotmatic II. At first glance there appear few external changes. The word 'Spotmatic' no longer appears on the front face of the camera beneath the shutter speed dial: instead, a bold and slightly stylised symbol consisting of the letters ES (Electronic Shutter). The delayed action mechanism has been eliminated, and the space on the front face of the camera utilised as a recessed housing for the six-volt battery required to power both the electronic shutter and TTL exposure meter mechanism. Further scrutiny reveals a marginally deeper base-plate, space having been cleverly provided to incorporate the complex electronic circuitry. This has increased the overall height by just 3mm to a total of 98mm. This, and other minor changes have also led to a weight increase of 60 grams.

On turning the camera around and observing the top plate carrying the major control assembly, further changes will be noted. The shutter speed dial now has engraved in white the speeds: 1/1000 - 1/500 - 1/250 - 1/125 - 1/60 second and 'B' (Brief Time). There is also the word 'Automatic' and beside it a wedge shaped indicator. The dial locates with a positive 'click' when

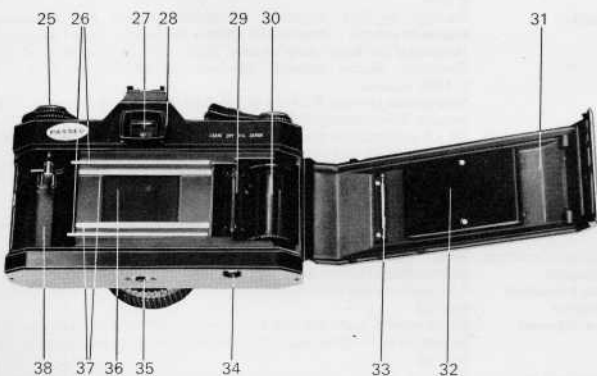


Type	35mm through-the-lens metering single-lens reflex camera with focal plane electronic shutter for automatic exposure control.
Film/Picture Size	35mm film. 20 or 36 exposures. 24 x 36mm.
Viewfinder	Permanently housed eye-level pentaprism finder incorporating a microprism focusing grid in centre of Fresnel lens. Finder magnification 0.89 with 50mm lens. Shutter speed calibration, through-the-lens meter needle and battery 'Live' mark on right side of viewfinder screen.
Shutter	Through-the-lens metering electronic shutter for automatic exposure control - mechanical shutter for manual speed selection. Horizontal run focal-plane shutter. Shutter blinds of rubberised silk. Electronic shutter speeds. Infinitely variable between 8 and 1/1000 second. Mechanical shutter: B., 1/60 (X), 1/125, 1/250, 1/500 and 1/1000 second. Non-rotating dial.
Flash Synchronisation	FP - X contacts for conventional flash cord connection. Synchronised at 1/60 second or faster for F.P. Flashbulbs. Hot shoe on top of prism housing with X contact. Synchronised at 1/60 second. Cordless connection. Instant return type.
Reflex Mirror	Rapid ratchet type window lever for film advance and shutter cocking. 10° pre-advance angle - 160° advance angle.
Film Transport	When 'cocked' a red disc appears in a window alongside the shutter release button and blacks out after firing. Automatic re-set type. Exposure counter resets to -2 when back is opened.
Shutter Cocking Indicator	Rapid rewind crank for fast film take-up. When depressed, rewind button on base of camera body releases film from take-up spool for rewind.
Film Exposure Counter	(0.5x, 1x, 2x, 4x). 1x for normal exposure. 2x, 4x, 0.5x for intentional controlled over/under exposure.
Film Rewind	42mm thread, Pentax mount. Width 143mm (5.6"). Height 98mm (3.86"). Thickness 91mm (3.6") 940g. (2lb. 1oz.) with 50mm f1.4 lens.
Exposure Factor Control Dial	Super-Multi-Coated Takumar 50mm f1.4 and 55mm f1.8 with automatic diaphragm. Distance Scale: 0.45m (1.5ft) to Infinity. Depth-of-field scale: Filter size 49mm.
Lens Mount	By rotating the Distance Ring until the Viewfinder image is sharply defined. Minimum focusing distance: 0.45m (1.5 ft.)
Dimensions	Black.
Weight	CdS activated TTL meter for open diaphragm and stop-down readings. Light measurement range EV1 - 18 with ASA100 film. ASA speed scale 20 - 1600.
Standard Lenses	6 volt silver oxide. Every-Ready 544. Mallory 4G13.
Focusing	
Finish	
Exposure Meter	
Battery	

Major Working Parts



- | | | |
|-----------------------------------|--|--|
| 1 X contact 'hot-shoe' | 10 Diaphragm and distance index | 18 Film speed indicator |
| 2 Shutter speed index | 11 Depth of field guide | 19 Film type reminder dial alignment indicator |
| 3 Film transport rapid wind lever | 12 Distance scale | 20 Film type reminder dial |
| 4 Shutter speed dial | 13 Battery housing | 21 'Stop-down' lever |
| 5 Shutter release button | 14 Focusing ring | 22 FP flash terminal |
| 6 Exposure counter | 15 Battery check button | 23 X flash terminal |
| 7 'Cocked' indicator | 16 Exposure factor control dial | 24 Diaphragm control ring |
| 8 D-ring lug | 17 Film rewind knob/camera back opening device | |
| 9 D-ring | | |



- | | |
|--|--------------------------|
| 25 Folding film rewind crank | 31 Camera back |
| 26 Film guide rails | 32 Film pressure plate |
| 27 Viewfinder eye-piece | 33 Film locating roller |
| 28 Viewfinder accessory retaining groove | 34 Film rewind button |
| 29 Film transport roller and sprockets | 35 Tripod bush |
| 30 Film take-up spool | 36 Shutter blind |
| | 37 Film guide rails |
| | 38 Film cassette chamber |

rotated for selection of the required setting.

A further minor change can be noticed (or felt) at the end of the film transport lever where the grooving is slightly smoother, although still affording adequate 'feel' and location for the thumb.

The viewfinder and focusing screen is basically unchanged, employing in fact the same optical system as on the previous model. However, there is now incorporated to the right of the focusing screen a vertical scale reading 1/1000 - 1 second. The scale is fractionally outside the actual critical picture viewing/taking area, and is extremely legible. Another rather unique feature is that the scale remains brilliant and easy to read, under virtually any normal lighting conditions.

The film rewind crank assembly has been re-designed, and apart from providing index settings on the surrounding milled discs for film data information (both film 'type' and 'speed') there is also a completely new control known as the Exposure Factor Control Dial. Its purpose is to allow intentional over/under exposure whilst the camera is being employed with the fully automatic control setting. This over-ride control may be required for several reasons, e.g. when exposing against the light, or when photographing a relatively small illuminated subject against a large dark background.

Once the necessary over-ride setting has been made, the fully automatic shutter of the ES compensates accordingly.

The film type reminder index is also quite new. This consists of a pair of small protruding pointers on the outer edge of a disc located beneath the rewind knob. It is set by gently pulling out the rewind knob and rotating the selector dial to the appropriate symbol, i.e. Daylight, Tungsten, Colour, Black & White, or Empty. The film speeds incorporated range from ASA20-1600, and are set by lifting, rotating and lowering the milled disc surrounding the rewind crank. Manual over-ride of the automatic exposure control is also operated by turning the upper milled disc bearing settings ranging from 0.5x, 1x, 2x and 4x (for normal operation the dial is left at the 1x position). The full significance of this over-ride control will be dealt with in the section 'Handling Technique' on page ES4.

There is a broader and new type knurling forming the focusing grip around the lens barrel, which appears to be a slightly soft synthetic material providing a more positive 'feel', especially when working out of doors or with cold fingers. Very noticeable is the constant striving on the part of the manufacturers to produce the finest possible instrument, which is seen with regard to these comparatively

trivial changes, i.e. the thumb grip on the film transport lever and the lens knurling, trivial, perhaps, in themselves, but so important collectively.

As mentioned earlier, the delayed action mechanism has now been abandoned and the space utilised to provide a housing for the silver oxide type battery (used for powering both shutter and TTL exposure meter). The battery used is a 6 volt Ever Ready No. 544 or Mallory 4G13. Naturally, the cell must never be allowed to drop beneath a minimum specified power, and so a test button is provided to the right of the rewind assembly which when depressed will cause a deflection of the meter needle to within a specified segmented area of the scale (opposite the figure 30). If the needle fails to reach the specified area then replacement of the cell is essential and it is for this reason that users of the Pentax ES will normally wish to carry a spare.

Incidentally, if the shutter is fired and an exposure made with the shutter speed set on the 'automatic' position with an 'exhausted' battery, the shutter will work at 1/1000 second.

It should be emphasised, however, that the Pentax ES does virtually offer the 'best of both worlds' allowing normal manual operation

of the mechanical shutter speeds as and when required. Now, let us examine two extremely important features to be found in this camera. The first is what Asahi term the 'Memory' device (Diagram below). Electronic exposure control in one form or another is not new and indeed has been used in certain cameras for a number of years. However, Asahi Pentax ES represents a 'world's first' in relation to the introduction of electronic exposure control used in conjunction with TTL metering incorporated in a 35mm SLR camera.

Certainly without the 'Memory' device the system just could not function, and it is to Asahi's very real credit that a means has been found to overcome what seemed until recently a seemingly insuperable problem. In brief, the problem was caused by the obstruction of the light path through the lens immediately prior to the opening of the shutter, due to the lifting of the reflex mirror assembly. With the ES system any fluctuation of light is 'noted' from the moment the shutter release is partially depressed (at which time the meter is switched on) up to the moment the shutter is released, when the reading is 'locked'. This is achieved by means of an electro-magnet energised by the current flowing through and from

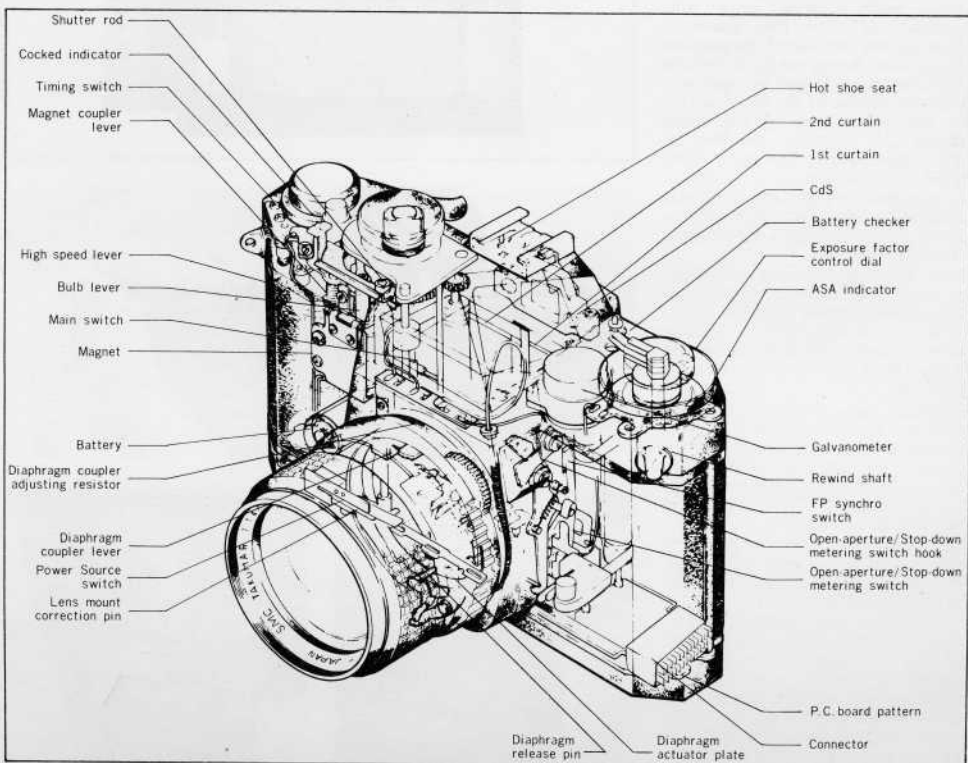
the photo resistive elements of the CdS meter.

The result is that according to the light intensity, governing in turn the strength of current flowing through the magnet, so is determined the actual position of the core of the magnet at that precise moment. This in turn controls the slit width of the focal plane shutter blind which governs the exact shutter speed.

Therefore, although the meter is virtually 'inoperable' during that brief period when, as mentioned above, the light rays are obscured from the CdS cells by the lifting of the reflex mirror assembly the focal plane shutter has been programmed, pre-set as it were - ready for the correct exposure to be made.

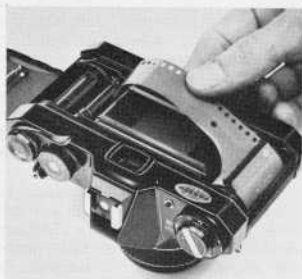
A further and obvious advantage is that the system permits an infinitely variable range of shutter speeds ensuring very accurate exposure. The 'memory' device regulates the light intensity up to the moment the exposure is made. It may result in a shutter speed of 1/727 or 1/13 second, but whatever the actual speed it will be correct.

So much, then, for constructional and design changes, and the broader concept of the Asahi Pentax ES. We turn now to the actual handling of the camera.





1



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Much of the handling technique of the Asahi Pentax ES is similar, if not identical, to the Spotmatic and normally this would not be repeated in detail for obvious reasons. As, however, many controls have been re-designed, sometimes in order to incorporate additional features, it has been decided to fully illustrate and discuss all matters relating to the handling of the camera, with particular emphasis being placed on the new AUTOMATIC features.

Let us start where film is loaded into the camera, the necessary controls set, and finally the unloading procedure.

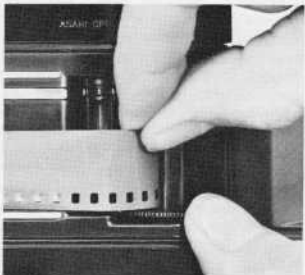
The camera back is opened by pulling out the rewind knob (1) until the back cover springs open. The film cassette is then placed into the cassette chamber and the rewind knob pushed back into position. (2) The film leader is inserted into the slot of the take-up spool, care being taken to ensure that the tongue is well secured, and with the offside of the film flush up to the inside face of the spool flange (3). Transport the film by alternately turning the rapid wind lever and depressing the shutter release button until both sprockets engage in the film perforations. Close the camera back by pressing it gently but firmly.

Next advance the rapid wind lever and note that the film rewind knob turns automatically counter clockwise, so indicating that the film has been correctly loaded and is moving freely from cassette to take-up spool (4).

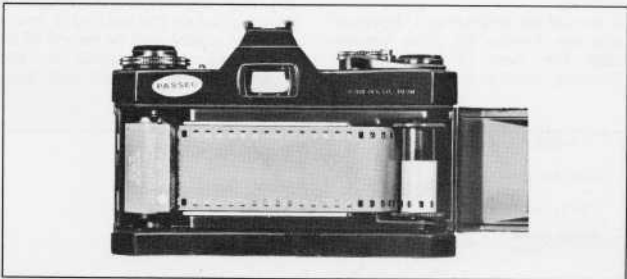
Normally, two or three blank exposures should be made before exposing the first picture. Therefore, advance the film until the exposure counter turns to and indicates '1', at which stage the first picture is ready to be taken (5).

There remains but the setting of the film speed on the appropriate dial, and the recording of the actual type of film material employed.

It is felt that great stress should be laid on the importance of the setting of the film speed dial, since, of course, if this is overlooked or forgotten and the film loaded is of different speed to that previously employed, then all subsequent work will be in jeopardy. The illustration



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(6) shows clearly the action, which is just a matter of lifting and rotating the outer ring of the exposure factor control dial and turning until the appropriate ASA number appears in the indicator window, then lowering and locking the ring in that position. The table shows a useful range of ASA/DIN speed comparisons.

	1250	1000	640	500	320	250	160	125	80	50	40	25
ASA	1400	800	400	200	100	64	32	20				
DIN	33	30	27	24	21	18	15					

The film type reminder dial (7) is operated by gently pulling out the rewind knob and turning the selector to the appropriate symbol, after which the knob should be pushed back (8).

- ☀ indicates daylight colour film
 - ⊗ indicates Tungsten type colour film
 - ◻ indicates black and white film
- EMP.** indicates when the camera is left unloaded.

Once the final exposure has been made it is necessary to lift into position the Film Rewind Crank, which is a simple up and over movement, as illustrated (9). Then depress the film rewind release button (10) on the base of the camera, which disengages the transport gears and turn the rewind crank in a clockwise direction as shown (11), in order to rewind the film back into the cassette. If this is done with moderate care it is quite easy to feel the tension suddenly slacken, indicating that the leader end of the film has been released from the take-up spool. If desired the film may be wound completely into the cassette, but on no account should unnecessary winding take place, since this can lead to the formation of stress or scratch marks, due to unnecessary and over-tightening of the film coil. Finally, pull out the rewind knob, thus opening the camera back, and remove the film cassette.

N.B. It should hardly be necessary to add that one should avoid sun or bright light when loading or unloading the film.

Let us now assume that the camera has been loaded with film and the appropriate film speed set on the ASA film speed indicator dial (12).

Check to see that the Exposure Factor Control Dial is at the 1x (normal exposure setting) (13).

Determine and preselect the required aperture and turn the shutter speed dial to the 'Automatic' position by aligning the indicator mark with that on the camera body (14 and 15).

Having once selected, focused and composed the subject, the electric circuit is then switched on by applying light first pressure to the shutter release button (16). The meter needle will now indicate the correct shutter speed on the viewfinder scale (17). Finally, fully,



8



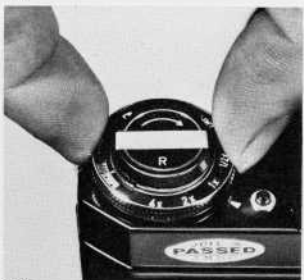
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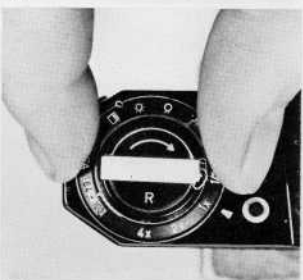
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12



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14



15

depress the shutter release when ready to expose.

Reference has already been made to the 'Memory' Device which virtually 'takes over' the moment the shutter release is fully depressed and 'holds' the exposure until the mirror assembly is raised and the shutter fired. Just as first pressure on the shutter release switches the circuit on, the circuit is broken the moment the release button returns to the 'up' position.

The sliding control of the 'stop-down' lever (18) is normally left in the 'down' position for full aperture exposure reading. This, as we know, means that the lens aperture (or diaphragm to be more specific), remains fully open and stops down to the pre-selected 'f' stop as the shutter release is fully depressed. The control should be moved upwards, however, to obtain depth-of-field preview or for taking a normal exposure reading with the lens 'stopped-down'.

For any novice who might be fortunate enough to be using the Asahi Pentax ES, the following guide to aperture settings may be of

interest.

Fine weather	f8-f11
Cloudy weather	f4-f5.6
Indoor shots	f2-f2.8

Naturally, the advanced amateur or professional will determine the correct aperture directly in relation to the specific requirements of the subject and available lighting conditions. Alternatively, he may, under certain circumstances, find his work dictates the shutter speed requirement as first priority. In this case it is equally convenient and fast to simply rotate the lens aperture ring in either direction until the specified shutter speed appears against the meter indicator needle in the viewfinder, finally checking, if necessary, the actual aperture reading from the aperture control ring.

It is therefore apparent that one is left free to think about the essential details, e.g. composition, facial expression, or the precise moment when to 'stop' a moving object, etc. This does not, of course, restrict in any way choice regarding lens, whether standard, wide-angle or telephoto, or special accessories,

such as bellows unit or extension tubes.

The Pentax ES has, as stated earlier, an Exposure Factor Control Dial, or, in other words, a manual over-ride of the Automatic System. The fact that there will be occasions when the photographer needs to countermand the Automatic mechanism has not been overlooked.

For normal exposures (19) the dial is always positioned at 1x. When photographing under conditions where it is required to intentionally increase the normal exposure, e.g. over expose when photographing against the light, etc. the dial is set to 2x or 4x according to requirements (20).

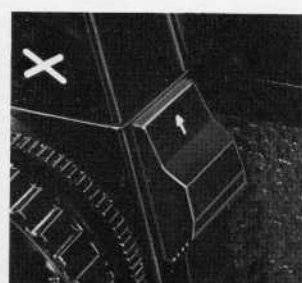
Alternatively, if a reduction in exposure is required (under-exposure) then this again is obtained by setting to the $\frac{1}{2}$ x position. The settings are achieved by turning the outer ring of the rewind crank assembly until the required exposure factor number is located against the small wedge shaped indicator on the camera body. Each of the four positions locates quite positively with a 'click' stop



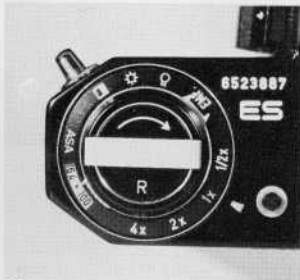
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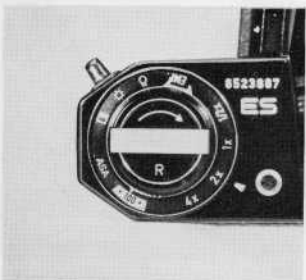
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20



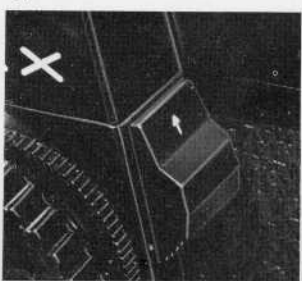
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ES6



23



24

action. In fact, the dial may be set at any position between the indicated settings should an even more variable control be required. In this case some care must be exercised to avoid accidental turning of the control dial, as there are no further positive locating stops.

Indeed, one must also remember always to reset the dial back to the 'standard' or 'normal' 1x position for all normal automatic exposure readings.

It is, nevertheless, a comforting thought that when exposure adjustment is required and the appropriate setting made, the automatic system once again takes over and no further adjustment or effort is necessary.

Lastly, perhaps for exceptional circumstances, even further exposure control can be obtained by physically changing the ASA setting.

'The best of both worlds'. This phrase was used elsewhere to describe the A.P. ES in relation to the choice of automatic or mechanical shutter operation. True, the speed range of the mechanical shutter is somewhat restricted but, nevertheless, it is sufficient for most normal requirements, ranging from 1/60, 1/125, 1/250, 1/500 and 1/1000 sec. and 'B' time (21), (22). The 1/60 setting is marked with an 'x' and is used for electronic flash synchronisation.) The required speed is simply aligned with the small wedge shaped indicator on the camera body. If use is to be made of the TTL meter for checking exposure, then readings must be taken on the 'automatic' setting and the shutter speed transferred to the non-auto range of speeds.

In effect, this is a camera which, apart from finding a suitable subject and focusing itself, is really automatic and well-nigh foolproof—and yet here is a camera of the highest possible precision manufacture, with an enormously wide range of features, that the most exacting and demanding professional photographer will find hard to fault. Are there really no faults, no hidden snags?

The camera system which can be said to answer in the affirmative will probably never exist, for the very fact that all types of users have to be considered and catered for, is in itself a complex problem.

However, there really are very few criticisms that can justifiably be levelled at Asahi Pentax ES. Really nothing more than a warning or two, perhaps for the slightly less initiated.

1. Do bear in mind that most people are unable to *guarantee* holding a camera perfectly still for more than, say, 1/30 second. Therefore, if the shutter speed indicator is showing speeds slower than this, do take precautions. Obviously, the first option is to open the lens to a wider aperture if possible, which will automatically shorten the ex-

posure time. But, if the lens is already fully open, or if, on the other hand, it is felt that 'opening up' further will result in insufficient depth-of-field then remedial action is called for, such as use of some sort of support or tripod.

2. On occasions it might be of some concern to users when a slow shutter speed is indicated beyond, say, 1 second duration and one is unable to determine just how much longer than 1 second the speed will be. On the other hand, the very real advantage of being able to obtain accurate automatic exposure on these longer exposure times almost certainly offsets the slight uncertainty referred to above.

It is also interesting to note that automatic exposure times far in excess of the claimed manufacturer's range of 1/1000 second—8 seconds are possible. In fact, times in excess of two minutes are quite feasible and must be of immeasurable value to those whose work requires or demands really long exposures.

Architectural work in dimly lit interiors or perhaps when working

with extension tubes or bellows are just two possible examples.

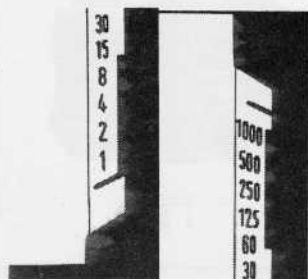
However, reciprocity failure must be taken into consideration, particularly when working with colour if really long exposures are to be made.

When using TTL metering and the Automatic shutter system care should be taken to observe the following points.

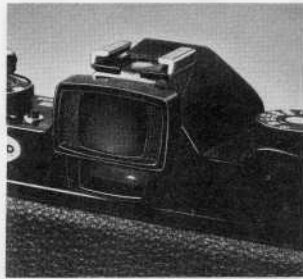
After cocking the rapid wind lever light first pressure of the shutter release switches on the electric circuit. (23)

For open-aperture reading ensure that the stop-down lever is in the 'down' position (24).

If the needle reaches above '1000' close down the lens diaphragm until the needle moves below '1000'. If the needle goes below '1' the shutter speed indicates an exposure longer than 1 second. The electronic shutter of the ES is guaranteed to work correctly down to 8 sec. (25). When making longer exposures and the viewfinder is not in continuous use, use the plastic cap provided to shield any light from entering the viewfinder which



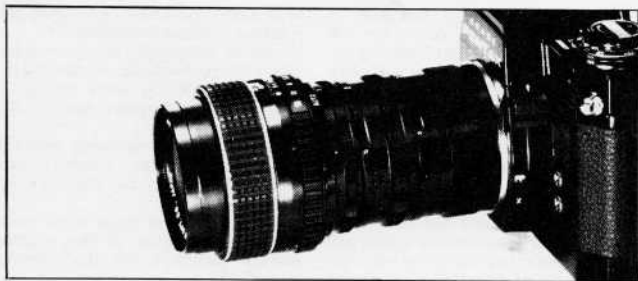
25



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may otherwise affect exposure (26). Finally, depress the shutter release button fully when ready to make the exposure. Once the shutter is released and the finger is removed from the shutter release button, the meter circuit is *off* and the needle will return to the top of the scale.

As is shown under the heading 'Asahi Pentax ES specification' the two standard lenses available are the Super Multi-coated Takumar 50mm f1.4 and the Super Multi-coated 55mm f1.8 both with fully automatic diaphragm (27).

All SMC lenses may be used on the ES body in the normal manner, with the exception of the SMC Takumar 85mm f1.9 and the SMC Takumar 85mm - 210mm Zoom, which do not have the open aperture reading pin, therefore necessitating use of the 'stop-down' lever for correct meter reading at the pre-determined working aperture.

With two exceptions (50mm f1.4 Super Takumar and the 55mm f1.8 Super Takumar which bears the inscription 1.8 on the left of the diaphragm ring and 16 on the right) all other lenses and accessories can

be used. It is, however, necessary to remember to slide the 'stop-down' lever upwards for correct exposure meter reading, or depth of field check at the pre-determined working aperture for correct automatic exposure (28).

In common with other camera optical systems, photography with infra-red film requires the use of the infra-red index when focusing, which is clearly marked with an orange line or a small 'R' on the depth-of-field guide (29).

In use it is necessary to first focus the lens on the subject in the normal manner. Next check the distance on the focusing scale, the re-adjust by turning the actual distance mark to the engraved 'infra-red' index. A somewhat fuller explanation relating to differences in the wavelength band between European and Japanese infra-red films is to be found on page SP5 of the manual.

As with most precision instruments no matter how rugged and potentially 'fool-proof' they may be, there remain certain do's and don'ts if one is to avoid potential or actual damage, and the Asahi Pentax ES is

no exception. Warnings do appear in earlier sections of this manual and it is not intended to repeat these.

The following, however, are more specific points to note, as they relate directly to the mechanical handling and characteristics of the camera. For instance, when inter-changing lenses do ensure that the 'stop-down' lever is in the 'down' position otherwise the automatic diaphragm pin on the lens will strike the diaphragm activating lever, positioned within the camera body, with possible damage resulting.

Another potential source of danger is in the form of a safety device which might, conceivably, be the basic cause of damage if the user has not taken the elementary precaution of complete familiarisation with the camera prior to actual use. Should the shutter dial of the ES be set at 'Automatic' and the shutter released under any of the following circumstances the reflex mirror assembly will be raised for safety purposes - if:

1. The lens cap is on.
2. The lens has been removed from the camera body.
3. The stop-down lever is in the 'down' position when using 'stop-down' metering lenses or close-up accessories.

In fact, the reflex mirror assembly is lowered by turning the shutter dial off the 'Automatic' setting, or by sliding the 'stop-down' lever upwards.

Definitely, but definitely not by physically touching the mirror assembly!

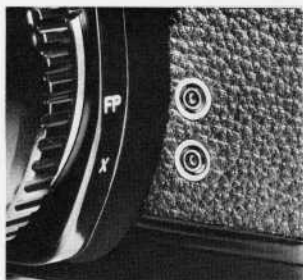
Always remember to reset to the 1x (normal) exposure position after making deliberate over/under exposure adjustment by means of the Exposure Factor Control Dial.

Always remember to re-set the shutter dial to 'Automatic' before exposing. Conversely, always remember to turn dial off 'Automatic' after exposure (unless re-exposing very shortly afterwards) in order to avoid wastage of battery by accidental depression of the shutter release. Do not make frequent (unnecessary) battery check readings, otherwise again the life of the cell will be needlessly curtailed.

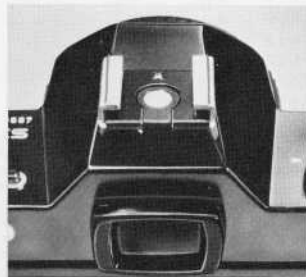
The Pentax ES incorporates FP and X terminals on the front face of the camera body (30) with an additional X contact located in the centre of the built-in 'hot-shoe' on top of the Pentaprism housing (31). When using FP type flash bulbs the flash unit is connected to the appropriate co-axial terminal which, in fact, is the upper of the two contacts and is, further, clearly marked with the letters FP. The shutter dial is set at 1/60 sec. or faster according to the bulb in use, and reference should be made to the table.

The use of electronic flash again

SHUTTER SPEED		1/1000	1/500	1/250	1/125	1/60X
FLASH TERMINAL	FP	FP CLASS				
	X					



30



31



32



33



34



35



36

requires a shutter setting of 1/60 sec, but in this case it remains constant. Again the flash unit in use is connected according to type, i.e. in the case of cordless units such as Pentax Superlite II then these are simply slipped into the 'hot shoe' provided, and immediate electrical contact is established (32). Otherwise, the connecting lead is plugged into the X marked contact beneath the FP terminal. Thoughtfully, the manufacturers provide two small plastic cover plugs which afford protection to the two coaxial terminals, and these should, of course, be used at all times when they are not in use (33).

Perhaps at this stage it would be wise to discuss what might truly be described as the 'heart' of Asahi Pentax ES, i.e. the battery. Of course it is not true to say that the camera is utterly dependent on this cell. Nevertheless, for providing the necessary current required to actuate not only the CdS exposure meter but also the rest of the circuitry for automatic electronic shutter operation the power is essential. As stated the battery is housed on

the front face of the camera and secured in the housing by a small screw-on front cover cap (34), slightly knurled on the front shoulder to facilitate easy removal/replacement. The battery itself, as supplied with the camera, is a silver-oxide type, 6 volt, Ever Ready No. 544 or Mallory No. 4G13. To insert the battery first remove the housing cover, as shown, and ensure that the (minus) base of the battery faces inwards. Replace the cover cap securely. The power circuit is only used on three occasions (a) with the shutter speed dial set at 'automatic' and light first pressure applied to the shutter release button for the purpose of obtaining a light meter reading; (b) when the shutter release button is fully depressed and the blinds of the focal plane shutter actuated; (c) when checking the state of the battery.

Normally, the cell should provide a year's service, but this, of course, depends on a number of circumstances, including actual usage of the camera, excessive temperatures, even although the camera is not in use, and accidental wastage of the

cell's capacity. In order to check the actual condition of the cell, simply set the shutter speed dial at 'automatic' (35) and depress the black check button alongside the exposure factor control dial (36). If the meter needle drops to the notch facing 30 the battery has sufficient capacity. Should it fail to do this, however, then the battery must be replaced. It cannot be over-emphasised, however, that unnecessary usage of the cell must be avoided if full advantage is to be taken of the normal life expectancy. For this reason it is recommended that the shutter speed dial should not be left on the 'automatic' setting for any length of time after making an exposure, in order to prevent any accidental downward pressure being made upon the shutter release button, i.e. from the top of an E.R.C. etc. Lastly, whilst on this subject, should an exposure be made with the shutter speed dial set to 'automatic' at a time when the battery has become exhausted, the resultant shutter speed will be 1/1000 second.

Questions and Answers on the Pentax ES

Prepared by the manufacturers and reproduced here to give users a better understanding of the operation of the camera.

1. I fully understand that the electronic shutter of the Pentax ES is really meant for full system cameras such as the Pentax. Its shutter automation is guaranteed to work even with extension tubes, bellows, microscope, etc. Yet the shutter release is soft and silky smooth. On the other hand, EE cameras with aperture automation do not work when accessories are inserted between the lens and the camera body. Is there any difference between the range of automation provided by an EE type camera and that offered on the Pentax ES?

Yes, there is a great difference between the automation ranges of these two types of cameras. EE refers to aperture automation. If an f/1.4 lens is coupled to an auto exposure system, the range of aperture automation is between f/1.4 and f/16. According to the shutter speeds you use, the aperture works automatically (without extension tubes, etc.) between f/1.4 and f/16. — 7 'steps' as indicated below — the ratio of automatic light in-take between these f/stops is 1:128.

f/16 — 11 — 8 — 5.6 — 4 — 2.8 — 2 — 1.4 (7 steps)
1 2 4 8 16 32 64 128
(Ratio)

Table A

EV 1	1 sec.	f/1.4	2 sec.	f/2	4 sec.	f/2.8	8 sec.	f/4
EV 2	1 sec.	f/2	2 sec.	f/2.8	4 sec.	f/4	8 sec.	f/5.6
EV 3	1 sec.	f/2.8	2 sec.	f/4	4 sec.	f/5.6	8 sec.	f/8
EV 4	1 sec.	f/4	2 sec.	f/5.6	4 sec.	f/8	8 sec.	f/11
EV 5	1 sec.	f/5.6	2 sec.	f/8	4 sec.	f/11	8 sec.	f/16
EV 6	1 sec.	f/8	2 sec.	f/11	4 sec.	f/16		
EV 7	1 sec.	f/11	2 sec.	f/16				
EV 8	1 sec.	f/16						

Table B

EV 18	1/1000 sec.	f/16	1/500 sec.	f/22	1/250 sec.	f/32	1/125 sec.	f/45
EV 17	4/500 sec.	f/16	1/250 sec.	f/22	1/125 sec.	f/32	1/60 sec.	f/45
EV 16	1/250 sec.	f/16	1/125 sec.	f/22	1/60 sec.	f/32	1/30 sec.	f/45

If, instead of an f/1.4 we use an f/4 lens with minimum aperture f/16, the automation range of EE cameras covers only 4 steps. The ratio of automatic light in-take in this case is only 1:16.

The automation of the Pentax ES electronic shutter works in more steps and covers a greater ratio of automatic light in-take. If, for example, you are using an f/1.4 lens on the ES, the electronic shutter is guaranteed to work properly from 1/1000 to 1 second at f/1.4 with ASA 100 film. From 1/1000 down to 1 second, there are 10 steps and the ratio of automatic light in-take is 1:1024, as indicated below.

1/1000 — 500 — 250 — 125 — 60 — 30 — 15 — 8 — 4 — 2 — 1 (10 steps)

The ratio of light in-take at these shutter speeds will be: 1 — 2 — 4 — 8 — 16 — 32 — 64 — 128 — 256 — 512 — 1024. At f/4, it is guaranteed to work down to 8 seconds. (See Question 2) If you are using the f/4 aperture, there will be 13 steps (between 1/1000 and 8 seconds) (See Question 2), and the ratio of automatic light in-take between 1/1000 and 8 seconds will be 1:8192. Compare these figures of the Pentax ES automation with the automation of EE cameras:

Auto EE range of f/1.4 lens .. 7 steps at 1:128 ratio

Auto EE range of f/4 lens .. 4 steps at 1:16 ratio

Auto ES range at f/1.4 .. 10 steps at

1:1024 ratio (8 times greater)

Auto ES range f/4 .. 13 steps at

1:8192 ratio (64 times greater)

2. Does the automatic electronic shutter of the Pentax ES work down to 8 second or up to 1/1000 sec. at any f/stop?

Not exactly. The automatic shutter operating range of the ES is controlled by the TTL metering range from EV 1 to EV 18 with ASA 100 film. In other words, the lowest light level at which the electronic shutter of the ES works is EV 1, equivalent to the exposure of f/1.4 at 1 sec. Table A shows at what f/stops the electronic shutter is guaranteed to work properly at speeds slower than 1 sec. against varying Exposure Values starting from EV 1. (With ASA 100 film.)

On the other hand, the following table B shows the combination of f/stops and the highest shutter speeds at which the electronic shutter is guaranteed to work properly against varying values starting from EV 18.

In table B the fastest speeds at the f/stops 16, 22, 32 and 45 are 1/1000, 1/500, 1/250 and 1/125 sec. respectively.

2a. I understand that with ASA 100 film, the slowest shutter speeds at the f/stops 1.4, 2 and 2.8 are 1, 2 and 4 second respectively, and that the fastest speeds at the f/stops 16, 22, 32 and 45 are 1/1000, 1/500, 1/250 and 1/125 respectively. How about with ASA 25 and ASA 400 films?

TTL light metering range is decided, regardless of the ASA setting, by response range of photo cells. Therefore, for subjects of maximum darkness limit for this camera, you have the following choice of the slowest shutter speeds with each ASA film.

	ASA 25	ASA 100	ASA 400
f/1.4	4 sec.	1 sec.	1/4 sec.
f/2.0	8	2	1/2
f/2.8	—	4	1
f/4.0	—	8	2
f/5.6	—	—	4
f/8.0	—	—	8

As you note from the above table, 8-second exposure is beyond the maximum range for certain combinations of f/stops and ASA values. Therefore, when using slow shutter speeds, please check the ASA and f/stop settings to see that they are within the maximum slow speed range. For subjects of maximum brightness limit for the ES, you have the following choice of the fastest shutter speeds with the following ASA values.

	ASA 25	ASA 100	ASA 400
f/8.0	1/1000 sec.	—	—
f/11	1/500	—	—
f/16	1/250	1/1000 sec.	—
f/22	1/125	1/500	—
f/32	1/60	1/125	1/1000 sec.
f/45	1/30	1/60	1/5000

If the light intensity is too dark or too bright and beyond the maximum TTL metering range of the ES camera with a certain ASA value, the same light intensity is also beyond the maximum metering range with any other ASA value.

3. The lighting is very low and the meter needle indicates an unknown speed slower than 1 second. How would I know which speed the camera will select?

If you are willing to waste one or two frames, you can try releasing the shutter and counting the time it is open. The surest way is to open the aperture to f/1.4 (with an f/1.4 lens) and take up first pressure on the shutter release button. If the needle points at 1 second, then you will be able to expose at 8 seconds at f/4, as in the table in (2) indicates. If the needle indicates longer than 1 sec., the exposure will be longer than 8 sec. at f/4. We do not guarantee proper exposures at longer than 8 seconds, although you may be able to take fairly good pictures at speeds longer than 8 sec.

4. With some EE cameras, the needle keeps moving without depressing the shutter button. Would it be more convenient if the Pentax ES had the same system?

Yes and No. If the camera keeps the meter switched on, the meter needle keeps moving against the varying lighting conditions but you keep consuming battery power. Even when you actually do not need the needle movement. With the Pentax ES, the meter switch is so designed

that you switch on the meter only when you want to see the needle movement. This greatly extends battery life.

5. *When I softly depress the shutter release button of an EE camera I own, the meter needle stops moving and remains static even though the lighting condition changes. How does the varying lighting condition affect the needle movement of the Pentax ES?*

As you depress the shutter button of EE cameras, you hold the meter needle where it was and pre-stop the aperture. From this point on, the electric eye cannot read and respond to varying lighting conditions. With the Pentax ES, as the shutter release button is first depressed, the meter is switched on and continually responds to varying lighting conditions. The meter needle keeps responding against varying lighting conditions until you give the final push on the shutter button.

6. *Put a lens cap on the lens. No light is supposed to come in through the lens. So there should be no exposure reading and the electronic shutter of the Pentax ES should not work. But if I depress the shutter button (at AUTOMATIC), the shutter opens for a few seconds. Why?*

You are right that when the lens cap is on, no light is coming through the lens. But light can come in through the viewfinder eyepiece and the CdS cells delicately respond to that through-the-eyepiece light. Slide the eyepiece cap on the viewfinder frame to prevent light coming in through the eyepiece, and then depress the shutter button. The shutter will operate at several seconds first with the residual exposure information remaining in the automatic exposure circuit. As you repeat releasing the shutter, you will find that the shutter release time will become longer and longer as the residual memory is exhausted. But please do not repeat this too much as you will be only wasting the battery power.

7. *When I depressed the ES shutter button, the needle moved beyond '1000'. Is it a defect?*

It is not a defect. Close down the f/stop and you can bring the meter needle to '1000' or slower speeds.

8. *I removed the lens from the ES body and released the shutter at AUTOMATIC, but the mirror jammed. Is this a defect?*

No, it is not a defect. Push up the stop-down lever or turn the shutter dial from AUTOMATIC to '1000'. The mirror will come down to its normal position. Without a lens (such as when taking microscope photos) or when using extension tubes, bellows or non-open-aperture-reading lenses, always keep the stop-down lever in the UP position. Otherwise the mirror will be locked up for safety.

9. *Suppose I release the shutter for long exposures such as 8 second, and the subject is suddenly illuminated by a bright light. Does the electronic shutter respond to that sudden light variation?*

The electronic shutter of the Pentax ES does not respond to light variation after shutter release. The memory device remembers the light coming in through the lens just before the exposure action starts. The memory function just stops at that point. Therefore, if there is a sudden light

variation after shutter release during long exposures, take another picture for correct exposure.

10. *With an SMC-Takumar lens, I compared the meter reading between open aperture and stopped-down aperture, and found some differences in the shutter speeds indicated. Why?*

The ES TTL metering device is designed to work best at open aperture when using open-aperture-reading lenses such as SMC-Takumars. With stopped-down metering lenses, such as Takumars and Super-Takumars, always take the meter reading through the stopped-down aperture.

10a. *You have not answered my question. Why does the meter reading differ between open aperture and stopped-down aperture?*

There are a number of factors that account for this difference. Firstly, the difference of response characteristics of CdS cells against high- and low-intensity light. Through open aperture, the CdS cells respond quickly to bright light. With less light, however, the CdS cells respond slowly; this is unavoidable due to their response characteristics. Using a stopped-down aperture, much less light hits the CdS cells and it takes time for them to respond to the low-intensity light coming through the stopped-down aperture. When you saw the meter needle when taking a stopped-down reading, the CdS cells had not responded properly to the low-intensity light.

The light coming in through the viewfinder also tends to inflate the CdS response especially when the aperture is stopped down. When the aperture is stopped down to f/5.6, for instance, only 1/16 of the light which would come through an open aperture (f/1.4) will come through the lens and hit the CdS cells. In such a case, the light through the viewfinder will unavoidably affect the CdS response, thereby influencing the meter reading.

In addition, there are some other factors contributing to the difference you mention: tolerance of the variable resistor for aperture-preselection-to-current converter; tolerance in the rotation of the above converter pins in relation to the rotation of the f/stop ring; tolerance between the indicated f/stops and actual apertures; and tolerance in the electronic circuits. Because these factors are unavoidable, the difference you have mentioned does exist. This also applies to any other cameras which are claimed to take both open aperture and stopped-down aperture readings.

11. *What happens if I release the shutter on AUTOMATIC with the stop-down lever DOWN when using Super-Takumar lenses or the SMC-Takumar-Zoom 85-210mm lens? (Which does not have the open aperture coupling.)*

The meter needle will rapidly fall down to the bottom of the shutter speed scale in the viewfinder and you will instantly notice there is something irregular. And the mirror will be locked up. When using such lenses for stop-down metering, always keep the stop-down lever in the UP position. (To lower the mirror move the stop-down lever to UP or rotate the shutter dial to '1000'.) Incidentally, when using a stop-down

metering lens, please wait awhile after you close down the aperture (by moving the stop-down lever UP) before you depress the shutter release button for meter reading and shutter release. This is necessary to accustom the CdS cells to respond properly to the sudden change of light intensity. The length of the waiting time (between aperture stop down and shutter button release) depends upon how many f/stops you will be stopping down; in other words, it depends upon the extent of the change of the intensity of the light reaching the CdS cells. In extreme cases, this waiting time may be as long as 1 minute to give CdS cells full response time for optimum exposure results.

12. *When I look at my 50mm f/1.4 lens closely, I notice that the distance between the calibrations 1.4 and 2 is wider than the distance between those of 5.6 and 8. Why aren't they equidistant?*

According to the optical law, the peripheral light transmission decreases as the lens aperture opens up to its full-open position. Therefore, if the f/stops are calibrated equidistantly, the pictures will be underexposed at the full-open aperture position. Suppose a distance 'A' is required between the calibrations of 5.6 and 4 to double the light transmission through f/4, a distance wider than 'A' is required between the calibrations of 2 and 1.4 to double the light transmission through f/1.4.

13. *Put the ES on a tripod for long exposures. Release the shutter and keep your face away from the viewfinder. Will the light coming in through the eyepiece affect exposures?*

No. The Pentax ES memory remembers the light through the lens just before the exposure action starts and does not respond to any light through the lens or viewfinder eyepiece after that memory point.

14. *How would you compare the exposure reading through non-SMC-Takumar lenses at stopped-down aperture with SMC-Takumar at full aperture?*

The SMC-Takumar lenses transmit more light than non-SMC-Takumars, and therefore the meter will read slightly higher speed with SMC-Takumar lenses. No matter which lens you use, SMC-Takumar or non-SMC-Takumar, there is no worry about exposure accuracy.

15. *Should I make any adjustment when using a telephoto lens or a wide-angle lens at the AUTOMATIC setting?*

When using an open-aperture-reading SMC-Takumar lens, it is absolutely unnecessary to make any adjustment. When using a long telephoto lens or a wide-angle lens used for stopped-down aperture reading only, the TTL meter slightly tends to over-read (over-expose) with a long telephoto lens (400mm, 500mm, 1000mm) and under-read (under-expose) with a wide-angle lens. In this case, for highly accurate exposure reading, adjust the exposure factor control dial by about 1/2 stop.

16. *The meter needle when the camera is slightly different from when it is horizontal. Why?*

This is 'positioning difference', which is unavoidable unless the meter needle

could be made weightless. Strictly speaking, it is correct when the camera is horizontal. Its vertical position, however, is still within the tolerance.

17. *When an electronic flash is used at the AUTOMATIC shutter setting, what happens if the indicated speed is faster than '60'?*

One side of the picture will not be exposed or under-exposed depending upon how you make the adjustment.

18. *How can I use M- or MF-class flash bulbs with the ES?*

As for electronic flash units, set the f/stop and lens distance according to the guide number of the flash bulbs. Be sure that the meter needle indicates speeds below '15'. If not, adjust the exposure factor control dial or the f/stops as mentioned earlier.

19. *The A-M lever (depth-of-field preview lever) of the open-aperture-reading SMC-Takumar lenses does not move when mounted on the ES body. Why?*

If the A-M lever of the open-aperture-reading SMC-Takumar moved, it would give incorrect exposure reading. This is why the camera body is so designed that the A-M lever can not move when these lenses are mounted on the ES body.

20. *Is there any difference in the TTL meter reading area between the ES and the SPOTMATIC?*

The CdS cells of the SPOTMATIC read the full format - 100% of the whole picture area. The CdS cells of the ES read about 70% of the picture area, and therefore the ES TTL meter is slightly center-weighted.

21. *When loading a new film indoors and making blank exposures at AUTOMATIC, the shutter operates at very slow speeds. How can I make these blank exposures rapidly?*

When you make blank exposures in low light indoors at AUTOMATIC, the shutter will release at slow speeds because the TTL meter and the electronic shutter faithfully respond to the existing light. When making blank exposures, always use the mechanical shutter speed such as 1/1000 sec.

22. *What happens if I release the shutter at AUTOMATIC without knowing that the battery is dead or nearly dead?*

The shutter will release at 1/1000 sec. irrespective of the needle indication. In this case, do not trust the needle indication.

23. *The battery checker indicates the battery is O.K. About a month or two later, I may go out on a long trip. Will the battery be O.K.*

Better carry a spare battery. Check the battery again before you leave on a trip.

24. *Can I keep checking the battery frequently.*

No. Whenever you check the battery, you consume battery power, just as you do when you release the electronic shutter. Check the battery only when you go out for picture taking, and do not keep the battery checker button depressed for a long time.

25. *How many rolls of 36-exposure films can I take with a fresh battery?*

Suppose you take pictures every second at temperatures above 5°C. Further suppose that you can finish meter reading and exposure in one second, then a fresh battery will last for about 500 rolls of 36-exposure films. You would never take pictures every second, and so this is a hypothetical answer. The meter reading time varies from one person to another and the exposure timing also varies from time to time. All considered, plus spontaneous discharge of batteries, we would say that a fresh battery may last for about 200 rolls of 36-exposure films. At temperatures below -5°C, however, the battery life will be shorter due to its characteristics.

26. *In some northern countries, the temperature often goes down below -10°C. Does the ES withstand such cold temperature?*

Yes. Both electronic and mechanical shutters of the ES are guaranteed to operate properly at cold temperatures down to -20°C. As mentioned earlier, however, the battery life will be shorter under very low temperatures, and therefore try to carry a fresh battery when taking photographs in very low-temperatures.

27. *How about at high temperature and humidity?*

No problems with the ES. This camera passes our rigid high temperature and humidity tests - 40°C and 80 to 90% humidity. The ES withstands these high temperatures and humidity levels but we do not recommend you to keep your camera exposed and left under hot direct sunlight or in high humidity places.

28. *What does 'ES' stand for?*

'Electronic Shutter'.

29. *Can I have focusing screens of the ES changed?*

Yes, you can have it changed at our authorized service stations. There are 5 different focusing screens available for the ES, just as for the Spotmatic cameras.

30. *Are you introducing a motor-driven ES camera?*

We are planning it. Since the Pentax ES is suitable for unmanned photography, a motor drive attachment would be highly desirable.

31. *I have heard of a new SLR camera with an interesting 'memory retainer' device. After taking a TTL meter reading at a close distance, you push a button and the exposure memory is retained at that point. So you can back up and release the shutter at the speed where the memory is retained. Why is this feature not included in the ES?*

Such a memory retainer is apparently convenient, especially when photographing a back-lighted model. With the ES, you can do exactly the same thing. Approach your model, take a meter reading and use the mechanical shutter at the speed indicated by the meter needle. With the camera you are talking about, you must keep depressing the memory retainer button with one finger and then push the shutter button with another finger of the same hand. Operation is not so convenient.

32. *Why does the ES TTL meter not work at the mechanical shutter speeds?*

When designing the ES camera, we thought about this very deeply. The conventional TTL meter is manual, as you know. You turn either the f/stop ring or the shutter speed dial to match the meter needle manually. The basic design concept of the Pentax ES was to fully automate these exposure reading operations. To make the TTL meter manually workable at the mechanical shutter speeds would mean that we are going backward to manual. It is against the basic design concept of the Pentax ES. Why do you need a TTL meter reading at the mechanical shutter speeds? Probably to pre-select the shutter speed in advance? You can select your desired shutter speed with the ES camera, as you know. Just turn the f/stop ring and bring the needle to the shutter speed you want. We can see no reason for a TTL meter operation at the mechanical shutter speeds.

33. *I know that the automatic electronic shutter of the ES is infinitely variable against light variation. Is the automatic aperture of EE camera lenses also infinitely variable?*

No. Between each f/stop of EE lenses, there are 3 notches. The aperture stops at each f/stop and at each of these 3 notches. Therefore, the aperture automation of EE cameras is not infinitely variable against delicate light variation.

34. *Some more questions. Firstly about the viewfinder cap. You said that the light through the lens or through the viewfinder will not influence the exposure reading after I release the shutter. When should I use the viewfinder cap, then?*

You should use it when there is a danger of light coming in through the viewfinder which will influence the exposure reading. Such as when taking close-ups and macrophotographs, or when using long telephoto lenses on a tripod and when there is some light from your back. When taking close-ups and macrophotos with extension tubes or bellows, you move the stop-down lever UP and actually close down the f/stop to a small aperture. Through small apertures, less light comes in through the lens than through wider apertures, and the light through the viewfinder may influence the exposure reading. Therefore, after correct focusing and picture composition, slide the viewfinder cap on the viewfinder and then release the shutter. Do the same when releasing the shutter with your face away from the camera, especially when some light will enter through the viewfinder.

35. *You have already said something about the battery life. My first battery had a shorter life than I expected. Why? How can I preserve the battery life?*

As the instruction manual clearly states, the battery circuit is switched on when you give the first stroke on the shutter release button at the AUTOMATIC setting. Suppose you keep your ES in its case with the shutter dial at AUTOMATIC, there is a danger of the shutter button being depressed accidentally, thus consuming the battery power.

Therefore, when not using the camera, you should turn the shutter dial to '100' to keep the battery circuit completely switched off. In this way, you can prevent accidental battery consumption.

Asahi Pentax ESII

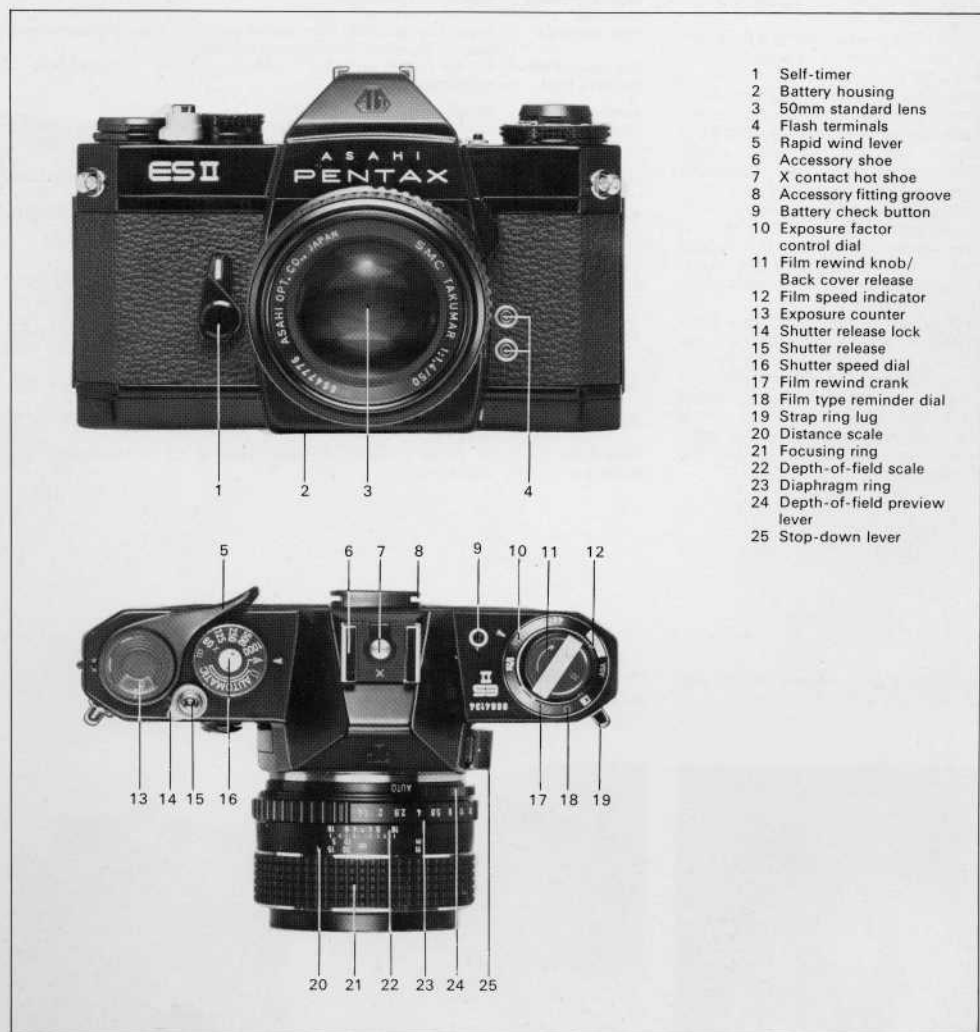
It would seem inevitable that once a sophisticated camera such as the Pentax ES was added to the Asahi Optical range, it would not be too long before it was followed by another model with even more refinements. This happened at the

end of 1973 with the introduction of the Pentax ESII.

The ESII has an extended film sensitivity range, provides an indication of all shutter speeds in the viewfinder and incorporates a delayed action device, a shutter

release lock and a viewfinder capping facility.

The ES has a meter range, on the ASA speed scale, of 20-1600. The ESII has an extended scale of 20-3200, this enables the electronic shutter to accurately cal-



- 1 Self-timer
- 2 Battery housing
- 3 50mm standard lens
- 4 Flash terminals
- 5 Rapid wind lever
- 6 Accessory shoe
- 7 X contact hot shoe
- 8 Accessory fitting groove
- 9 Battery check button
- 10 Exposure factor control dial
- 11 Film rewind knob/
Back cover release
- 12 Film speed indicator
- 13 Exposure counter
- 14 Shutter release lock
- 15 Shutter release
- 16 Shutter speed dial
- 17 Film rewind crank
- 18 Film type reminder dial
- 19 Strap ring lug
- 20 Distance scale
- 21 Focusing ring
- 22 Depth-of-field scale
- 23 Diaphragm ring
- 24 Depth-of-field preview lever
- 25 Stop-down lever

culate the exposure when using ultra high speed film.

A built-in delayed action release has been added which has an interrupt function between 5–11 seconds. This has been located on the front right hand side of the camera, and the battery housing, which was previously positioned there, has now been moved to the baseplate of the ESII.

A shutter release lock has also been incorporated which ensures that exposures will not be made when the camera is in transit. This is a useful aid when time exposures are required.

Even though the ES electronic shutter was variable between 8 seconds –1/1000th, the speed scale in the viewfinder did not indicate exposures longer than 1 second. The ESII has an extended scale which shows speeds down to 8 seconds.

One problem when using a through-the-lens metering camera without the eye to the viewfinder, is that stray light could possibly enter the viewfinder and cause an incorrect meter reading. On the ES a plastic cap was provided which was placed over the viewfinder when making exposures this way. The ESII has been produced with an automatic capping device. It is only necessary to turn the shutter dial to the rectangle at the automatic position and the viewfinder is lightproof.

The power source has also been changed. Where previously on the ES one six volt silver oxide battery was required, the ESII uses four 1.5v silver oxide batteries. Apart from the differences listed above the operation and handling techniques are the same as for the Pentax ES.

Type	35mm TTL-metering single-lens reflex camera with focal-plane electronic shutter for automatic exposure control.
Film and Picture Size	35mm film 20 or 36 exposures 24mm x 36mm.
Viewfinder	Eye-level pentaprism finder with Fresnel lens+microprism. 0.89 x magnification with 50mm lens. Life-size magnification with 55mm lens. –1.0 dioptre. 93% viewfinder coverage. Viewfinder blinds can be closed in automatic shutter mode. Shutter speed calibration, TTL meter needle and battery check mark in the viewfinder screen.
Shutters	TTL-metering electronic shutter for automatic exposure control+mechanical shutter for manual speed selection. Horizontal run focal plane shutter. Electronic shutter speeds: Unlimited variation between 8 and 1/1000 sec. Mechanical shutter: B, 1/60 (X), 1/125, 1/250, 1/500, 1/1000 sec. Shutter button safety lock also serves for Time exposure.
Flash Synchronisation	FP+X contacts for conventional flash cord connection. X contact on hot shoe for convenient cordless flash connection.
Reflex Mirror	Instant return type.
Film Transport	Ratchet type rapid wind lever. 10° pre-advance and 160° advance angle.
Shutter Cocking	A red disc appears in a small window alongside the shutter release button when the shutter is cocked, and blacks out when it is released.
Film Exposure Counter	Automatic re-set type.
Film Rewind	Rapid rewind crank. Film rewind button on base of camera body releases film from take-up spool for rewind.
Exposure Factor Control Dial	1 x for normal exposure. 2 x, 4 x, 1/2 x for intentional over- or under-exposure.
Lens Mount	42mm thread (Pentax-mount).
Dimensions	With 50mm lens: width 143mm (5.6") x height 98mm (3.9") x thickness 93mm (3.7"). With 55mm lens: width 143mm (5.6") x height 98mm (3.9") x thickness 90mm (3.5").
Weight	930 g (1 lb. 14 oz.) with 50mm lens. 879 g (1 lb. 12 oz.) with 55mm lens. 678 g (1 lb. 6 oz.) without lens.
Standard Lenses	SMC Takumar 50mm f/1.4 and 55mm f/1.8 with fully automatic diaphragm.
Focusing	Distance scale: 0.45m (1.5 feet) to infinity. Filter size: 49mm. With depth-of-field scale.
Exposure Meter	Turn the distance scale ring until the subject image in the viewfinder comes into sharp focus. Minimum focusing distance: 0.45m (1.5 feet).
Power Source	CdS-activated TTL meter for open-diaphragm and stop-down reading. Light measurement range: EV1–18 with ASA 100 film. ASA speed scale: 20–3200.
Self-timer	Four 1.5V silver oxide batteries (Eveready S76E or Mallory MS-76H).
Film Type Indicator	Built-in self-timer with interrupt function. Releases shutter in 5–11 sec. ☐ (black & white), ☼ (color daylight), ♂ (color tungsten) and EMP. (empty).

Delayed action release which can be set from 5 to 11 seconds.

The viewfinder becomes light-sealed when the rectangle is positioned opposite the arrow.

Shutter release lock.



Asahi Pentax ES II Motor Drive

The ES II Motor Drive, which was first shown at the 1974 Photokina, is basically a combination of the Pentax ES II and the Motor Drive Unit II. With this camera it is now possible to incorporate automatic exposure control with motor drive facilities. The camera can be used for both single frame and continuous shooting, with either of the two shutter control systems, at a maximum rate of three frames a second. Switching from continuous to single frame shooting is quickly done by rotating a selector dial.

The ES II Motor Drive is available in two versions:

Set 36 is the standard unit with a normal back for 20 or 36 exposure cassettes.

Set 250 is fitted with a 10 metre film magazine giving a maximum of 250 exposures. The magazine incorporates a subtractive film counter and an automatic stop mechanism which operates when the counter reaches zero. By using feed and take-up cassettes the need

to rewind the film is eliminated. The camera hand grip houses one rechargeable 12v NiCad battery, which when fully charged, should provide power for 2000 exposures. Other power sources are listed in the specification.

Further information on the Motor Drive and illustrations of accessories can be found in Section 6 of this Manual.

A full specification of the Pentax ES II can be found on the preceding pages.

Specification

Camera	Asahi Pentax ES II Motor Drive.
Lens mount	Asahi Pentax/Takumar lens mount.
Film	35mm film.
Power source	12v NiCad rechargeable battery giving 2000 exposures at normal taking speed. 8 penlight dry batteries (on Battery Loader). Other 12v DC sources. AC mains (with Power Pack).
Exposure	Automatic exposure—single frame shooting at shutter speeds 8 seconds to 1/1000 second. Automatic exposure—continuous shooting at shutter speeds 1/30 to 1/1000 second. Manual speed selection (Mechanically controlled shutter). Single frame shooting from 1/60 to 1/1000 second +B. Continuous shooting from 1/60 to 1/1000 second.
Dimensions	Set 36 with SMC Takumar 50mm f/1.4. Width 143mm x Height 280mm x Depth 99mm. Set 250 with SMC Takumar 50mm f/1.4. Width 289 x Height 280mm x Depth 99mm.
Weight	Set 36: 1.82kg. Set 250: 2.87kg.



Asahi Pentax ES II Data II Camera

Asahi Pentax ES II Motor Drive Data II Camera

Asahi Pentax ES II Data II Camera

This is a Pentax ES II which has been adapted to accept the Data II Unit on the back of the camera. The recording housing contains a three handed timepiece, a battery compartment, data plate, circuit check pilot lamp, projection lamp, and a 6.3mm f/3.5 projection lens.

Information to be recorded, such as date, place, or description of subject, is handwritten on the data plate. The image projection lens is focused on the face of the watch or the data plate, projecting the data to an area 3.2mm in diameter in the top left hand corner of the film. The projection lens has adjustable intensity and will properly expose data on films 50ASA to 800ASA. The unit is powered by one 6v silver oxide battery, Ever-Ready 544 or equivalent. When the Data II Unit is detached from the back of the camera, the receptacle part is automatically light sealed, enabling the camera to be used as a normal Pentax ES II. The camera is supplied with a Super Multi-Coated Takumar 50mm f/1.4 and can be used with other lenses in the range.

Asahi Pentax ES II Motor Drive Data II Camera

Combining all the features of the Pentax ES II, the motor drive and the data recording unit, this camera is ideal for time-sequence subjects. Data recording is only possible with single frame shooting but exposures can be made at the rate of one frame a second. The motor drive data camera can only be obtained in the Set 36 version which accepts 20 or 36 exposure cassettes. It is supplied with a Super Multi-Coated Takumar 50mm f/1.4 and will accept any of the other lenses in the range and the Asahi Pentax 35mm accessories.



Section 6
Asahi Pentax
Motor Drive System

Asahi Pentax Motor Drive System

Asahi Pentax Spotmatic motor drive

A great deal of research and general development over the past years has resulted in the Asahi Pentax Spotmatic Motor Drive. In fact Asahi engineers commenced basic preparation in the year 1960 aiming primarily to retain the traditional ease of operation, overall precision and compact size coupled with minimum weight characteristics as found in the Asahi Pentax Spotmatic.

The Pentax Motor Drive System offers simplified working methods and technique for all professionals and advanced amateurs. Just press the release button and this com-

plex piece of engineering, cocks the shutter mechanism, transports the film, and makes an exposure at the rate of 2.5-3 frames every second. A wide range of allied accessories exist depending upon which of the two Motor Drive Systems are employed which are known as Set 36 and Set 250. An initial examination will show that Set 36 consists of:

Asahi Pentax Spotmatic Motor Drive with Super-Takumar 50mm f1.4.

Asahi Pentax Motor Drive Unit.

Cordless Battery Grip.

Battery Loader.

Battery Checker.

Set 250 consists of:

Set 36 (except soft leather case).

Plus the addition of a Bulk Film Magazine with two film cartridges.

Although a special Pentax camera is used the basic operating technique of the Spotmatic camera remains unchanged, the only significant external difference being the words "Motor Drive" which are engraved along the lower plate just beneath the self-timer.

The all-essential linking of camera and motor drive system has been exceptionally well done and they lock together very firmly indeed. When the camera is being employed for conventional purposes the actual motor drive coupling is completely protected by means of a threaded cover.

Set 36



Set 250



Camera and lens operation

The basic operating manual for the standard Spotmatic camera applies to the Spotmatic Motor Drive. Anyone not familiar with the operation of the standard Spotmatic camera should, therefore, read this carefully and become fully acquainted with the correct operating and handling technique.

Exposure counter

Both Set 36 and Set 250 are equipped with exposure counters. For Set 36, the exposure counter shows the number of frames remaining unexposed. When the counter reaches 0 the Unit switches off automatically. For Set 250, dial the number of exposures it is wished to make. The Unit switches off automatically when the film has been completely transported on to the take-up spool.

Shutter release

To release the shutter, depress the trigger button (10) of the battery grip after setting the C/S switch either at C (consecutive) or S (single).

As the trigger button is depressed with the C/S switch set at S the Motor Drive Unit releases the shutter; when the trigger button is released the Motor Drive Unit is automatically set for the next exposure.

Single frame exposure

Other than for B (Bulb) and T (Time) exposures set the bulb switch (16) at CS and C/S switch (19) at S (single).

For Bulb exposures, set the bulb switch at B and the C/S switch at S. While depressing the trigger button, the shutter stays open; when the trigger button is released the shutter closes.

For Time exposures, set the bulb switch at B and the C/S switch at S. While depressing the trigger button, turn the C/S switch off to keep the shutter open. To close the shutter, turn the C/S switch to S.

Consecutive exposure

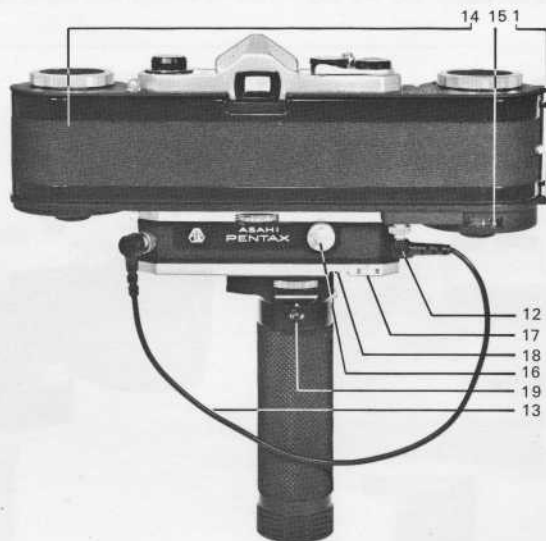
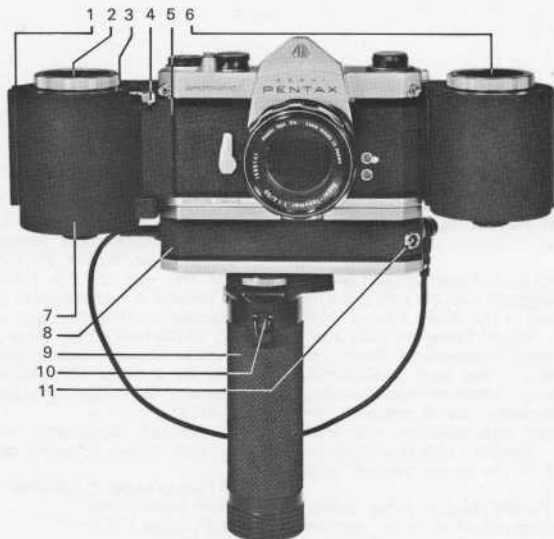
For consecutive exposures, shutter speeds from 1/60 to 1/1000 can be used, setting the bulb switch at CS and the C/S switch at C (consecutive).

Whilst the trigger button is depressed the Motor Drive Unit automatically repeats - shutter release, cocking the shutter, and film winding at the speed of 2.5-3 frames per second. When the trigger button is released the Motor Drive Unit stops working, with the shutter cocked for the next exposure.

Power sources

The standard operating DC power source of the Motor Drive Unit is 12v/0.4A. In addition to the Battery Loader and the battery grip loaded

Major Operating Parts



- | | |
|---|--|
| 1 Back cover lock of bulk film magazine | 12 Connector plug for film magazine exposure counter |
| 2 Film cartridge locking knob | 13 Connector cord for film magazine exposure counter |
| 3 Set button | 14 Back cover of film magazine |
| 4 Set lever | 15 Film magazine exposure counter |
| 5 Camera body retainer plate | 16 Bulb switch dial |
| 6 Film cartridge locking knob | 17 Motor Drive Unit exposure counter |
| 7 Bulk film magazine | 18 Film rewind release button of Motor Drive Unit |
| 8 Motor Drive Unit | 19 C/S (consecutive/single) switch dial |
| 9 Cordless battery grip | |
| 10 Trigger button | |
| 11 Remote control socket | |

with a NiCad battery, the Motor Drive Unit also operates with other 12v DC current, such as an automobile battery, etc., through the Relay Pack or the Power Pack - (See Accessories). It also operates with AC current through the Power Pack.

Automatic switch-off

The film roller in the film magazine also functions as an automatic switch for the Motor Drive Unit. After the film has passed over the roller, the roller automatically switches off the Motor Drive Unit. If the exposure counter of the Motor Drive Unit rests at 0 and if the magazine is empty, the Motor Drive Unit will not operate because it is completely switched off.

Operating Technique: Asahi Pentax Spotmatic motor drive

As has been previously stated the Spotmatic Camera is manifestly the same in outward appearance and operational function as the Asahi Pentax Spotmatic Motor Drive camera.

It is assumed that anyone possessing or operating the Motor Drive system will already be conversant with the general operating technique, but if not, then reference should be made first to the Operating Book or pages of this manual. The power source for the Motor Drive is housed in the battery grip. The grip is a very simple functional design and is extremely comfortable to hold. It is also very strong and the deep cut diamond knurling provides a very positive grip. When the grip is not in use the electrical contacts are protected by means of a screw-on cover.

The wheel on the back of the Drive Unit is set on the black mark for single exposure operation and the knurled knob on the back of the Battery Grip is set on 'S' (single). For continuous operation the knob on the Grip is moved to 'C' (continuous) while the upper wheel remains set on the black mark. At times when not in use the knob should be set against the green dot between the letters 'C' 'S'. For time exposures the shutter speed dial on

Specifications

Camera	Asahi Pentax Spotmatic Motor Drive
Lens mount	Asahi Pentax/Takumar lens mount
Film	35mm film
Power source	8 pen-light batteries (on Battery Loader) 1500 exposures at normal taking speed 12v NiCad rechargeable battery 2000 exposures at normal taking speed Other 12v DC sources AC mains (with Power Pack)
Exposure	Single-frame exposure Consecutive exposure (2.5-3 frames per second at 1/1000 sec. shutter speed) 20 or 36 exposures (Set 36) 250 exposures (Set 250)
Dimensions	Set 36: Width 143mm x Height 274mm x Depth 95mm Set 250: Width 289mm x Height 274mm x Depth 95mm
Weight	Set 36: 1.75 kg. Set 250: 2.93 kg.

the camera must first be set to 'B' and then the upper wheel must also be set on 'B' and finally the knob on 'S'. The shutter will remain open for as long as the trigger button is depressed. For longer exposures the 'C'/'S' knob should be turned to the green dot when the shutter will then remain open without depressing the trigger button. In order to close the shutter at the end of exposure simply turn the knob to 'S'. When the Unit is being operated for single exposure and the knob set on 'S' the trigger button must then be depressed in order to release the shutter. The Drive Unit then automatically transports the film and cocks the shutter ready for the next exposure.

Virtually any shutter speed from 1 to 1/1000 sec. may be used. For consecutive exposure operation the wheel on the back of the Drive Unit remains set on the black mark and the knob on the battery grip is set at 'C'. In these circumstances shutter speeds ranging from 1/60 to 1/1000 sec. may be used. On depressing the trigger button the shutter is released, film advancement and shutter cocking automatically operated all at the rate of 3 frames per second.

When the trigger button is released the motor drive stops with the shutter cocked and the film in position for the next exposure.

The Motor Drive exposure counter indicates the number of exposures remaining, but when reaching '0' the Unit is switched off automatically in order that the film is not pulled right through the cassette. In practice the little counter dial is rotated by thumb pressure and set to the number of exposures ac-

ording to the film used. The film rewind button is positioned next to the exposure counter.

The Unit is powered by 12v batteries contained within the grip. Either the rechargeable NiCad battery or inexpensive pen-light cells may be employed, and 8 of the pen-light batteries will, in fact, supply power sufficient for more than 1,000 exposures. Alternatively, the NiCad battery (Ever Ready 10/BH 500) or equivalent will provide sufficient power for approximately 2,000 exposures before recharging is necessary.

It is essential that one can have an instant and accurate means of checking the actual working condition of the power supply for obvious reasons, and to this end an indispensable aid comes in the form of a battery checker which is supplied with the Motor Drive Unit as a whole. The device is plugged into the socket on the side of the battery grip with the 'C'/'S' knob set on 'C', which also stands for check.

The needle of the instrument will reach the black area on the dial marked 10-12, if the battery is still serviceable. Should the needle fail to reach this area then obviously the cells must be replaced or recharged in the case of NiCads. One important point to note is that the instrument should not be plugged in for more than 10 seconds or otherwise there is a danger of it overheating.

To undertake the recharging of the NiCad battery it is not necessary to remove it from the battery grip. Simply set the 'C'/'S' knob on the green dot and turn the fastening knob of the grip in order that the attaching screw screws into the accessory battery charger. The elec-

trical contact of the grip should be carefully inserted into the contact receptacle on the charger. For convenience when the AC cable on the charger is plugged into the main supply the 'C'/S' knob should be turned to 'C' indicating Charge, in this instance. The pilot light incorporated in the charger will indicate that the recharge operation has begun and some fourteen hours are required to ensure a full charge. However, the NiCad battery will not suffer damage even if the charge time is extended to, but does not exceed 24 hours. Should the battery have to be used either through negligence or in emergency, when only partially charged, no damage will result other than the time cycle will be slower than would be with a fully charged battery. Use of the accessory connecting cord permits the battery grip to be kept in a pocket or near one's person when operating under conditions of extreme cold. In fact, the Motor Drive may be operated at a distance up to 33ft. from the actual battery grip, which may well assist the operator working under difficult conditions. Another extremely useful accessory is the Relay Pack which extends the distance between the battery grip and the camera. There are two other uses for the Pack, the first being that by shorting out the remote terminals on the Pack, external triggering may be achieved; further, when using a 12 volt car battery as the power source the Pack may be employed as a connecting Unit between the battery and motor drive unit.

Yet another useful accessory is the AC Power Pack. In addition to its normal use as a Power Pack it can also be used to serve in place of the Relay Pack. Further, its use includes service as a battery charger required when recharging NiCad batteries. As a Power Pack 100 volt is converted to 240 volt AC/50-60 Hz to 12v. DC.

Note Although it has been stressed that the Spotmatic camera body supplied with either of the Motor Drive Units is identical to all intents and purposes to the standard model, it is, nevertheless, designed specifically for the job in hand.

Certain basic features have been strengthened to stand the powerful automatic functioning of the motorised system and the normal production Spotmatic camera body is not suitable for use with the Motor Drive Unit. The standard Spotmatic body cannot be modified for use with the Motor Drive units.

Conversely, all Asahi Pentax Takumar and Super-Takumar lenses are intended for use on either standard Asahi Pentax cameras, or on the special Spotmatic Motor Drive camera body.

250 Exposure back

As mentioned earlier the second of the two basic Motor Drive Outfits is termed Set 250, relating to exposure capacity. The Outfit is identical, with the exception of the special purpose 250 exposure film cassettes and extended camera back. When using this back it is necessary to first remove the normal Spotmatic Motor Drive camera back by careful use of the small screwdriver supplied with the new back. Detailed instructions are supplied, but, basically, the operation consists of inserting the screwdriver between the existing camera back hinge and the light seal and pushing towards the baseplate which disengages the front shaft of the hinge. Once the top part of the cover is free the lower section is removed by sliding it down towards the baseplate.

In order to prepare the 250 exposure film back the large locking knob is turned to the 'open' position, the 'Set' button depressed and by pushing the 'Set' lever finally lifting the camera body retainer plate. The Magazine is now ready for attachment to the camera body.

First of all the camera is offered up to the 250 Back, take-up side first, ensuring that the light seal edges of the magazine are correctly located in the grooves of the camera body when lowering the camera into position. The camera body is then gently pushed toward the magazine on the rewind side and will click into position. It then but remains to turn the locking knob into the 'close' position. In order to remove the back first open the film cartridge locking knobs, push the 'Set' lever while depressing the 'Set' Button, and finally lift the film rewind knob of the camera body, thus disengaging the film rewind end of the camera body from the magazine.

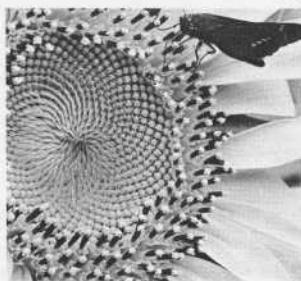
The Accessory Coupler must be employed when it is wished to use the 250 Camera Back without the Motor Drive Unit, in order that when operating the Rapid Wind Lever of the camera the film transport mechanism will be actuated. The coupler does not have to be employed when using the Motor Drive Unit.

In practice the film in the 250 exposure Back is transported from a supply to take-up cassette, thus eliminating the need for film rewind.

Remote control photography

Remote control is by means of either extension cables or a Radio Control Unit.*The 1 meter extension cord is particularly convenient for copying. The radio control unit operates up to 2Km from the Motor Drive Unit. This is extremely useful for all kinds of candid photography or when there is danger in approaching too close to the subject.

*Not imported into the U.K. as subject to Post Office regulations.



Automatic Documentary photography

By connecting the accessory Timer to the Motor Drive System at desired pre-set time intervals, one can photograph growth of animals or plants, chemical variation, etc., without actually being present.

Multiple simultaneous photography

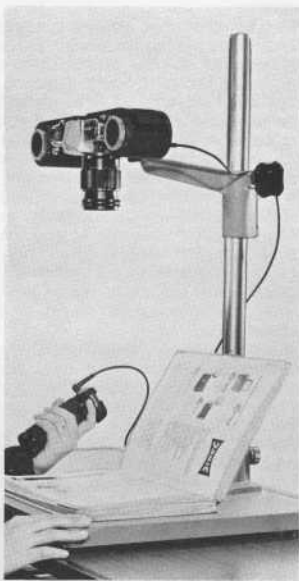
This sophisticated photographic technique utilises two or more Motor Drive systems, enabling the subject to be photographed simultaneously from various angles.

Consecutive exposures

Exposing 2.5-3 frames per second one can capture the excitement of sporting events, wild life, news coverage, etc. In fact, wherever there is action, this is the perfect system with which to capture it.

Single frame photography

Using any shutter speed from B., 1-1/1000 sec. single frames can also be taken.



Accessories

1 Battery checker

Plugs into side socket of battery grip for quick check of battery operating capacity.

2 Charge pack

Enables the NiCad battery to be charged from AC mains without removing it from battery grip.

3 Film winder

Enables the film cartridge to be loaded with the desired length of 35mm bulk film up to about 10m, equivalent to 250 exposures.

4 Battery loader

Holds 8 pen-light batteries. Loads quickly and easily into battery grip. Lasts for about 1,500 exposures.

5 Relay pack

For remote control and a variety of trick photography.

6 Power pack

Does the function of both Relay Pack and Charge Pack.

7 Timer

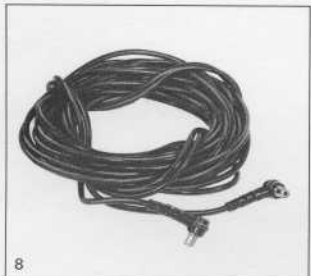
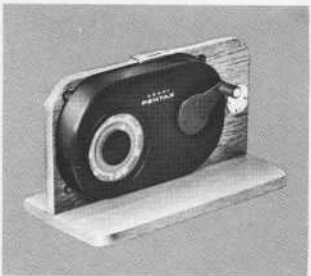
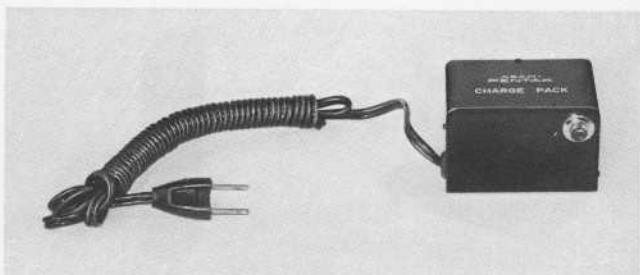
Automatically activates the Motor Drive Unit at a desired pre-set time interval. Three kinds of Timers are available: by seconds, by minutes, and by hours.

8 Ten Metre cord

For remote control shooting.

9 One Metre cord

suitable for multiple copying.



10 Radio control unit

Enables the Motor Drive Unit to be operated by wireless remote control. Operating distance up to 2Km.

11 M-bracket

For attaching flash unit to Set 36, for single-frame shooting.

12 Film cartridge

Spare cartridge, holds up to 30.5m of film.

13 Attaché case for set 250

Holds Set 250 and additional lenses.

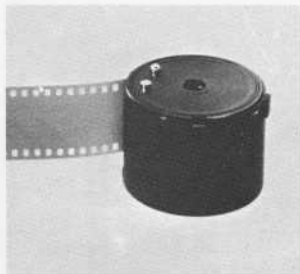
14 Kit bag for set 36

Ideal for travelling with the Motor Drive Unit. This bag holds Set 36, plus a wide-angle and telephoto lens.

15 Soft leather case for set 36

Rich soft leather case for camera fitted with Motor Drive Unit and battery grip.

10



11

12



13

15

14

Section 7
Asahi Pentax 6 × 7

Asahi Pentax 6x7

The evolution of the Asahi Pentax Spotmatic has been covered in this Manual step by step, from the first early days of SLR camera production in 1952.

Asahi ingenuity and advanced technology has produced the World's most exciting and largest selling 35mm SLR camera.

Now, another unique introduction is the Asahi Pentax 6x7 Ideal Format Camera System. A camera utterly new in conception.

Photokina 1966 was the venue where the original 6x6 prototype was shown, causing considerable impact at the time - little wonder. Redesigned and again on view at Cologne in 1968 and later at the Tokyo Camera Exhibition in March 1969, culminating in the release on the Japanese market in July 1969.

Nevertheless, it would appear that among the many new and significant features, we have to look forward to is a completely new 'Ideal Film Format' 6x7cms.

As it will readily be seen this new 6x7 format is directly proportional to the Professional 5x4 ins., and yet is functional and economic in relation to the 6x6cm shape.

In fact, Asahi claim that due to the inevitable trimming of the old 6x6 format one gains nearly 100% in usable film area! It further points out the unsuitability of the 6x9cm format that has enjoyed a degree of popularity from time to time over past years.

Mechanically, the provision of an electronic shutter control system governing the focal plane shutter provides a degree of accuracy and constancy never previously considered possible.

The electronic source of the shutter system is provided by means of a 6 volt silver battery (Ever Ready 544 or Mallory Px28).

Asahi Pentax 6x7 is a single lens reflex with Pentaprism and focal plane shutter, with a frame format 6x7cm, 10 or 21 exposures on 120/220 film respectively. The main body structure is, basically, made up of two container units, one of which is the main housing, the other containing the mirror assembly, the latter also serving as an excellent lens board. The housing is diecast and machine finished to a very high standard. Certain



Type	Large-format single-lens reflex camera with interchangeable lenses.
Film size	120 roll film (10 exposures) 220 roll film (21 exposures)
Picture size	55mm x 69mm
Exposure counter	Automatic re-set type
Back cover	Hinged back for easy film loading and unloading
Film transport	Single-stroke rapid wind lever transports film and cocks shutter; permits free film transport without shutter cocking when film frames to be exposed are being brought into place.
Rotation angle of rapid wind lever	10° pre-advancing angle + 180° advancing angle
Shutter	Electronically time-selecting focal plane shutter with rubberized silk blinds.
Shutter speed dial	Linear scaled speed dial is a rotary switch for changing fixed resistors for electronic shutter mechanism.
Shutter speeds	B, 1, 1/2, 1/4, 1/8, 1/15, 1/30, 1/60, 1/125, 1/250 1/500, 1/1000 sec. and X.
Electronic flash synchronization	1/30 sec.
Power source for electronic shutter	6V silver battery (Ever Ready 544 or Mallory Px28)
Battery check	Push button + pilot lamp
Viewfinders	Detachable eye-level and waist-level viewfinders. Ground glass permits viewing of 100% film image; eye-level pentaprism viewfinders have a 10% safety factor.
Ground glass and Fresnel lens	Combination of microprism centre and fine ground glass
Instant return mirror	Swing-back and Swing-up type instant return mirror
Diaphragm	Fully automatic diaphragm lenses from 35mm fish-eye to 300mm
Lens mount	Special dual bayonets: inside bayonet for lenses from 35mm fish-eye to 300mm, outside bayonet for other longer telephoto lenses.
Weight	2.3kg with 105mm standard lens and pentaprism viewfinder

Asahi Pentax 6 × 7



internal divider strips are of heavy gauge brass, as are also the gears. Externally, the body is leather covered and black stove enamelled on the metal parts. Obviously, a camera of this proportion cannot be manufactured as a small, compact instrument, but certainly Asahi have used every opportunity to cut away, round off, and generally eliminate any unwanted or unnecessary bulk and weight.

Nevertheless, the format is 6 × 7cm, the standard focal length 105mm, and these two basic facts are the criteria upon which all else is resolved. Reference to the specification will show that the camera, complete with lens, measures 13.7cm × 17.5cm × 14.0cm and weighs 2.4 kg. However, there is the possibility of compromise which means simply that some sacrifices are inevitable, if overall size and weight are to be kept to the minimum. With the Asahi 6 × 7cm this compromise is found in the Pentaprism which covers 88% of the overall screen image, thereby reducing considerably the size and weight of the Prism. However, the Pentaprism is, of course, interchangeable and when replaced with the waist-level finder the field of view is

expanded to 99%. The Pentaprism is easily removed by pressing two small buttons situated either side of the base, and then lifted clear, leaving the focusing screen remaining in the camera body. In place of the more conventional condenser type lens which is employed in most single lens reflex cameras for brightening the viewfinder, Asahi have used a revolutionary new combination consisting of two Fresnel screens, on top of which is positioned a glass sheet, preventing dust from penetrating the interior. The plastic focusing screen positioned immediately beneath the glass plate is of Fresnel construction, comprising on the upper surface a number of concentric grooves with a 13mm clear centre spot. The lower surface is frosted, apart from the central area which corresponds to the 13mm clear spot above. This is, in fact, the micropism, consisting of many minute pyramids, each base side measuring 0.15mm. The bottom layer of the 'sandwich', as such, is in the form of a second plastic sheet, the top surface comprising again a Fresnel screen construction slightly finer than the upper Fresnel (10 grooves per millimetre com-

pared to 8 grooves per millimetre) again with a clear central area 13mm in diameter. The lower surface is perfectly plain. This unique arrangement produces a quite extraordinarily clear and brilliant screen image. The viewfinder produces a magnification of 1.0x when an object focused at infinity is seen through the standard lens (105 mm) life size. A number of interchangeable focusing screens are available, but these may only be changed by authorised Asahi mechanics or workshops. One must, necessarily, experience a slight sense of disappointment in this fact, and trust that the future development will ultimately eliminate the need for this somewhat inconvenient arrangement. The user has the choice of loading 120 or 220 film, according to the number of exposures required, these being 10 or 21 respectively. In accordance with requirements, the film pressure plate is adjusted to the appropriate position by depressing and sliding it to the left or right, which automatically registers the appropriate 120 or 220 index marks in a small window on the camera back. It is also necessary to position the index at either 10 or 21 which is done by rotating a small knob positioned on the upper leftside of the body. The actual film loading is semi-automatic. After loading and turning the film until the warning 'starter marks' appear, the film is wound until it automatically stops at the first frame. At the same time the shutter is cocked ready for firing.

The one-stroke film transport lever has a 10° pre-advance and a 180° advance movement. It will be noticed that a fair degree of pressure is necessary when advancing the lever, as it is, after all, completing a number of functions at the same time, i.e. transporting the film, tensioning the shutter springs, and actuating the instant return mirror mechanism. After the last exposure has been made, the lever is automatically disconnected from the spring tensioning mechanism. As has been stated, the mirror is similar to the Asahi Pentax 35mm reflex cameras, in that it is 'instant return' in action. The actual functioning, however, is unique, the mirror swinging back as it lifts.

This unusual action results in a very slight loss of light along the lower edge of the viewfinder when lenses of longer focal length are employed, i.e. 200mm or more. This, of course, has absolutely no effect on the exposed film.

Another most interesting feature is the arrangement of the shutter release mechanism. When the shutter release is fired or actuated, its only function is the release of the mirror tray assembly.

Once this has occurred, the mirror assembly itself is responsible for the eventual firing of the automatic dia-

phragm and shutter. Consequently, since the shutter release itself has but one function, it will be found to be extremely light in action.

Shutter speeds range from 1000th-1 sec. (+B), as can be seen from the specification. Tests have proven that the electronically controlled shutter is likely to set new standards for both accuracy and evenness of travel. Utterly new techniques and the employment of new materials have contributed in producing the smooth friction free and fast running focal plane blinds which actually cover the 70mm frame width in a fraction over 24 milliseconds.

The shutter is powered by a 6v silver battery (Ever Ready 544) which fits into a specially designed holder, the whole of which is then located in a box-like recess at the base of the camera body. Advantages of the silver battery are, it is claimed, a larger capacity than the mercury

pattern, size for size, and more reliability in extreme low temperature. Electronic flash is synchronised at 1/30 sec. A battery test device is built-in and is located on the back of the body, top left position. If the battery is satisfactory, a red light will be seen to shine on the side of the shutter dial.

Asahi state that the minimum power required for successful operation is in the region of 4.5v. In fact, the shutter blinds will still be actuated, but without opening the exposure slit. Conversely, even with the current down to the permitted lower level (4.5v) complete accuracy and consistency will be maintained.

The shutter blinds, rubberised silk, run from right to left, viewing from behind the camera.

The rear blind is held by a magnet and is released as soon as current flows through the system. Once the front blind commences its travel, a condenser is charged via the battery

system, and upon reaching a predetermined voltage the rear blind is thus released, and follows the front blind across the focal plane. Electric current, regulated by the resistance of the circuit, determines the actual time lag. Beneath the shutter speed dial is a fixed resistor which adjusts according to the speed selected, and so automatically sets specific resistances, thus effectively controlling the amount of current flowing into the circuit. Tests carried out by an absolutely independent Japanese team of experts who carefully analysed an 'over the counter' purchased 6 x 7 Pentax, included careful laboratory testing of the actual shutter speeds among other things. They described the results of their shutter speed tests as 'superlative' and further stated 'Repetition of the tests produced practically no inequalities'. The use of the word 'inequalities' would, perhaps be more accurately interpreted as 'variations'.

Left side view



View of top



Right side view



View of bottom





Specifications of Takumar Lenses for Asahi Pentax 6 × 7 SLR System

Name of lenses	Focal length and maximum aperture	Minimum aperture	Lens element	Dia- phragm	Minimum focusing distance		Angle of view degrees	Weight		Filter size mm	Lens-hood size mm	Lens cap size mm
					mm	ft.		gr.	ozs.			
1 Super-Takumar /6 × 7	35mm f/4.5 ¹	22	11	FA	0.45	1.5	180	932	32.6	1*	—	100
2 Super-Takumar /6 × 7	55mm f/3.5	22	8	FA	0.45	1.5	77	962	33.7	95 ²	100 ³	100
3 Super-Takumar /6 × 7	75mm f/4.5	22	5	FA	0.7	2.4	61	580	20.3	82 ²	85 ³	85
4 Super-Takumar /6 × 7	105mm f/2.4 ⁴	22	6	FA	1.00	3.5	45	630	22.1	67 ²	70 ³	70
5 Super-Macro-Takumar/6 × 7	135mm f/4	22	5	FA	0.85	2.57	36	767	26.8	67 ²	70 ³	70
6 Super-Takumar /6 × 7	150mm f/2.8	22	5	FA	1.5	5.0	33	780	27.3	67 ²	70 ³	70
7 Super-Takumar /6 × 7	200mm f/4	22	4	FA	2.5	8.2	26	895	31.3	67 ²	4*	70
8 Super-Takumar /6 × 7	300mm f/4	45	5	FA	5.0	17.0	17	1400	49.0	82 ²	4*	90
9 Takumar/6 × 7	400mm f/4	45	5	MA	8.0	26.0	12	2480	86.8	77 ²	4*	116
10 Takumar/6 × 7	600mm f/4	45	6	MA	12.0	40.0	8	5500	192.5	77 ²	4*	170
11 Takumar/6 × 7	800mm f/4	45	6	MA	20.0	65.0	6	17500	612.5	77 ²	4*	235
12 Reflex-Takumar	1000mm f/7 ⁷	—	7	—	35.0	120.0	5	6400	224.0	67 ¹	4*	170

1 = 4 filters built-in
5 = Fish-eye lens

2 = 2-claw bayonet filter
6 = Standard lens

3 = 2-claw square bayonet hood
7 = Catadioptric lens

4 = Pull-out hood built on the lens

Reference to the lens specifications opposite, shows the very wide range that has been developed simultaneously with the camera. This, in itself, is typical of the thoroughness that has come to be expected of Asahi in their entire evolutionary development programme. They range from 35mm Fish-eye to a 1000mm Telephoto. Incidentally, apart from size, these lenses are easily distinguishable by the figures 6 × 7 near the name and designation of the lens around the front of the lens rim.

The standard lens is the 6 × 7 105 mm f2.4 Super-Takumar. In relation to the 35mm Pentax, with standard lens, the angle of acceptance or picture angle of 46° is approximately the same. Nearest focusing point is one metre. Distortion on this and most of the ancillary lenses has been reduced to minimal level and from early test reports, these newly developed lenses are certainly going to become world renowned. The all important question of lens mount and method of attachment to the camera body has been most carefully considered and a double bayonet system is the result. The main central aperture of the lens flange has three cut-outs on the inner section which measures 76mm, and four male prongs on the outer edge, measuring 87mm. Accordingly, the smaller of the lenses attach to the inner bayonet, whilst the longer, heavier lenses (400mm) upwards, fit on to the outer bayonet. This system provides absolutely rock steady mounting, resulting in a high degree of overall accuracy.

Accessories

Correction lens adapter
Accessory adapter
Eye cup
Magnifier
Extension tubes
Copy stand
Auto-Bellows
Filters

Viewfinders

Four types of viewfinders are available for the Asahi Pentax 6 × 7.
Eye level pentaprism viewfinder with adjustable magnifier.
Rigid 3x focusing magnifier adjust-

able from -1 to -4 dioptry.
Folding type waist level viewfinder.
Eye-level pentaprism viewfinder with a through-the-lens exposure meter; full frame, open diaphragm or international stop-down diaphragm exposure reading, with adjustable magnifier, will be available later.
The viewfinders are easily removed by depressing the release pins on either side of the viewfinder locating base. On the front of the viewfinder seating are two protruding pins which engage in the holes in the base of the viewfinder, thus ensuring correct location.

Film loading and unloading

The spring-tensioned hinged back opens as the back cover lock is pulled out. On both sides of the base plate there are two film spool retainer knobs. Turn them clockwise and they will pop out.

The loaded film spool is inserted into the film chamber on the left and the empty take-up spool into the take-up chamber on the right. The film spool keys hanging from the top of the spool chambers should be properly engaged into the hole of the film spools. Turn the film spool retainer knobs clockwise to fasten them and retain the film spools in place.

The film spool retainer knobs have a red dot. Two separate black dots on the base plate round the outer ring of the spool retainer knobs indicate the 'open' and 'locked' positions of the spool retainer knobs.

The leader paper of the loaded film spool is pulled out and inserted into the slit of the empty spool on the right.

The 120 film has a paper back while the 220 film has no paper back. Therefore, the position of the pressure plate of the camera must be changed depending upon the type of film used. The back cover of the camera has a small window which indicates '120' or '220'. Press the pressure plate, pull it down and then shift it to the left for positioning it for 120 film. For 220 film press it, pull it down, and then shift it to the right. The film type indicator window on the back cover will then show the figures 120 or 220. On the right hand side of the camera body, next to the rapid wind lever, is an exposure frame adjustment knob with figures 10, and 21 engraved on the outer ring of the knob. Push the adjustment knob and turn it until the red dot on the knob matches the figure 10 for 120 film and figure 21 for 220 film. This adjustment knob should be set before the back of the camera is closed.

Turn the rapid wind lever all the way until it stops. Keep turning it until the start mark (large arrow) on the film's backing paper has reached the red mark next to the film guide rail on the back of the camera body.

In this and subsequent rapid wind lever operation it is not necessary, nor indeed is it possible, to release the shutter button.

The shutter cocking mechanism is completely freed from the film transport mechanism until the first film frame to be exposed starts moving into place. Close the camera back and push back the back lock. Start cocking the rapid wind lever and keep cocking it until you feel resistance. This resistance indicates that the first film frame is about to come into the taking position and that the rapid wind lever is starting to cock the shutter, too. Cock the rapid wind lever again all the way until it stops. The first frame has now come into place, the shutter has been fully cocked and the exposure counter shows the figure '1'.

When all frames (10 frames on 120 film and 21 frames on 220 film) have been exposed the shutter cocking mechanism is again completely freed from the rapid wind lever mechanism. The rapid wind lever can be freely turned, without releasing the shutter, until the end of the film backing paper has all been transported onto the take-up spool. Then open the back and remove the exposed film spool after loosening the film spool retainer knobs. As soon as the back cover is opened, the film exposure counter automatically returns to 0.

Lens system

All lenses for the Asahi Pentax 6 × 7 are named 'Takumar/6 × 7' and 'Super-Takumar/6 × 7' to distinguish them from the lenses for the 35mm Asahi Pentax cameras. The Super-Takumar/6 × 7 lenses all have a fully automatic diaphragm. Focusing is by rotating the distance scale ring of the lens, calibrated in feet and metres. The lenses have a diaphragm selection ring with full and half f/click stops and a depth-of-field guide. They operate in the same way as the lenses for the Asahi Pentax Spotmatic, except the Takumar/6 × 7 and Super-Takumar/6 × 7 lenses have a bayonet mount.

The 'Auto-Manual' depth-of-field preview lever for the Super-Takumar/6 × 7 lenses is slightly different from the depth-of-field preview lever for the Super-Takumar lenses for the Spotmatic. The preview lever is moved down to the manual position, the top side of the lever is slightly lifted, and as the lifted side of the lever is pushed down it automatically returns to the automatic position.

The camera body has unique dual bayonets. The inside bayonet accepts the Super-Takumar/6 × 7 lenses from fish-eye to 300mm and the outside bayonet accepts the other telephoto lenses up to 1000 mm. The bayonet mount lock/

release key is located underneath the FP and X flash terminals on the outside of the mirror housing. Push the lock/release key and turn the lens about 60° to the left to detach it from the camera body mount. There is a red dot on the lens and on the outside bayonet on the body side for lens mounting purpose.

Shutter

The shutter dial, linear scaled from X, B, 1-1/1000 sec., is located on the left top of the camera body, looking from the camera's back. The shutter dial rotates endlessly and may be turned in any direction to match the selected shutter speed to the red index next to the shutter speed dial. This index is also the pilot lamp for checking the battery which powers the unique electronic shutter.

The shutter dial is a rotary switch for

changing the fixed resistors aligned inside the camera body. When selecting the shutter speed by turning the shutter dial, the shutter electronically selects the speeds. Since this electronic shutter has far less mechanical parts than mechanical focal plane shutters, it offers higher accuracy and durability of performance. The shutter dial can be set before or after cocking the rapid wind lever. Underneath the shutter release button seat, next to the rapid wind lever, is a shutter safety lock lever. Turn it to the viewfinder side to lock the cocked shutter. This safety lever is also convenient for making Time exposures. Set the shutter dial at B, and while depressing the shutter button, turn the shutter safety lever to the viewfinder side to keep the shutter open. To close the shutter, turn the safety lever to the other side.

The battery housing, which contains a 6v silver battery (Ever Ready type 544) is located in the base of the camera underneath the mirror housing. One can easily remove the battery holder (cover of the housing) by lifting the folding key and turning it anti-clockwise. To check the battery, push the white 'Batt. Check' button on the top back of the camera body. The pilot lamp (index for the shutter dial) glows if the battery has sufficient capacity. The same silver battery also powers the through-the-lens exposure meter to be incorporated in one of the eye-level viewfinders.

Instant return mirror

The instant return mirror of this camera is a new swing-back and swing-up type to permit more image area viewing and focusing through the viewfinder.

Section 8
Asahi Pentax Nocta

Asahi Pentax Nocta

The Asahi Pentax Nocta is a 35mm single-lens reflex camera with an infra-red electro-optical system, designed and constructed for infra-red telephotography in total darkness. The unique feature of this instrument is that it permits constant surveillance in total darkness through the conversion of an infra-red scene by electronic means to a bright representation visible in the camera's viewfinder. The Nocta 35mm is extremely suitable for criminal and military clandestine photography, psychological and other specialized applications.

An infra-red flash gun and a search light are provided on both sides of the 300mm taking lens.

Behind the infra-red filter of the search light is a tungsten light source. The search light illuminates a scene, and the infra-red light reflected from the scene, coming through the taking lens, is converted electro-optically to a visible image on the fluorescent screen of the noctovision viewfinder for surveillance and focusing.

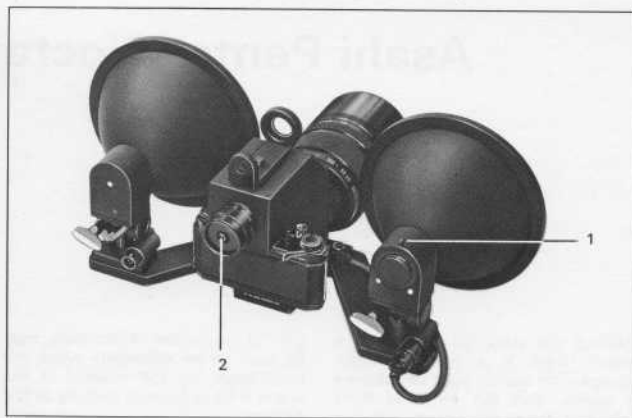
After the scene has been brought into focus, the shutter is released, the flash bulb behind the infra-red filter of the flash gun is fired, and the infra-red image of the scene is exposed onto the infra-red film.

The infra-red beam from the search light is almost invisible, and the infra-red flash beam from the flash

gun, at the instant of exposure, may be seen as an extremely weak red light beam by the subject at the scene if he is looking directly at the camera.

The effective (photographically) operable distance of this instrument depends upon the effective distance of the infra-red illumination and flash, and upon the identifiability of the feature of the subject exposed on the infra-red film. With the 300mm f3.3 lens, mounted on the Nocta, using a 'Toshiba Super 5R' flash bulb (special order) and Kodak High Speed Infra-Red film, considerably boosted through development, the maximum operative distance is approximately 100 metres.





Optical Specification

Camera:	Picture size 24mm x 36mm Shutter speed 1/30 sec. and Bulb Synchronised flash terminal Detachable sports finder
Lens:	300mm f3.3, especially designed for infra-red Minimum aperture f29 Angle of view 8° Supplied with 256X N.D. protective filter (42mm)
Eye-piece:	Focal length 25mm Adjustable between -4 and +2 diopter
Total viewfinder image magnification	10x
Effective angle of viewfinder image	5° (approximately)
Resolution of image on image converter tube	50 Lpm at centre (approximately)
Maximum visible distance	100 metres (328 ft) (approximately) with 50W bulb in search light.
Maximum operating distance	100 metres (328 ft) (approximately) when operated as specified.
Range of wavelength band used	0.85/1.2 microns
Parabolic mirror of infra-red search light:	
Effective diameter	170mm
Focal length	20mm
Effective angle of irradiation	5°
Parabolic mirror of infra-red flash gun:	
Effective diameter	170mm
Focal length	20mm
Effective angle of irradiation	12°

Electrical Specification

Image converter tube in noctovision viewfinder:	
Image converter tube	RCA 6914-V1
Output	16KV
Consumption	30 milliwatts
Power source	One 9V dry cell contained in camera body.
Infra-red search light:	Bulb used 12V, 50 Watt (DC/AC). Power source DC - 12V, 8A/H battery, approximately 1.5 hour life after full charge - automatic warning signal against over-discharge - on-off switch - supplied with special battery charger (AC input - 100, 120, 220V, 50-60 cycles). AC - 12V, 70 Watt (AC input - 100, 110, 120, 125, 200, 220, 230, 240V, 50-60 cycles). Direction and angle of infra-red beam is adjustable Parabolic mirror reflector is capped with an infra-red filter (RT-1A).
Infra-red flash gun:	Power source - one 9V dry cell - direction and angle of infra-red beam is adjustable - equipped with flash bulb test button - parabolic mirror reflector is capped with an infra-red filter (R90-A).
Flash bulb:	Toshiba Super 5R: Peak Lumen 1,500,000 Total output 25,000 Lumen/sec. Effective duration 14 milliseconds
Camera Assembly	515 x 360 x 225mm - 7 kg.
DC Power Pack	135 x 160 x 110mm - 3.7 kg.
AC Power Pack	135 x 200 x 180mm - 3.9 kg.
Charger	120 x 300 x 150mm - 8 kg.

Finder

Turn on the switch of the noctovision viewfinder.

Flash Bulb

Depress the lock button (1), pull out the socket, insert a flash bulb, and push back the socket. The socket is pushed back with a 'click', and with this click the flash gun circuit is closed completely. Be sure that the socket is pushed with a 'click'. Test the bulb with the white Bulb Test button.

Focusing

Look through the eyepiece (2), rotate the focusing ring (3) of the lens by holding the focusing lever (4), and bring the object into focus. Always focus by observing the image at the centre circle of the fluorescent screen of the image converter tube. When focusing, rotate the roulette ring of the eyepiece to fit it with your sight. Once you remember the calibration of the eyepiece which suits your eye sight, this adjustment is not always necessary.

Exposure

After composing and focusing, gently release the shutter. The reflex mirror rises, and the shutter is fired, also firing the synchronised flash bulb. On removing pressure from the release button (or cable release) the mirror returns to the original viewing position, and the image of the object returns on to the fluorescent screen.
(To minimise noise, the instant-return mirror is not incorporated in this Nocta camera).

Fired Flash Bulb

Pull out the socket of the flash gun as when you inserted the bulb, and remove the fired bulb. A conventional type ejector is not used in this instrument, and therefore, the fired bulb should be removed manually with care since it is hot.

After Operation

After operation, immediately switch off the noctovision viewfinder to prevent the risk of shortening the life of the image converter tube. Close down the lens diaphragm to f22, mount the N.D. filter and cap the lens.

Owing to the high resistance of the high voltage power source, it will take several minutes before complete attenuation of the high voltage. This must not be confused with the normal image when the equipment is switched on in an operable condition.

Before placing the Nocta unit back into the carrying case, make sure again that the noctovision viewfinder is Switched Off.

Accessories

The following accessories are supplied with the Nocta unit.

- 1 Charger
- 1 Portable DC power pack in leather case
- 1 AC power supply pack
- 1 256X N.D. filter
- 1 Leather lens cap
- 1 Leather cap for infra-red search light
- 1 Leather cap for infra-red flash gun
- 1 9V battery for image converter tube
- 1 9V battery for flash gun
- 1 Spare 12V-50W bulb for search light

- 1 12V-20W bulb for flash beam adjustment
- 5 Film magazines
- 1 Eye-cup
- 1 Spare fuse for charger input
- 1 Spare fuse for charger output
- 1 Spare fuse for AC power supply pack
- 1 Cable release
- 100 Spare flash bulbs
- 1 Silicon cloth
- 1 Carrying case

(A 'Tele-Holder' for hand-held shooting without tripod is available as a separate accessory. Weight - 1.5 kg.)



Important Notes-
extreme caution
must be observed

Protection of Image Converter Tube

Do not switch on the noctovision viewfinder while letting available daylight in through the lens at full aperture, as the image converter tube may be damaged. The image converter tube is very expensive, and therefore, the noctovision viewfinder must be handled with extreme care.

If you wish to view through the lens under daylight, keep the N.D. filter on the lens, and then turn on the switch. Such subdued light will

not damage the image converter tube if it is kept switched on for a short time. However, do not let direct sunlight in through the lens.

Even while operating the noctovision viewfinder with the aid of the infra-red search light, with the lens at full aperture, the image converter tube may be damaged if an object stands immediately in front of, or several metres away, from the lens, with the infra-red reflection from such object.

Operate the noctovision viewfinder with care so that high intensity light will not enter the finder system.

Focusing

Owing to the characteristics of the image converter tube, the image on its fluorescent screen has a pin-cushion distortion. Since the image resolution on the screen is sharper at the centre than elsewhere, use the small centre area for focusing. The image area of the image converter tube is a circle of 25mm diameter, against the film's picture area of 24mm x 36mm. Therefore, the infra-red film will record not only the image represented on the fluorescent screen but also the image not visible through the viewfinder.

Bulb Test

To test flash bulbs, push the white 'Bulb Test' button on the back of the flash gun. If it does not light, the bulb is defective, and should be replaced.

Exposure

The Nocta exposes the film at the shutter speed of 1/20 second by firing an M-class flash bulb.

Since this is an 'open flash', try to prevent camera movement. Use a rigid professional type tripod. If a tripod is not available, place the Nocta on some rigid support and release the shutter gently. Use a cable release whenever possible. The Nocta can be operated without a tripod if it is supported on the Tele-Holder (available as an accessory). Yet the shutter should be released as carefully and gently as possible to prevent camera movement.

If the object is more than 50 metres (164 ft) away, and if not moving, the 'B' shutter setting is recommended to be used for higher sensitivity.

Film

The film specified for the Nocta is Kodak High Speed Infra-Red film (HIR 421-1). This is a bulk film of 100 feet (30.48 metres) supplied in a can. It should be loaded into the film magazine in total darkness. Since it is a highly sensitive film, do not expose the loaded film magazine to daylight.

To store the film, place it in a polyethylene bag with silica gel, seal the bag, and keep it in a refrigerator below 0°C.

Before using the film, take it out of the refrigerator, keep it at the room temperature for at least four hours.

Film Processing

D76 is specified for developing Kodak High Speed Infra-Red film. It is recommended to develop the film for objects photographed within a 30 metre (98 ft) distance for about 11 minutes at 20°C; and beyond the 30 metre (98 ft) distance, for about 20 minutes at 20°C. Pandol developer (made in Japan - equivalent to Phenidone developer), used for about 15 minutes at 20°C, causes less fogging, and is more sensitive than D76. This type of developer is therefore recommended for objects photographed beyond a 30-metre (98 ft) distance.

The rest of the processing can be handled in the same way as for conventional films.

Battery

The portable battery pack is completely sealed. Fully charged, it will last for about 1.5 hours. The battery indicator (automatic signal against over-discharge) in the back of the search light will give an intermittent

dark red signal when the battery is completing its discharge. When this signal lights, stop using the battery, as discharging the battery beyond this point will shorten the battery life.

To charge the battery, connect the input plug of the charger with an AC mains supply, plug the output connector of the battery to the charger, and turn the setting dial from the Stop to Start position. The charger will start charging the battery automatically. If the battery is fully discharged before charge, the dial will start rotating from the Start position after about 4 hours, and will stop at the Stop position about 2 hours thereafter, thus completing the full charge. At the same time, the input current will be automatically interrupted and the pilot lamp will turn off.

When the battery is needed in case of urgency, the charger can be stopped if the dial has started rotating from the Start position. In this case, remember to rotate the dial manually to the Stop position after switch off.

After about 20 full charge/discharge cycles, charge the battery as follows to protect the life of the battery: Rotate the dial from the Stop to Manual position after plugging in the charger. After about 20 hours, turn the dial from the Manual to Stop position, and this completes the full charge.

The total life of the battery is approximately 150 cycles of full charge/discharge.

Always keep the battery charged. After it has been kept for more than 15 days after full charge, charge it again before operation. Try to use

For obtaining proper exposure, the following distance/f-stop/developer combination guides are given. Since fog, smog and other atmospheric conditions considerably affect exposure, these are merely rough guides.

Distance	F-stop	Developer
20m (65.6 ft)	f3.3	D76
15m (49.2 ft)	f4 -f5.6	20°C
10m (32.8 ft)	f5.6-f8	10 minutes
30m (98.4 ft)	f3.3	
25m (72 ft)	f4	D76
20m (65.6 ft)	f4 -f5.6	20°C
15m (49.2 ft)	f5.6-f8	20 minutes
10m (32.8 ft)	f8 -f11	
40m+ (131.2 ft)	f3.3	
30m (98.4 ft)	f4 -f5.6	Pandol (Phenidone) developer
25m (72 ft)	f5.6	
20m (65.6 ft)	f5.6-f8	20°C
15m (49.2 ft)	f8 -f11	15 minutes
10m (32.8 ft)	f11 -f16	

AC power supply whenever available.

Replacement of Dry Cells

The batteries for the high-voltage power source for the image converter tube and for the flash gun are both 9V dry cells, same as used in transistor radios. Before operating the Nocta, insert the dry cells into the power housing underneath the Nocta camera body. (Once the batteries are in the power housing they need not be taken out until the time of replacement.)

When these batteries are low, the image on the image converter tube darkens or the flash bulbs will not fire. Usually, they should be replaced with new batteries every two or three months.

Before loading or replacing batteries, turn the Nocta upside down. The old batteries can be removed by opening the power housing with a coin keep the noctovision viewfinder switched off when inserting or replacing batteries.

When the Nocta is upside down, be extremely careful not to change the angle of the infra-red search light and flash gun.

The following dry cells can be used:

NEDA 1604	KENT-6570
BURGESS 2U6	EVEREADY 216
RAY-O-VAC 1604	WARD 95
MALLORY TR-146R	MARATHON 1604
RCA VS312	006P (JIS-C-8504)

Adjustment of Axis of Infra-Red Beams

The axis of the beams from the flash gun and search light is pre-adjusted to be parallel with the optical axis of the lens. If, however, the optical axis of the flash gun or the search

light accidentally gets out of alignment, check and adjust it as follows: Switch on the noctovision viewfinder and the search light. Pre-select an object about 40 metres away. Look through the viewfinder and check whether the beam of the search light points at the pre-selected object. If the beam does not properly point at the target, adjust the direction of the search light by loosening the adjustment screw provided for this purpose. After adjustment tightly fasten the screw.

Insert the test bulb (12V 20W), instead of a flash bulb, into the flash gun. Remove the camera-flash gun connector from the side of the flash gun, and connect the connector from the power source for the search light (either from the portable DC pack or AC pack) to the flash gun. Select an object about 20 metres (65 ft) away, and check and adjust as explained in the preceding paragraph.

Filters

The infra-red filters for the search light and flash gun are fragile. Handle them with care. Dirt and stains on the filter surface will absorb infra-red light, and therefore, they should be kept clean at all times.

Miscellaneous

Replacement of bulb in infra-red search light:

Remove the filter of the search light by loosening the screw retaining the filter frame, and replace the bulb (12V 50W) from the front side of the parabolic mirror reflector.

An input AC voltage switch is provided in the base of the charger and AC power pack. Before plugging the charger or AC power pack into an AC mains supply, turn the switch so that the pointer indicates the standard AC voltage of the place of operation.

The tolerance of the input AC voltage is $\pm 10\%$ for the charger and $\pm 5\%$ for the AC power pack. The charger and AC power pack will operate both on 50 and 60 cycles, but will not work properly on other cycles.

Operation

Search Light. Connect the power source cord with the connector of the search light, and turn on the switch.

Lens. Remove the lens cap and N.D. filter. Open up the diaphragm to f3.3.

Section 9
Takumar Lenses

Takumar Lenses

A definition of lens mount terminology

Manufacturer's name: Asahi Optical Co.

Country of origin: Japan

Auto-Takumar indicates Pre-set diaphragm

Super-Takumar indicates Fully Automatic diaphragm.

1:1.8/55. The first part (1:1.8) indicates the maximum aperture ratio of the lens, i.e. $f1.8 : f/1.8$: or F1.8

The second part (55) indicates the basic focal length of the lens in question, i.e. 55—55mm.

Series of numbers. Each lens has individual serial number providing useful information (to manufacturer, date of manufacture, batch, etc.)

To owner, positive means of identification for insurance purposes, etc. Some lenses bear further positive forms of identification relating to special purpose designation.

Macro-Takumar: Close-up Macro-photography.

Bellows Takumar: Short barrel designed for use on Extension Bellows.

Fish Eye: Ultra Super Wide-Angle.

Zoom: Manually variable focal length.



Lenses—diaphragm

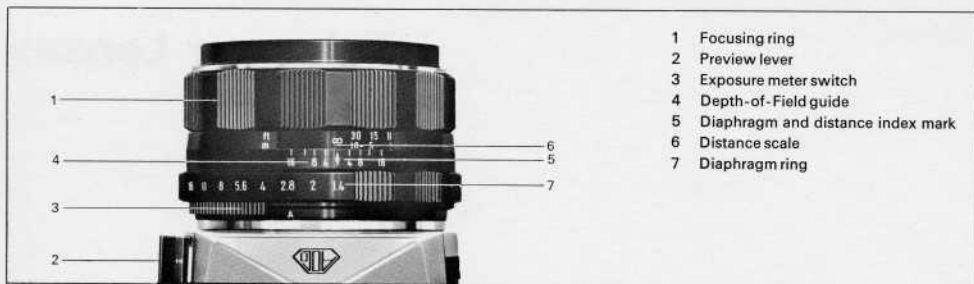
The single lens reflex system as a whole has not only influenced design but virtually dictated the evolution of the diaphragm system. In early days lenses designed and manufactured for use on SLR cameras were unashamedly identical in every respect to lenses designated for use on any other similar 35mm but non-SLR interchangeable lens camera other than individual variation in the actual style of mounting.

However, apart from the many outstanding advantages of the SLR system it was soon realised that there was much room for improvement with regard to the selection and ultimate mechanical shift from full (viewing) aperture to the actual required exposing aperture.

In other words, having produced a system whereby one could view on the screen quite literally the exact image as seen by the camera lens, i.e. Angle of View, Depth of Field (and, with the Pentaprism a laterally non-reversed and vertically correct image) it was wholly undesirable to have to interrupt one's viewing in order to examine the iris diaphragm ring, to select and position the control ring before making the exposure.

Just a word at this stage for any non-SLR users who may be reading this Manual as to the necessity, or at least, desirability for utilising full aperture when viewing the subject prior to shooting. It is pretty obvious that the first of two specific

advantages is by virtue of the brilliant screen image resulting. The second advantage being that focusing at full aperture means that one is focusing with shortest possible depth of field, thus ensuring really fast, critical and accurate focusing, the whole procedure becoming just a matter of simple routine. Needless to say, with certain well lit subjects and where a reasonably wide aperture could be employed without sacrificing too much in the way of depth of field and optical performance, one could get round this otherwise cumbersome routine, as indeed is still necessary with certain of the longer focal length lenses for purely mechanical consideration. However, the past years have seen an interesting development of this very important feature. First, the introduction of the Pre-set diaphragm which allowed one to pre-select the required aperture for exposure and by virtue of a click stop setting ring manually turn the ring to the required taking aperture.



- 1 Focusing ring
- 2 Preview lever
- 3 Exposure meters switch
- 4 Depth-of-Field guide
- 5 Diaphragm and distance index mark
- 6 Distance scale
- 7 Diaphragm ring

Manual

The diaphragm is opened and closed by a single manually operated control ring. For viewing and focusing purposes it is turned manually to the widest aperture and then again manually returned to the required taking aperture prior to making the exposure.

Pre-set diaphragm

As is seen in the illustration there are two control rings relating to the iris diaphragm. The front ring is engraved with diaphragm numbers and rotates with a series of click stop movements, with the ring temporarily locking upon reaching any one of the engraved numbers. The process of selecting and setting the required exposure aperture or F number is achieved by rotating the front ring until the required F number is located directly facing the pre-set diaphragm index mark. The iris diaphragm control ring which is positioned adjacent to and immediately behind the front locking ring is then turned manually to the fully open position (widest

aperture), for the purpose of viewing and focusing the screen image. At the required moment prior to making the exposure the diaphragm control ring is manually turned to the full permitted degree of rotation determined by the previously selected position of the front control ring.

Semi-automatic diaphragm

Auto Takumar Lenses*

This represents the third system of diaphragm selection and is in action semi-automatic. A click stop diaphragm is set to the desired taking aperture. Then a spring actuated cocking lever positioned on the right hand side of the lens barrel is moved to open the diaphragm to maximum aperture for bright screen viewing and focusing. Upon releasing the shutter an internal link in the camera body shoots out and depresses a connecting pin on the rear of the lens mount and the diaphragm is thus automatically stopped down to the required taking aperture. Once the exposure has been made it is necessary to move

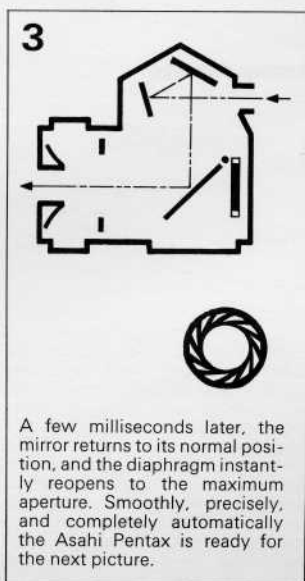
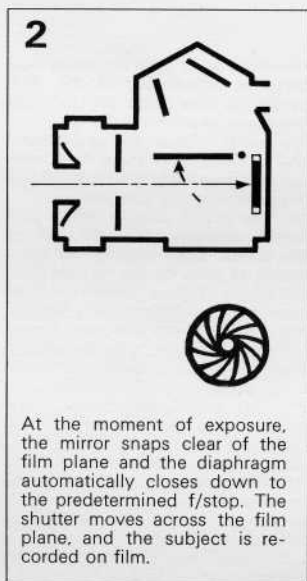
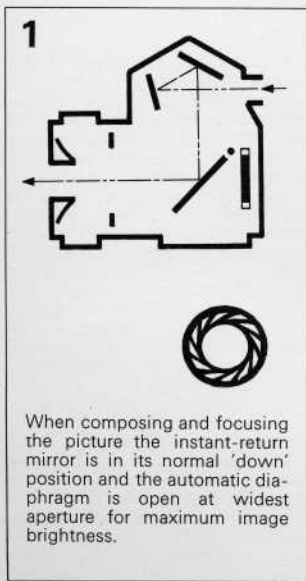
the cocking lever across when the diaphragm will again be opened to the widest position. One convenient and important point worth noting is that the actual position of the diaphragm ring may at any time be changed irrespective of whether the diaphragm is in the 'cocked' position or not.

*Supplied with Model Pentax S2 1959 and later discontinued for fully-automatic version.

Automatic diaphragm

The fully Automatic Diaphragm is open to the widest possible setting (widest aperture) at all times. That is, until the moment of actual exposure when the diaphragm closes momentarily to the pre-selected F number.

Thus the moment the diaphragm has closed and the shutter has completed its travel across the focal plane, it instantly reopens under spring tension to the fully open position, so providing the brightest possible screen image. One of the great values of the SLR however, is the ability to see the actual depth of field at any aperture.



With this fact in mind Asahi have conveniently arranged for a form of manual over-ride. In short, by sliding the crescent-shaped projection down a short distance, the lens becomes to all intents and purposes a manually operated lens. Consequently, the screen will darken or brighten according to the position of the iris diaphragm control ring, and in direct relation to the actual F number selected. The red letter 'M' for Manual or white letter 'A' Automatic, appear as a convenient form of reminder each side of the crescent shaped setting lug, either one of which is exposed according to the position of the lug.

Image fidelity

Image fidelity is a term used to describe certain characteristics found in all Takumar lenses. All Takumar lenses are today calculated by Electronic Computer and ultimately developed and tested in one of the finest optical design laboratories in the world. Furthermore, all lenses are scrupulously checked for actual resolving power having to conform to Asahi Optical Company standards, which are, in fact, set higher even than those required by J.I.S. (Japanese Industrial Standards).

Each Takumar lens finally passing all tests imposed at the laboratories bears the seal of the Japanese Camera Inspection Institute which in itself automatically ensures the highest possible standards of performance. The lens, is, in itself, an incredibly complex arrangement of glass components, but this would not, of course, constitute much without the precisely machined lens barrels into which the lenses are fitted. High grade precision engineering ensures accurate positioning of elements and provides a silkily-smooth focusing movement. All engraved markings are clean cut with a high degree of legibility.

Coating

All Takumar lenses are surface coated and this coating serves several purposes. Essentially, it assists in the actual degree of light transmission through the lens. For instance, by coating a lens with eight glass-to-air surfaces the lens will work at one half stop faster than an identical non-coated lens. Internal reflection is minimised and the real danger of flare and resultant degrading effect on the negative considerably reduced. Furthermore, it can be used for the correction of a lens in relation to the proper rendition of specific colours.

Thus it will be seen that some Takumar lenses have amber colour coating, some a purple coating, whilst others have a combination of both amber and purple.

Focal length

Most of the basic characteristics governing any lens can be related to the focal length.

Focal length dictates brightness of the image on the film plane, size of image reproduction, angle of acceptance (thereby determining exactly the area of any given subject to be covered), depth of field, and so on. When the focal length is equal to the diagonal of the negative it is considered to be of 'normal' focal length. The 35mm format being 36×24 mm the diagonal measures approximately 45mm. Albeit, most manufacturers produce standard lenses of 50 to 58 mm since apart from slightly increased image size, perspective is approaching that of the human eye.

Thus lenses of shorter focal length are termed Wide Angle and those of long focal length are, somewhat predictably, long focus or Telephoto. In the simplest possible terms a lens which has a focal length longer than the diagonal of the negative is virtually a 'long focus lens'. There is, however, a departure from this simple statement of fact in the case of Telephoto lenses which are constructed on a different principle. This makes for a more complicated lens structure which in turn must obviously add to the cost. In return the lens is generally more compact and therefore shorter in overall measurement compared to a long focus lens of equivalent focal length.

The three basic controlling factors, image size, depth of field and perspective are related thus.

When the standard or normal lens is fitted to the camera, objects very close to the camera would, if photographed, appear overlarge and distorted in relation to subject matter further away. A typical example would be the human face, where nose, eyes and mouth would be distorted first in relation to their own proximity to the camera lens, and again in relation to, say, the ears. Thus the nose, nearest the lens, would show the greatest degree of distortion, the ears the least amount of distortion.

Everyday one can see in the press and magazines examples of the current trend to introduce a certain degree of freakishness by deliberately utilising Wide Angle instead of standard 50 to 58mm lenses, a purpose for which they were certainly not intended by the original designers!

This question of perspective is always with us, a positive and dominating factor. Used in the normal way a Wide Angle lens will, of course, still cause distortion and perspective will appear 'stretched' in the sense that distant subjects will appear farther away than they really are and the distance between objects are also seemingly greater

than really is the case. The human eye nevertheless tends to accept this more gradual perspective distortion because it is not 'obvious' or 'violent' as in the case where deliberate distortion is used purely as a means of journalistic eye-catching technique.

The reverse can be said of the long focus or telephoto lenses. Distortion does inevitably occur in the form of foreshortening where the planes of a picture are compressed. How often this can be seen vividly demonstrated at the cinema, where, for instance, a group of runners competing in a race and moving toward the camera appear almost to be on the same plane, and even the leaders move forward but little. All the figures seem to be of equal size, and all real sense of proportion lost. Naturally, there are occasions when any form of distortion may be gainfully employed for pictorial or other effect, but when it is not desirable and a true rendering is required then that is where the 85mm-135mm focal length lens is invaluable.

There is another controlling factor depending on circumstances, this being what might be considered a convenient working distance between camera and subject - or - as stated earlier - image size. By using a focal length of between 85-135 mm in portraiture it is possible to conveniently fill the 24×36 mm frame with the sitter's head or head and shoulders, without having to approach closer than a few feet. This fact and the lack of distortion, not to mention the compact form of lenses in this category must contribute greatly towards their undoubted popularity.

The question of image size in relation to actual working distance between camera and subject should soon become apparent even to the relative newcomer. It should be appreciated that there are occasions when some form of barrier, i.e. water, railways, or even one's seat position at theatre or circus dictates the nearest point of approach to the subject. It is on these occasions that the use of even three or four lenses of varying focal length can initially make or mar a photograph, quite apart from the tremendous personal satisfaction to be experienced in having the 'right kind of tool (lens) for the job.'

Speed and F numbers

The 'speed' of the lens or brightness of the image is determined by an aperture ratio for the aperture when fully opened. The ratio D/f represents the aperture in diameter to the focal length of the lens. Therefore with f (the focal length) constant, the larger the aperture (D) the greater the aperture (D/f).

Expressed simply, the image produced is brighter.

The reciprocal of the aperture ratio, i.e. f number f/D, for instance, may be as follows:

1 : 1.8, f1.8, f/1.8, or F1.8.

It is simple for the purpose of calculation when, for instance, determining exposure, to appreciate that the f group represents a doubling up from the smallest to the greatest, or vice versa. That is, the light entering the lens with the aperture set at f.8 will be half the amount with the setting at f.11, or double the brightness at f.5.6.

Consequently, there are various combinations or groups of f numbers and shutter speeds which permit the same total amount of light to pass through the lens, and which are called 'light value', or 'exposure value'. This is of great convenience, having once ascertained correct exposure, allowing one to adjust exposure by means of either shutter speed or lens aperture according to the specific demands or nature of the subject.

Lenses - depth of field

One enormous advantage the user of an SLR camera has is that even without any basic theoretical knowledge of optics he or she can always determine actual depth of field at any specific aperture - visually - simply by looking carefully at the subject in the viewfinder.

As a general guide the longer the focal length of a lens the shallower the depth of field, always assuming the aperture remains the same. Elsewhere in this Manual complete depth of field reference charts

appear for all Takumar lenses, but a word concerning what is actually meant by the term for those who may be a little uncertain, for it is of extreme importance in mastering completely the basic fundamentals of picture making. For example let it be assumed that the lens is focused on a middle distance plane. The actual plane at the point of focus will be rendered perfectly sharp. However, planes either side of the point of focus will gradually become blurred, more so the greater the distance becomes both in front and behind the point of focus.

The degree of blur is normally expressed in terms of the diameter of the circle of confusion. Provided the degree of blurring remains within the permitted limit the image will appear sharp enough to the discerning viewer.

Therefore, the area of picture which falls between the actual point of focus and extends both in front and behind and remains acceptably sharp is termed depth of field. The permissible diameter of the circle of confusion for almost all high grade 35mm camera lenses is 1/30mm allowing for subsequent enlargement of the negative and also taking into consideration the actual viewing distance of the final enlargement. Without becoming too mathematically involved there are some reliable hard and fast rules governing depth of field which are worth remembering.

The longer the focal length the shorter the depth of field.

The shorter the focal length the greater the depth of field.

The depth is always greater behind

the point of focus than in front.

The closer the subject to the lens the shallower the depth of field.

The smaller the aperture the greater the depth of field.

Let us take three typical Takumar lenses: 35mm f2; 55mm f1.8; and 135mm f3.5.

Now set all the iris diaphragms at f11, and focus each lens at 10ft. distance.

The 35mm lens will have a depth of field extending from 5'4" - 103'3", the 55mm 7'5" - 15'4" and the 135mm 9'6" - 10'7".

Optimum lens aperture

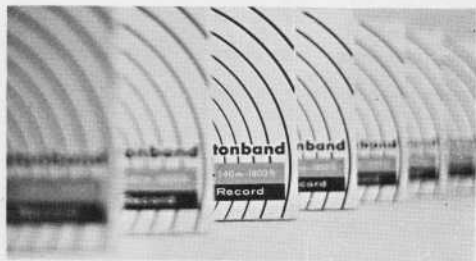
The finest photographic lenses do not always produce the sharpest results at full aperture, due to certain inherent aberrations.

Even though lens design has now reached an extremely high degree of perfection, the undeniable fact remains that the wider the aperture the more difficult is it to correct or eliminate all the aberrations.

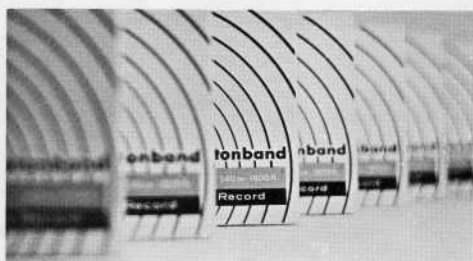
As is generally appreciated, the best possible picture quality will normally be obtained by stopping the lens down. But the very action of stopping down will ultimately cause loss of definition due to the increasing diffraction of light. This is likely to be more noticeable in the central rather than marginal areas. Therefore, in order to obtain the sharpest possible image with any one particular lens, the optimum f number should be used. This will be, generally, three or four stops down from the widest opening.

Care of lenses

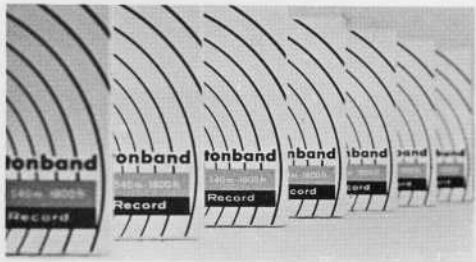
It has already been established beyond doubt that not only are



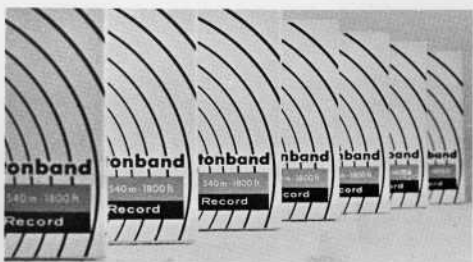
55mm f1.8 Super-Takumar D.O.F. f11.8



55mm f1.8 Super-Takumar D.O.F. f2



55mm f1.8 Super-Takumar D.O.F. f5.6



55mm f1.8 Super-Takumar D.O.F. f8

Asahi Pentax lenses among the finest in the world, but also that optically and mechanically they are beyond reproach.

It stands to reason, therefore, that given proper care, a lens of this kind will last indefinitely. Any failure in a lens is due either to misuse or accidental damage and can affect either (a) the optics (b) mechanical elements. First quality optical glass is softer than other kinds and also the coating on all glass to air surfaces is ultra thin. So, obviously, great care must be taken to avoid any damage occurring to the two outer exposed surfaces at front and rear.

Since all Takumar lenses are supplied with front and rear lens caps these should be used whenever possible. The rear lens cap is of particular significance in that it protects not only the outer rear lens surface (when the lens is not in use), but also the all important precision turned thread used to attach the lens to the camera body proper.

Further protection to the front element is very simply provided by use of the U.V. filter, which will help prevent damage that might otherwise occur through excess dust or dirt particles, sand, moisture, etc. Exposure is not in any way affected and the filter may be left permanently in position, if desired, for almost all work.

Unless photography is confined to taking pictures in a completely dust-free atmosphere, lenses will require periodic cleaning. Dry dust should only be removed with a soft camel hair brush or by blowing it off with a small rubber syringe. Never

blow or breathe on a lens element as this breath contains moisture which will leave an almost imperceptible film on the glass, impairing the light transmission of the lens.

It is very rare for the mechanical elements to suffer any form of failure, but if any part does cease to operate correctly do not attempt to rectify the matter, but return the lens to an authorised Asahi Pentax dealer. In fact, only if a lens has been badly maltreated (including being dropped) is there much likelihood of faults developing.

Actual lens surfaces should on no account be touched with the fingers, as the perspiration on the hands and finger tips contain acid, which if allowed to remain on the glass could in time become permanently etched, resulting in actual damage to the lens. If a finger does accidentally come into contact with the lens surface the mark should be removed as soon as possible with a special lens cleaning tissue moistened with one or two drops of a commercial lens cleaning fluid.

Never use a handkerchief or cloth, as any dust or small particles of grit embedded in the cloth could cause severe surface scratching. Normal paper tissues are not suitable for they leave considerable amounts of dust and lint on the lens surface.

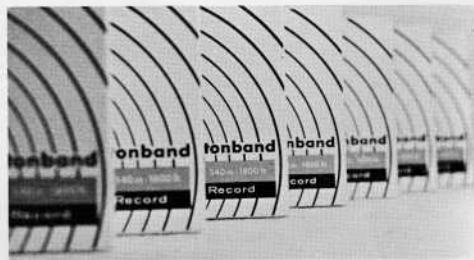
A photographic lens is a precise complex instrument, and only those with the proper tools and specialised training should attempt to undertake even apparently simple repairs. Do not have it repaired by an unauthorised repair department.

Despite the advanced form of lubri-

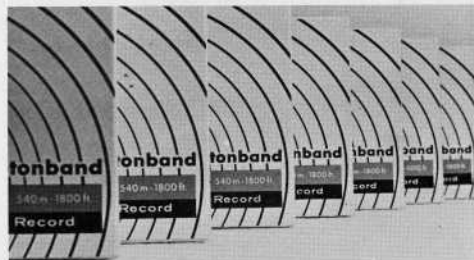
cants available today, the grease used in lens barrels will thicken slightly in extremely cold weather, causing the focusing to become rather stiff. Never attempt to remedy this by using a supplementary lubricant. The oils and other lubricants used in cameras and lenses are highly specialised, and to contaminate them with improper lubricants merely invites trouble. In normal use, lenses will require no attention other than an occasional cleaning to keep them performing perfectly, picture after picture.



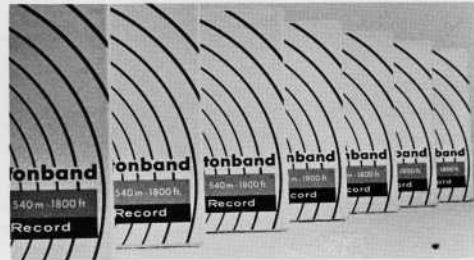
55mm f1.8 Super-Takumar D.O.F. f2.8



55mm f1.8 Super-Takumar D.O.F. f4



55mm f1.8 Super-Takumar D.O.F. f11



55mm f1.8 Super-Takumar D.O.F. f16

Lense Angle Differences (All photographs were taken from the same location and distance from the subject).



35mm



55mm



85mm



105mm



135mm



200mm



300mm



400mm



500mm

Specifications of Takumar Lenses

Name of Lens	Focal length and Maximum Aperture	Minimum Aperture	Lens Element	Diaphragm	Minimum Focusing Distance m. ft.	Angle of View degrees	Weight gr. ozs	Filter Size mm	Lens hood Cap Size mm	Lens Cap Size mm
Super-Takumar Fish-Eye	17mm f/4	22	11	FA	0.2 0.66	180 ¹	228 7.98	81	—	60
Super-Takumar	20mm f/4.5	16	11	FA	0.2 0.65	94	251	77	60	60
Super-Takumar	24mm f/3.5	16	9	FA	0.25 0.8	84	247 8.71	58	60†	60
Super-Takumar	28mm f/3.5	16	7	FA	0.4 1.3	75	218 7.6	49	51†	51
Super-Takumar	35mm f/2	16	8	FA	0.4 1.25	62	242 8.53	49	49*	51
Super-Takumar	35mm f/3.5	16	5	FA	0.45 1.5	63	152 5.4	49	49	51
Super-Takumar	50mm f/1.4 ²	16	7	FA	0.45 1.5	46	230 8.1	49	49	51
Macro-Takumar	50mm f/4	22	4	PS	0.208 0.68	46	265 9.3	49	—	51
Super-Macro-Takumar	50mm f/4	22	4	FA	0.234 0.77	47	248 8.74	49	—	51
Super-Takumar	55mm f/2 ³	16	6	FA	0.45 1.5	43	215 7.5	49	49	51
Super-Takumar	55mm f/1.8 ²	16	6	FA	0.45 1.5	43	215 7.5	49	49	51
Super-Takumar-Zoom	70-150mm f/4.5	22	14	FA	3.5 11.5	16-35	1209 42.6	67	67*	70
Super-Takumar	85mm f/1.9	16	5	FA	0.85 2.75	28	350 12.3	58	58*	60
Bellows-Takumar	100mm f/4	22	5	PS	—	24	139 4.9	49	49*	51
Super-Takumar	105mm f/2.8	22	5	FA	1.2 4	23	290 10.2	49	49*	51
Super-Takumar	135mm f/3.5	22	4	FA	1.5 5	18	343 12.1	49	49*	51
Super-Takumar	135mm f/2.5	22	5	FA	1.5 5	18	444 15.5	58	58*	60
Super-Takumar	150mm f/4	22	5	FA	1.8 6	16.5	324 11.3	49	49*	51
Super-Takumar	200mm f/4	22	5	FA	2.5 8.2	12.5	550 19.3	58	58*	60
Tele-Takumar	200mm f/5.6	22	5	PS	2.5 8.2	12	370 13.1	49	49*	51
Tele-Takumar	300mm f/6.3	22	5	PS	5.5 18	8	729 25.7	58	58*	60
Super-Takumar	300mm f/4	22	5	FA	5.5 18	8	946 33.1	77	*	85
Tele-Takumar	400mm f/5.6	45	5	M	8 27	6	1300 45	77	*	85
Takumar	500mm f/4.5	45	4	M	10 32.8	5	3500 122.5	49	*	127
Tele-Takumar	1000mm f/8 ⁴	45	5	M	30 98	2.5	5500 192.5	49	*	143

B1 = 3 filters built-in. M = Manual. FA = Fully Automatic. PS = Preset.

¹ = Diagonal coverage. ² = Standard lens for Spotmatic. ³ = Standard lens for model S1a. ⁴ = Supplied with wooden tripod and carrying cases.

All lenses, including standard lenses purchased separately, are supplied with leather case, straps, front and rear caps. All filters and lenshoods are screw-in type unless otherwise indicated.

(* Lenshood supplied with lens. † Clip-on type)

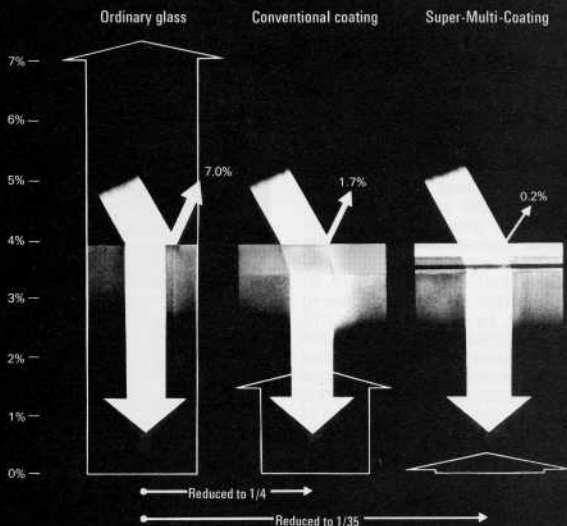
Super Multi-Coating

When light passes through glass it reflects on the surface and tends to be absorbed inside the glass. Absorption is minimal but reflection can result in from 8% to 18% of the light being reflected from both surfaces, depending on the type of glass.

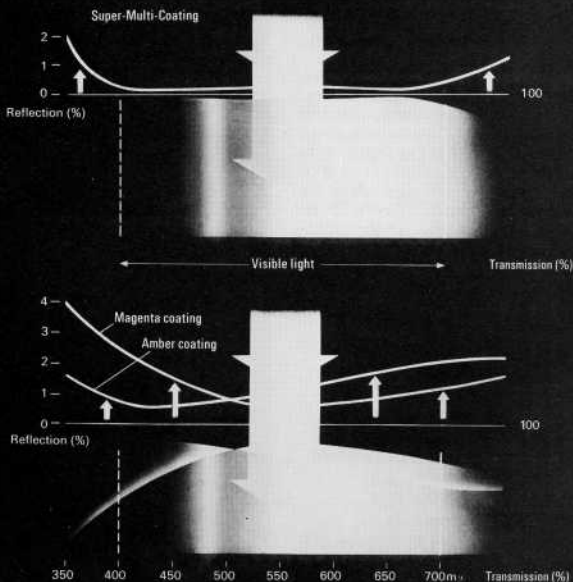
Up to World War II, most camera lenses were simply polished optical glass without any surface treatment. It was discovered that by depositing a thin film of magnesium fluoride on the lens surface by means of vacuum evaporation, the surface reflection became less with a consequent increase in light transmission. In addition, it was found that this coating process prevented the lens yellowing with age and eliminated the growth of moulds. This coating was known as the single layer soft coating type. Unfortunately, it was prone to scratching and on occasions, rubbed off when the lens surface was wiped. A hard one or two layer coating was subsequently developed which is the type found on most lenses today.

With suitable coating, reflection from each side of a glass surface can be reduced from 4% to 1%. The reflection ratio varies with the type of glass but with present day optical glass this ratio is in the region of 7%, which is reduced to approximately 1.7% with conventional coating. With the introduction of Super-Multi-Coating, Asahi Optical managed to reduce the reflection ratio to as low as 0.2%. This has been achieved by depositing on each surface, seven ultra-thin layers of coating, each layer just a few microns thick. The seven layer coating increases light transmission dramatically and prevents the entry of ultra-violet light by reflecting it back, which eliminates flare and as a

Difference in reflection by coatings



Characteristics of coatings



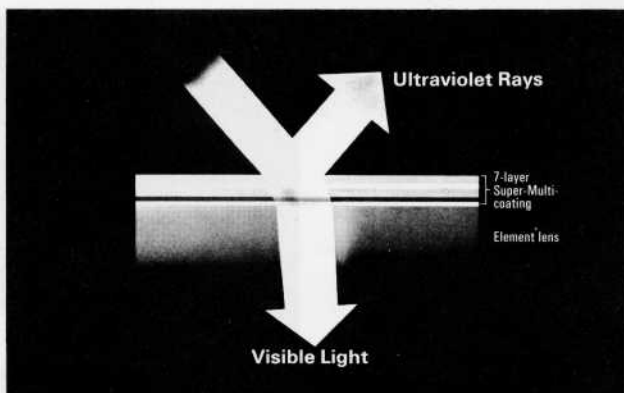
result, gives a greater image clarity. It follows that it is not necessary to use a UV filter with these lenses. Super-Multi-Coating has the effect of increasing the light transmission ratio of a 7 element lens by approximately 20% and a 14 element lens, such as a zoom lens, by as much as 50%. Therefore a lens of the same f-value could become brighter by half an f-value, depending on its type and so an f/4 zoom lens becomes as bright as an f/3.3 and an f/1.4 standard lens becomes as bright as an f/1.3.

In terms of colour clarity, conventional lens coatings clearly showed their colour, such as amber, magenta, purple or green. This indicated that the colour of a particular wavelength was being reflected back and that a great deal of its complimentary colour was being transmitted. To compensate for this it was necessary to improve the colour balance of the transmitted light by mixing together various types of coating materials while considering the absorption value of the glass itself. With Super-Multi-Coating reflection control is almost flat against the whole range of visible light. It has maximum light transmission for all wavelengths, whilst keeping the surface reflection of the coating extremely small. This results in a better colour balance and much richer colours.

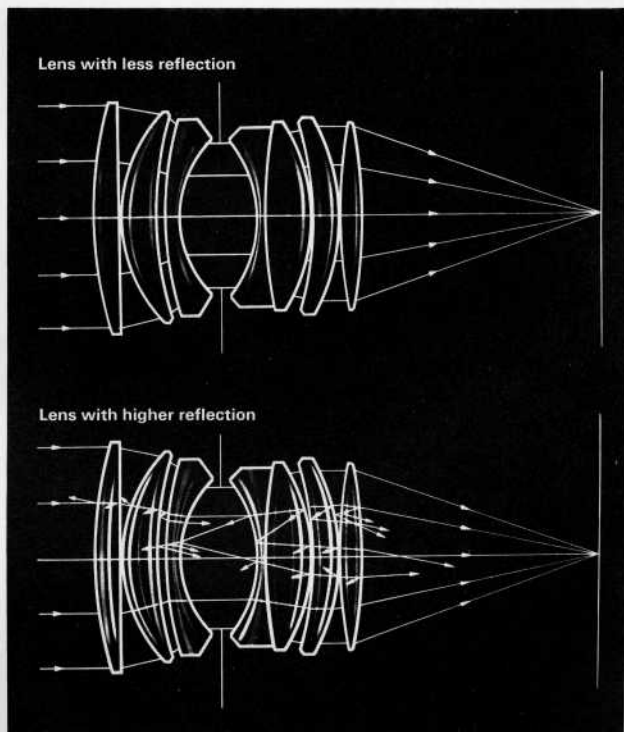
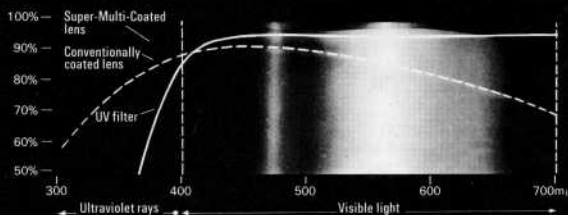
It will be seen that by the introduction of Multi-Coating, the Asahi Optical Company has increased the speed, improved the image quality, enhanced the colour balance and made the surfacing more durable in their range of Super-Multi-Coated lenses. This makes it possible for Pentax owners to obtain better pictures under more difficult conditions.

Originally there were only two Super-Multi-Coated Takumar lenses, which were obtainable only with the Spotmatic II. With the introduction of a further 14 of these lenses it is assumed that the complete range of Takumar lenses will eventually be Super-Multi-Coated. The 16 SMC lenses are listed below, all specifications remain the same as those tabulated on page L6.

- SMC Takumar 28mm f3.5
- SMC Takumar 35mm f3.5
- SMC Macro-Takumar 50mm f4
- SMC Takumar 50mm f1.4
- SMC Takumar 55mm f1.8
- SMC Takumar 85mm f1.9
- SMC Takumar 105mm f2.8
- SMC Bellows-Takumar 100mm f4
- SMC Takumar 135mm f3.5
- SMC Takumar 135mm f2.5
- SMC Takumar 150mm f4
- SMC Takumar Zoom 85-210mm f4.5
- SMC Takumar 200mm f4
- SMC Takumar 400mm f5.6
- SMC Takumar 500mm f4.5
- SMC Takumar 1000mm f8



Characteristics of transmission



Section 10
Wide Angle Lenses

Super-Takumar Fish-Eye 17mm f4

An ultra wide-angle lens, and as such undoubtedly one of the most advanced of its kind in the world. More commonly known by photographers as 'Fish Eye' this designation is hardly surprising when considering the incredible 180° angle of acceptance (film diagonal). Asahi have achieved rare distinction in lens technology in that this lens may be fully employed in conjunction with the mirror and Pentaprism of the camera body, with normal through the lens viewing/composing, focusing, and in the case of Spotmatic, metering. For the record it may not be generally appreciated that with lenses of similar specification from other manufacturers this is quite impossible, as the rear projection of the back component prohibits the normal movement of the mirror mechanism, thereby forcing one to resort to the use of an ordinary optical accessory viewfinder. This has only been made possible due to the almost unbelievably compact and lightweight design which can be regarded as an optical breakthrough by the Asahi design group. Further the lens has not only fully automatic diaphragm, but also boasts the luxury of built-in filters, three in total, comprising UV, Y2, O2, selected by means of a rotating filter control ring. Alternatively, an adapter is provided enabling the use of gelatine filters to be employed at the rear of the lens.

It is worth noting that even at full aperture standard of definition is remarkably good.

It is a lens primarily employed by those seeking imaginative and unusual photographic effects. Asahi

have created this unique lens and opened up completely new fields of possibilities. Those seeking new means of photographic expression will themselves be the architects of unique and impressive achievement. Add to the general specification the fact that this lens will focus from infinity down to an incredible 20 cms. plus the brilliantly sharp image produced by the 7 groups of 11 individual elements and it is not difficult to see why it is in constant demand and use the world over.

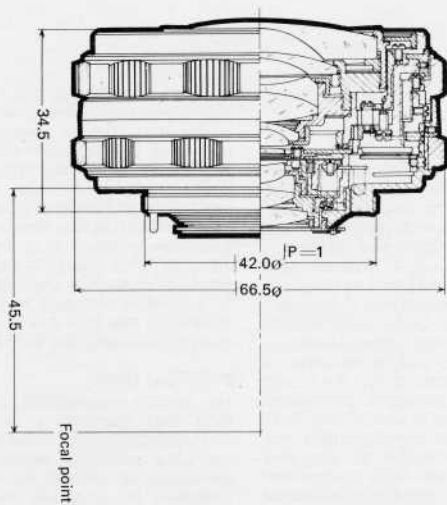
Principal Uses

The almost unbelievable depth-of-field and fascinating degree of distortion both help make this lens the ideal objective where a new dimension is desired for the presentation of all scenic work and unique aspects of commercial and pictorial photography. The superb colour rendering should be of particular interest to all colour specialists.

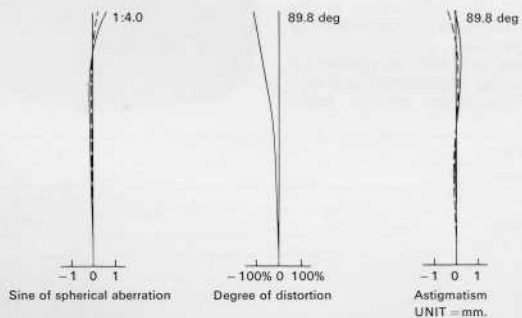


Focal length	17mm
Maximum aperture	F4
Lens elements	11 in 7 groups
Diaphragm	Fully automatic
Angle of view	180°
Minimum focusing distance	0.2m
Minimum aperture	F22
Dimensions Maximum diameter	66.5mm
Length	30mm
Weight	228g
Filters	3 built-in filters *
Additional features	Gelatine filter frame

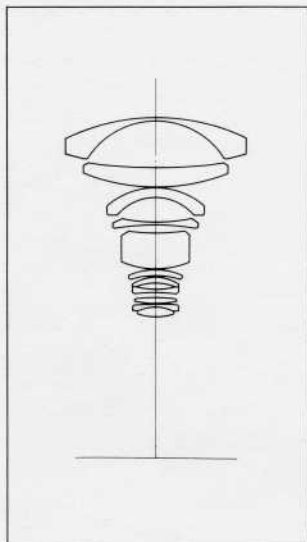
Super-Takumar Fish-Eye 17mm f4



(mm)



Super-Takumar 20mm f4.5



In spite of the super-wide-angle design of 94° , this 11-element lens gives even brightness over the entire picture format. Aberrations corrected from centre to edges. Its short focal length and deep depth of field permit fixed focusing when the lens is set at f8 and 5 metres (15 feet).

Principle Uses

Ideal for photography where space is restricted, architectural work, and because of its deep depth of field, casual shots in poor light when using a flash.

Focal length	20mm
Maximum aperture	F4.5
Minimum aperture	F16
Lens elements	11 in 10 groups
Diaphragm	Fully automatic
Minimum focusing distance	0.2m
Angle of view	94°
Dimensions Maximum diameter	62mm
Length	59mm
Weight	251g
Filter size	77mm screw-in type (onto lenshood)
Lenshood	58mm clip-on type square hood
Lens cap size	58mm

Super-Takumar 24mm f3.5

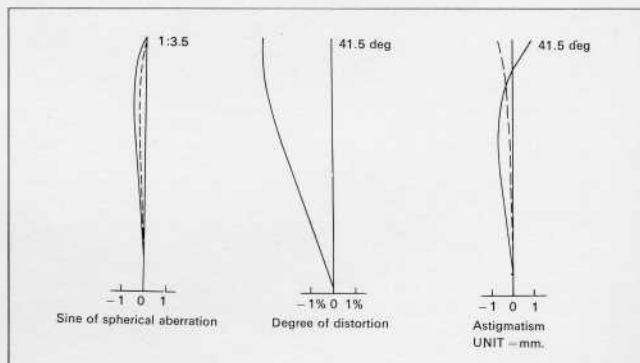
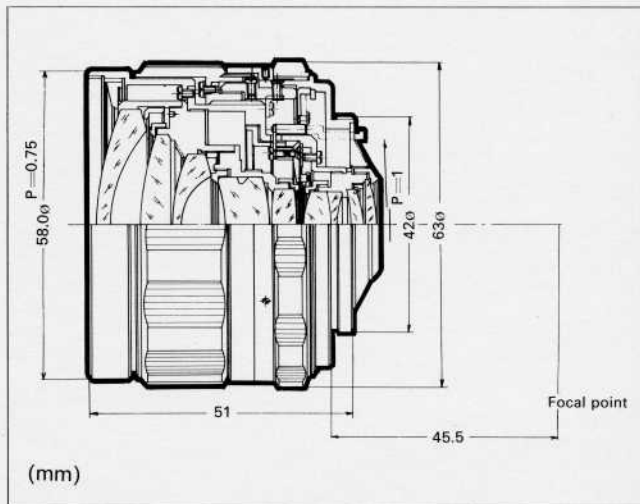
Another ultra wide-angle lens lightweight and compact with an incredible 84° angle of view. The resulting wide-angle image and low degree of distortion produce effects of strong perspective. Construction is of the Retrofocus type with the 9 lens elements mounted in 8 groups, providing a razor sharp and contrasty image of a degree not always associated with wide-angle lenses. For close-up work it is invaluable with a minimum working distance of only 25cm and has, of course, a fully automatic diaphragm.

It should be noted that this lens is used in the conventional manner employing the full facilities of reflex mirror focusing/screen viewing unlike some lenses of other manufacture which, due to their general design and resulting bulk prohibit the free movement of the reflex mirror. The advanced amateur and professional will find this remarkable lens forever providing a never ending range of unusual subject matter.

Principal Uses

Most indoor or outside work, or anywhere where space is strictly limited. All kinds of architectural work, portraits and/or commercial work where strong perspective is of prime importance.

Truly a lens to be used in order to create pictures with dramatic impact.



Focal length	24mm
Maximum aperture	F3.5
Lens elements	9 in 8 groups
Diaphragm	Fully automatic
Angle of view	84°
Minimum focusing distance	0.25m
Minimum aperture	F16
Dimensions Maximum diameter	63mm
Length	46.5mm
Weight	241g
Filter size	58mm

Super-Takumar 28mm f3.5

This is another super wide-angle Retrofocus lens of 7 elements with a very useful f3.5 maximum aperture. The 75° (film diagonal) angle of view makes this an ideal lens for architecture, fast action, and special purpose photography.

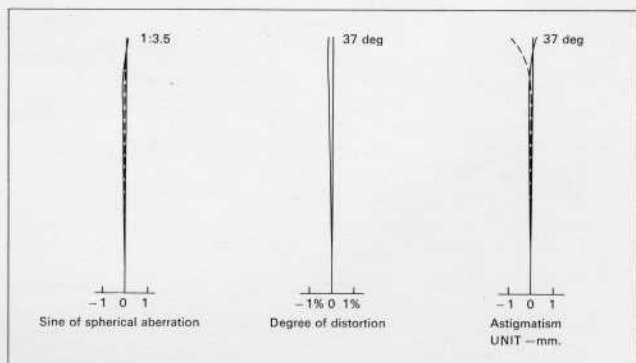
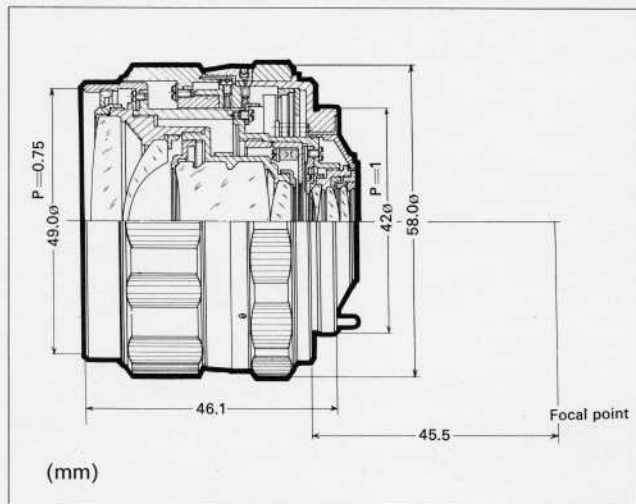
It is also the smallest wide-angle lens in existence for the 35mm SLR which must make it just about the ideal general purpose wide-angle lens available today. The third element comprises a thick meniscus type lens, resulting in a light optic weighing a mere 207 grams and measuring 41.6mm overall.

Focusing is from 1.5m to infinity and standard 49mm filters are employed.

Colour performance is superb. Both advanced amateurs and professionals will find the critical resolution of this lens even at full aperture outstanding. The fully automatic Diaphragm ensures top speed operating technique.

Principal Uses

An almost unlimited range of application, from candid work to general scenic, commercial and pictorial subjects.



Focal length	28mm
Maximum aperture	F3.5
Lens elements	7 in 7 groups
Diaphragm	Fully automatic
Angle of view	75°
Minimum focusing distance	0.4m
Minimum aperture	F16
Dimensions Maximum diameter	58mm
Length	41.6mm
Weight	207g
Filter size	49mm

Super-Takumar 35mm f2

By the brilliant use of completely new design technique Asahi have maintained utmost compactness.

In view of the fast f2 maximum aperture this represents optical design/engineering of the highest order. Furthermore, not only does one have the ability to work at high shutter speeds in really poor lighting conditions, but also a brilliant, easy-to-see, fast-to-focus screen image. Moreover, this lens is virtually distortion free, including the coma distortion which plagues most other wide-angle lenses of similar specification.

So, where speed combined with a moderate wide-angle is essential,

this fully automatic 35mm Retro-focus wide-angle lens is undoubtedly the answer. Particularly useful for all subjects where a wider than normal angle of view is required and for available light pictures.

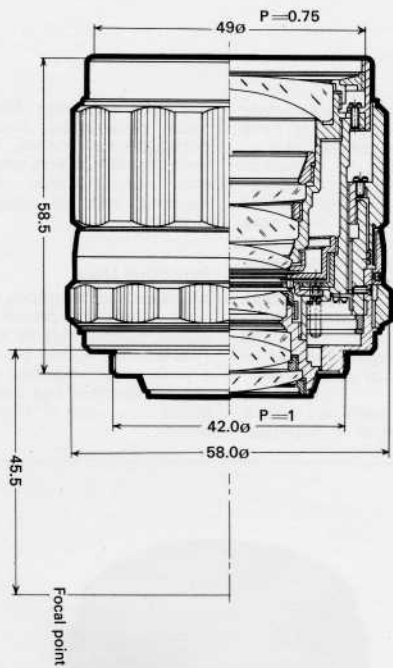
Principal Uses

All types of photography where poor light conditions prevail, including indoor/outdoor day or night shots. This lens can indeed be regarded as a wide-angle objective incorporating the qualities and wide aperture found in a lens of standard focal length.

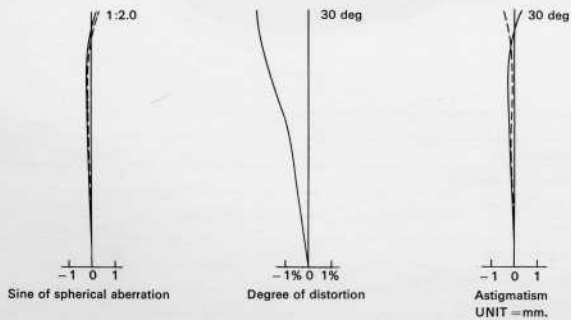


Focal length	35m
Maximum aperture	F2
Lens elements	8 in 7 groups
Diaphragm	Fully automatic
Angle of view	62°
Minimum focusing distance	0.4m
Minimum aperture	F16
Dimensions Maximum diameter	58mm
Length	54mm
Weight	242g
Filter size	49mm

Super-Takumar 35mm f2



(mm)

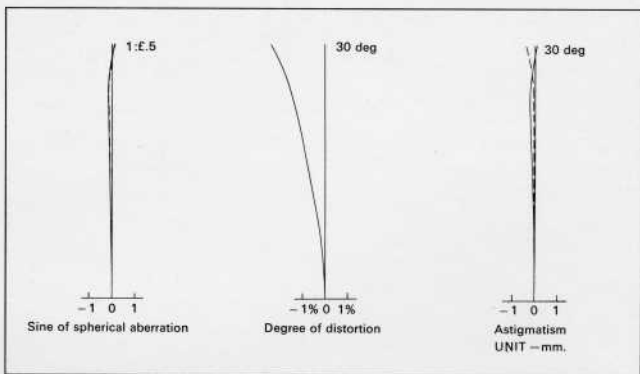
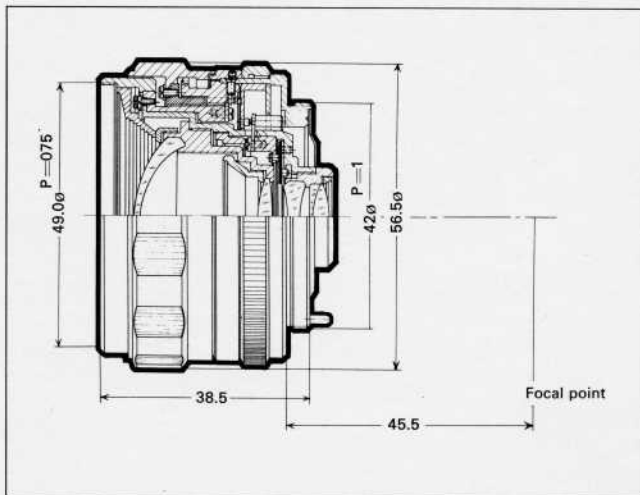


Super-Takumar 35mm f3.5

The impressive performance and high resolving power help make this lens outstanding, particularly when considering the mere 149 grams weight and overall length of 34mm. Little wonder, then, that this high performance lens is the most widely purchased from the whole range of Asahi Pentax wide-angle objectives. The 62° angle of view provides exciting possibilities and as a general purpose wide-angle lens it is recommended to all photographers.

Principal Uses

Compact, lightweight and medium speed, this is an excellent general purpose Wide-Angle Retrofocus lens, a special feature again being the extremely high resolving power. A perfect lens for all pictorial, industrial and architectural and close-up photography. Ideal when weight and size have to be considered whilst travelling.



Focal length	35mm
Maximum aperture	F3.5
Lens elements	5 in 4 groups
Diaphragm	Fully automatic
Angle of view	62°
Minimum focusing distance	0.45m
Minimum aperture	F16
Dimensions Maximum diameter	56.5mm
Length	34mm
Weight	149g
Filter size	49mm

Section 11
Standard Lenses

Super-Takumar 50mm f1.4

In having an aperture of f1.4 this is the widest of all Super-Takumar optics, and provides an incredibly bright screen image and fast, critical focusing.

A crisp, contrasty image results even when used at full aperture. Add to this the minimum focus distance of 45mm and it is easy to appreciate why this is a lens of rare distinction. Filters remain standard 49mm.

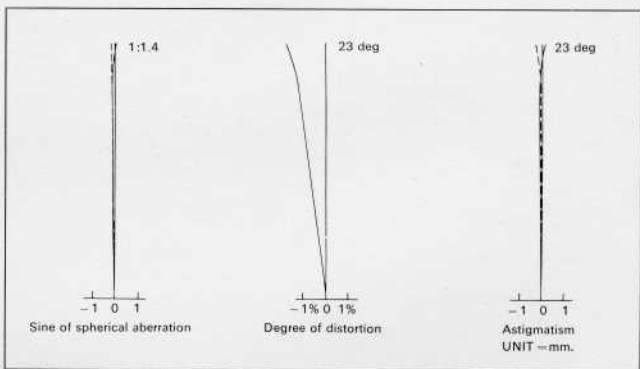
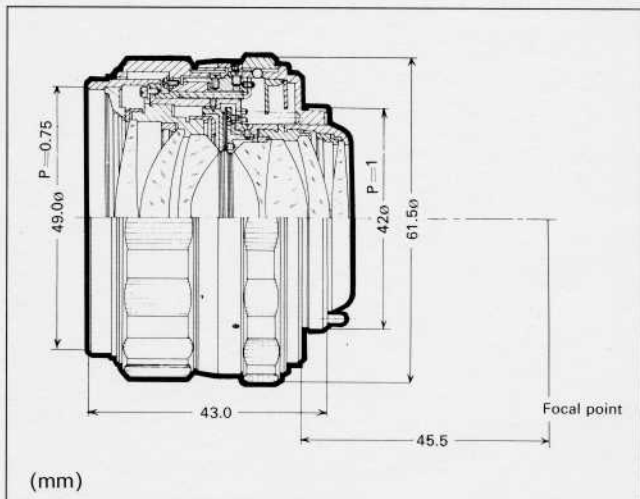
The overall length is a compact 38.5mm and the weight 239 grams.

Principal Uses

This 50mm f1.4 lens is designed especially and aligned for use on the Asahi Spotmatic.*

The high resolution of this 7 element lens will satisfy the most critical professional requirements and may be confidently employed for virtually any task wherever the characteristics of this fully automatic diaphragm lens would suit.

* If using this lens on SV or S1a models, first ensure that either model has engraved on the film rewind knob an orange coloured 'R' mark.



Focal length	50mm
Maximum aperture	F1.4
Lens elements	7 in 6 groups
Diaphragm	Fully automatic
Angle of view	46°
Minimum focusing distance	0.45m
Minimum aperture	F16
Dimensions Maximum diameter	61.5mm
Length	38.5mm
Weight	239g
Filter size	49mm

Super-Takumar 55mm f1.8

The design ensures a high standard of performance throughout whether at long or short range, and a crisp, distortion-free, image at all apertures.

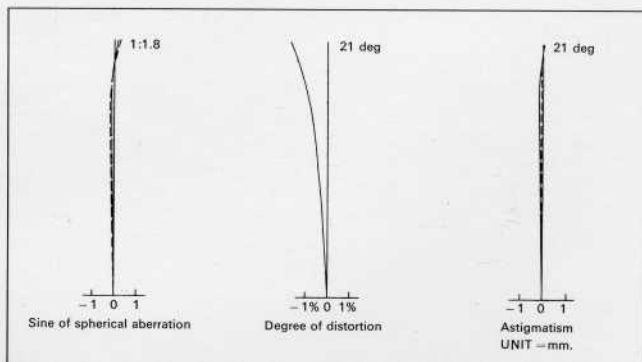
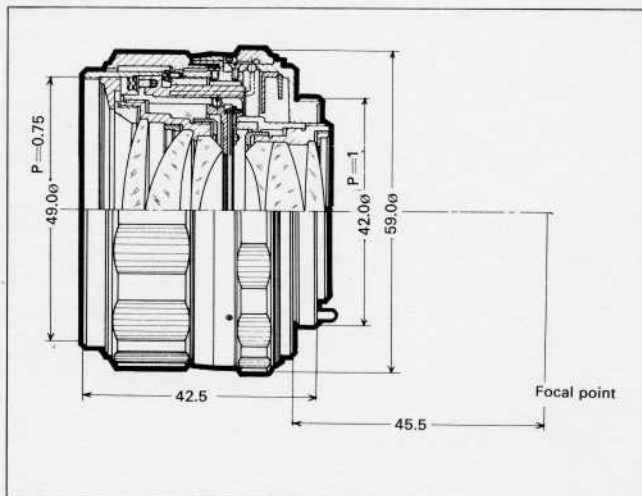
Particularly recommended for superb colour rendering.

Principal Uses

With a 45cm - Infinity focusing range this standard lens is the basic unit around which one can commence to build a system of interchangeable lenses of shorter or longer focal length.

Also there are those who might prefer to employ as a standard lens the marginally longer focal length of this 55mm f1.8 6 element objective with the slightly restricted angle of view of 43° compared to the other 50mm standard lens described overleaf.

High resolving power, minimum bulk and weight, very fast f1.8 maximum aperture, and, of course, fully automatic diaphragm make this a most desirable objective.



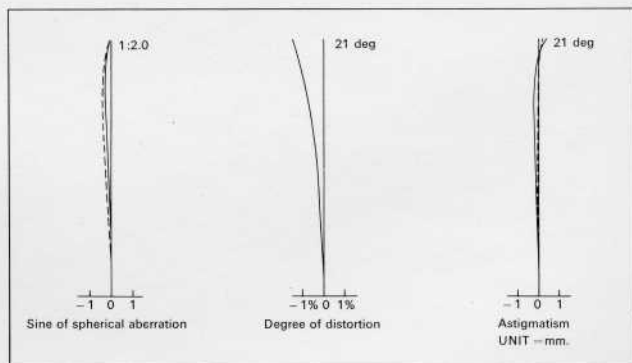
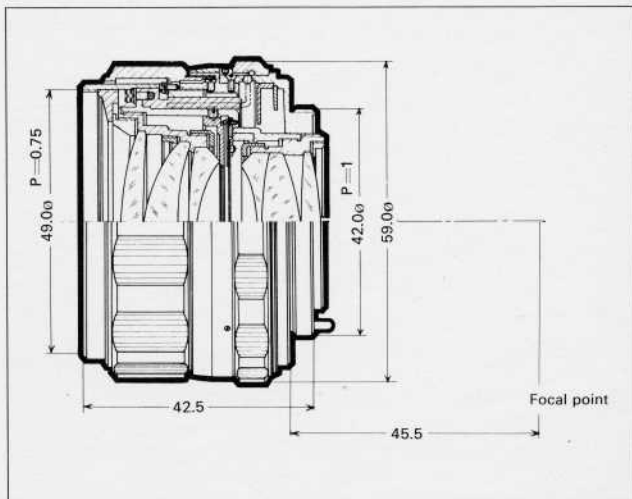
Focal length	55mm
Maximum aperture	F1.8
Lens elements	6 in 5 groups
Diaphragm	Fully automatic
Angle of view	43°
Minimum focusing distance	0.45m
Minimum aperture	F16
Dimensions: Maximum diameter	59mm
Length	38mm
Weight	202g
Filter size	49mm

Super-Takumar 55mm f2

Combining most of the virtues of the 55mm f1.8 this is another famous standard camera objective with fast (f2) maximum aperture. However, with the wide range of medium and high speed emulsions available today this 55mm f2 lens can be employed in almost any situation other than where light availability is really extremely poor. An interesting point worth noting is that this is virtually the same basic lens as the 55mm f1.8 but with the slightly reduced maximum aperture which conveniently reduces the cost accordingly. The bright, life-sized image in the viewfinder ensures fast, accurate focusing. Special optical glass has been employed in the manufacture of this lens which guarantees superb colour reproduction.

Principal Uses

A general purpose lens for all suitable outdoor subjects or interior work, including portraiture.



Focal length	55mm
Maximum aperture	F2
Lens elements	6 in 5 groups
Diaphragm	Fully automatic
Angle of view	43°
Minimum focusing distance	0.45m
Minimum aperture	F16
Dimensions Maximum diameter	59mm
Length	38mm
Weight	202g
Filter size	49mm

Section 12
Long Focal Length
Lenses

Super-Takumar 85mm f1.9

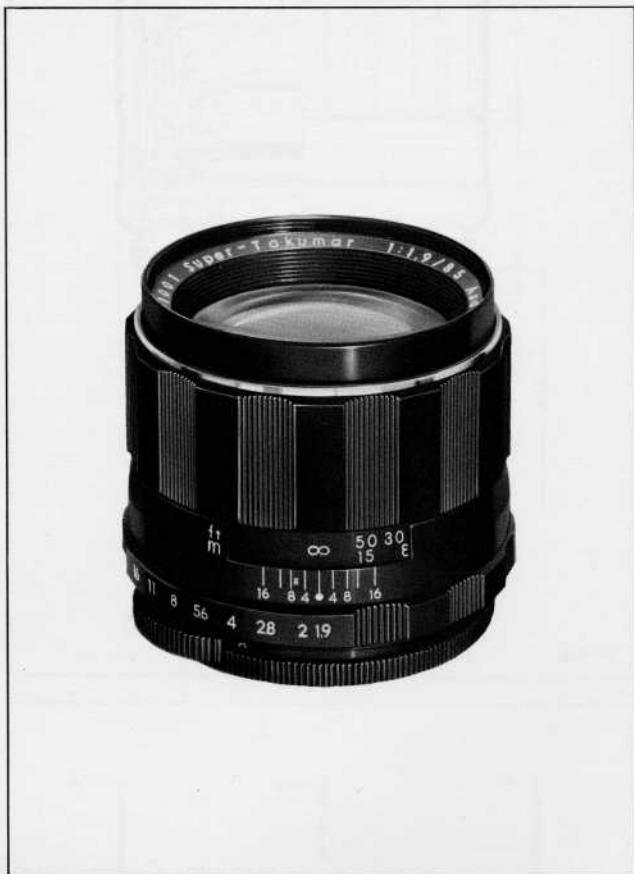
The first in the range of the longer-than-standard focal length lenses is this 85mm f1.9 lens with fully automatic diaphragm.

The 85 mm focal length of this lens combined with an ultra wide aperture necessitates a certain degree of weight (340 grams to be exact) but even so it is the most compact (58mm long) and lightest of its kind in existence. When attached to the camera it handles very well and is exceptionally well balanced. The slightly soft focus effect of those areas not in sharp focus makes it admirably suitable as a portrait lens, particularly as the focal length provides a comfortable working distance between camera and sitter, while still producing a really large image to fill the frame.

An ideal long-focus lens for a wide range of applications and a lens that would be in constant use by advanced amateur, professional and news photographers. Whether used in the studio or out of doors it is perfect for portrait work, sports coverage, and nature photography. The fast working f1.9 aperture can be used to very real advantage where, for instance, shallow depth of field is required for maximum impact or concentration of the main subject.

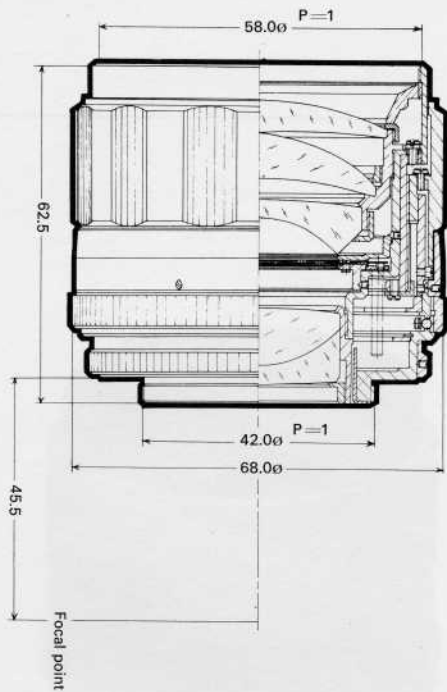
Principal Uses

All forms of human or animal portraiture/indoors/outdoors. Night street scenes, illuminated buildings. Theatre and circus are yet further instances where this lens could prove invaluable.

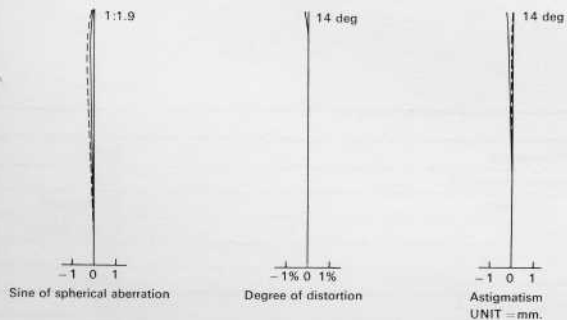


Focal length	85mm
Maximum aperture	F1.9
Lens elements	5 in 4 groups
Diaphragm	Fully automatic
Angle of view	29°
Minimum focusing distance	0.85m
Minimum aperture	F16
Dimensions Maximum diameter	68mm
Length	58mm
Weight	340g
Filter size	58mm

Super-Takumar 85mm f1.9



(mm)



Super-Takumar 105mm f2.8

This is a wonderfully compact and comparatively lightweight (290 grams) long-focus lens with fast working f2.8 maximum aperture, ideal for use where moderate telephoto effect is called for. Usually, the first long-focus lens purchased when a planned collection of ancillary lenses is started, acting as an extremely useful and versatile link between the standard and super telephoto lenses.

All forms of sport, photo-journalism, portraiture and many other applications can be covered with this fully automatic lens. One of the most

useful features is the convenient working distance that may be established between camera and subject, yet still allowing the frame to be filled. The resultant improved perspective and less obvious camera awareness on the part of the subject – human or animal, is also a very real advantage.

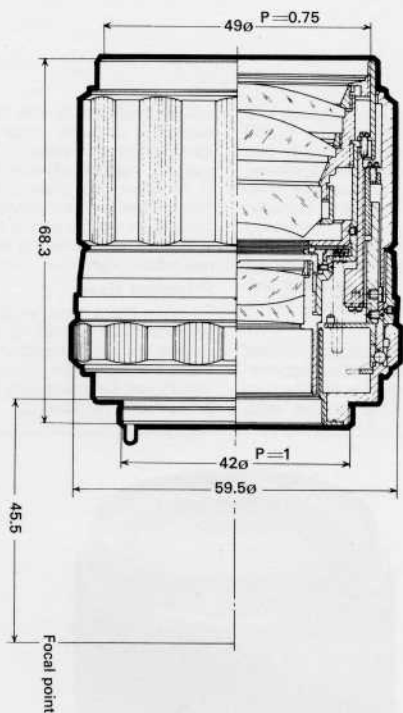
Principal Uses

Suitable for a very wide range of subjects and providing that extra degree of magnification approximately double the standard lens, which can be absolutely invaluable on so many occasions.

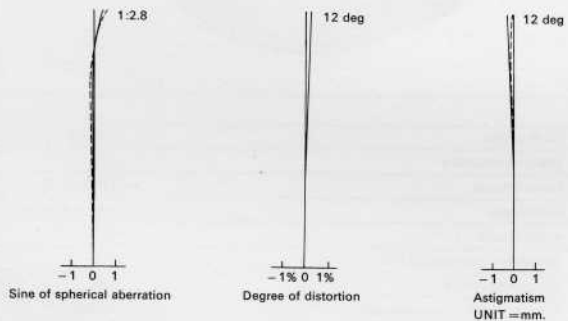


Focal length	105mm
Maximum aperture	F2.8
Lens elements	5 in 4 groups
Diaphragm	Fully automatic
Angle of view	23°
Minimum focusing distance	1.2m
Minimum aperture	F22
Dimensions	59.5mm
Length	63.8mm
Weight	273g
Filter size	49mm

Super-Takumar 105mm f2.8



(mm)



SMC-Takumar 120mm f2.8

This large aperture Telephoto Lens represents a rare and exciting addition to the already extensive range of Asahi Pentax lenses.

As will be seen from the specification, here is an innovation in that not only does this lens fit comfortably between existing long focus lenses of 105mm and 135mm, but is by far the shortest focal length of any of the true telephoto lenses. Again, an interesting comparison is to be seen in the relative weights of these three lenses, with the 120mm weighing 340g against 444g of the 135mm f2.5 (nearly 25% lighter in fact) or approximately 25% heavier than the 105mm f2.8.

Statistics apart, this addition to the range will attract many enthusiasts who will be eager to possess a lens of such commendable specification, and where overall weight and compactness are important. Obviously, with a relatively 'safe' shutter speed, coupled with a wide working aperture, this lens will probably be used mainly for hand-held exposures, and this is where the Super Multi-Coated Optics will undoubtedly score.

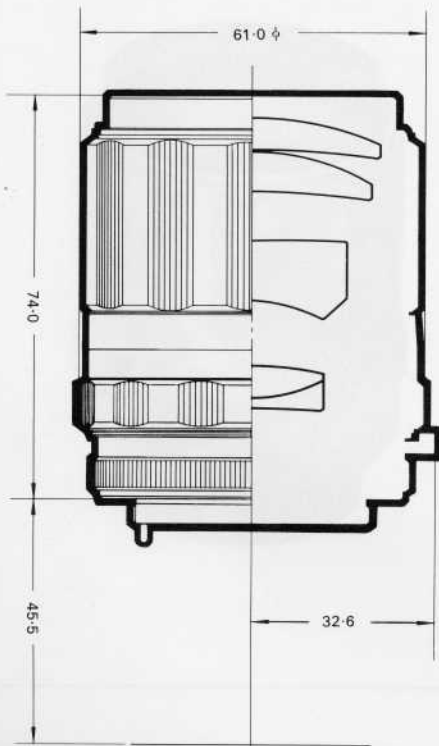
In fact, for all indoor/outdoor work under conditions of brilliant lighting and for sports enthusiasts in particular, where exposures frequently have to be made more or less directly against the main source of illumination, this lens will prove invaluable.

Many other fields of work, including portraiture, theatre work and so on, will all readily fall within the scope of this lens. The multi-coating also ensures really crisp and brilliant colour rendering.



Focal length	120mm
Maximum aperture	F2.8
Lens elements	5 in 4 groups
Diaphragm	Fully automatic
Angle of view	20°
Minimum focusing distance	1.2m
Minimum aperture	F22
Dimensions Maximum diameter	61mm
Length	82mm
Weight	340g
Filter size	49mm

SMC-Takumar 120mm f2.8



(mm)

Super-Takumar 135mm f3.5

For any 35mm camera system the lens of 135mm focal length has come to be recognised more or less as the 'standard' long focus lens covering the majority of subjects. A lens of this specification has so much to offer and due to the compact construction it is indeed surprisingly small and lightweight.

Whether used for animal and bird studies or portrait work it affords a comfortable working distance, at the same time allowing the subject to fill the frame. The maximum aperture is suitable for working under varied light conditions and used even at full aperture will produce a brilliant, sharp image over the entire film plane. Undoubtedly the most versatile of all accessory lenses.

This lens has, in fact, been in production for more than 17 years, and is firmly established as a firm favourite by Asahi Pentax users the world over. In a sense it has grown up and matured along with Asahi Optical, being steadily improved over the years as advanced design and techniques have been developed.

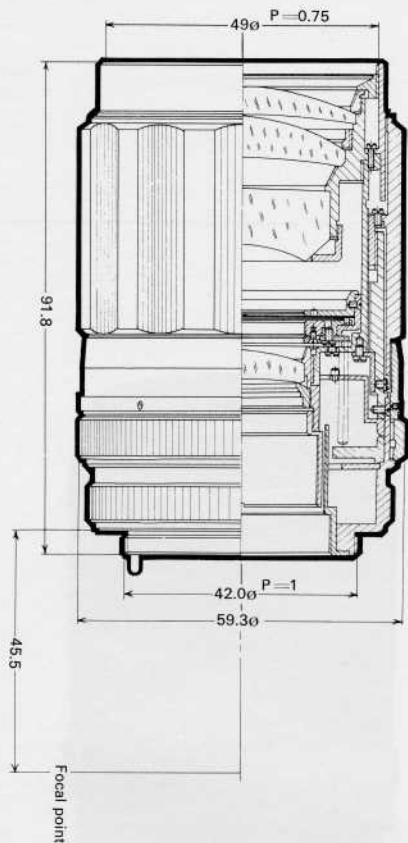
Principal Uses

Inexpensive, this is a telephoto lens for all occasions, comparatively lightweight and comfortable in use. The ideal partner to complement, say, a standard and wide-angle lens.

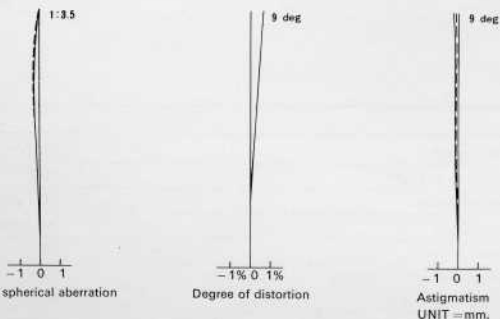


Focal length	135mm
Maximum aperture	F3.5
Lens elements	4 in 4 groups
Diaphragm	Fully automatic
Angle of view	18°
Minimum focusing distance	1.5m
Minimum aperture	F22
Dimensions Maximum diameter	59.3mm
Length	87.3mm
Weight	320g
Filter size	49mm

Super-Takumar 135mm f3.5



(mm)



Super-Takumar 135mm f2.5

All that has been said regarding the 135mm f3.5 telephoto objective applies here, plus the fact that even greater opportunities now exist due to the quite rare and exceptional maximum aperture of f2.5. This particularly applies when shooting colour under available light conditions, or when perhaps, fast shutter speeds are required for stopping moving subjects. The fully automatic diaphragm further assists in really fast working.

Incorporating the latest in technique and design, Asahi describe this as a 'de Luxe' objective and state that it has won wide acclaim for both optical performance and also external styling.

Little wonder when one considers the specification which is itself almost unique, offering as it does a superb f2.5 maximum aperture combined with a focal length of 135mm. Superb definition at any aperture and particularly recommended for all colour work. A full range of the intermediate settings of the diaphragm can be used, ensuring perfect exposure.

Principal Uses

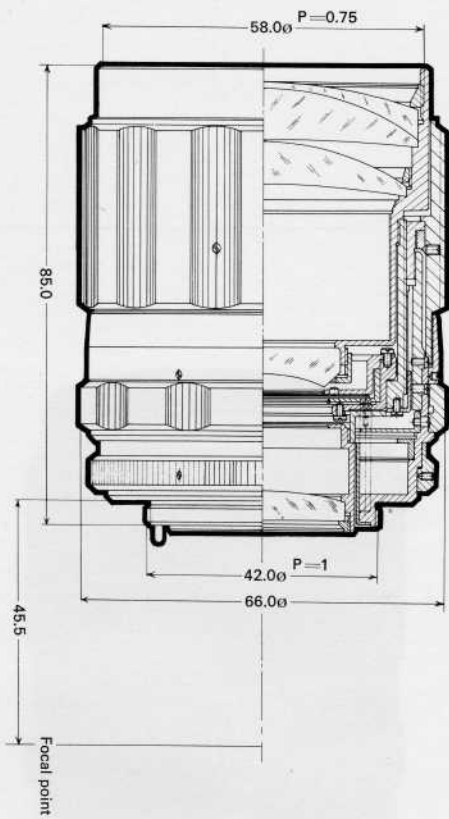
The fast working f2.5 maximum aperture is perfect for indoor work with artificial light and indeed, for a very wide range of subjects wherever the specification of the lens suits the job in hand.

The manufacturers recommend that for those fortunate enough to be building together a lens system this would be considered the perfect intermediary comprising a group of, say, 35mm f2, 85mm f1.9, 135mm f2.5, and 300mm f4.

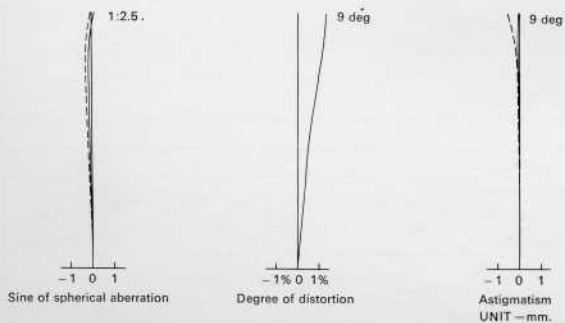


Focal length	135mm
Maximum aperture	F2.5
Lens elements	5 in 4 groups
Diaphragm	Fully automatic
Angle of view	18°
Minimum focusing distance	1.5m
Minimum aperture	F22
Dimensions: Maximum diameter	66mm
Length	80.5mm
Weight	444g
Filter size	58mm

Super-Takumar 135mm f2.5



(mm)



Super-Takumar 150mm f4

Yet another astonishingly useful and highly desirable telephoto, which although affording a full three-fold magnification in relation to the standard 50mm camera lens, is only 7mm longer than the 135mm long-focus and weighs even less! The low distortion ratio and high resolving power are other noteworthy features of this lens. Standard 49mm filters are used and a fully automatic diaphragm is incorporated.

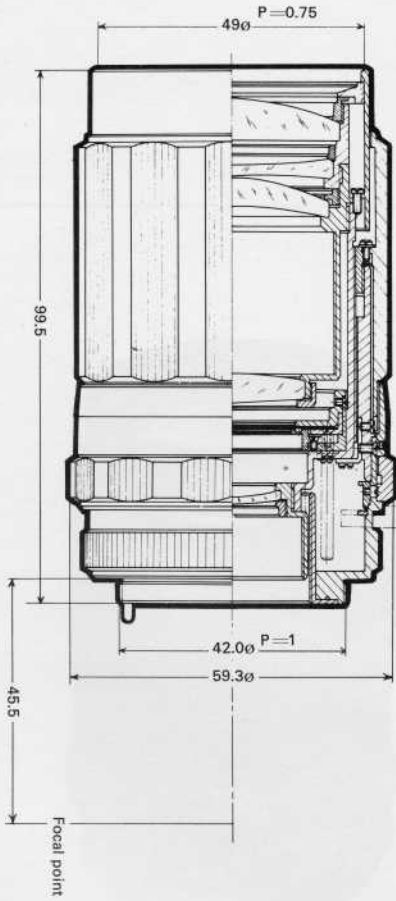
Principal Uses

Once again, in view of the useful 3x magnification in relation to the standard 50mm objective, this is a lens that can be comfortably accommodated when travelling and will certainly prove of value, whether used for landscapes, figure studies, and so on. For almost any form of pictorial, sports, and/or news coverage, theatre, or nature work. Employed with an extension tube an immediate whole new field of possibilities emerges for close-ups of plants, birds or any small objects.

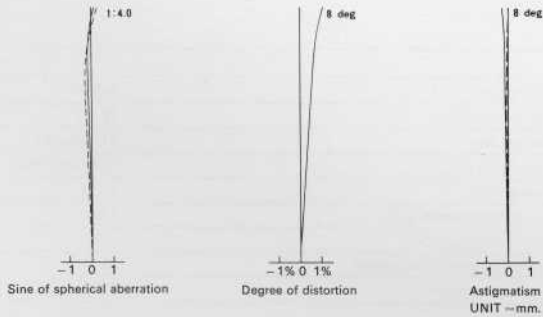


Focal length	150mm
Maximum aperture	F4
Lens elements	5 in 5 groups
Diaphragm	Fully automatic
Angle of view	17°
Minimum focusing distance	1.8m
Minimum aperture	F22
Dimensions Maximum diameter	59.3mm
Length	95mm
Weight	324g
Filter size	49mm

Super-Takumar 150mm f4



(mm)



Section 13
Telephoto Lenses

Super-Takumar 200mm f4

A 200mm focal length plus an f4 maximum aperture and fully automatic iris diaphragm make this an outstanding telephoto lens by any standard. As with the f5.6 version it possesses excellent light gathering properties, and provides high resolution and good contrast together with compact design and comparative light weight.

One of the major considerations when initially designing the lens was the aim to produce a powerful telephoto lens, yet compact and light enough to be used in the hands without resort to a tripod support. Accordingly this compact masterpiece of technical and optical engineering was devised with special emphasis on lens/camera balance. The low degree of distortion, clear crisp definition and excellent colour characteristics, plus fast working f4 aperture make this an ideal multi-purpose lens.

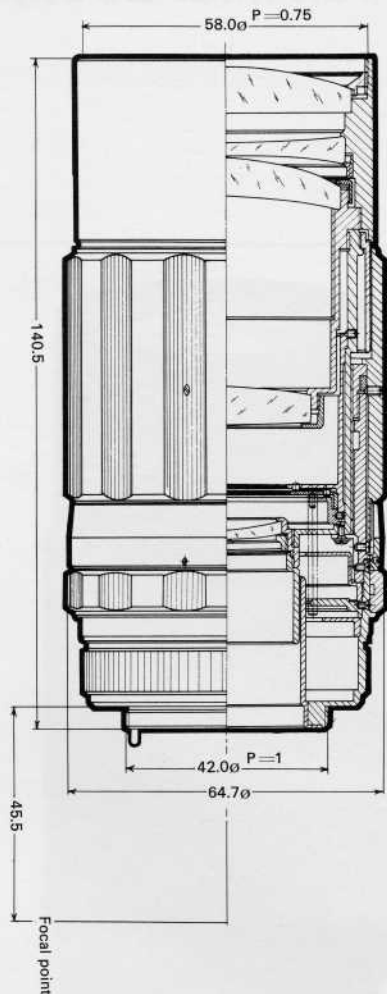
Principal Uses

All kinds of sports photography, candid shots, bird and animal work are just a few of the many varied possibilities, for which this lens would prove invaluable.



Focal length	200mm
Maximum aperture	F4
Lens elements	5 in 5 groups
Diaphragm	Fully automatic
Angle of view	12°
Minimum focusing distance	2.5m
Minimum aperture	F22
Dimensions Maximum diameter	64.7mm
Length	136mm
Weight	558g
Filter size	58mm

Super-Takumar 200mm f4



(mm)



Sine of spherical aberration



Degree of distortion



Astigmatism
UNIT = mm.

Tele-Takumar 200mm f5.6

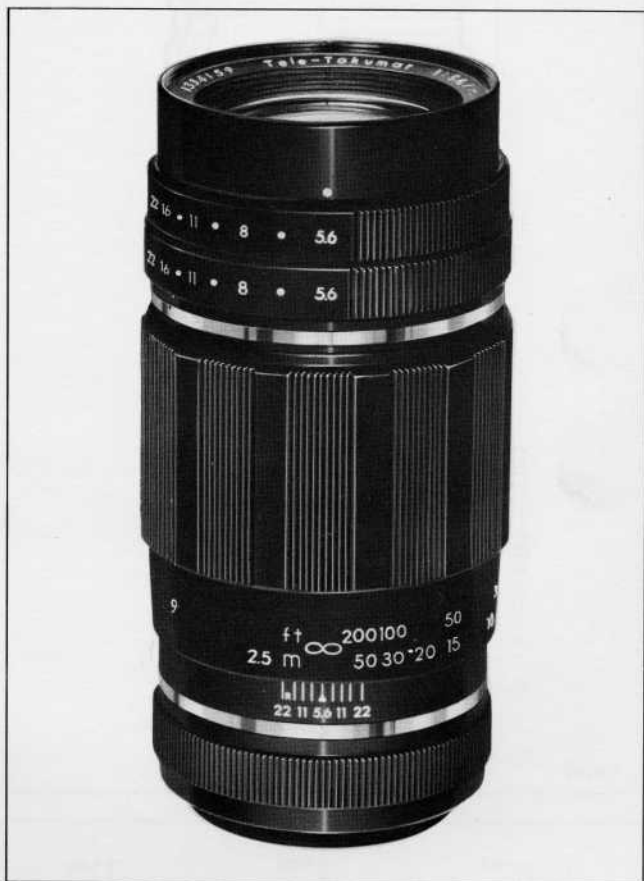
A comparatively inexpensive tele-photo enabling even the advanced amateur the possibility of enjoying the thrill of securing pictures that would otherwise be completely unobtainable.

Although the maximum aperture of f5.6 is (by today's standards) quite moderate, nevertheless an enormous variety of subjects can be tackled successfully in conjunction with the use of fast mono/colour emulsions. In sacrificing a little in terms of light transmission (maximum aperture f5.6 compared to f4) it has resulted in an exceptional, compact and lightweight lens.

Minimum distortion and excellent image quality once again ensure first-class results in monochrome or colour.

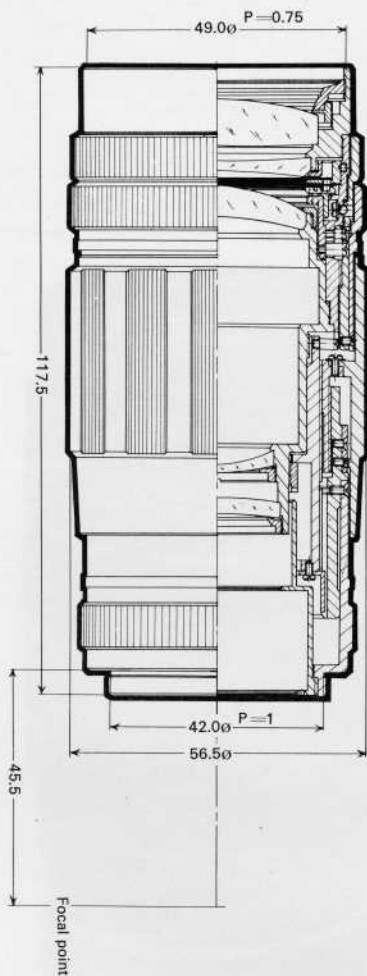
Principal Uses

Due to the wonderfully compact design and coupled with minimum weight, this lens could be a constant companion for all outdoor excursions – walking, sailing, skiing or climbing. Perfect for ornithologists, stalking big game, and numerous other purposes.

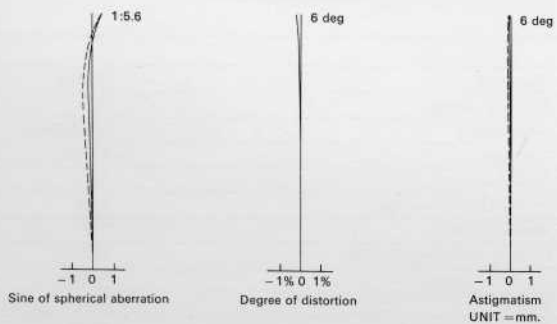


Focal length	200mm
Maximum aperture	F5.6
Lens elements	5 in 5 groups
Diaphragm	Pre-set
Angle of view	12°
Minimum focusing distance	2.5m
Minimum aperture	F22
Dimensions Maximum diameter	56.5mm
Length	113mm
Weight	404g
Filter size	49mm

Tele-Takumar 200mm f5.6



(mm)



Super-Takumar 300mm f4

Offering a full 6x magnification over and above a standard 50mm lens, this Takumar Super Telephoto lens is a remarkable achievement. The compactness is again a design feature together with superb balance characteristics.

An f4 maximum aperture produces an almost unbelievably bright screen image, in turn ensuring ease of subject observation and fast critical focusing.

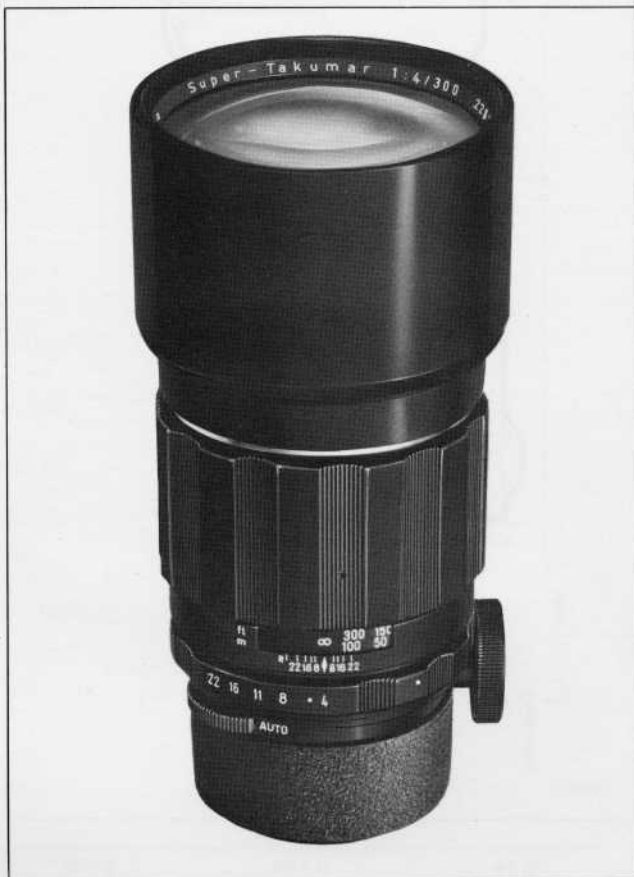
Minimum distortion and first-class resolution are further qualities of this fine lens.

A built-in tripod socket is provided, but it should not necessarily be assumed that the use of a tripod is an essential factor.

Indeed, with a little experience and a suitably fast shutter speed, little or no difficulty should be encountered when making hand-held exposures.

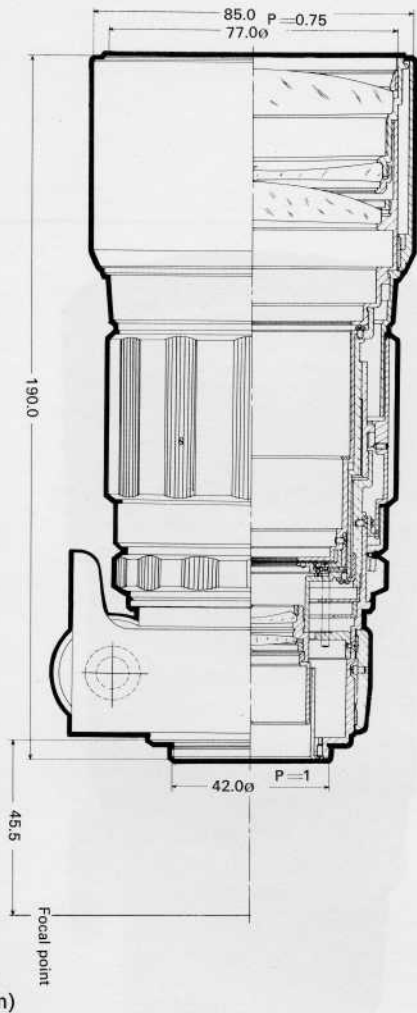
Principal Uses

The admirable balance characteristics, the moderate overall weight and size, together with added luxuries, including fully automatic diaphragm and built-in lenshood make this lens eminently suited for many outdoor activities including fast action shots, and indoor stage photography, among others.



Focal length	300mm
Maximum aperture	F4
Lens elements	5 in 5 groups
Diaphragm	Fully automatic
Angle of view	8°
Minimum focusing distance	5.5m
Minimum aperture	F22
Dimensions Maximum diameter	85mm
Length	185.5mm
Weight	954g
Filter size	77mm

Super-Takumar 300mm f4



Tele-Takumar 300mm f6.3

A manually operated diaphragm and moderate (maximum) lens aperture of f6.3 help this lens to be marketed at a price quite within the normal budget allowance of the keen amateur photographer. It is remarkably compact and may be confidently hand held in conjunction with a reasonably brief shutter speed. Absolutely first-class edge to edge definition can be expected even at full aperture. The weight is a mere 729g, and the beautifully smooth helicoidal focusing is indeed a joy to use.

The diaphragm is pre-set which reduces weight and cost. Even so, a bright screen image aids easy viewing/focusing.

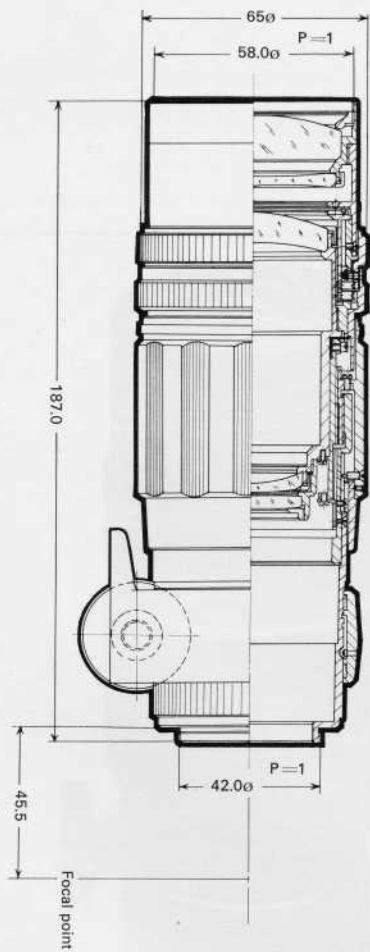
Principal Uses

All scenic and outdoor work, including animal and sports photography.



Focal length	300mm
Maximum aperture	F6.3
Lens elements	5 in 5 groups
Diaphragm	Pre-set
Angle of view	8°
Minimum focusing distance	5.5m
Minimum aperture	F22
Dimensions: Maximum diameter	65mm
Length	182.5mm
Weight	706g
Filter size	58mm

Tele-Takumar 300mm f6.3



(mm)



Tele-Takumar 400mm f5.6

A compact addition to the large range of ancillary lenses is this 400mm telephoto designed for mainly professional use, being particularly suitable for sports and news coverage, nature work, etc. It is so compact that it may be hand held (with appropriate shutter speed) allowing unrestricted use. The incorporation of a click stop diaphragm further assists in really fast working technique.

This 400mm lens is the longest of the compact Telephoto series.

Overall length has been restricted to little more than that of a reflector (mirror) type telephoto lens.

The ultra high quality design of this lens produces a fine contrasty image of high resolution and fine colour reproduction, despite the long focal length construction.

Asahi state that production of a suitable long telephoto lens for hand held operation has always been a problem, but now they feel that their success in solving this is a triumph for their research and craftsmanship.

A built-in lens hood and provision of a click stop diaphragm ring all contribute to making this lens the success it has proved to be.

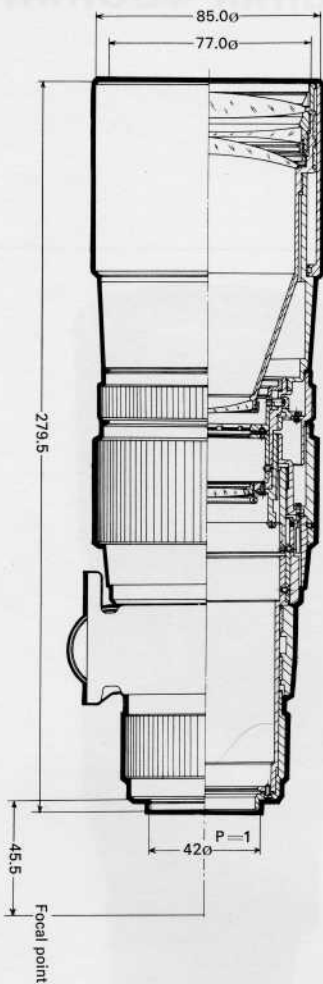
Principal Uses

Many exciting possibilities present themselves, ranging from fast action shots, big game at zoos or on safari, and almost every kind of sporting event, by virtue of the hand held operation of this lens.



Focal length	400mm
Maximum aperture	F5.6
Lens elements	5 in 5 groups
Diaphragm	Manual
Angle of view	6°
Minimum focusing distance	8m
Minimum aperture	F45
Dimensions Maximum diameter	85mm
Length	275mm
Weight	1255g
Filter size	77mm

Tele-Takumar 400mm f5.6



(mm)



Takumar 500mm f4.5

Asahi have overcome all the major problems that arise when undertaking the design and manufacture of a complicated lens of this nature. The result is a sophisticated optical and engineering triumph. Virtually distortion-free with high resolution and excellent colour rendering properties.

Image magnification 10x that of a standard lens, necessitating the very practical inclusion of a sighting system for ease of operation.

A really strong tripod is essential, as the lens measures 44cm overall and weighs 3.5kg.

However, the attachment and removal of the camera body is fast and simple as the rear part of the lens barrel is removable for this purpose. A locking ring permits, when loosened, a 90° rotation of the camera body and clicks positively into the vertical or horizontal position.

The lens features a built-in lens hood and a manually operated click stop diaphragm.

Standard 49mm filters are employed. Good contrast and high resolution even at full working aperture are other important features.

Principal Uses

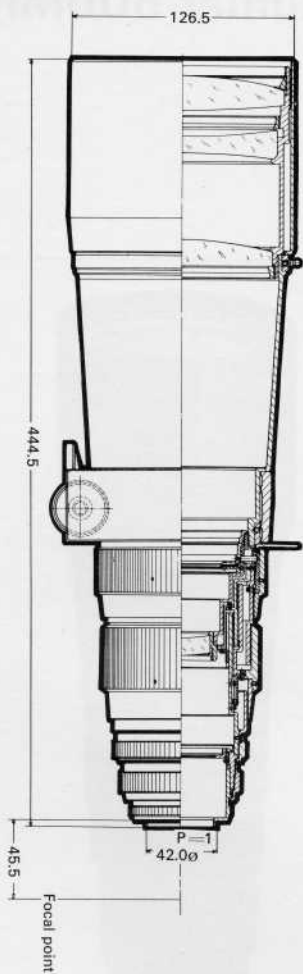
A specialist lens of telephoto construction. The extreme narrow angle of acceptance (5°) helps one visualise the type of subjects for which this would be employed. A true instance of bringing the inaccessible into reach.

Press photographers find these lenses invaluable for long range celebrity work and there are numerous other uses, including big game in zoo or nature reserve, sporting events and so on. It is frequently employed for criminal investigation, and celestial photography.

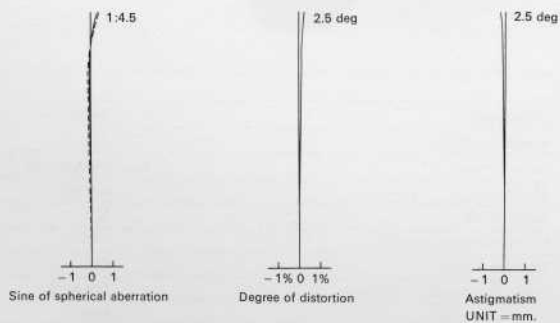


Focal length	500mm
Maximum aperture	F4.5
Lens elements	4 in 4 groups
Diaphragm	Manual
Angle of view	5°
Minimum focusing distance	10m
Minimum aperture	F45
Dimensions Maximum diameter	126.5mm
Length	440mm
Weight	3500g
Filter size	49mm

Takumar 500mm f4.5



(mm)



Tele-Takumar 1000mm f8

Truly the 'Big Gun' of the Asahi Pentax system. It is true to say that with the aid of this ultra powerful telephoto lens, subjects may be photographed which are virtually indiscernable to the naked eye. Used in conjunction with a rigid special-purpose metal tripod (supplied) focusing is by means of positive rack and pinion drive. Nevertheless, the whole lens has been contained within a modest overall length of only 728mm and is easily transportable. Even with the diaphragm fully open, excellent resolution and contrast is obtained.

The small minimum aperture of f45 is a means of achieving great depth of field where and when required.

A built-in lens hood is another feature and the lens accepts standard 49mm filters.

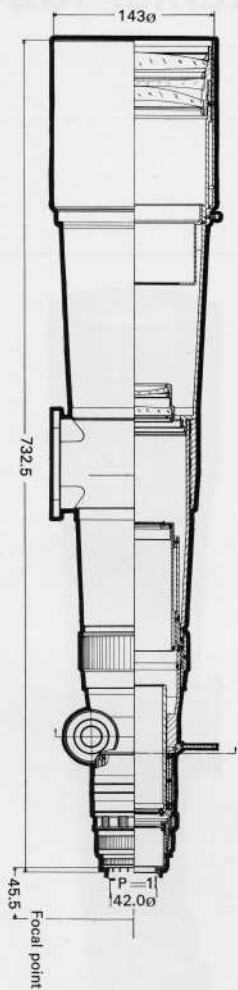
Principal Uses

Primarily for news and sports coverage, criminal investigation, scientific and wild life photography. The powerful telephoto properties make this the ideal lens for producing the charming landscapes seen from time to time with huge sun or moon backgrounds.

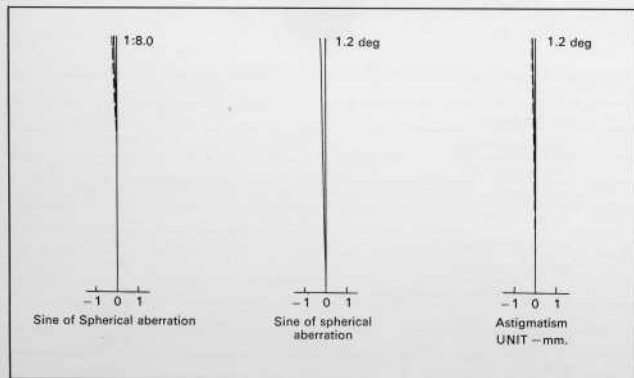


Focal length	1000mm
Maximum aperture	F8
Lens elements	5 in 5 groups
Diaphragm	Manual
Angle of view	2.5°
Minimum focusing distance	30m
Minimum aperture	F45
Dimensions Maximum diameter	143mm
Length	728mm
Weight	5500g
Filter size	49mm

Tele-Takumar 1000mm f8



(mm)



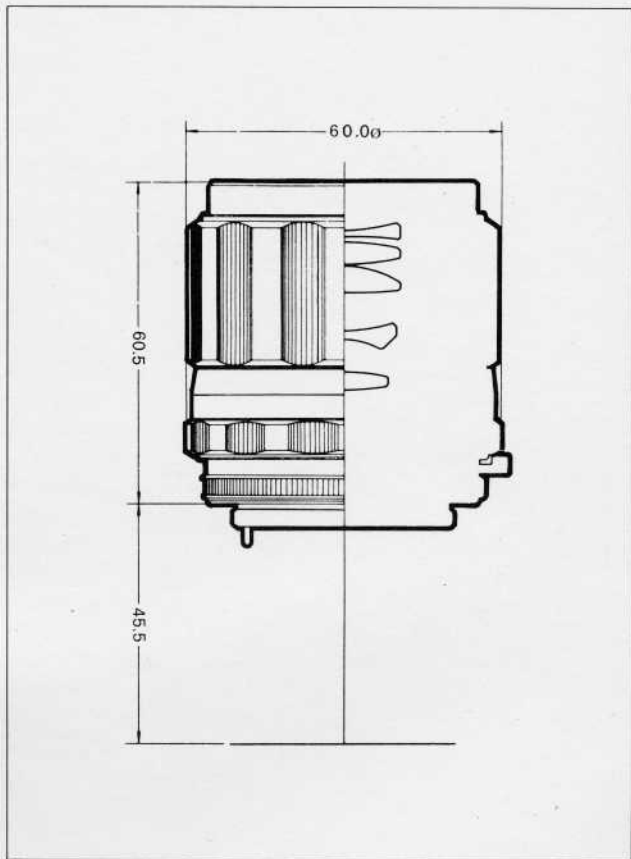
Section 14
Specialist, Zoom and
Macro Lenses

Ultra-Achromatic-Takumar 85mm f4.5

The Ultra-Achromatic-Takumar 85 mm f4.5 is corrected against chromatic aberration from ultra-violet to infrared wavelength bands. Not only is it a high-resolution lens for visible light photography, but also it gives unmatched optical performance in ultraviolet and infrared photography.

This lens uses no glass; it uses fluorite and quartz. It answers some of the optical quality and performance problems in ultraviolet and infrared photography. Although it is superb for infrared and visible light photography, its main design emphasis is placed on ultraviolet photography at a close distance. It is corrected against chromatic aberration from 250μ to 800μ , and photographic tests without filters show good results within these wavelength bands.

Although two filters are available against 365μ and 362μ special filters may be made against other wavelength bands up to 1000μ . R62, and R68 filters are also available for infrared photography.



Focal length	85mm
Maximum aperture	F4.5
Minimum aperture	F22
Lens elements	5
Diaphragm	Fully automatic
Minimum focusing distance	0.6m
Angle of view	29°
Weight	248g
Filter size	49mm screw-in type
Lenshood	49mm screw-in type
Lens cap size	60mm
Accessories	Filters for infra-red photography (R62, R66, R68) Filters for ultra-violet photography (662 μ , 365 μ)

Super-Takumar-Zoom 70-150mm f4.5

Without question this is one of the finest Zoom lenses ever made, with a continuously variable focal length ranging from 70-150mm.

A superb lens, the result of painstaking research, optical and mechanical achievement. With satin smooth focusing, the point or plane of focus remains unchanged throughout the entire range when zooming. Individual scale markings are 80mm, 90mm, 105mm, 120mm and 135mm and, naturally, all intermediate settings may be employed.

The lens features a unique single movement - dual action control system operating both focusing and variable zoom control mechanism. This facilitates ultra fast shooting, since once the lens is focused, shots of moving objects can be taken in rapid succession - all at varying focal lengths as required.

A glance at the technical drawing illustration shows clearly the quite formidable internal line-up of lens elements, 14 in total arranged in 12 groups.

Where this Zoom differs from so many on the market is that there is no loss in resolving power and that definition is comparable to that of any other individual Takumar lens. Many zoom lenses are only operable over a restricted focusing range and it is virtually impossible to undertake any reasonable near-distance work.

Takumar engineers have, therefore, perfected a special low powered close-up lens enabling focusing to continue from 3.7m to 1.9m.

Actual distances are indicated with a special close-up scale (provided) when the supplementary lens is being used.

Principal Uses

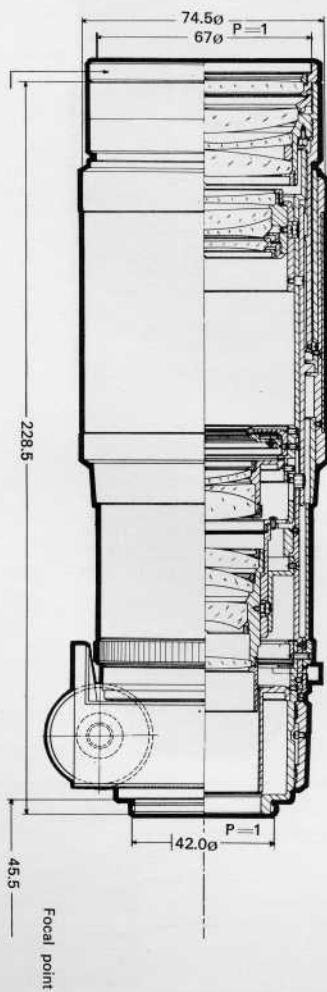
The overall smooth working of the lens and combined ability to focus and zoom simultaneously, makes this a great lens for almost every occasion, particularly when one is wishing to follow action.

Further, with use of the supplementary lens, it is ideal for portraiture.

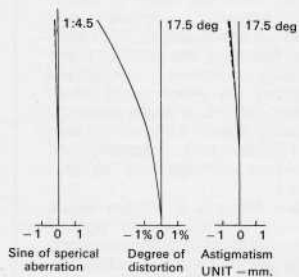


Focal length	70-150mm
Maximum aperture	F4.5
Lens elements	14 in 12 groups
Diaphragm	Fully automatic
Angle of view	35°-17°
Minimum focusing distance	3.5m
Minimum aperture	F22
Zooming mechanism	Rotary helical type (by zoom ring)
Dimensions	Maximum diameter 74.5mm
Length	224mm
Weight	1140g
Filter size	67mm

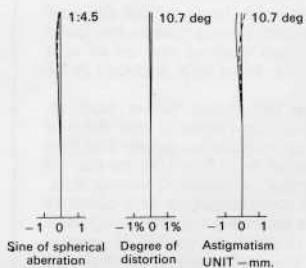
Super-Takumar-Zoom 70-150mm f4.5



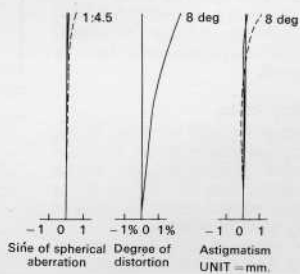
(mm)



Focal length 70mm



Focal length 114mm



Focal length 150mm

SMC-Takumar-Zoom 85-210mm f4.5

This lens replaces the Super Takumar Zoom 70-150mm f4.5 and as can be seen by its prefix, is Super Multi-Coated.

With a variable focal length from 85mm to 210mm it has a zoom ratio of 2.5 with focal calibrations of 85, 100, 120, 135, 150, 180, 210, and any point within this range. The focus can be adjusted simultaneously with the zooming action by turning the zoom-focus ring to focus and at the same time sliding it backward or forward to zoom. This permits fast action shooting even while zooming. The minimum focusing distance is 3.5m (11.5ft) but if closer focusing is required then by fitting an attachment lens, which is supplied, focusing can be made to a minimum of 1.9m (6.24 ft).

Once focused the SMC Takumar lens maintains the focus setting throughout the zoom. With zoom lenses optimum sharpness can be obtained by first focusing at maximum focal length and then zooming back to the desired field of view.

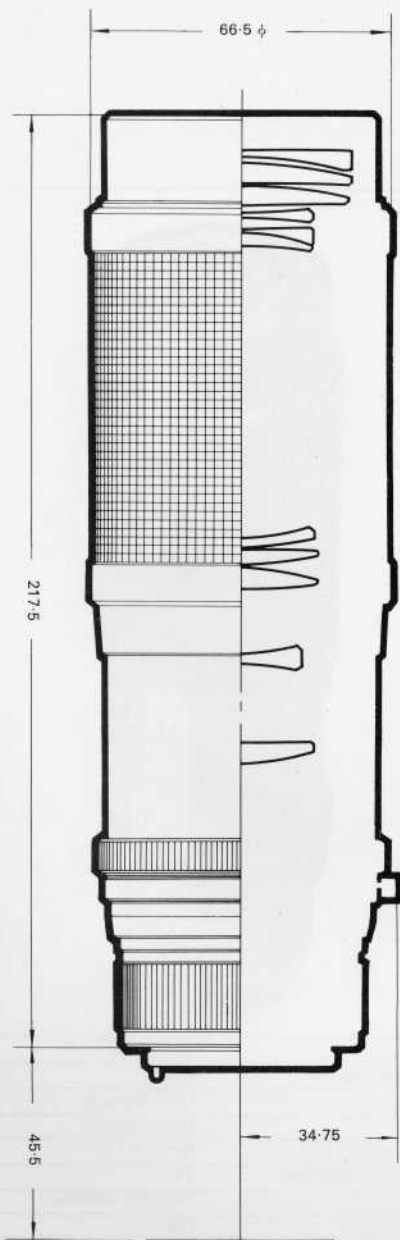
Principal uses

Zoom lenses are generally used in circumstances demanding variation of image size in action situations. The fast handling zoom-focus ring ensures a speedy and smooth operation and the Super Multi-Coating gives bright and flare-free results regardless of a possible variation of light direction when following action. When used with the supplementary attachment lens it can be used for portraiture. To avoid camera shake it is advisable to use a tripod when using this lens at slow speeds.



Focal length	85-210mm
Maximum aperture	F4.5
Lens elements	11 in 10 groups
Diaphragm	Fully automatic
Angle of view	28° 5'-11° 5'
Minimum focusing distance	3.5m
	1.9m with attachment
Minimum aperture	F22
Zooming mechanism	Rotary helical type (by zoom ring)
Dimensions Maximum diameter	66.5mm
Length	217.5mm
Weight	705g
Filter size	58mm

SMC-Takumar-Zoom 85—210mm f4.5



(mm)

Macro-Takumar 50mm f4

A comparatively simple 3 group 4 element lens designed specifically for macrophotography with the highest degree of resolution probably even known for any 35mm camera lens. This lens works almost equally well at full aperture and has high contrast, particularly suitable for copying subjects which tend often to be of rather low contrast. Will photograph from life size to infinity without resort to the use of any accessory. Distortion has been reduced to less than 0.1% which is something in the order of less than one tenth of any normal lens. The diaphragm is pre-set.

Principal Uses

All close up and copying work and all forms of general photography where ultra critical definition and resolving power is essential.

The exposure increase factors are conveniently colour coded in red, orange, yellow and blue around the pre-set diaphragm ring. The calibration for objective image reduction is similarly coded on the front edge of the distance scale ring. The figures from 1 to 50 are coded in red, orange, yellow, blue and white, corresponding to the colours of the exposure factor guide. At the red calibration 1 the image of the subject will be reduced to life-size on the film plane, while at the white calibration 25 it is reduced to 1/25 of the actual subject size (these two calibrations are for use without bellows or extension tubes).

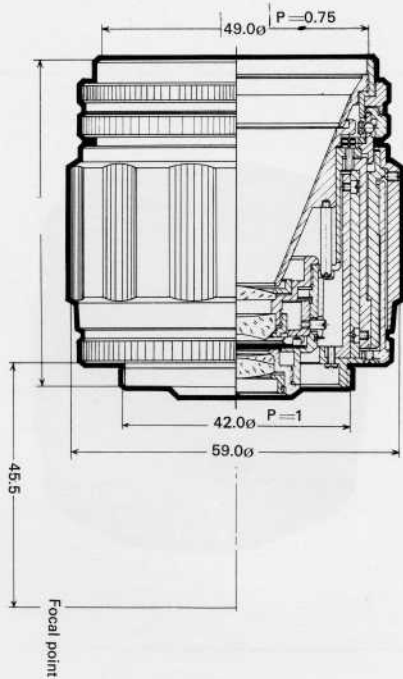
Both calibrations are easy to use. If a red calibration for objective image reduction matches with the index, the pre-set f/stop is moved to the red dot of the exposure factor guide, and the exposure will be automatically increased.

If, however, depth of field is important the pre-set f/stop is not moved. The exposure increase factor is read from the colour coded guide, e.g. 4x and the exposure increased by changing the shutter speed. When using the Spotmatic it is not necessary to refer to this exposure factor guide, as the integral exposure meter of the camera measures the exact amount of light entering the taking lens, making it unnecessary, therefore, for any exposure adjustment.

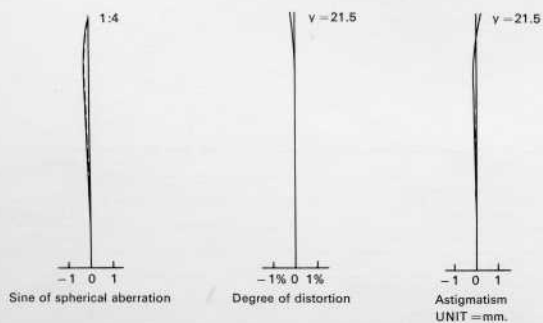


Focal length	50mm
Maximum aperture	F4
Lens elements	4 in 3 groups
Diaphragm	Pre-set
Angle of view	46°
Minimum focusing distance	0.255m
Minimum aperture	F22
Dimensions Maximum diameter	59mm
Length	56mm
Weight	257g
Filter size	49mm

Macro-Takumar 50mm f4



(mm)



Super-Macro-Takumar 50mm f4

A fully automatic diaphragm makes this just about the ultimate in macro-optics when used in conjunction with Spotmatic.

Half life size (23.4cm) to infinity by means of the double helicoid focusing is the normal focusing range, but by the addition of the auto-extension tubes full scale life size is possible.

Principal Uses

One is no longer confined to static objects with this set-up, and even

slow moving insects etc., can be photographed thanks to the ease of operation.

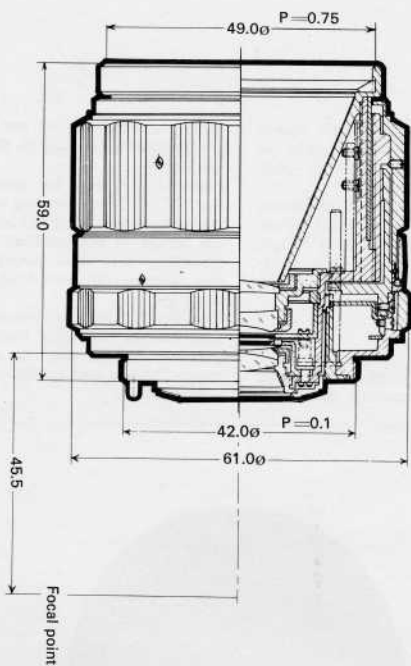
Moreover it can be used for all normal purposes, as one would use a standard lens. The actual theoretical range of possibilities with this objective is limited, surely, only by the degree of resourcefulness of the user.

The double helical focusing is of inestimable value for macrophotography, as are the 'at a glance' magnification and exposure increase factor scales.

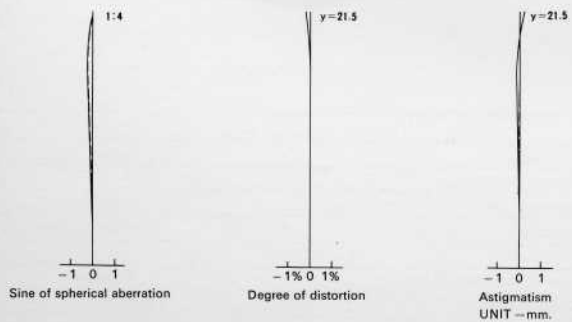


Focal length	50mm
Maximum aperture	F4
Lens elements	4 in 3 groups
Diaphragm	Fully automatic
Angle of view	46°
Minimum focusing distance	0.234m
Minimum aperture	F22
Dimensions: Maximum diameter	61mm
Length	54.5mm
Weight	236g
Filter size	49mm

Super-Macro-Takumar 50mm f4



(mm)



Bellows-Takumar 100mm f4

Specifically designed for use in conjunction with the focusing bellows unit, this short mount 100mm f4 lens constitutes an impressive specialist Tele-Macro lens, focusing from life size to infinity. The superior high resolution performance is due to the fact that again this lens is computed for close-up and macrophotography.

Furthermore, the lens will still provide critical definition and resolution for all normal subjects. The fact that one can work with a comfortable lens/subject distance relationship when photographing insects or small animals and the like is particularly valuable when a

closer approach is not possible or desirable for whatever reason. Further, it eases the sometimes difficult problem of establishing adequate frontal lighting.

Distortion is virtually non-existent. The diaphragm is pre-set with a 'click' stop indent control ring and the lens accepts standard 49mm filters.

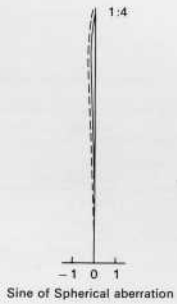
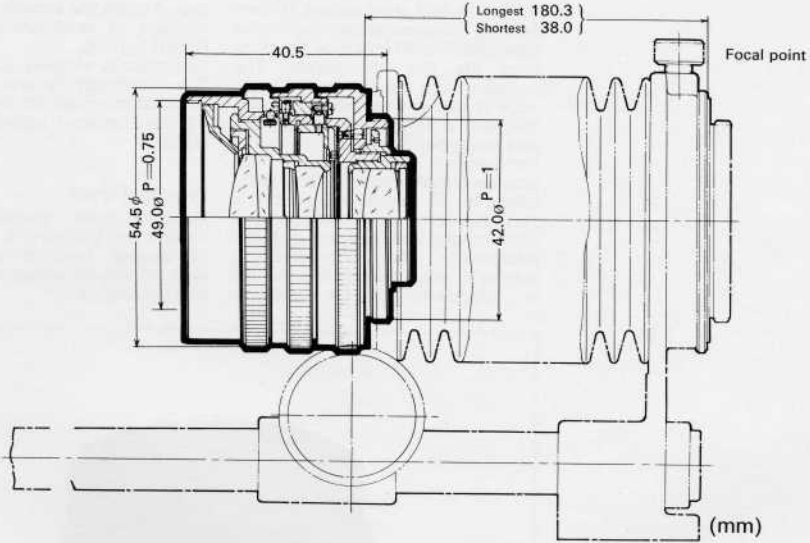
Principal Uses

Ranging from specialist Macro studies, but including a wide range of general purpose applications with all the advantages offered by this unusual lens.



Focal length	100mm
Maximum aperture	F4
Lens elements	5 in 3 groups
Diaphragm	Pre-set
Angle of view	24.5°
Minimum focusing distance	Varies with length of Bellows Unit
Minimum aperture	F22
Dimensions Maximum diameter	54.4mm
Length	36mm
Weight	139g
Filter size	49mm

Bellows-Takumar 100mm f4



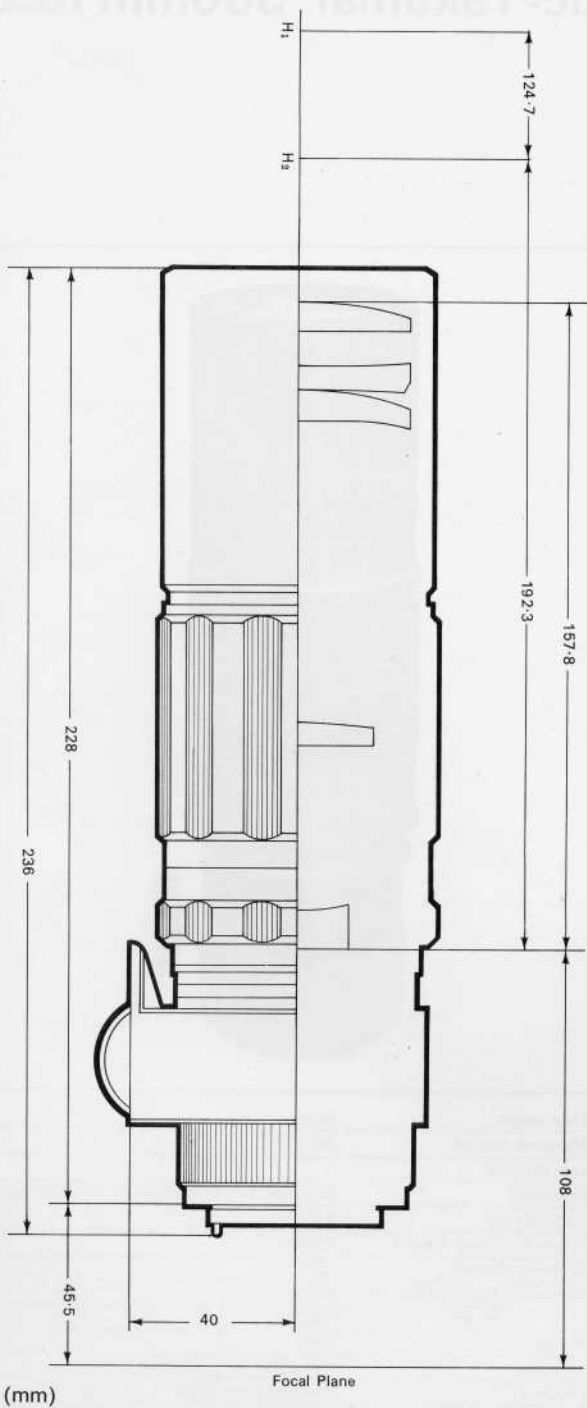
Ultra-Achromatic-Takumar 300mm f5.6

This is a high resolution lens for both visible light and infra-red telephotography. It is made from glass and fluorite and is corrected against chromatic aberration for a wide range of wavelengths from 320m μ up to 850m μ . Tests without filters show good results within these wavelength bands. The use of fluorite in the manufacture has resulted in a compact lens for the focal length, which gives good contrast and definition. It has an automatic diaphragm with a switch knob for click-stop operation when required. R62, R66 and R68 filters are available for this lens for infra-red photography.



Focal length	300mm
Maximum aperture	F5.6
Lens elements	5
Diaphragm	Automatic with switch knob for click diaphragm
Angle of view	8.2°
Minimum focusing distance	4-85m
Minimum aperture	F22
Dimensions Maximum diameter	68mm
Length	229.5mm
Weight	709g
Filter size	58mm
Lens hood	Pull out type (built-in)
Accessories	Filters for infra-red photography (R62, R66, R68)

Ultra-Achromatic-Takumar 300mm f5.6



Section 15
Asahi Pentax
Accessories

Asahi Pentax Accessories

Miscellaneous Caps

All Asahi Pentax cameras and lenses are provided with their full quota of body and lens caps when sold as normal routine procedure, but are made available as accessories for the purpose of replacing the caps if lost or broken.

1 Lens Cap (Front)

Precision push-on fit, made from light weight alloy and an essential protective cover which should be used on every possible occasion, whenever the lens is not in use.



1



2

2 Lens Cap (Rear)

Moulded from rigid black plastic this screw-on rear lens cap has the double purpose of protecting not only the rear lens element, but also the screw thread and diaphragm operating pin.



3



4

3 Body Cover

A precision moulded black plastic cover plate designed to screw into the lens mount of the Asahi Pentax Camera, affording complete protection when the camera is stored or handled without a camera lens fitted. The camera body is thus effectively sealed from possible damage that may otherwise occur by accidental penetration of damp, or dirt particles, quite apart from the all important and easily damaged precision mirror assembly.

It is, of course, particularly valuable to the photographer owning more than one camera body.



5



6

4 Leica Mount Adapter A

Permits use of Leica-mount lenses on the Asahi Pentax camera body. Leica-mount lenses can be used on the Asahi Pentax camera body with this adapter ring only for close-up photography. The right hand table illustrates the film-plane to subject distance that can be covered by Leica mount lenses when using this adapter.

5 Leica Mount Adapter B

Permits use of Takumar lenses on Leica-mount camera bodies. (Primarily intended for use on enlargers with Leica lens mounts).

6 Asahi Mount Adapter

46-49mm.
For mounting Asahiflex lenses on Pentax cameras.

Focal length of Leica mount lens	Film-to-subject distance	Size of area to be photographed
50mm	10 $\frac{11}{16}$ in. 26cm	2 $\frac{11}{16}$ × 3 $\frac{11}{16}$ in. 6.7 × 10cm
85mm	22 $\frac{7}{16}$ in. 57cm	4 $\frac{11}{16}$ × 6 $\frac{11}{16}$ in. 10.6 × 16cm
105mm	32 $\frac{3}{8}$ in. 83cm	5 $\frac{11}{16}$ × 7 $\frac{7}{8}$ in. 13.3 × 20cm
135mm	48 $\frac{3}{8}$ in. 124cm	6 $\frac{11}{16}$ × 10 $\frac{1}{32}$ in. 17.0 × 25.5cm

7 Lens Hood

All Takumar lenses ranging from 85mm-1000mm are supplied with lens hoods designed to provide maximum protection from glare or any form of extraneous light, liable to cause flare with loss of contrast in the negative. For all other 'standard' lenses of focal length shorter than 85mm, lens hoods are available as an accessory. There are those who consider that the special coating applied to the optical surfaces of all Asahi lenses is in itself a sufficient protection against extraneous light. Naturally it does help considerably but nevertheless only a properly designed lens hood can provide maximum protection.

8 Asahi Pentax ghostless anti-glare Filter

Some forms of photography inevitably entail a greater degree of risk from flare than others. Immediate examples that come to mind are photographs with the subject facing towards the sun/moon, spotlights, unshielded neon, or brilliant reflections off glass or water.

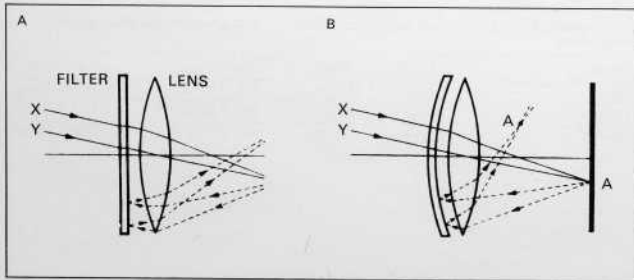
Hitherto, there was virtually little if anything that could be done to help avoid the problems involved. Now Asahi Pentax have designed and manufactured this unique Anti-Glare aid in the form of a curved glass U.V. filter. In practice the image is reflected back to the filter surface and is re-transmitted through the lens forming a duplicate image in the air, so eliminating the formation of a ghost image on the film plane.

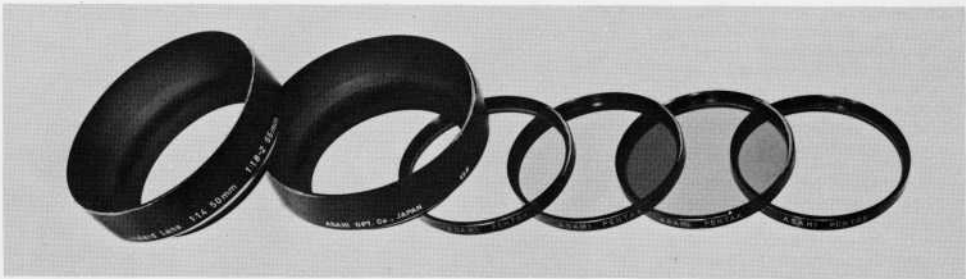
This special purpose filter is available only in 49mm size.

Filters 49mm

Whole books have been written devoted to the all important question of 'knowing your filters'. Truly

their importance cannot be over-emphasised and the Asahi Pentax user is fortunate indeed, since there is a full range available and all are precision ground, polished, surface coated and generally finished to the same high standard that is the hallmark of all Asahi Takumar lenses. The thin metal filter holder carries two threads, one (male) thread for the purpose of screwing directly into the threaded mount of the lens, the second (female) thread permitting the screw-in attachment of lens hood, etc. A great deal of care during initial design work has resulted in a most helpful and economical 'plan' system being evolved whereby many lenses accept a standard 49mm filter or hood. Thus by purchasing one 'standard' set, or whatever may be individually required, a great deal of time (and money) may thus be saved. Even some early pattern lenses have been redesigned in order that they now fit the general pattern, i.e. 49mm screw thread. Listed are Takumar lenses which accept 49mm filters, etc., page L6.





U.V. Absorbs only ultra-violet rays, helping to prevent haze in distance scenes. Can be used permanently without having to increase exposure, at the same time affording good protection to the lens.

Principal use – B & W film.

Y.1. One of the most frequently used filters in B. & W. photography. Absorbs excess blue and renders moderate tonal correction. Is useful for providing slight emphasis on separation between clouds and sky.

Principal use – B & W film.

Y.2. Another extremely useful and popular filter functioning along the same lines as Y.1. but with greater absorption of blue. Provides average tonal correction and again gives good tonal separation between sky and clouds.

Principal use – B & W film.

O.2. Absorbs ultra-violet and blue light thus darkening blue tones. Extremely useful for marine and aerial photography and produces slightly dramatic pictures of landscape and certain floral photographs (Blossom, etc.) out-doors.

Principal use – B & W film.

Y.G. Invaluable for outdoor rendering of landscapes, flesh tones against a sky background, tree blossom and numerous other occasions when shooting monochrome out of doors.

Principal use – B & W film.

81a. Helps to penetrate haze, thus eliminating excess blue tone and produces pleasanter, warmer tones, especially in conditions of shade or hazy cloud. More pronounced effect than the Skylight filter.

Principal use – Daylight Colour Reversal film.

82a. Primarily intended for use in early morning or late afternoon in order to provide correct colour rendition by counteracting excess red.

Principal use – Daylight Colour Reversal film.

Flash 80c. For use with *clear* wire filled flash bulbs – never with blue bulbs. Provides a more effective means of preventing excess 'warmth' than use of the 82a.

Principal use – Daylight Colour Reversal film.

R.2. The use of this filter will help produce really dramatic sky effects, indeed, simulating moonlight effect in mid-day with slight under-exposure. Produces maximum contrast with all Panchromatic emulsions or may be employed with Infra-red film for the same purpose. It will penetrate through haze or mist by virtually eliminating all excess blue and ultra-violet rays. Excellent for use when copying blue-prints.

Principal use – B & W film.

Skylight For outdoor use in conjunction with Daylight Colour Reversal film in order to reduce excess blue and add warmth to the subject. Improves rendering of flesh tones if any appreciable amount of excess blue is present and also is of value for the same purpose in areas of open shade.

Principal use – Daylight Colour Reversal film.

Flood 80b. If it is wished to avoid the slight 'warmth' sometimes produced when using Photo-Flood lamps, this 80b filter is the answer.

Principal use – Daylight Colour Reversal film.

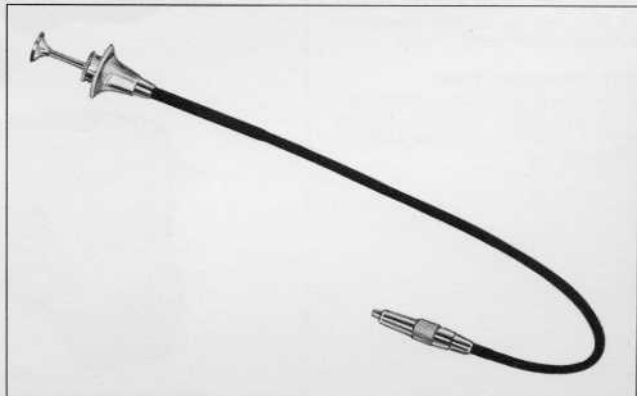
Conversion. A. Converts tungsten type colour film for use in daylight. Use only with tungsten type colour film.

Cable Release

Ten inches in length this useful accessory screws directly into the top recess threaded area of the Pentax shutter release. A floating collar eliminates the need to turn the whole accessory when screwing in or unscrewing.

Another useful feature is a time lock device incorporated which permits the shutter to be kept in the 'open' position for periods of short or lengthy duration.

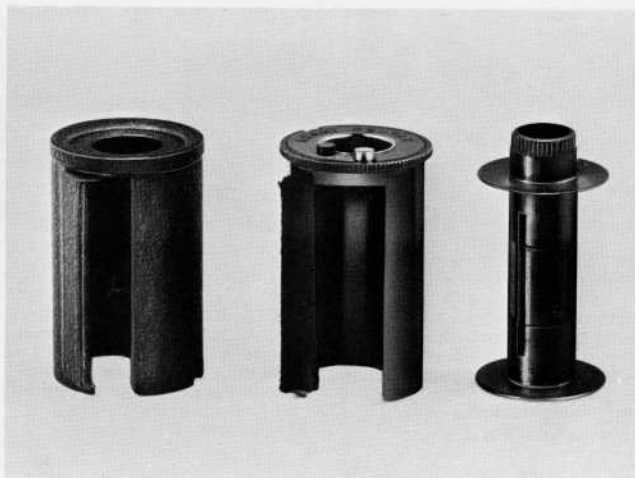
The use of a cable release does ensure the minimum amount of camera movement (camera shake) during exposure and consequently may assist in the production of even sharper pictures, particularly if a fairly slow (hand held) shutter speed is being employed.



Film Cassette

This useful precision built, all metal, film Cassette is designed for use by those who wish to load their own film from bulk film supply. Or indeed any film stock not normally available in standard cassette form. There are also some film manufacturers who market pre-cut film lengths of 18-36 exposures individually packaged specifically for loading into Cassettes of this nature. In some European countries certain manufacturers also produce similar pre-cut lengths in daylight loading form where a length of black leader strip is attached to and precedes the film proper.

The cassette takes apart quite easily, but when loaded and re-assembled, snaps positively into position so eliminating the chance of accidental opening. A maximum length of film sufficient for forty exposures can be loaded.



Asahi Pentax Cases

Soft cases (small)

For Spotmatic and Model SL – For Models SV and S1a

Soft case (King size)

This case fits Models SV, S1a and SL with the Asahi Pentax Clip-on Meter mounted.

Short soft case

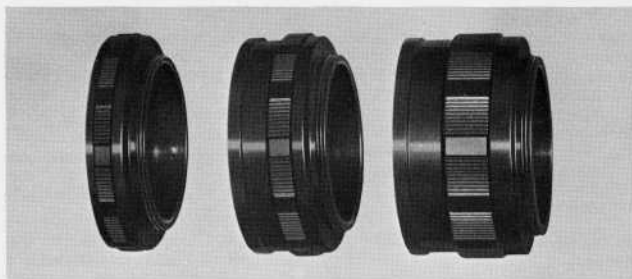
Especially designed soft case without a nose for the lens. This allows you to take pictures with the camera in the case for quieter operation. For use with SV and S1a only.

Soft case jumbo front

Jumbo-size front for the soft camera case to contain an Asahi Pentax with a 135mm, 105mm or 85mm telephoto lens.



Complete system of Asahi Pentax accessories for close-ups, Macrophotography, and Photomicrography.



1

1 Extension tube set

A set of 3 rings, numbers 1, 2 & 3, of 9.5mm, 19mm and 28.5mm respectively. They may be used singly or in combination as desired. When all three are used simultaneously with the 55mm Super-Takumar lens, the subject is enlarged on film to a magnification of 1.17 life size.



2

2 Auto-extension tube set

An extension tube set of 3 rings, 9.5mm (1), 19mm (2) and 28.5mm (3), with coupled automatic diaphragm release pins. Mounted singly or in combination between an Asahi Pentax and a 55mm automatic diaphragm lens, this set of Auto Extension Tubes permits focusing at magnification ranging from 1.17x to 0.17x and operation of the automatic diaphragm.



3

3 Helicoid extension tube

The Helicoid Extension Tube extends from 16.8mm to 30.6mm. It serves the purpose of the Asahi Pentax Extension Tubes 2 and 3. Mounted between an Asahi Pentax body and a 55mm lens, it permits photography at magnification from 0.3x to 0.7x. It is an extremely versatile variable extension ring.



5

4 Reverse adapter

This allows 50mm or 55mm Takumar lenses to be used on bellows or extension tubes in reverse position for improved macro photographic results.

5 Bellows Unit I

Extremely flexible for ultra close-up photography, the Bellows Unit I permits use of the camera lens. The special calibrated gear-shaft is for reading continuous magnification from 0.62 to 2.45 with the standard 55mm Super-Takumar lens.



6

6 Bellows Unit II

This dual-track unit provides maximum stability, outstanding design and rugged reliability. With precise, firm control, it may be locked in any position. Has an oversized focusing knob for increased sensitivity and ease of focusing. 3.2x magnification at maximum extension with the standard 55mm Super-Takumar lens.

Discontinued

7 Slide copier

Here is real copying ease for duplicating slides. Slide stage raises or lowers for precise positioning and a separate set of bellows shuts out all extraneous light between the slide surface and the lens, preventing lens flare, and consequent desaturation of contrast and colour. Used with Bellows Unit II.

Discontinued

8 Auto-Bellows and slide copier

The Asahi Pentax Auto-Bellows is a highly flexible close-up and macro-photographic instrument. The bellows extension is longer than the extension of the standard Bellows Unit.

The Auto-Bellows Unit is also more versatile. By means of the twin cable release supplied with the Auto-Bellows one can release the shutter, and activate the automatic diaphragm simultaneously when using a fully automatic diaphragm lens.

With the lens reverse system, one can use a lens in reversed position for improved macro resolution.

The geared rail of the Auto-Bellows is meticulously engineered with high precision. The freely movable tripod plate underneath the rail rod maintains the whole equipment on tripod in complete balance.

Micro-action extension knobs are equipped on the camera body and lens sides for precise bellows extension.

The Slide Copier attaches to the front end of the Auto-Bellows for easy duplication of colour films (transparencies).

The Bellows-Takumar 100mm f4 lens can photograph from 1.32x magnification to infinity (∞) or obtain higher magnification with a 28mm to 35mm lens. By adding the standard Bellows Unit or Extension Tubes to the front or back of the Auto-Bellows 10x to 20x magnification can be reached.

The Asahi Pentax Auto-Bellows is a precisely designed close-up and macro equipment for professional photographers, research workers,

scientists and specialists in close-up and macro work.

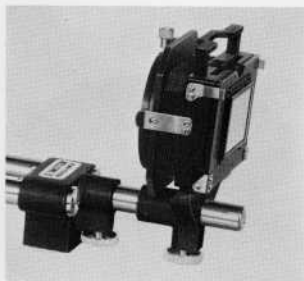
9 Microscope adapter

Fitting between the Asahi Pentax camera body and the microscope tube, this adapter permits utilisation of the microscope's objective in place of the camera lens. It may be used with any microscope which has a tube of 25mm diameter. Complete set consists of adapter tube, fastening knob, light sealing tube and clamp ring.

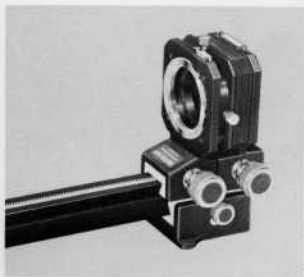
10 Copipod

Lightweight, but extremely rigid and sturdy. This portable copying stand fits all models of the Asahi Pentax and can be used anywhere for copying documents, artwork, stamps, etc.

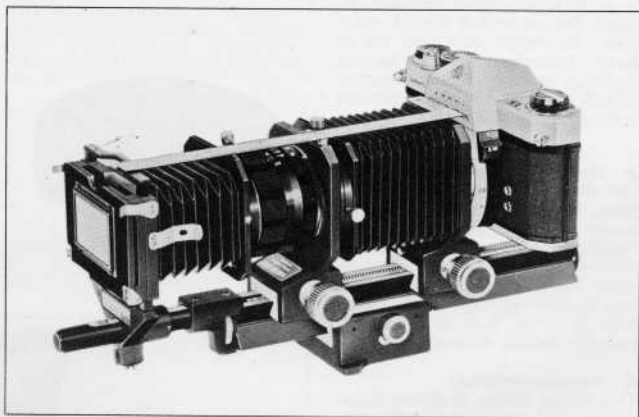
Consists of a lens board complete with adapter rings for 46mm and 49mm lenses, and four calibrated telescoping legs. Sets up easily in seconds and is quickly dismantled. Supplied in small black pouch for storage or carrying convenience.



7



8 Bellows closed



9



10



Copy stand Mk I

The Copy stand, Mk 1, is a versatile and rugged vertical copier, with fast overall and varied adjustment of distance between camera and subject matter. The equipment comprises a well made rigid baseboard and column. A camera retaining arm moves freely over the entire length of the column in a similar manner to the lamphouse of a vertical enlarger.

Discontinued

11 Copy stand Mk II

A development from the Mk 1 Unit described above incorporating an advanced design, including improved micro-movement knob, table clamp and other features.



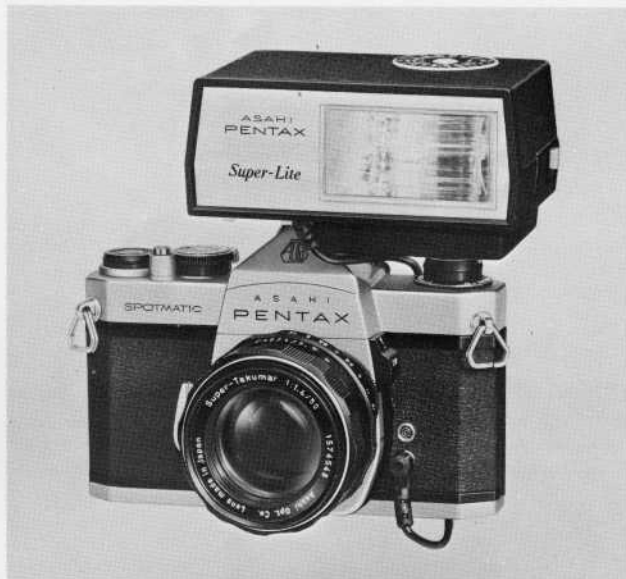
11

Asahi Pentax Super-Lite electronic flash



The Asahi Pentax Super-Lite is a compact, easy to operate electronic flash unit produced with the same engineering skill as the whole Asahi Pentax System of Photographic Equipment. Light and compact it is attached easily to the Asahi Pentax camera.

The angle of light distribution of most flash guns is designed to match the angle of standard lenses. The Super-Lite is one of the widest-angle electronic flash units on the market to-day. Because of the specially designed curvature of the



Super-Lite's reflector, the angle of light distribution practically covers the angle of a 28mm super-wide-angle lens.

The Super-Lite has a unique automatic light output stabiliser. The light output of many other electronic flash units decreases considerably after continuous use, which means having to compensate by opening up the lens aperture. The light output stabiliser of the Super-Lite maintains constant maximum output of each flash.

Penlight batteries for the Super-Lite

are inexpensive... they are available almost everywhere.

Carry a spare battery case with fresh penlight batteries in case the loaded batteries need replacing.

Asahi Pentax clip-on meters

Model II

The best planned picture can be ruined by incorrect exposure. Repeating exposures may provide one usable negative or transparency out of every three or four, but it is a totally needless waste of film — needless, that is, when an accurate exposure meter, properly used, will help obtain consistently good exposures under all but the most impossible lighting conditions.

The Asahi Pentax CdS Clip-on Exposure Meter is an accurate exposure meter, and it is easy to use. It is extremely sensitive and highly selective. As the name implies it simply clips on to the Asahi Pentax, and couples directly to the shutter speed dial. It is light, compact, and this precision instrument will help

to take perfectly exposed pictures by showing the proper shutter speed and aperture to use.

Suitable for use with Models S1a/SV.

Model SL

The Asahi Pentax Clip-on Exposure Meter SL is identical to the S1a/SV model with the exception of two small points. First, the angle measurement is 40° compared to 30° on the earlier model and a very slight increase in weight (140g. compared to 129g.) It is also calibrated up to $\frac{1}{1000}$ sec. instead of $\frac{1}{500}$. Method of attachment to the camera, use, and determination of exposure are precisely the same as for the model II. Precisely the same recommendations apply regarding battery replacement, zero adjustment, and general care of the meter. It is worthy of note that the angle of measurement is less than the angle of the standard camera lens. This fact ensures that a really accurate reading is obtained unaffected by deceptive marginal or peripheral lighting.



Asahi Pentax Data II Camera



The Asahi Pentax Data II Camera is a Spotmatic which has been modified to accept the data recording housing on the back cover of the camera. This compact unit, which contains a Citizen 17 jewel three handed ladies watch, battery housing, circuit check pilot lamp, data plate, projection lamp and 6.3mm f/3.5 data image projection lens, is attached to the camera by means of a bayonet receptacle.

To record time data and other relevant facts, information such as date, place or description of subject is handwritten on the data plate. The image projection lens is then focused on the data plate and face of the watch, projecting all the data on to the top left hand corner of the film. The data recording area on the film is 3.3mm in diameter. The data recording unit, which weighs 91 grams, measures 57mm wide x 37.5 mm high x 30mm deep, and is so designed to properly expose the data on to 50 ASA, 100 ASA and 200 ASA films. By using a filter in the unit itself the image projection lens will expose correctly on 400 ASA, 800 ASA and 1600 ASA films. The battery housing contains three Ever Ready S41 1.5V batteries which will allow for approximately 10,000 exposures. When the recording unit is detached from the back of the camera the receptacle part is automatically light sealed allowing the camera to be used as the standard Spotmatic.

The Asahi Pentax Data II Camera does accept any of the Takumar lenses and therefore is extremely versatile for taking photographs with time and other data of construction work, experimental and research work, sports events and nature photography.

Spotmatic and SL focusing screens

Alternative screens for use with Spotmatic and SL cameras which will give more critical focusing with a variety of lenses and various light conditions. The Microprism "A" is fitted as standard and alternative screens must be fitted by trained service personnel.

Description	Appearance	Finder system
Micro system A Ground glass "A" with Microprism (Standard)		
Made of plastic Cross-Microprism at centre matt field at edges		The standard fitted screen with cross microprism and fresnel lens
Micro system B Ground glass "B" with Microprism "Acuter"		
Made of plastic Cross-Microprism at centre matt field at edges		Ground glass with microprism acuter. Brighter than the standard screen which makes it ideal for focusing in adverse light conditions
Matt system A Ground glass "A" with total matt		
Made of plastic total matt		A matt ground glass screen with fresnel lens for use in conjunction with telephoto lenses
Matt system B Ground glass "B" with total matt		
Made of glass total matt		A ground glass screen without fresnel lens which concentrates the light in the centre of the screen for better focusing when using telephoto lenses in poor light conditions
X Cross system Ground glass with X Cross		
Made of plastic X Cross at centre matt at edges		Ground glass with split image and fresnel lens for use in photomicrography
Split image system Ground glass with split-image		
Made of plastic split-image at centre matt at edges		Ground glass with split image and fresnel lens for quick focusing general photography



Section 16
Asahi Pentax
Clip-on Meter

Asahi Pentax Clip-on Meter

Asahi Pentax CdS Clip-on exposure meter

The Asahi Pentax Camera and ancillary accessories rate among the finest photographic products in the world, and rightly so. Nevertheless, the question of exposure is *vital* if all the painstaking research, infinite care and craftsmanship during actual production of the camera, lenses and accessories is to be justified. Monochrome films have in the main, wide latitude; that is to say, under or over exposure, even by as much as two whole stops, will still render a usable if not perfect negative, but this is not the case with colour where correct exposure is essential for really first class results. The Asahi Pentax CdS Exposure Meter is, therefore, a well nigh essential

item if full confidence and consistency in results are to be attained. The Meter is light, compact and yet extremely sensitive and highly selective. It is designed to clip directly on to the Asahi Pentax Body and couples directly to the slotted shutter speed dial. A small lens positioned in front of the CdS cell actually allows a restricted 30° angle of light measurement which is, of course, somewhat narrower compared with the angle of the standard lens. Thus, by eliminating all extraneous marginal light a high degree of accuracy is achieved. A glance at the specification makes one appreciate just how versatile and yet simple the meter is in operation. Powered by a minute mercury battery a very wide exposure range is covered, a dual scale providing L. & H. positions (L = low, for dim light; H = high, for high light intensity). The fact that the meter is coupled to the actual Asahi Pentax shutter speed

dial permits really fast working and once a light reading has been taken and the required shutter speed set, just a glance at the diaphragm scale will show the correct lens aperture. At this point, however, it must be stated that no exposure meter is absolutely 100% foolproof. Indeed, it would be quite untrue to suggest that a meter will provide accurate light measurement unless some degree of common sense and understanding of the basic principles is provided by the user. In other words, although the angle of view, as stated above, has been controlled to that approximating to the camera lens there are, nevertheless, many outside influences which can, unless taken into account, produce distorted readings. It is at all times advisable to approach the subject as close as is practicable, particularly where the main subject area, such as a person's face shown against a darker or lighter background is being photographed.

The history and introduction of Asahi Pentax exposure meters

The original meter was introduced in 1961 when the Asahi Pentax camera range consisted of the S1 and S3 models. In fact, the actual shutter speed dial of the camera dictated whether or not the clip-on meter could be used with any specific Pentax model. The dial had to contain a slot to accept the shutter speed dial coupling pin of the meter. Pentax S2 and some early models of S1 and S3 were not suitable as the dials were not slotted.

However, later models of S1 and S3 were supplied with appropriately slotted dials which will, in fact, work with the latest model clip-on Meter.

Original Asahi Pentax clip-on meter

The meter was positioned on top of the Pentaprism housing of the camera and was retained in position by clips that fitted into the viewfinder frame slots. The Meter employed a CdS cell, was highly sensitive, and was powered by a 1.3v Mercury battery, Mallory 640-R, Ever-ready E625 or equivalent. By turning a knurled ring beneath the shutter speed dial of the meter

the ASA speed of the film could be set, the range being ASA 6-1600. The acceptance angle of the Meter was 30°. On the top surface of the Meter was a three position switch controlling the 'off' position, H 'High', L 'Low' light levels and two sets of aperture figures appeared on the Meter dial f1.4-f22 - (black figures for High light levels and red figures for low levels). In use once the ASA film speed had been properly set, a light reading was taken and the coupled shutter speed dial of the meter turned until the Meter indicator needle indicated a usable aperture. Many thousands of these early clip-on Meters are still giving Pentax owners dependable service.

Asahi Pentax clip-on meter, Model 1

Basically this model was identical to the original in all respects excepting that it contained a battery test circuit. Further, the control switch had an additional position, a green 'B' to the left of the High 'H' position. In order to test the battery the switch was set on the 'B' and providing the Meter needle moved to a green segment on the Meter dial the battery was considered to be in good condition. If the needle failed to reach the green mark a replacement battery was called for. With normal use and care the mercury battery used in the Clip-on Meter should last about a year.

Model 11 (S1a/SV)

This current clip-on Meter operates in exactly the same way and has

Light sensitive element	Cadmium Sulphide (CdS)
Weight	129 gr. (4.6 oz.)
Angle of measurement	30°
Coupling system	Couples directly with shutter speed dial and gives reading of diaphragm settings
Film speed range	ASA 6—1600
Shutter speed range	B, 1—1/1000 sec.
Diaphragm range	f/1.4—f/22
Power source	1.3v mercury battery (Mallory PX-13 or PX-625)
Battery checker	Push-button battery checker
Switch positions	'L' (low) for dim light and 'H' (high) for high light intensity
Light input window	Infra-red light-cutting glass

almost identical performance specification as the previous model, but is of different appearance. The selector switch houses a central green button for battery test purposes. On depressing the button the meter needle will move to a green index mark at the bottom of the aperture scale providing the battery

is in good condition. The actual method of attaching the Meter to the camera has been very much improved in as much as there is now a positive locking device clamping tightly to the viewfinder frame and eliminating accidental detachment. The earlier versions were held in place largely by friction grip.

Model 1



Model 11



Attaching the meter to the camera

Press the claw release levers (14) and slide the base of the Meter (15) into the grooves on the camera viewfinder frame as far as it will go. Then turn the Meter shutter speed dial in either direction to engage the coupling pin (19) in the slot of the camera shutter speed dial. Once the pin is engaged turning the meter shutter speed dial will also turn the shutter speed dial of the camera.

How to use the meter

Measuring exposure with the Asahi Pentax Clip-on Meter is easy. First, line up the ASA number of the film

being used with the film speed index. If outdoors and the light intensity is high, turn the switch to the 'H' setting.

Then, turn the meter's shutter speed dial and set the required shutter speed opposite the shutter speed index. Compose the picture — then lower the camera to examine the meter's needle. Be sure to keep the meter in approximately the same position as when composing the picture. The diaphragm setting above the guide scale which lines up with the meter's needle is the correct aperture for the combination of film and shutter speed.

If the needle does not move at the 'H' setting, or when indoors using

available light, or outdoors in dim light or deep shade, turn the switch to 'L'.

If it is wished to use a certain aperture — a wide one, for example to render the background blurred — take the reading and line up the selected diaphragm calibration with the needle by turning the shutter-speed dial. When the diaphragm calibration lines up with the needle, the shutter speed opposite the shutter speed index is the proper one to use.

Leaving the meter switched on when not in use will rapidly exhaust the battery. Always switch the meter off when not actually taking readings.

Asahi Pentax Clip-on meter SL



Just as there are different ways of taking pictures, there are different ways of using the meter to determine proper exposure. Here are several methods.

At the camera position

For distant scenes, or when one cannot move in closer, point the meter slightly downwards to exclude excessive sky light which can distort the meter reading and cause underexposure of the subject. Where shadow detail is important, open up one full stop for black and white and negative colour film, and a half stop for reversal colour.

At the subject's position

For extremely critical exposures, move in as close as possible and take the reading directly from the subject. Hold the meter six or eight inches from the subject (it may be convenient to remove the meter from the camera) making certain that no shadows are cast by the hand or the meter on the area being measured. This method is particularly effective for relatively small main subject areas (such as a person's face) in front of a much darker or lighter background when full exposure of the main subject only is important.

Substitute hand method

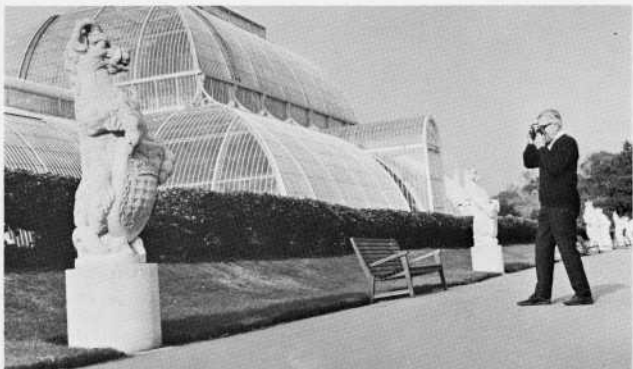
When it is not practical to take a close-up reading, try a substitute reading by using the palm of the hand. Hold the meter six to eight inches away, being careful that no shadows are cast on the palm.

Take several readings

It is often best to take readings from different areas of the subject, using the average exposure to obtain detail in both light and dark picture areas. This is practical if no more than a six-stop difference in high and low readings exists with black and white film, or a three stop difference with colour.

Zero adjustment

If the meter's needle does not indicate the zero point when switched off, turn the zero adjusting screw in either direction until the needle rests exactly on the zero point.





Clip-on meter SL fitted to camera.

Light sensitive element	Cadmium Sulphide (CdS)
Weight	140 gr. (4.9 oz.)
Angle of measurement	40°
Coupling system	Couples directly with shutter speed dial and gives reading of diaphragm settings
Film speed range	ASA 6—1600
Shutter speed range	B.1—1/1000 sec
Diaphragm range	f/1.4—f/22
Power source	1.3v mercury battery (Mallory PX-13 or PX-625)
Battery checker	Push-button battery checker
Switch positions	'L' (low) for dim light and 'H' (high) for high light intensity
Light input window	Infra-red light-cutting glass

Battery replacement

Mercury batteries of the type used in this meter have an extremely good shelf life. A battery will give a constant current during its life, but when it deteriorates the current drops rapidly. It will last for approximately one year depending upon frequency of use. As a guide, when the battery is exhausted, the needle will move very slowly, or not at all. Push the battery check button (7).

If the needle reaches the battery check mark (2) the battery still has sufficient capacity. If the needle does not reach the battery check mark, replace the battery. Use Mallory PX-13 or PX-625 or its equivalent.

To replace the battery, simply slide the replacement lever (18) out of the way and remove the battery cover. The battery will lift out easily and the new one put in place. Insert the battery with the positive (+) side up, in contact with the battery cover.

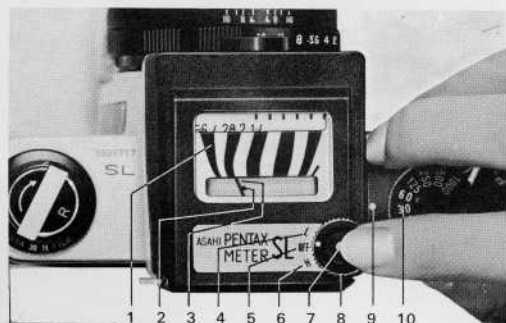
Caution

Keep the battery dry. Do not touch it with the fingers unnecessarily. Wipe the surface completely with a dry cloth before inserting it into the battery housing.

Do not try to charge the battery or it will deteriorate.

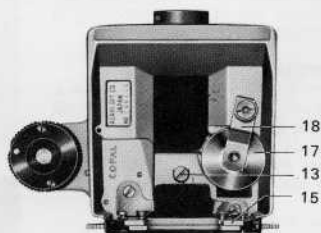
Do not short circuit the battery. Do not throw a used battery on to a fire. It may explode.

If the meter is not to be used for some length of time, the battery should be removed from the housing.



- 1 Guide scale
- 2 Battery check mark
- 3 Meter needle
- 4 L (low) switch setting
- 5 OFF switch setting
- 6 H (high) switch setting
- 7 Battery check button
- 8 Switch nob
- 9 Shutter speed index
- 10 Shutter speed dial

- 11 Film speed calibration
- 12 Light input window
- 13 Zero adjust screw
- 14 Claw release levers
- 15 Slide legs
- 16 Claws
- 17 Mercury battery cover
- 18 Mercury battery replacement lever
- 19 Shutter speed coupling pin
- 20 Film speed index



Section 17
Asahi Pentax
Spot Exposure Meter

Asahi Pentax Spot Exposure Meter

Asahi Pentax Spotmeter

Model 1

In 1961 Asahi Pentax introduced their first Spotmeter, the 3°/21° Meter. Resembling in itself a small reflex camera the Meter contained an optical reflex viewing system for chest level reading. The name, in fact, was derived from the minute 3° angle of view covered by the light sensitive CdS element which was located in the centre of a 21° viewing field. There was an image magnification of 1.5x. The metering system was powered by 1-1.3v mercury battery Mallory RM-1R or equivalent, and 1-22.5v dry cell Ever-Ready 412 or equivalent. The Meter became an almost instant success, as no accessory quite like this had been previously available. The 3°/21° meter was supplied complete with batteries, leather case, neck strap, lens cap and rubber eye-piece.

Advanced amateurs and professionals were impressed by the ease of use. On looking through the vertical viewfinder a circular area was revealed, representing the 21° field of view. In the centre a smaller circle, the 3° actual reading angle. Two scales, marked H for 'High' and L 'Low' were clearly visible. The low scale covered light levels from 3-10, and the high scale from 10-18. On the top of the Meter body was located a two position button which switched on the meter mechanism and selected the high scale for subdued light with the button completely depressed. To make a reading, the specific area to be read was covered by the small 3° circle, the button then pressed for the appropriate lighting condition, and the LL number indicated by the meter needle on the proper scale noted. Next, the two rotating rings on the lens barrel of the meter were used to calculate the correct camera setting. The ring closest to the lens contained two scales, 11 numbers from 3-18 and shutter speeds from 8

secs. to 1/8000 sec. The second ring also had two scales with apertures from f11 to f128 and ASA film speed index numbers from ASA 3 to ASA 6400. Lining up the ASA number of the film being used with an index mark prepared the Meter for use. Then the LL-number indicated by the meter needle was lined up with another index mark and a suitable combination of shutter speed and aperture selected from the wide range of combinations which appeared as the f/stop and shutter speed scales coincided. Provision was made for the acceptance of screw-on 46mm filters and/or lens hood in order that readings could be taken directly through the filter intended to be used on the camera. Additionally, extremely high light levels could be measured by attaching a neutral density filter to the meter.

Minor changes mainly concerning the internal circuitry were made in later versions and in these one 1.3v mercury battery was required instead of two.



Specification

Dimension:	Height 130mm Width 62mm Length 135mm
Weight	420g.
Viewing angle:	21°
Angle of acceptance of CdS photo conductor	3°
Light Sensitive Element	Cadium Sulphide (CdS)
Power source	One 1.3v mercury battery and one 22.5v dry battery
Light level range	3-18 (ASA 100)
ASA film speed range	3-6400
Diaphragm range	f11-128
Shutter speed range	8 secs.-1/8000
Type of measurement	Reflected light meter

Asahi Pentax Spotmeter

Model II

The model II Asahi Pentax 1°/21° Meter changed considerably and became an immediate success. Completely redesigned, the new style provided far greater ease in handling, among other things. The



really well-shaped handle type grip provided a very simple yet positive method of holding the meter.

There was also a completely new innovation – the actual building-in and utilisation of a pentaprism for viewing/sighting purposes identical to the prism built into the Asahi Pentax cameras. Naturally, this permitted eye level operating with a vertically correct and laterally non-inverted image which really facilitated handling and using the meter.

Shutter speed scale

The shutter speed scale (9) is calibrated from 4 minutes to 1/4000 second. The figures 4m, 2m and 1m calibrated in red indicate minutes, and 30, 15, 8, 4, 2, all calibrated in red, and 1, calibrated in white, indicate seconds. All other numbers calibrated in white, from 2 to 4000, are fractions, '30' indicating 1/30 second. The red mark next to the figure '60' indicates the speed for 16-fps 8mm cine.

Specification

Type of measurement	Reflected light meter which reads high light range with the lens cap off, and low light range with the 'L' button depressed
Dimensions	Length 122mm x Width 60mm x Height 162mm
Weight	510 grams
Viewing	Eye-level pentaprism viewfinder with adjustable eyepiece
Viewing Angle	12° (vertical) / 17° (horizontal) / 21° (diagonal)
Light sensitive element	Cadmium Sulphide (CdS)
Angle of acceptance of CdS photo conductor	1°
Light-level range	3-18
Shutter speed range	4 mins. - 1/4000 second
Diaphragm range	f1-f128
ASA Film Speed range	6-6400 (DIN 9-39)
Power source	One 1.3v mercury battery (Mallory RM640, Ever-Ready E640, or equivalent) One 9v dry battery (Mallory M1604, Ever-Ready 216, or equivalent)

Asahi Pentax 1° - 21° Spotmeter

Model III

Several major changes have been made in this later version, primarily that the reflex optical system has now been designed around the same Pentaprism as used in the Pentax cameras. This, of course means that the Meter may be used at eye-level and identification of the subject is somewhat easier due to the non-inverted and laterally correct image. As can be seen from the illustration, a smooth moulded casing has now provided a pistol grip type base which certainly makes for greater convenience in use.

The meter is permanently 'on' and upon removing the lens cap it is ready to measure High Light levels. On the front of the handgrip is a switch marked 'L' which is depressed when the light level is insufficient to move the scale needle enough to provide a usable reading in the normal or 'High' position. Immediately above the Low Light button is a grey button marked 'B' which is for testing the 9v dry

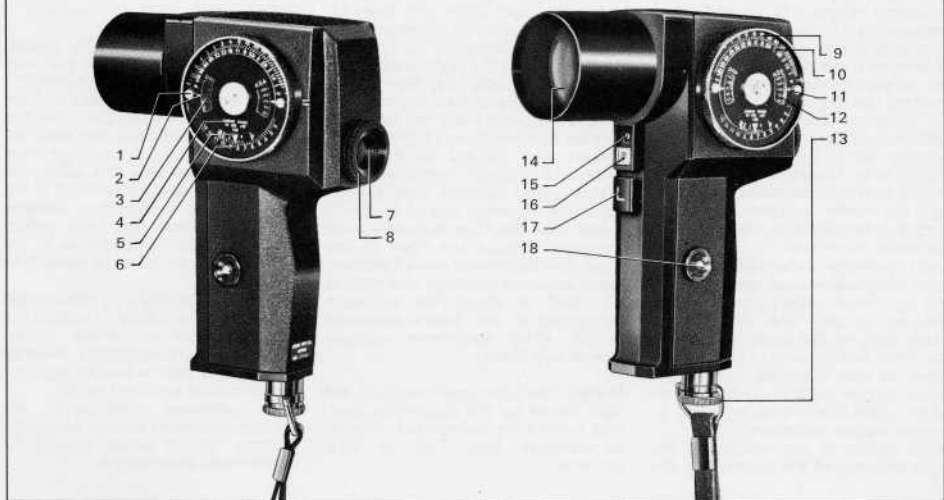
Specification

Type of measurement	Spot-reading reflected light meter which reads high-light range with the lens cap off, and low-light range with the 'L' button depressed.
Distance of measurement	1m - ∞
Light level range	3 - 18
ASA/DIN film speed range	ASA 6 - 6400/DIN 9 - 39
Diaphragm range	f/1 - f/128
Shutter speed range	4 minutes - 1/4000 second
Viewing	Eye-level pentaprism finder (magnification 1.5x) with adjustable eyepiece (0 - 1.5 Dptr.)
Viewing angle	12° (vertical) / 17° (horizontal) / 21° (diagonal)
Angle of acceptance of CdS photo conductor	1°
Scale illuminator	Scale illuminator glows, for dark area reading, when the illuminator button is depressed.
Power source	One 1.3v mercury battery (Mallory TR146, Ever-Ready E640 or equivalent) - for high-light range. One 9v dry battery (Mallory M1604, Ever-Ready 216 or equivalent) - for low-light range.
IRE scale	IRE scale for television filming and other special readings.
Battery checker	Battery checker mark on Light-Level scale: battery checker button on grip.
Dimensions	Height 164mm x Width 62mm x Length 127mm.
Weight	475g.
Accessories	Soft leather case + hand strap.

- 1 Nipple for turning ASA/DIN scale
- 2 Index for DIN scale
- 3 DIN scale
- 4 IRE scale
- 5 Standard index for Light Levels
- 6 Light-level scale

- 7 Adjustable eyepiece
- 8 Adjust ring
- 9 Shutter speed scale
- 10 f/ number scale
- 11 Index for ASA scale
- 12 ASA scale

- 13 Hand strap retainer
- 14 Objective lens
- 15 Zero adjust screw
- 16 Battery check button
- 17 'L' switch button for low-light range
- 18 Scale illuminator button



battery, Mallory M1604; Ever-Ready 216 or equivalent. The meter also requires one 1.3v mercury battery Mallory RM 640, Ever-Ready E640, or equivalent. Failing power will result in only a sluggish movement of the meter needle even when aimed at a bright light source. Also located on the front of the meter immediately above the battery test button is a zero adjustment screw, which in fact is used only with the mercury battery removed.

Positioned on the left-hand side of the meter is a large easy-to-read exposure calculator dial with movable inner disc and outer rotating ring. There are contained on the dial four scales. LL numbers from 3-18, shutter speeds 4 mins.-1/4000 sec., apertures f1-f128, and film speed index ASA '6-6400' and DIN '9-39'. The eyepiece on the meter may be adjusted to suit individual vision. Unlike the original model the viewing field is rectangular as opposed to circular and the diagonal covers the full 12° and the 17°. In the centre of the viewing screen is again a small circle showing the ° covered by the CdS light sensitive element. The High and Low level

scales are very clearly shown and the rectangular block between figure 7 and 8 on the Low level scale is the position where the meter needle should rest when the battery is checked and found to be in order. As with the previous model 46mm lens hood and filters (including neutral density) may all be used, the meter being supplied with lens cap, batteries and zip leather case.

Use of the Spotmeter

Unlike the clip-on Meter or built-in TTL Meter of the Spotmatic, which produce an average overall reading of the entire picture area, the Spot Exposure Meter measures with great accuracy a spot of only 1° of arc but with the advantage that it can do this at virtually any distance from the subject.

Immediately one will think of the many occasions when this system would be invaluable particularly where, in fact, telephoto or longer focus lenses are being employed. Furthermore, it can help ascertain the relative brightness of all objects within the picture area thus showing clearly whether the brightness range

is acceptable for, say, accurate colour reproduction. Obviously the meter must be used with some degree of intelligence, but by taking a reading from the shadow and high light areas of the subject and using the calculator dial in order to determine the proper exposure for each of these areas one can ascertain essential information. Thus by knowing the relative brightness ranges of the sensitive film material being used it is not difficult to calculate the most suitable exposure that will guarantee an exposure contained within the known ratio limitations of the film. Naturally, with monochrome film the general brightness range is very high, as is to some lesser extent the colour transparency film but with the latter only at the expense of true colour rendering. Negative colour film comes lower on the scale.

How to use the Spotmeter

First, set the film speed to the correct index (3) representing the DIN scale, or (12) for ASA by turning the indicator plate with the embossed nipple (1).

Remove the lens cap and view the subject through the viewfinder. The eyepiece may be easily adjusted by turning to suit the user's eyesight. The centre circle of the viewing screen covers an angle of 1° in which the meter's light sensitive element operates. Point the centre circle to a position within the subject area, where it is wished for a measurement to be taken. The meter is constantly 'on' and the simple act of removing the lens cap is sufficient to commence operations, so a reading can be taken immediately. If, however, there is insufficient light to provide a workable reading, depress the 'L' switch button (17). Please note, however, that if the 'L' switch button is depressed in bright light the needle will read completely off scale, and damage may occur to the meter movement.

Light intensity expressed in light/level numbers is read directly from the light/level scale located on the viewing screen. The 'High' light scale seen on the upper portion of the scale line is used in bright light while in dim light the 'Low' light scale shown on the lower portion of the scale line is used with the 'L' switch button depressed.

After obtaining the reading of the light intensity of the spot within the

subject area which it is intended to measure, move the outer ring and match with the light-level index (5) the same number as read from the light-level scale of the viewing screen. For convenience, the light-level numbers on the scale (6) are in two colours: from 3 to 10 in white, which correspond to the low light scale, and from 11 to 18 in red, which correspond to the high light scale.

After matching the light-level number with the index (5), look at the shutter speed and diaphragm scales (9 and 10), and there will be found various combinations of the shutter speeds and f/stops to be used. Choose a suitable combination.

When taking pictures with a filter, cover the objective lens of the Spotmeter with the filter and determine exposure through the filter. In this case, the Spotmeter gives compensated exposure readings and there is no need to adjust the exposure according to the filter's exposure factor. (The Spotmeter accepts 46mm size filters).

Note: The light-level numbers are light values for the Spotmeter only, and cannot be transposed directly to cameras with EVS or LVS systems.

Other uses

In black and white reproduction of a colour subject it is known that adjacent areas which have little difference in light reflection, albeit are different in visual colours, will not be reproduced on the film with adequate variations of contrast. In such a case a suitable filter is required, and used to produce a tonally correct scale.

It is, however, difficult to choose the correct filter for the purpose. The Asahi Pentax Spotmeter will, in fact, help in this respect. First, place the filter over the objective lens of the Spotmeter and read the difference in the L.L. readings – use different filters until the difference in the L.L. readings (contrast) of the picture areas in question become greatest. Select the filter which gives the greatest difference in the L.L. readings to correctly reproduce the contrast.

The Spotmeter will also help correct illumination, not only in colour but also in black-and-white photography. The reproducible contrast of a picture area is limited within a certain range, as stated earlier.

The Spotmeter readings of the various important picture areas will indicate which areas should be additionally illuminated.

Battery check and replacement

The condition and life of the 9v dry battery is checked by means of the battery check button (16). Observe the scale through the viewfinder, and depress the battery check button. If the needle moves to the black mark between figures 7 and 8, then the battery is still active, but should the needle not reach this mark then the dry battery should be replaced.

For replacing the dry battery, remove the strap retainer (A) by unscrewing it and turn the lever (B) in the direction of the arrow, whereupon, the

whole mercury battery housing will spring up. Open it as illustrated, and remove the dry battery from within and when inserting the replacement do ensure that it makes good contact and is correctly positioned in relation to the (+) and (-) terminals.

Normally, the mercury battery lasts for about a year, but signs of deterioration are when the meter needle does not move rapidly even when working in bright light.

Care should be taken to ensure that the replacement battery is of the correct type. Access to the battery is

by means of the battery housing cover (C) which is unscrewed with the aid of a coin. When the new battery is inserted, be quite certain that the (+) side is uppermost.

Cine index

Between 30 and 60 on the shutter speed scale is a red index. This is the index for 24/fps cine speed. For 18/fps cine speed, use the calibration 30 (1/30 sec.). Use the f/stop number facing this red index (for 24/fps) or the calibration 30 (for 18/fps).



ASA and DIN Scales

The DIN scale (3) is calibrated in green from DIN 9 to 39, with every third number fully indicated (9, 12, 15, etc.), and the balance are indicated by markings.

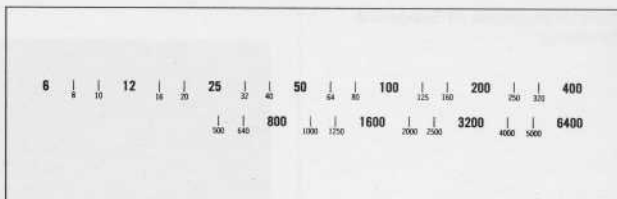
The ASA scale (12) has the following calibrations in red. (The figures under a dash are merely indicated by markings).

Zero Adjustment

After the mercury battery is taken out, the needle should rest at the zero point of the light-level scale. If the meter's needle is off the zero point, turn the zero adjustment screw (15) with a screwdriver to bring the needle to the zero point. When making this adjustment, the mercury battery must be removed from its housing.

Colour correction

The Spotmeter contains an optical system consisting of an objective lens, reflex viewing system including a pentaprism (the same pentaprism as used in the Asahi Pentax camera), and an eyepiece. The reflex viewing system and the CdS cell have a special coating which properly corrects the colour sensitivity of the light-sensitive element, making the Spotmeter highly accurate in critical colour photography.



Conversion of L.L. values to candle power/foot Lamberts K=1.3

EV	cd/m ²	cd/ft ²	ft—L
3	1.1	0.1	0.3
4	2.2	0.2	0.6
5	4.4	0.4	1.3
6	8.8	0.8	2.5
7	17.5	1.6	5.1
8	35	3.2	10.2
9	70	6.5	20.4
10	140	13.1	40.9
11	280	26.1	81.8
12	560	52.2	163
13	1,120	104	326
14	2,240	208	652
15	4,480	416	1,304
16	8,960	832	2,608
17	17,920	1,664	5,216
18	35,840	3,328	10,432

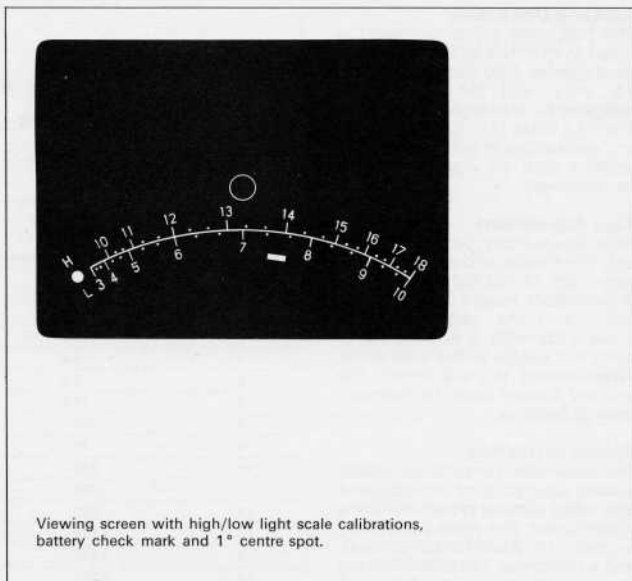
Against 18% reflection surface only.

Short operating instruction

- 1 Set the ASA scale to the correct film speed rating of the loaded film.
- 2 Hold the meter in the right hand (with viewing ocular close to the eye) and direct the meter toward the photographic subject.
- 3 Looking through the viewfinder, centre the small circle (centre of the scale glass) on the area of prime picture interest. (Turn the adjust ring (8) until you can clearly see the viewfinder scale.) Observe on the H scale of the viewing screen the Light-Level (L.L.) number at which the needle comes to rest. If the level is less than 10 on the H scale and/or the needle is not deflected, then press the 'L' button down and observe the L.L. number on the low range indicated by L scale.
- 4 Set this observed number below the green standard index mark on the meter calculator by turning the knurled outer ring.
- 5 Select the shutter speed and f/stop combination desired (from the two top scales of the meter calculator) and transfer this data to the camera.



Various methods of Exposure Readings



Viewing screen with high/low light scale calibrations, battery check mark and 1° centre spot.

General Method

Centre the small circle (seen through the viewfinder) on the half-tone spot in the area of prime picture interest. Set the observed Light-Level (L.L.) number below the standard index, and get the shutter speed and f/stop combination desired.

Averaging Method

Read the high-light and low-light areas, and get the average L.L. by dividing the total added L.L. numbers by the number of spot readings. Set the divided L.L. numbers below the standard index.

For black and white films, the difference (contrast ratio) between high-light and low-light areas can be about 6—7 L.L. numbers; for colour films, this difference should be kept below 5 L.L. numbers. If the contrast ratio exceeds these L.L. numbers, the picture area outside of these L.L. ranges will be over- and/or under-exposed.

High-light Reading Method

Developed for television filming, this method can be also applied to still photography. As stated earlier, the reproducible contrast ratio for colour films is about 1:30 (5 L.L. numbers 5 E.V.), same as in television filming. For black-and-white, this ratio is about 1:100 (6—7 L.L. 6—7 E.V.).

Read the high-light spot (white spot, for instance) in the picture area. Set the observed L.L. number below the IRE index 10. This will give you an optimum exposure based on the high-light spot.

In this case, however, the details in the picture area reproducible on

colour films are those areas giving L.L. number readings covered by the IRE scale from 10 to 1. The shadow details in the picture area giving L.L. number readings not reaching the IRE index 1 will not be reproduced on the film.

Therefore, such shadow areas should be additionally illuminated so that the L.L. reading will exceed the IRE index 1, as in television filming.

Shadow Reading Method

Contrary to the high-light reading method, this method reads the low-light spot to determine optimum exposure, such as when it is wished to properly reproduce shadow details, based on the shadow area.

Read the shadow spot in the picture area. Set the observed L.L. number below the IRE index 1. This will give an optimum exposure based on the shadow area (in this case read the L scale by depressing the 'L' switch button).

Special Colour Reading Method

This method cannot be recommended as a strict reading method, but after becoming accustomed to this it will be found highly efficient.

Do not be misguided by colours. One of the important points to be borne in mind when using this Spotmeter is the colour in the picture area. Reading any colour spot in the picture area will not give correct exposure unless the various indices are used correctly.

The reflection of light greatly differs from one colour to another.

Light Reflection of 7 Colours

Purple	6—12%
Indigo	6—12%
Blue	15—21%
Green	18—26%
Yellow	65—75%
Orange	35—45%
Red	15—21%

Yellow has the highest reflection among the 7 colours. Therefore, if spot reads a yellow area and uses the standard index to determine exposure, the picture will be under-exposed. To get proper exposure according to the colour of the picture area, set the observed L.L. numbers below the following indices:

L.L. Reading of:	Use following indices:
White spot	Index 10 (white)
Yellow spot	Index 8 (yellow)
Orange spot	Index 6—7
Red spot	Index 5 (red)
Green spot	Standard index (green)
Blue (dark) spot	Blue dot between 3 and 3

IRE* Scale

(*Institute of Radio Engineers)

IRE units are used for percentage-wise comparison of energy. They are used in wireless communications for comparison of signal voltage. In the Asahi Pentax Spotmeter, an IRE scale is incorporated for comparison of the energy of light under exposure measurement. The brightest spot in the high-light area is rated at 10 (100% IRE) and other areas are compared with this brightest spot in percents.

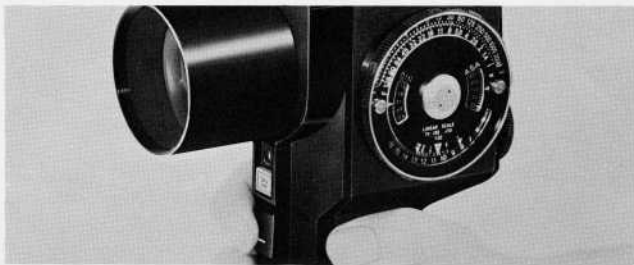
The index 10 (100% IRE) shows the maximum brightness in the high-light detail reproducible on colour film. ('White Level'.)

The index 1 (10% IRE) shows the maximum darkness in the shadow detail reproducible on colour film. The other indices from 2 to 9 (20%—90% IRE) show the percentage comparison of the brightness based on the 'White Level'. The large green triangle index between the indices 3 and 4 (not marked) is the standard index which shows the average of optimum exposure range.

Colour indices:

Index 8	Yellow
Index 5	Red
Standard index	Green
Dot between 2 and 3	Blue

The figure '1.32' on the calculator indicates the contrast ratio between IRE scale 1 and 10. The IRE scale from 1 to 10 covers 5 EV ranges; hence the contrast ratio is 1:32. In television broadcasting, the contrast ratio of the picture is limited to 1:30; therefore, the illumination for television filming is so adjusted that the contrast ratio is kept within 1:30.

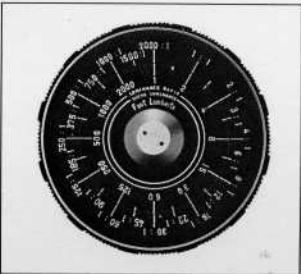
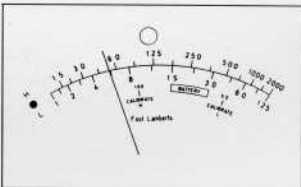


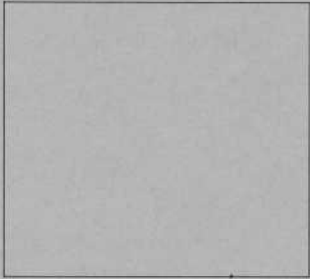
Asahi Pentax Spotmeter Model 'FL'

The Model 'FL' Spotmeter is identical to the Model III in mechanical and optical construction with the exception of the viewfinder scale and the calculator. The viewfinder scale directly reads Foot/Lamberts; the inside scale of the calculator on the side of the meter is the Foot/Lamberts calibration, and the outside scale indicates luminance ratio.

If, for instance, the brightest spot in a given area reads 1000 ft/L and the darkest spot reads 2 ft/L: Set the 2 ft/L calibration (inside scale) of the calculator below the luminance ratio 1:1 (outside scale), as illustrated. Observe the luminance ratio number (outside scale) matching the 1000 ft/L calibration (inside scale). You will note that the luminance ratio is 500:1.

The operation of the Model 'FL' is identically same as the Model III.





Section 18
Close-up Photography

Close-up Photography

Definition of terms relating to near distance and ultra close-up photography

It is somewhat difficult to define clearly what is meant by Close-up Photography as such. More particularly in the case of Asahi Pentax photography since even basic or standard camera lenses are capable of focusing from infinity to what might well be termed 'close-up'. Therefore, for terms of reference in this Manual it will be considered to relate to where the use of ancillary close-up attachments or equipment are employed.

Macro photography

Generally speaking, this term relates to the photographing of small objects at large magnification within the region of a 1:1 or more reproduction on the film. It is at this stage, incidentally, where the special Lens Reversal Ring accessory becomes invaluable for reasons stated elsewhere.

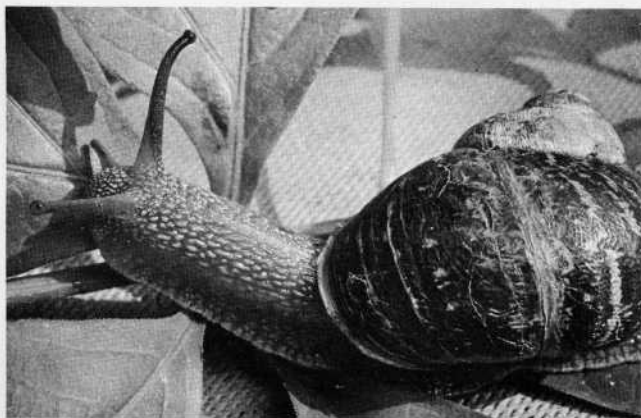
Photomicrography

Where a magnification of the subject even greater than is possible to obtain by the use of Bellows, Tubes, etc., i.e. 10x or 20x is required then

use is made of a microscope in place of the normal camera lens. Page CU 18 refers fully to the Asahi Pentax Microscope Adapter.

Microphotography

Unfortunately it is only too easy to mistakenly refer to Photomicrography when meaning in fact Microphotography. The difference is that with Microphotography one is simply photographing objects with the greatest possible degree of precision, as in micro-filming documents, etc.



The photographs on this page were taken with a Spotmatic fitted with a 50mm f/1.4 Macro Takumar lens.

Supplementary lens or lens extension devices

In order to obtain larger magnification than is possible with the normal camera lens used at the closest focusing distance, there are two possibilities. First, to increase the actual power of the camera lens, or second, to extend the distance between the lens and the film.

The first means, i.e. the use of a supplementary lens of positive power, is very simply and inexpensively achieved and 'Close-ups' on this page refers in detail.

The second system requiring the actual insertion of a device between the camera body and lens in order to increase the lens to film distance, is covered on the following pages which refer to Extension Tubes, Helicoidal Extension Ring, Bellows, etc.

Reproduction ratio (magnification or reduction)

Reproduction ratio is the relation between the resultant image size on the film and the original size of the subject. Therefore, when a subject of the same dimensions as the picture frame (24 x 36mm) is photographed and fills the frame the reproduction ratio will be 1:1. In order to fill the frame (24 x 36 mm) with a subject measuring, say, 6 x 9mm this would represent a reproduction ratio of 4:1.

Conversely, when an object larger in real life than the actual film format is photographed, the reproduction on the negative is necessarily a reduction i.e. a document measuring 110mm x 180mm photographed to fill the frame would have a reproduction ratio of approximately 1:5.

Asahi Pentax lens reverse adapter for macrophotography

Most normal 35mm camera lenses are computed for work over distances ranging from approximately two feet to infinity, and where exists a distance greater between lens and subject than lens to film. In the case of close-up and macrophotography the lens is artificially extended by means of extension tubes or bellows

Close-ups

Perhaps above all else the SLR Asahi Pentax system is undoubtedly supreme in the wide field of close-up work including copying, micro and macro photography, etc. Even without purchasing a single accessory we know that the 50/55mm Takumar standard lenses already possess a remarkable focusing range enabling a certain degree of medium close-up/copying and reproduction work to be undertaken.

When working out of doors and utmost mobility and minimum weight is essential, a vast new range of near distance subjects can now be photographed, that a few years ago would have seemed quite impossible without the aid of special close-up attachments. Nevertheless, there are complete fields of work made possible only by ancillary equipment without which much important professional photography including medical and research work could not be undertaken. Also the keen or advanced amateur would miss a great deal of fun without access to some of the simpler accessories. Happily, the range of ancillary equipment is very wide indeed both in scope and cost. For instance, for an extremely moderate outlay one can purchase the Asahi Close-up lens, a thin positive meniscus lens which is screwed into the front of the lens mount, as one would fit a filter. The lens has two spherical surfaces, convex and concave (both of which are coated), the greater curvature being that of the convex side, resulting in the lens being thinner at the edges than at the centre, and therefore less likely to detract from the fine optical

performance of the basic camera lens.

With the 50mm Super-Takumar focused at infinity the supplementary lens provides a reproduction ratio of about 1:6 at 18½ ins. from the subject. Alternatively, with the Super-Takumar focused at its nearest distance, i.e. 18 ins. a reproduction at approximately 1/3 scale is achieved at a working distance of 11 inches. This simple close-up lens fits all the standard Asahi Pentax lenses, in addition to the 105mm f2.8 Takumar, 105mm f2.8 Super-Takumar, 135mm f3.5 Super-Takumar, and 200mm f5.6 Tele-Takumar, all of which have standard 49mm thread.

Distance from film to subject cm	Magnification	Lens distance scale setting cm
47	0.15	∞
28	0.32	45

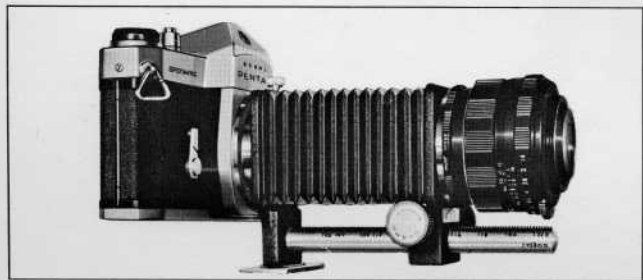


further away from the film plane, but closer to the subject. In this situation and where a magnification of life size or greater is being obtained, it is advisable to use the Lens Reverse Adapter in order to ensure optimum optical performance.

The Adapter screws into the front thread of any Takumar lens which accepts 49mm size filters. Screw the other end into the extension

tubes or bellows, and mount this combination on to the Asahi Pentax as illustrated.

This Adapter is for macrophotography only. Alternatively, for superb results, use the Macro-Takumar or Bellows-Takumar lens, especially designed for macrophotography and for conventional photography.



Copipod



There exist two further aids for the purpose of facilitating copying, the first being in the form of the Asahi Pentax Copipod. The Copipod is a small lightweight precision-made accessory comprising of rigid metal plate in the form of a lens board complete with 46mm and 49mm lens adapter rings, and four adjustable legs which screw into the lens board. The actual format within the area of the four splayed legs is fractionally larger than the field of a 50mm Takumar lens when focused to nearest distance, i.e. 46cms. The overall height of the legs ensures that an immediate and precise working distance is instantly established

and is particularly useful for copying documents, book pages, maps, etc. One of the main advantages for all vertical forms of copying is, of course, the fact that one is not concerned with having to mount or hold in vertical plane the material to be copied.

Further there is provision for additional extension by means of an adjustment on each leg section. The legs are calibrated by means of colour coded engraved rings. If the subject proves too large to be included in the normal field of view obtained by the first stage extension the four telescopic legs are released and are withdrawn in order to provide the necessary degree of additional height. At this stage care must be taken to observe that the extension legs are relocked and each extended equidistantly. This is easily accomplished by a glance at the coloured calibration rings provided for the purpose.

Assembly and use

Screw the (male) threaded ends (1) of the two section extension legs (2) into the female thread (3) on the lower side of the lens plate (4).

When employing a lens with a 49mm accessory mount, screw in the main adapter ring (5) provided, in the same way as if attaching a filter. Conversely, if using a camera lens with 46mm front accessory mount, then obviously the 46mm adapter ring is used, but in this instance the main adapter ring must also be screwed into the 46mm ring. The camera and lens, complete with adapter ring(s) is then lowered with the outer ring of the main adapter ring entering the central aperture of

the main lens plate (4) finally being locked into position by means of the locking screw (6). In this position it is necessary to use the Extension Tube in order to obtain a usable focusing range.

However, when, as said earlier, the subject matter to be copied requires greater extension (due to increased area) then the extension legs (2) are loosened by unlocking at point (7) and the extension legs pulled out to the required distance. Should this distance not exceed the first calibration line (8) no extension tube is required, providing an Auto- or Super-Takumar standard 50/55 mm lens is used, with minimum focusing distance of 45cm.

Should a standard Takumar or Auto-Takumar lens with minimum focus (55cm) be used without extension tube, then the inner legs must be extended to a point where a focusing range is established. Again, use should be made of the engraved calibrated lines for determining equal extension of the Copipod legs. This further provides an accurate parallelism between film plane and copy negative.

In actual use, the shutter should be first wound or 'cocked' and whenever possible focusing carried out with the aid of the Asahi Pentax Magnifier accessory, in order to achieve really 100% accurate focus. The use of a Cable release minimises any possibility of camera movement during exposure.

Needless to say, one should work with a light source that provides even illumination and with a lens aperture in the region of f11/f16. This is to provide a useful working depth of field.



Copipod

It is worth noting that the extension facility of the four inner legs may be utilised for a secondary purpose, i.e. when the copy material does not necessarily consist of a smooth flat plane and where slight individual adjustment of the leg extension will help to compensate.

Asahi Spotmatic makes easy work regarding the actual determining of exposure, but for all other Asahi

Pentax models then the CdS Exposure Meter will prove invaluable. It is always comforting to know that the actual field of view of all Asahi Pentax viewfinders is fractionally smaller than the actual resulting negative image, so eliminating the possibility of accidental cut-off. One interesting aspect of working with the Asahi Pentax Copipod is the complete portability of this useful accessory.

When dismantled the whole Unit slips into a soft leather carrying

purse with zip fastening, and can easily be carried in brief case or pocket when required.

Like most of the available accessories the actual assembly or incorporation, involving setting up or attachment to the camera, etc., invariably take considerably less time in practice than the time required to read the instructions. Conversely, the initial understanding and correct application of the many accessories can save valuable time in achieving first-class results.

Copy stand

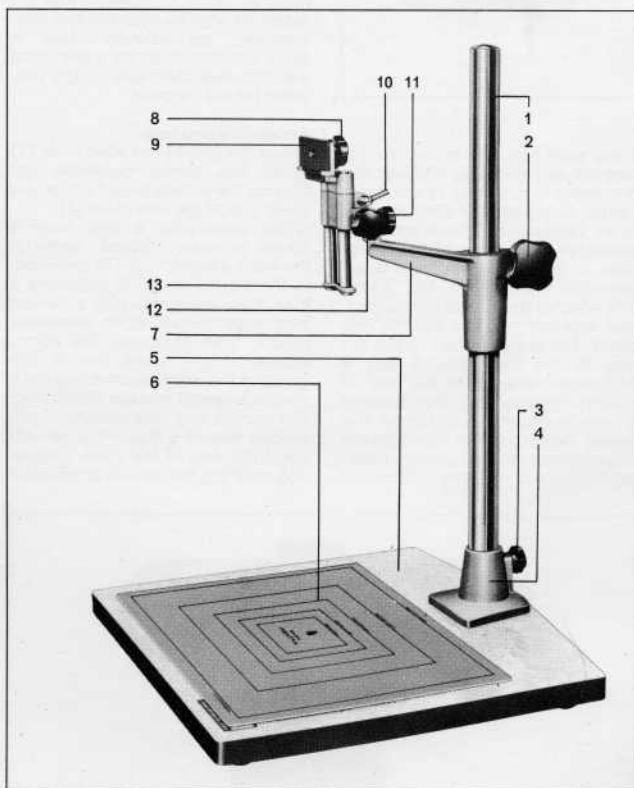
The second of the two aids, the first of which has been described (Copipod), is again a more versatile and rugged extension of the first in that it allows vertical copying but with fast overall and varied adjustment of distance between camera and subject matter. The equipment comprises a well-made rigid baseboard and column.

A camera retaining arm moves freely over the entire length of the column in a similar manner to the lamphouse of a vertical enlarger. Rapid overall height adjustment is provided by movement of the arm up and down the column, whilst fine adjustment is possible by means of the knob provided. The camera itself may naturally be used in conjunction with any of the copy aids, including supplementary lens, extension tubes or Mk. 1 or Mk. 2 bellows assembly. Generally speaking, the best form of illumination is two reflector light sources, of, say, 100w (or brighter) bulbs, placed at equidistance either side of the copy base and at an angle of about 45°.

Data regarding the use of extension tubes for copying a subject of a given size is shown on page CU 6. See Close-up Tables.

When using slow speed copying film take care to ensure correct exposure, as film of this type has very little latitude. For a film speed ASA 25 (DIN 15/10) the basic exposure at f8 is approximately $\frac{1}{2}$ sec when using two 100w. lamps. Obviously this can only be an approximation and due allowance should be made for influencing factors such as distance of lamp to subject, type of reflector used, colour of material to be copied, and so on.

With a 55mm lens it is advisable to use a slightly smaller f/stop, e.g. f11, in order to increase depth of field. The use of a cable release is advisable in order to prevent accidental camera movement.



- 1 Pole
- 2 Arm retainer screw
- 3 Pole retainer screw
- 4 Pole retainer
- 5 Base plate
- 6 Frame plate
- 7 Arm
- 8 Camera holder screw
- 9 Camera holder
- 10 Clamp lever
- 11 Micro-moving attachment Retainer knob
- 12 Micro-moving knob
- 13 Micro-moving attachment

Helicoid extension tube

The variable Asahi Pentax Helicoid Extension Tube permits, by means of a helicoid screw thread, a continuous extension between 16.8 mm to 30.6mm and represents the combined use of the extension tubes, number 2 and 3 (19mm and 28.5mm respectively). A magnification from 0.30x to 0.7x is possible in conjunction with Asahi Pentax 55 mm lens. The actual movement of this tube is similar to focusing movement of the lens itself, and is of immeasurable use for a wide range of close-up subjects. It is an extremely versatile extension ring.



Close-up Table for Helicoid Extension Tube

Lens	Magnification	Lens extension	Picture area	Film-to-subject distance	Exposure factor
35mm f/3.5	0.48	Helicoid shortest + lens ∞	75 × 50mm	16.9cm	× 1.9
	0.58	Helicoid shortest + lens longest	63 × 42mm	16.0cm	× 2.1
	0.87	Helicoid longest + lens ∞	41 × 27mm	15.0cm	× 2.8
	0.97	Helicoid longest + lens longest	37 × 25mm	14.9cm	× 3.0
55mm f/1.8, f/2	0.30	Helicoid shortest + lens ∞	122 × 81mm	31.9cm	× 1.7
	0.47	Helicoid shortest + lens longest	77 × 51mm	25.8cm	× 2.1
	0.54	Helicoid longest + lens ∞	67 × 45mm	24.6cm	× 2.3
	0.71	Helicoid longest + lens longest	51 × 34mm	30.0cm	× 2.9
85mm f/1.9	0.20	Helicoid shortest + lens ∞	182 × 121mm	61.1cm	× 1.6
	0.32	Helicoid shortest + lens longest	111 × 74mm	45.5cm	× 2.0
	0.36	Helicoid longest + lens ∞	100 × 67mm	43.1cm	× 2.2
	0.49	Helicoid longest + lens longest	74 × 49mm	38.1cm	× 2.7
105mm f/2.8	0.16	Helicoid shortest + lens ∞	225 × 150mm	89.3cm	× 1.5
	0.27	Helicoid shortest + lens longest	134 × 89mm	64.0cm	× 2.0
	0.29	Helicoid longest + lens ∞	124 × 82mm	61.1cm	× 2.1
	0.40	Helicoid longest + lens longest	90 × 60mm	52.5cm	× 2.5
135mm f/3.5	0.12	Helicoid shortest + lens ∞	289 × 193mm	138.3cm	× 1.4
	0.24	Helicoid shortest + lens longest	152 × 101mm	88.4cm	× 1.9
	0.23	Helicoid longest + lens ∞	159 × 106mm	90.8cm	× 1.9
	0.34	Helicoid longest + lens longest	106 × 71mm	72.5cm	× 2.4
150mm f/4.5	0.11	Helicoid shortest + lens ∞	321 × 214mm	170.9cm	× 1.5
	0.22	Helicoid shortest + lens longest	166 × 110mm	107.7cm	× 2.1
	0.20	Helicoid longest + lens ∞	176 × 118mm	111.9cm	× 2.0
	0.31	Helicoid longest + lens longest	117 × 78mm	88.5cm	× 2.7
200mm f/4	0.08	Helicoid shortest + lens ∞	429 × 286mm	286.9cm	× 1.4
	0.18	Helicoid shortest + lens longest	196 × 131mm	159.7cm	× 2.0
	0.15	Helicoid longest + lens ∞	235 × 157mm	180.9cm	× 1.8
	0.25	Helicoid longest + lens longest	143 × 95mm	131.3cm	× 2.4
Super-Macro-Takumar 50mm f/4	0.33	Helicoid shortest + lens ∞	111 × 74mm	28.0cm	× 1.8
	0.59	Helicoid longest + lens ∞	61 × 40mm	22.2cm	× 2.7
	0.83	Helicoid shortest + lens longest	44 × 29mm	20.9cm	× 3.6
	1.09	Helicoid longest + lens longest	33 × 22mm	20.8cm	× 4.7
Macro-Takumar 50mm f/4	0.33	Helicoid shortest + lens ∞	111 × 74mm	28.0cm	× 1.8
	0.59	Helicoid longest + lens ∞	61 × 40mm	22.2cm	× 2.7
	1.33	Helicoid shortest + lens longest	27 × 18mm	21.2cm	× 6.0
	1.59	Helicoid longest + lens longest	23 × 15mm	21.9cm	× 7.5

Helicoid shortest = Helicoid Extension Tube adjusted to shortest length Lens ∞ = Lens set at infinity

Helicoid longest = Helicoid Extension Tube fully extended Lens longest = Lens fully extended

Reversed Lens Position (using Reverse Adapter)

Lens	Magnification	Lens extension	Picture area	Film-to-subject distance	Exposure factor
28mm f/3.5	2.48	Helicoid shortest	14 × 10mm	16.4cm	× 38.6
	2.97	Helicoid longest	12 × 8mm	17.6cm	× 47.9
35mm f/3.5	1.91	Helicoid shortest	19 × 13mm	16.4cm	× 9.7
	2.31	Helicoid longest	16 × 10mm	17.5cm	× 12.9
50mm f/1.4	1.10	Helicoid shortest	33 × 22mm	19.6cm	× 7.4
	1.37	Helicoid longest	26 × 17mm	20.1cm	× 7.7
55mm f/1.8 and f/2	0.71	Helicoid shortest	51 × 34mm	23.0cm	× 4.9
	0.95	Helicoid longest	38 × 25mm	22.3cm	× 6.4

Note: Please disregard exposure factors when using Helicoid Extension Tube with the Asahi Pentax Spotmatic.

Asahi Pentax Extension Tube Sets

55mm semi-automatic lens as fitted on the Pentax S.1, S.2, S and K models. (now discontinued). The second for use on the 55mm fully automatic lens on the Pentax S3 and all later models, gives non-automatic operation.

The third type gives fully automatic diaphragm operation on the S3 and all later models.

The tables below show the individual measurement of the tubes.

Standard extension tube set S1

What may be considered as an infinitely flexible but still inexpensive system of undertaking close-up photography is the utilisation of Extension Tubes, which are mounted between the camera lens and body. These comprise three precision-made lightweight tubes each numbered respectively 1, 2 and 3.

There are, in fact, three separate patterns of Extension Tube Sets.

The first is designed for use with the

Extension tube set S3

Use the S3 type extension tubes with the semi-automatic Takumar lenses, such as the following: Auto-Takumar 55mm f2 for Pentax S2; Auto-Takumar 55mm f2.2 for S1; Auto-Takumar 35mm f2.3 and f3.5; Auto-Takumar 85mm f1.8 and Auto-Takumar 105mm f2.8; but when using the S3 type extension tubes with one of these semi-automatic lenses be sure that the automatic diaphragm mechanism of the lens is not cocked. To make sure, depress the diaphragm acti-

vating pin on the rear side of the lens before screwing it to the extension tube. Remember that when using the S3 type extension tube No. 1 with the Auto-Takumar 55mm f2 or f2.2 lens there is a very short range of distance that cannot be covered. (The length of the helicoidal extension of the semi-automatic 55mm f2 and f2.2 lens is 7.5mm and therefore, if this lens is set at its minimum distance scale it has helicoidally extended by 7.5mm. By inserting the S3 type extension tube No. 1 which is 9.5mm thick, between the semi-automatic 55mm lens and the camera body, the lens is extended by 9.5mm if it is set at infinity without its own helicoidal extension. The gap of 2mm beyond the lens helicoidal extension of 7.5mm cannot be covered. If this is not inconvenient, use the S3 type extension tubes with the semi-automatic 55mm lenses, provided the diaphragm is not cocked before you screw the lens to the extension tube.

Type	Ring 1	Ring 2	Ring 3
S1	7.5mm	15mm	30mm



Type	Ring 1	Ring 2	Ring 3
S3	9.5mm	19mm	28.5mm



Extension Tubes Close-up Tables S1

Auto-Takumar 35mm f3.5 (Distance scale set at 0.45m)

Note: Since the barrel of the Auto-Takumar 35mm f2.3 lens is comparatively long, the lens-to-subject distance is extremely short with the No. 2 or No. 3 extension tube, and it is not practicable to use this lens with these extension tubes.

Extension tube combination	Subject size		Film-to-subject distance		Magnification	Exposure factor
	cm	inches	cm	inches		
Not used	27 × 40	10.6" × 1'3.7"	45	1'5.7"	0.09	× 1.2
1	7.7 × 11.6	3.0" × 4.6"	19.5	7.7"	0.3	× 1.7
2	4.6 × 6.9	1.8" × 2.7"	15.5	6.1"	0.5	× 2.3
1 + 2	3.2 × 4.9	1.3" × 1.9"	14.3	5.6"	0.74	× 3
3	2.5 × 3.8	0.9" × 1.5"	14.0	5.5"	0.95	× 3.8
1 + 3	2.1 × 3.2	0.8" × 1.3"	14.1	5.6"	1.16	× 4.7

Auto-Takumar 55mm f2, f2.2
(Distance scale set at 0.55m)

Extension tube combination	Subject size		Film-to-subject distance		Magnification	Exposure factor
	cm	inches	cm	inches		
Not used	18.5 × 27.7	7.3" × 10.9"	55	1'9.7"	0.13	× 1.3
1	9.2 × 13.8	3.6" × 5.4"	33.3	1'1.1"	0.26	× 1.6
2	6 × 9	2.4" × 3.5"	27	10.6"	0.4	× 2
1+2	4.4 × 6.6	1.7" × 2.6"	24.2	9.5"	0.54	× 2.4
3	3.6 × 5.4	1.4" × 2.1"	22.9	9.0"	0.67	× 2.8
1+3	3 × 4.5	1.2" × 1.8"	22.2	8.74"	0.81	× 3.3
2+3	2.5 × 3.8	1.0" × 1.5"	22.0	8.66"	0.95	× 3.8
1+2+3	2.2 × 3.3	0.9" × 1.3"	22.0	8.66"	1.08	× 4.3

Auto-Takumar 85mm f1.8
(Distance scale set at 0.85m)

Extension tube combination	Subject size		Film-to-subject distance		Magnification	Exposure factor
	cm	inches	cm	inches		
Not used	18.5 × 27.7	7.3" × 10.9"	85	2'9.5"	0.13	× 1.3
1	10.9 × 16.4	4.3" × 6.5"	58.3	1'11.0"	0.22	× 1.5
2	8 × 12	3.1" × 4.7"	47.6	1'6.7"	0.3	× 1.7
1+2	6.2 × 9.2	2.4" × 3.6"	42	1'4.5"	0.39	× 1.9
3	5 × 7.5	2.0" × 3.0"	38.8	1'3.3"	0.48	× 2.2
1+3	4.2 × 6.3	1.7" × 2.5"	36.8	1'2.5"	0.57	× 2.5
2+3	3.6 × 5.5	1.4" × 2.2"	35.5	1'2.1"	0.66	× 2.7
1+2+3	3.2 × 4.9	1.3" × 1.9"	34.7	1'1.7"	0.74	× 3.0

Auto-Takumar and Takumar 105mm f2.8
(Distance scale set at 1.2m)

Extension tube combination	Subject size		Film-to-subject distance		Magnification	Exposure factor
	cm	inches	cm	inches		
Not used	21.8 × 32.7	8.6" × 1'0.9"	120	3'11.2"	0.11	× 1.2
1	13.3 × 20	5.2" × 7.9"	81.6	2'8.1"	0.18	× 1.4
2	9.6 × 14.4	3.8" × 5.7"	65.6	2'1.8"	0.25	× 1.6
1+2	7.5 × 11.3	3.0" × 4.4"	57	1'10.4"	0.32	× 1.7
3	6.2 × 9.2	2.4" × 3.6"	51.8	1'8.4"	0.39	× 1.9
1+3	5.2 × 7.8	2.0" × 3.1"	48.5	1'7.1"	0.46	× 2.1
2+3	4.4 × 6.7	1.7" × 2.6"	46.2	1'6.2"	0.54	× 2.4
1+2+3	3.9 × 5.9	1.5" × 2.3"	44.7	1'5.6"	0.61	× 2.6

Takumar 135mm f3.5
(Distance scale set at 1.8m)

Extension tube combination	Subject size		Lens-to-subject distance		Magnification	Exposure factor
	cm	inches	cm	inches		
Not used	27 × 40.5	10.6" × 1'3.9"	167	5'5.7"	0.09	× 1.2
1	17 × 25	6.7" × 9.8"	107	3'6.1"	0.14	× 1.3
2	12 × 18	4.7" × 7.1"	81	2'7.9"	0.2	× 1.44
1+2	9.5 × 14	3.7" × 5.5"	68	2'2.8"	0.26	× 1.58
3	7.7 × 11.5	3.0" × 4.5"	57	1'10.4"	0.31	× 1.72
1+3	6.5 × 9.8	2.6" × 3.9"	51	1'8.1"	0.37	× 1.87
2+3	5.7 × 8.5	2.2" × 3.3"	46	1'6.1"	0.42	× 2.0
1+2+3	5 × 7.5	2.0" × 3.0"	42	1'4.5"	0.48	× 2.2

Takumar 200mm f3.5
(Distance scale set at 2.5m)

Extension tube combination	Subject size		Film-to-subject distance		Magnification	Exposure factor
	cm	inches	cm	inches		
Not used	25 × 37	9.8" × 1'2.6"	250	8'2.4"	0.1	× 1.2
1	18 × 27	7.1" × 10.6"	192	6'3.6"	0.13	× 1.3
2	14 × 21	5.5" × 8.3"	160	5'3.0"	0.17	× 1.4
1+2	12 × 17	4.7" × 6.7"	140	4'7.1"	0.21	× 1.5
3	10 × 15	3.9" × 5.9"	126	4'1.6"	0.25	× 1.6
1+3	8 × 13	3.1" × 5.1"	116	3'9.7"	0.28	× 1.65
2+3	7 × 11	2.8" × 4.3"	109	3'6.9"	0.32	× 1.75
1+2+3	6.7 × 10	2.6" × 3.9"	103	3'6.6"	0.36	× 1.85

Takumar 300mm f4
(Distance scale set at 5.5m)

Extension tube combination	Subject size		Film-to-subject distance		Magnification	Exposure factor
	cm	inches	cm	inches		
Not used	39 × 59	1'3.4" × 1'11.2"	550	18'0.6"	0.06	× 1.13
1	28 × 42	11.0" × 1'4.5"	410	13'7.4"	0.09	× 1.18
2	22 × 32	8.7" × 1'0.6"	330	10'9.9"	0.11	× 1.23
1+2	18 × 26	7.1" × 10.2"	280	9'2.2"	0.14	× 1.29
3	15 × 22	5.9" × 8.7"	250	8'2.4"	0.16	× 1.35
1+3	13 × 19	5.1" × 7.5"	230	7'6.6"	0.19	× 1.41
2+3	11 × 17	4.3" × 6.7"	210	6'10.7"	0.21	× 1.47
1+2+3	10 × 15	3.9" × 5.9"	190	6'2.8"	0.24	× 1.53

Extension Tube Close-up Tables S3

Auto-Takumar 35mm f3.5 (Distance scale set at 0.45m)

Extension tube combination	Subject size		Film-to-subject distance		Magnification	Exposure factor
	cm	inches	cm	inches		
Not used	26 × 49	10.2" × 1'7.3"	45	1'5.7"	0.09	×1.2
1	6.6 × 10	2.6" × 4.0"	18	7.1"	0.36	×1.9
2	3.8 × 5.7	1.5" × 2.2"	15	6.0"	0.64	×2.7
3	2.6 × 4.0	1.0" × 1.6"	14.0	5.5"	0.91	×3.6
1+3	2 × 3	0.8" × 1.2"	14.1	5.6"	1.18	×4.7

Note: Since the barrel of the Auto-Takumar 35mm f2.3 lens is comparatively long, the lens-to-subject distance is extremely short with the No. 2 or No. 3 extension tube, and it is not practicable to use this lens with these extension tubes.

Auto-Takumar 55mm f1.8 (Distance scale set at 0.45m)

Extension tube combination	Subject size		Film-to-subject distance		Magnification	Exposure factor
	cm	inches	cm	inches		
Not used	13.9 × 20.8	5.5" × 8.2"	44	1'5.3"	0.17	×1.4
1	6.9 × 10.4	2.7" × 4.1"	29	11.4"	0.35	×1.8
2	4.6 × 6.9	1.8" × 2.7"	24	9.4"	0.52	×2.3
3	3.5 × 5.2	1.4" × 2.0"	22.8	9.0"	0.69	×2.9
1+3	2.8 × 4.2	1.1" × 1.7"	22.1	8.7"	0.86	×3.5
2+3	2.3 × 3.5	0.9" × 1.4"	22.0	8.7"	1.04	×4.1

Auto-Takumar 85mm f1.8 (Distance scale set at 0.85m)

Extension tube combination	Subject size		Film-to-subject distance		Magnification	Exposure factor
	cm	inches	cm	inches		
Not used	18.9 × 28.4	7.4" × 11.2"	85	2'9.5"	0.13	×1.3
1	10.1 × 15.1	4.0" × 6.0"	55	1'9.7"	0.24	×1.5
2	6.9 × 10.3	2.7" × 4.1"	44	1'5.3"	0.35	×1.8
3	5.2 × 7.8	2.0" × 3.1"	39	1'3.5"	0.46	×2.1
1+3	4.2 × 6.3	1.7" × 2.5"	37	1'2.6"	0.57	×2.5
2+3	3.5 × 5.3	1.4" × 2.1"	35.2	1'1.9"	0.67	×2.8
1+2+3	3.0 × 4.5	1.2" × 1.8"	34.4	1'1.5"	0.80	×3.2

Auto-Takumar and Takumar 105mm f2.8 (Distance scale set at 1.2m)

Extension tube combination	Subject size		Film-to-subject distance		Magnification	Exposure factor
	cm	inches	cm	inches		
Not used	22.4 × 33.6	8.8" × 1'1.2"	120	3'11.2"	0.11	×1.2
1	12.1 × 18.2	4.8" × 7.2"	76	2'6.0"	0.20	×1.4
2	8.3 × 12.5	3.3" × 4.9"	60	1'11.6"	0.29	×1.7
3	6.3 × 9.5	2.5" × 3.7"	53	1'8.9"	0.38	×1.9
1+3	5.1 × 7.7	2.0" × 3.0"	48	1'6.9"	0.47	×2.2
2+3	4.3 × 6.4	1.7" × 2.5"	46	1'6.1"	0.56	×2.4
1+2+3	3.7 × 5.5	1.5" × 2.2"	44	1'5.3"	0.65	×2.7

Takumar 135mm f3.5 (Distance scale set at 2m)

Extension tube combination	Subject size		Film-to-subject distance		Magnification	Exposure factor
	cm	inches	cm	inches		
Not used	30.6 × 45.9	1'0.0" × 1'6.1"	200	6'6.7"	0.08	×1.2
1	16.1 × 24.2	6.3" × 9.5"	120	3'11.2"	0.15	×1.3
2	11.0 × 16.5	4.3" × 6.5"	92	3'0.2"	0.22	×1.5
3	8.3 × 12.5	3.3" × 4.9"	78	2'6.7"	0.29	×1.7
1+3	6.7 × 10	2.6" × 4.0"	69	2'3.2"	0.36	×1.8
2+3	5.6 × 8.4	2.2" × 3.3"	64	2'1.2"	0.43	×2.0
1+2+3	4.8 × 7.2	1.9" × 2.8"	61	2'0.0"	0.50	×2.3

Takumar 200mm f3.5 (Distance scale set at 2.5m)

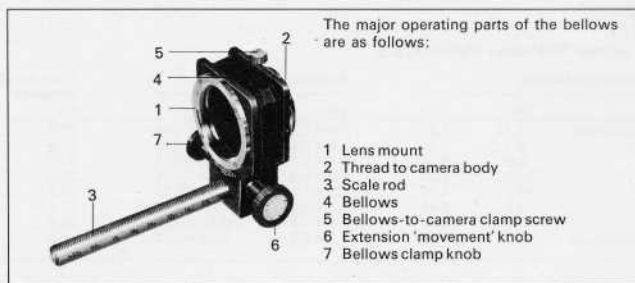
Extension tube combination	Subject size		Film-to-subject distance		Magnification	Exposure factor
	cm	inches	cm	inches		
Not used	25.0 × 37.5	9.8" × 1'2.8"	245	8'0.5"	0.096	×1.2
1	16.7 × 25.3	6.6" × 10.0"	182	5'11.7"	0.14	×1.3
2	12.6 × 18.9	5.0" × 7.4"	148	4'10.3"	0.19	×1.4
3	10.0 × 15.1	3.9" × 5.9"	129	4'2.8"	0.24	×1.5
1+3	8.4 × 12.6	3.3" × 5.0"	116	3'9.7"	0.29	×1.7
2+3	7.2 × 10.8	2.8" × 4.3"	107	3'6.1"	0.33	×1.8
1+2+3	6.3 × 9.5	2.5" × 3.7"	100	3'3.4"	0.38	×1.9

Takumar 300mm f4 (Distance scale set at 5.5m)

Extension tube combination	Subject size		Film-to-subject distance		Magnification	Exposure factor
	cm	inches	cm	inches		
Not used	39 × 59	1'3.4" × 1'11.2"	550	18'0.5"	0.06	×1.13
1	26 × 39	10.2" × 1'3.4"	380	12'5.6"	0.09	×1.19
2	19 × 29	7.5" × 11.4"	300	9'10.1"	0.12	×1.27
1+2	15 × 23	5.9" × 9.1"	260	8'6.4"	0.16	×1.34
1+3	13 × 19	5.1" × 7.5"	230	7'6.6"	0.19	×1.41
2+3	11 × 16	4.3" × 6.3"	200	6'6.7"	0.22	×1.49

Asahi Bellows Unit I

As can be seen from the preceding section dealing with Extension Tubes we now move up the scale to the Bellows Unit I. The most obvious advantage working with this accessory is the flexibility of the system which, inevitably, increases the speed of working. For instance, when working with the standard 55mm Super-Takumar lens a continuous magnification from 0.62 to 2.45x is possible. A precision calibrated magnification scale is engraved along one side of the central gear shaft, so providing instant data



relating to the 55mm lens. Similar information is provided on the reverse side for use with earlier 58mm Takumar lenses.

Reference to the Close-up Tables page CU 20, will provide all necessary data regarding increase in exposure (exposure factor) for users with other than Spotmatic models.

If a fully automatic Takumar lens is used adjust the pre-view lever to the 'manual' position in order that the diaphragm may be manually adjusted. In cases where a semi-

automatic lens is used the diaphragm activating pin on the rear side of the lens must be depressed before screwing the lens to the Bellows Unit.

Whilst the largest magnification obtainable with all three extension tubes employing a 55mm lens is approximately life size, one can obtain continuous magnification from 0.62 to 2.45 with the bellows unit with the same 55mm lens. This is the most convenient feature of the bellows unit.

Asahi Bellows Unit II (Discontinued)

The Asahi Bellows Unit II comprises principally, twin parallel rods upon which ride a flexible square Bellows having metal plate rear and front with necessary coupling pieces permitting instant camera and lens mounting respectively. There are two possible means of movement, the first in the form of positive rack and pinion drive controlled by the large milled knob on the left-hand side of the twin tracks and on the right-hand rear a clamping bar allowing rapid movement of the rear end of the Bellows.

An accurate engraved magnification scale is incorporated along the outside face of the dual slide copier rods. The right hand rod, i.e. the rod with the focusing rack is engraved with a calibration of actual exposure factors in addition to magnification from 0.1 up to 1.0 (life size) when employing focal length 100mm. The left scale rod contains engraved exposure factors and magnifications ranging from 1.0 (life size) up to 3.0 when employing focal length of 55mm.

Also contained on the left-hand side rod an engraved calibration marked in red running in the opposite direction for use when the slide copier unit is employed. The scale and exposure factors are for 1.0 up to 3.0x for use with the 55mm lens.

Operation of Bellows II

Remove the lens from the camera body. Loosen the clamp screw (2), screw the ring (1) to the camera lens mount, and tighten the screw (2) keeping the camera body horizontal. It may be easier to detach the camera body connector ring (1) by loosening the body clamp screw (2),

screw the ring to the camera lens mount before clamping it with the screw (2).

Screw the lens to the lens mount (3). Loosen the clamp lever (8) pull the rear board (4) attached to the camera body to the end of the scale rods, and fasten the lever (8).

Loosen the clamp knob (7) and move the bellows back and forth by rotating the extension 'Movement' knob (6).

On the right scale rod (9) is engraved a calibration of exposure factors and magnifications from 0.1 up to 1.0 (life size) for the focal length of 100mm. The other left scale rod (10) is calibrated for exposure factors and magnifications from 1.0 (life size) up to 3.0 for the focal length of 55mm. Note that on this left scale rod there is a red-coloured calibration marked in the opposite direction for exposure factors and magnifications from 1.0 up to 3.0 for use with the 55mm lens when the front board is extended to the farthest end of the scale rods, such as when using the slide copier unit.

Looking through the viewfinder of

Super-Takumar 35mm f/3.5

(Distance scale set at infinity)

Bellows length		Subject size		Film-to-subject distance		Magnification	Exposure factor	
cm	inch	cm	inch	cm	inch			
Minimum	3.73	1.47	5.5 × 3.7	2.16 × 1.45	22.9	9.0	0.66	× 2.74
	5.7	2.24	3.6 × 2.4	1.41 × 0.94	21.9	8.61	1.00	× 4.0
	8.0	3.14	2.6 × 1.7	1.02 × 0.67	22.6	8.88	1.40	× 5.8
	10.2	4.01	2.0 × 1.3	0.79 × 0.51	23.9	9.39	1.80	× 7.8
	12.5	4.91	1.6 × 1.1	0.63 × 0.43	25.7	10.10	2.20	× 10.2
	14.8	5.82	1.4 × 0.9	0.55 × 0.35	27.5	10.80	2.6	× 13.0
	17.4	6.84	1.2 × 0.8	0.47 × 0.31	29.5	11.59	3.0	× 16.0
Maximum	18.03	7.09	1.1 × 0.8	0.43 × 0.31	30.4	11.94	3.2	× 17.42

Super-Takumar 55mm f/1.8

(Distance scale set at infinity)

Bellows length		Subject size		Film-to-subject distance		Magnification	Exposure factor	
cm	inch	cm	inch	cm	inch			
Minimum	3.7	1.45	3.6 × 2.4	1.41 × 0.94	14.90	5.86	1.0	× 4.0
	4.9	1.93	2.6 × 1.7	1.02 × 0.67	15.30	6.01	1.4	× 5.8
	6.3	2.48	2.0 × 1.3	0.79 × 0.51	16.10	6.33	1.8	× 7.8
	7.7	3.03	1.6 × 1.1	0.63 × 0.43	17.20	6.76	2.2	× 10.3
	9.1	3.58	1.4 × 0.92	0.55 × 0.36	18.32	7.20	2.6	× 12.9
	10.5	4.13	1.2 × 0.8	0.47 × 0.31	19.50	7.66	3.0	× 16.0
	11.9	4.68	1.06 × 0.7	0.42 × 0.28	20.80	8.17	3.4	× 19.36
	13.3	5.23	0.95 × 0.63	0.37 × 0.25	22.10	8.69	3.8	× 23.0
	14.7	5.78	0.86 × 0.57	0.34 × 0.22	23.40	9.20	4.2	× 27.0
	16.1	6.33	0.78 × 0.52	0.31 × 0.20	24.80	9.75	4.6	× 31.4
Maximum	18.03	7.09	0.70 × 0.47	0.28 × 0.18	26.60	10.45	5.2	× 37.76

Super-Takumar 85mm f/1.9

(Distance scale set at infinity)

Bellows length		Subject size		Film-to-subject distance		Magnification	Exposure factor	
cm	inch	cm	inch	cm	inch			
Minimum	3.73	1.47	8.2 × 5.5	3.22 × 2.16	39.6	15.56	0.44	× 2.07
	6.8	2.67	4.5 × 3.0	1.77 × 1.18	33.9	13.32	0.80	× 3.20
	10.2	4.01	3.0 × 2.0	1.18 × 0.79	33.8	13.28	1.20	× 4.80
	18.6	7.31	2.3 × 1.5	0.90 × 0.59	35.4	13.91	1.60	× 6.80
Maximum	18.03	7.09	1.7 × 1.1	0.67 × 0.43	38.5	15.13	2.10	× 9.76

Super-Takumar 105mm f/2.8

(Distance scale set at infinity)

Bellows length		Subject size		Film-to-subject distance		Magnification	Exposure factor	
cm	inch	cm	inch	cm	inch			
Minimum	3.73	1.47	10.1 × 6.8	3.97 × 2.67	55.3	21.73	0.36	× 1.97
	8.40	3.30	4.5 × 3.0	1.77 × 1.18	43.6	17.13	0.8	× 3.20
	12.60	4.95	3.0 × 2.0	1.18 × 0.79	43.37	17.04	1.2	× 4.80
	16.80	6.60	2.3 × 1.5	0.90 × 0.59	45.40	17.84	1.6	× 6.80
Maximum	18.03	7.09	2.09 × 1.3	0.82 × 0.51	46.20	18.16	1.7	× 7.38

Takumar 100mm f/4

(Distance scale set at infinity)

Bellows length		Subject size		Film-to-subject distance		Magnification	Exposure factor	
cm	inch	cm	inch	cm	inch			
	3.80	1.49			∞	∞	∞	× 1.0
	7.8	3.07	9.0 × 6.0	3.54 × 2.36	49.1	19.30	0.4	× 1.96
	11.8	4.64	4.5 × 3.0	1.77 × 1.18	40.6	15.96	0.8	× 3.2
	15.8	6.21	3.0 × 2.0	1.18 × 0.79	40.4	15.88	1.2	× 4.8
Maximum	18.03	7.09	2.51 × 1.68	0.99 × 0.66	41.4	16.27	1.43	× 5.87

Super-Takumar 135mm f/3.5

(Distance scale set at infinity)

Bellows length		Subject size		Film-to-subject distance		Magnification	Exposure factor	
cm	inch	cm	inch	cm	inch			
Minimum	3.73	1.47	13.63 × 8.68	5.36 × 3.41	80.7	31.72	0.28	× 1.63
	5.40	2.12	9.0 × 6.0	3.54 × 2.36	67.3	26.45	0.4	× 1.96
	10.80	4.24	4.5 × 3.0	1.77 × 1.18	55.8	21.93	0.8	× 3.20
	16.20	6.37	3.0 × 2.0	1.18 × 0.79	55.6	21.85	1.2	× 4.80
Maximum	18.03	7.09	2.7 × 1.79	1.06 × 0.70	56.25	22.11	1.34	× 5.46

the camera extend the bellows by turning the 'movement' knob and when the subject is in sharp focus or when it has reached the desired magnification, stop the bellows movement, and tighten the clamp knob (7).

To be perfectly sure that the subject is in sharp focus, turn the distance scale ring of the lens.

Look at either one of the scale rods (9, 10) depending upon the focal length of the lens used, and obtain the exposure factor and magnifica-

tion figures. The left scale rod is for the focal length of 100mm. For the focal lengths other than 55mm and 100mm refer to the tables of data appearing elsewhere in this manual. Remember that the depth of field is extremely shallow in close-up and macrophotography. Close down the diaphragm to obtain sufficient depth of field and use a rigid tripod to avoid camera movement.

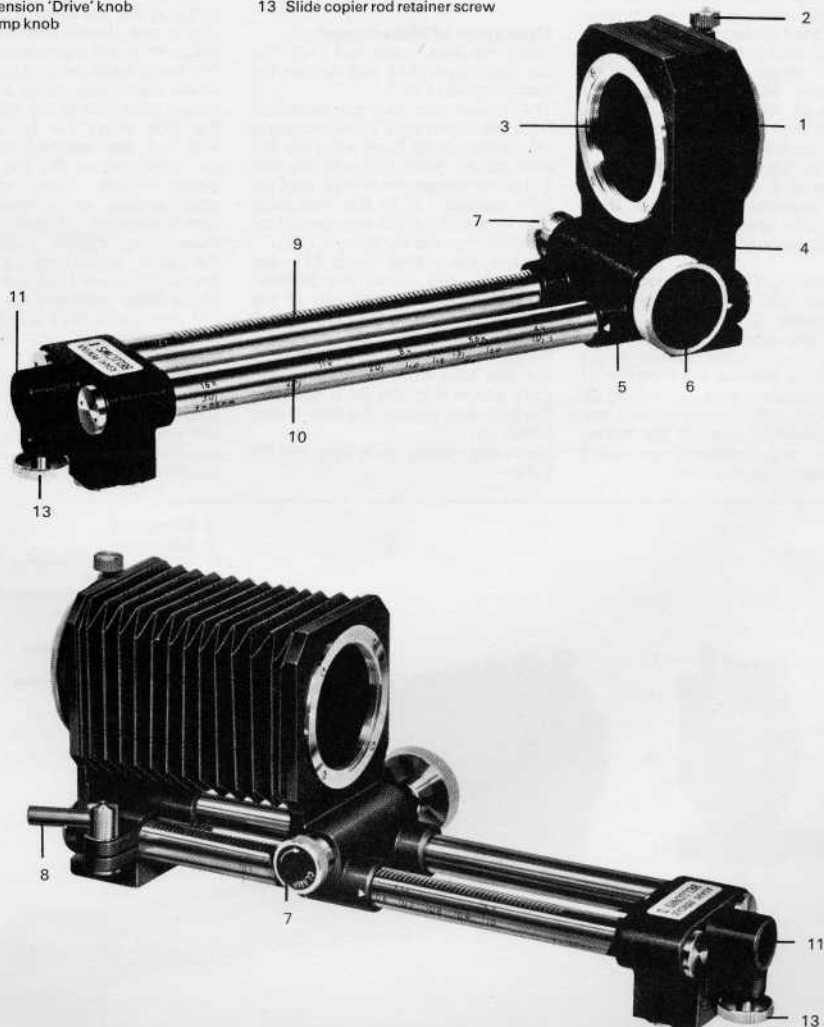
When using an exposure meter, point your meter as close to the subject as possible to avoid un-

wanted light reaching the meter cell. Multiply the meter reading by the exposure factor. (If the meter gives a reading of f5.6 at 1/125 sec. the actual exposure should be f5.6 at 1/60 sec. if the given exposure factor is 2).

The automatic diaphragm of the Auto- or Super-Takumar lenses does not operate automatically with this bellows unit. Compose and focus with the diaphragm fully open and manually close it down before releasing shutter.

- 1 Camera body connector ring
- 2 Camera body clamp screw
- 3 Lens mount
- 4 Rear board
- 5 Front board
- 6 Extension 'Drive' knob
- 7 Clamp knob

- 8 Clamp lever
- 9 Right scale rod (with racks)
- 10 Left scale rod
- 11 Slide copier rod receptacle
- 12 Slide copier rod
- 13 Slide copier rod retainer screw



Slide copier (Discontinued)

The Slide Copier is a most intriguing and ingenious small accessory designed specifically for use with Bellows Unit II, and as can be seen from the illustration fits into the central sleeve provided on the front outer end of the Bellows assembly and is locked into position. With the use of this accessory it is possible not only to obtain a straightforward 1:1 copy, but by use of increased magnification and the ability to raise or lower the original transparency to any desired position actual specific parts or areas only may thus be copied. The transparency is simply placed into the gate provided, with the emulsion side of the film facing out.

It goes without saying that film strip or single unmounted frames may also be copied in similar manner in which case the film is inserted into the area immediately behind the diffuser cover which pulls down to provide access for this purpose and in contact with the square aperture of the Copier Unit. As with the mounted transparency, the film emulsion must be facing out.

A second short bellows is provided, one end of which is attached permanently to the Slide Copier device, the opposite end having a locking clamp ring which is in practice placed over the front rim of the camera lens, thus preventing all extraneous light from reaching the non-illuminated side of the transparency, and providing increased and better contrast.

It is inadvisable when employing this technique for duplicating colour slides to point the lens directly at the light source, otherwise incorrect exposure meter readings may result. A sound technique is to reflect the light source on a white smooth surface positioned at 45° or to use a suitably diffused light source. In any case it is always advisable to make three exposures for each individual original to be copied, one at the estimated 'correct' reading, a second at a full stop under, and finally the third a full stop over.

It should be hardly necessary to add that not only colour duplicates may be made with this accessory, but also monochrome copies of monochrome or colour originals.

Operation of slide copier

Insert the slide copier rod (12) into the receptacle (11) and tighten the clamp screw (16).

The copier rod can be detached from the copier unit. When inserting it into the copier base, keep the flat side down, place the side marked 1.0 to the diffuser cover side, and the side marked 1.5 to the lens side. The lens side of the rod should be inserted into the receptacle (11). Loosen the clamp knob (7) and lever (8) and move the bellows portion to the forward end of the scale rods. Tighten the clamp knob (7).

Release the spring arms (19), pull out the lens front receptacle ring (14) attach it to the front frame of the lens, and tighten the lens clamp screw (20).

Insert the colour slide into the slit (15).

Look at the red calibration on the left scale rod. Move back the camera and stop at the desired magnification. Tighten the clamp lever (8).

For composing and focusing the colour slide, loosen the slide copier clamp screw (16) and move the copier back and forth.

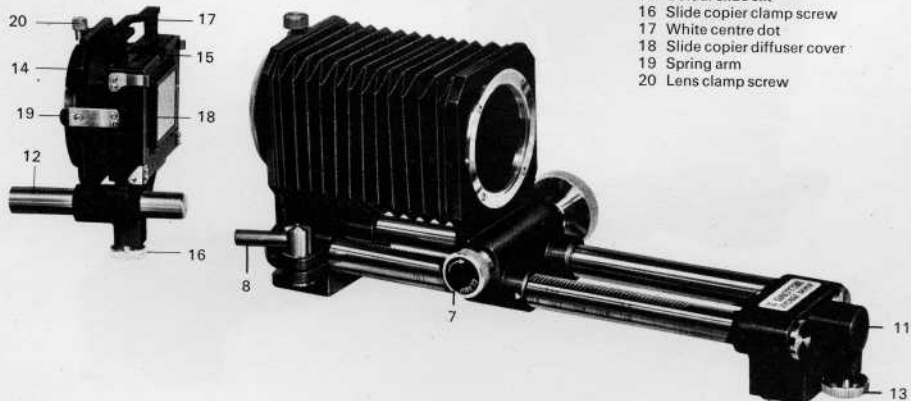
The slide copier can be moved up and down along the central frame for proper trimming of the colour slides. To keep the copier unit coaxial with the taking lens, bring the top of the unit up or down to the white centre dot (17).

The two red scales (1.0 and 1.5) on the slide copier retainer rod (12) are an approximate guide of magnification when duplicating colour slides.

When the rear board (4) is extended as far as the red scale 1.5, this slide copier rod should also be stopped down at its red calibration 1.5.

The basic focal point of object upon which these two scales of magnification are made is the plane where the film strips are to be placed and not the position of the colour slide plane, for the width of colour slides differs from one manufacturer to another without standardisation. Therefore, when duplicating colour slides retain the slide copier rod (12) with the clamp screw (16) with a gap of about 3mm between the 1.5 scale rod receptacle (11) and the scales of magnification will apply with little deviation.

To duplicate unmounted film strips pull down the diffuser cover (18) place the film strip on the square aperture of the copier unit with the emulsion side *out* and push back the diffuser cover (18).

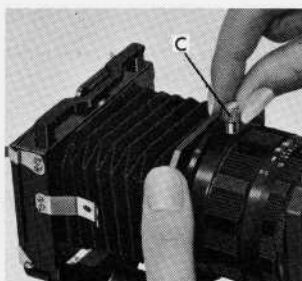




Slide copier/assembly

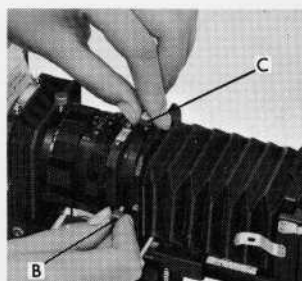
1 Remove the stop screw (11) and fix the slide copier attaching screw (28) into the thread for the stop screw.

2 Move the lens side of the Auto-Bellows to the copier-side end of the gear rail. Open



the bellows retainer plates (27) on both sides of the copier. Pull out the bellows and place the ring end over the front frame of the lens. Tighten the screw C.

3 If the lens is reversed, put the end ring of the copier bellows into the grooved ring of the front board (7) (rear side of the



front board). Tighten the screw B.

4 When using a 50mm lens lock the front end of the gear box underneath the front board (7) to the end of the gear rail of the Auto-Bellows. When using a 55mm lens, lock the front end of the gear box at the red dot (9).

Auto-Bellows and Slide Copier

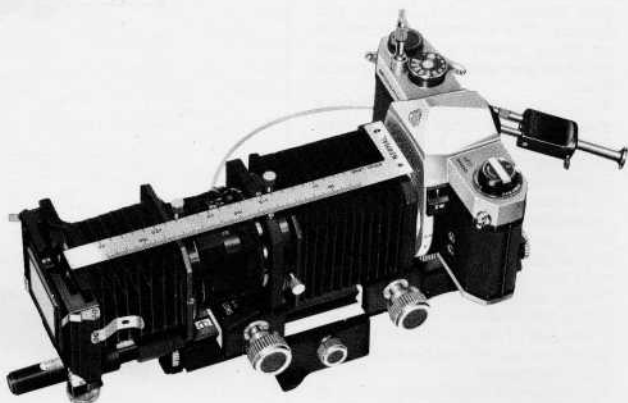
The Asahi Pentax Auto-Bellows is a highly flexible close-up and macro-photographic instrument. The bellows extension is longer than the extension of the standard Bellows Unit. The Auto-Bellows is also more versatile. With the double cable release supplied with the Auto-Bellows the shutter is released and the automatic diaphragm can be activated simultaneously when using a fully automatic diaphragm lens. The lens reverse system will help provide higher macro resolution.

The geared rail of the Auto-Bellows is meticulously engineered with a high degree of precision. The freely movable tripod block beneath the rail rod ensures the whole equipment is in complete balance when on the tripod. Micro-action extension knobs are equipped on either side for critical bellows extension. The Slide Copier attaches to the front end of the Auto-Bellows for easy duplication of colour films.

The Bellows-Takumar 100mm f.4 ranges from 1.32x magnification to infinity (∞). High magnification with a 28mm to 35mm lens is easily attained.

By adding the standard Bellows Unit or Extension Tubes to the front or back of the Auto-Bellows 10x to 20x magnification can be obtained.

The Asahi Pentax Auto-Bellows is a precisely designed piece of close-up and macro equipment for professional photographers, research workers, scientists and specialists in close-up and macro work.



Cameras	Asahi Pentax cameras
Lenses	Takumar lenses
Length of lens extension	At 'Normal' position: 39mm-170mm (with standard lenses) At 'Reverse' position: 62mm-175mm (with standard lenses)
Double cable release	Releases shutter and automatic diaphragm simultaneously
Lens reverse system	Reversible front lens board
Dimensions	Without Slide Copier: Width 87mm Height 135mm Length 207mm With Slide Copier: Width 87mm Height 135mm Length 276mm
Weight	Without Slide Copier 857g (30 ozs.) With Slide Copier 1,107g (38.8 ozs.)
Accessories	Double cable release / Scale for 50mm lens / Scale for 55mm lens / Slide Copier

Other cameras with the same Asahi Pentax lens-mount system can also be used.

- | | |
|---|---------------------------------|
| 1 Rear board | 16 Clamp screw B |
| 2 Clamp screw for camera body connecting ring | 17 Extension knobs |
| 3 Bellows | 18 Clamp knob |
| 4 Clamp knobs | 19 Tripod plate |
| 5 Tripod position drive knob | 20 Retainer plate |
| 6 Index for scales | 21 Slide slot |
| 7 Front board | 22 Film holder |
| 8 Cable release socket | 23 Copier rail |
| 9 Red dot | 24 Clamp knob |
| 10 Gear rail | 25 Clamp screw C |
| 11 Stop screw | 26 Bellows |
| 12 Clamp screw A | 27 Bellows retainer plate |
| 13 Lens mount | 28 Slide copier attaching screw |
| 14 Magnetic plates for scales | 29 Scales |
| 15 Camera body connector ring | 30 Double cable release |

The close-up tables appearing in this manual contain data on Magnification, Lens Extension, Picture Area, Film-to-subject distance and Exposure factors. If it is wished to magnify the subject on the film at a given magnification, or if the approximate size of the picture area is known these close-up tables show the length of the lens/bellows extension required, film-to-subject distance and exposure factor.

The calibration for actual magnification on the scales (29) is for use with standard lenses (50mm and 55mm). The millimetre calibration on these scales is for use with standard and other interchangeable lenses.

According to the size of the picture area, note the length of the lens extension required. Extend the bellows according to the millimetre calibration of the scale (29). (Match the index (6) with the millimetre calibration). Move the camera away from the subject according to the film-to-subject distance shown in the close-up tables.

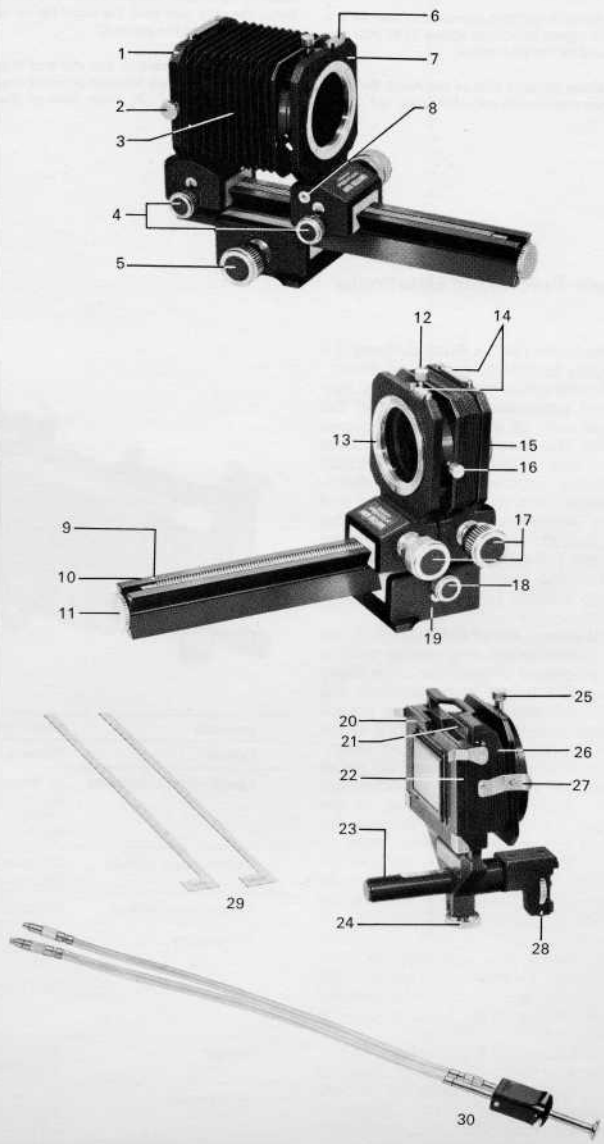
When using a wide-angle lens, fasten the lens side of the bellows to the end of the gear rail so that the end of the rail will not be accidentally photographed.

The minimum width of the bellows when fully folded, from the surface of the rear board (1) to the surface of the front board (7) is 39mm. (The width of the Extension Tube No. 3 is 28.5mm).

With a 55mm lens, close-up and macrophotography can be undertaken at any magnification between 0.7x and 3x as shown in one of the close-up tables.

Focus by turning the extension knobs (17) while observing the subject image through the camera viewfinder. After determining exposure and setting the correct shutter speed and f/stop depress the double cable release button. The diaphragm (when using an automatic diaphragm lens) closes down automatically to the predetermined aperture and the shutter is fired.

For T (Time) exposures, set the shutter speed at B. While depressing the cable release button, tighten the locking screw (31). Loosen the locking screw for closing the shutter.



Close-up Photography

Scales

Two scales are provided. The scale for the 50mm lens has a magnification calibration for the 50mm lens and a millimetre calibration for lens extension. The scale for the 55mm lens has a magnification calibration for the 55mm lens and a millimetre calibration for lens extension. Both sides of the scales are calibrated, the side engraved 'Normal' for use with the lens in normal position, and the other side engraved 'Reverse' for use with the lens in the reversed position. Ensure that the correct side is used.

The magnification calibration is for standard lenses (50mm and 55mm) only. The millimetre calibration for lens extension is for all lenses.

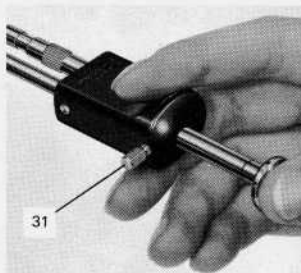
Double cable release

In macrophotography the camera lens is necessarily separated from the camera body due to the use of extension tubes or bellows. Therefore, when employing a lens with fully automatic diaphragm mechanism it is desirable, to say the least, that full use can still be made of the automatic features of the lens. The special-purpose Double Cable Release does just this. The release comprises two flexible cables lying parallel to each other secured at the one end by means of a small plastic block, from the centre of which emerges a release plunger.

In use, the threaded end of one cable is screwed directly into the cable release socket provided (8), and the second into the camera shutter release button. At the top end of one cable is a red identifying mark and a small control ring which can be adjusted to delay or advance the firing of the automatic lens diaphragm mechanism, which, obviously, must occur just prior to the firing of the camera shutter.

Reversing lenses

Due to the resolution characteristics of normal lenses much improved definition is obtained by using the lens in a reversed position when employed for microphotography. This only applies to microphotography and on no account should the lens be used in reversed position for magnifications less than 1:1.



The reverse system of the Auto-Bellows permits use of 49mm filters.

Lens reversal technique

Basic operation of the Auto-Bellows with a lens reversed is the same as for normal lens position.

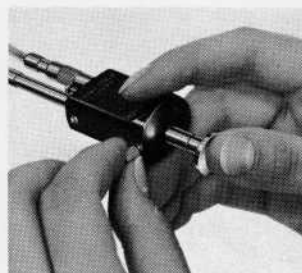
Higher magnification is easily obtained by using a short focal-length lens with the same lens/bellows extension as for longer focal length lenses.

The diaphragm of automatic diaphragm lenses will not work automatically when using extension tubes or additional bellows with the lens Reverse Adapter between the Auto-Bellows and the lens for a set-up for high magnification macro work.

Determination of exposure

When using the Spotmatic there are no exposure problems, but in the case of other models, such as SV/S1a/SL a special exposure technique is required.

Although there are a number of ways by which exposure may be determined when duplicating colour slides, or taking extreme close-ups, experience would suggest that the following method is probably the simplest and most reliable.



As shown in the illustration the correction lens adapter accessory is first fitted into position over the viewfinder of the camera. The clip-on meter is then placed immediately behind the adapter so preventing any extraneous light from penetrating between the meter window and the camera viewfinder. Observe then the following procedure.

Set the ASA dial of the meter at the corresponding ASA number of the film in use.

Set the meter switch to L (low). Close down the lens diaphragm to the predetermined f/stop.

Turn the shutter speed dial of the meter in order to match the f1 position of the meter scale with the needle. (In fact the meter has no f1 position but corresponds to the scale next to the f1.4 position).

Next, after determining the indicated shutter speed from the calibrated meter scale, set the camera shutter dial accordingly.

This will provide correct basic exposure. Furthermore, since the meter is measuring the light passing through the stopped-down diaphragm and the Pentaprism viewfinder, it is not necessary to have to calculate any exposure increase normally required due to the use of extended bellows.



Explanation of Close-up Tables

Lens extension

The greater the distance the lens is moved from the film plane the higher the magnification obtainable. The 'lens extension' indicates the distance from the surface of the lens thread. The Auto-Bellows permits lens extension from 39-170mm using standard lenses in a normal position.

Picture area

By 'picture area' is meant the whole area that can be recorded on the film. The viewfinder of the Asahi Pentax, in fact, shows 93% of the actual total picture area. The reason for this is to allow for the marginal loss of image which occurs when a colour transparency is mounted in the form of a slide or frameholder.

Exposure factor

The intensity of light is in inverse proportion to the square of the distance; therefore, if the distance is doubled, the intensity of light decrease is $2=4$ times.

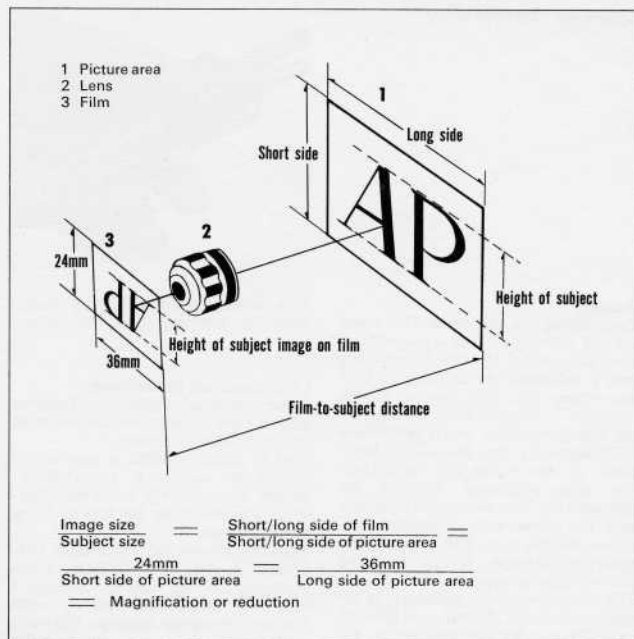
The further the lens is extended away from the film plane the smaller the amount of light reaching the film, and, therefore, exposure must

How to use close-up tables

Depending on the purpose of the close-up or macro work, first determine the picture area, film-to-subject distance or magnification from the close-up tables. Then extend the bellows accordingly.

When determining magnification first

To photograph a subject of pre-determined size on the film, first check the magnification. For instance, to photograph a 10mm subject 20mm size on the film with a 55mm lens, the magnification is 2. From the scale for 55mm lens one obtains the lens extension of 114mm. The close-



be increased. In normal photographic practice it is not always strictly necessary to observe this law, but in close-up and macro-photography it is most essential that a proper allowance be made. The exposure factor serves as a useful guide as to the actual extent of exposure increase necessary. When using the Asahi Pentax Spot-

matic, all such calculations and exposure increases are completely unnecessary, as the built-in meter reads the exact amount of light reaching the film — a very considerable aid, particularly in all fields of close-up, macro, and micro-photography.

up table for the 55mm lens also indicates that the picture area will be slightly smaller than 18.6mm x 12.4 mm.

Determining picture area first

To photograph a certain picture area measure the size of the area. Look at the 'picture area' column. For instance, if it is wished to photograph a 30mm x 20mm subject with a 55 mm lens one obtains approximate lens extension of 70mm and magnification of 1.2x from the close-up table for the 55mm lens.

Determining film-to-subject distance first

If one cannot bring the lens closer to the subject, determine the film-to-subject distance first. For the same magnification, this film-to-subject

distance differs from one focal length lens to another. Choose the correct lens according to the close-up tables. For close-up and macro work at a distance, use a longer focal-length lens.

The Bellows-Takumar 100mm lens is extremely versatile for this purpose.

Focusing

Keep the depth-of-field preview lever of the lens in automatic position for focusing. For close-up and macro work, focusing through the central micro-prism portion of the viewfinder can become rather difficult. Use the other 'ground glass portion for precise focusing. If there is difficulty in focusing, move the subject or the Auto-Bellows back and forth while observing the subject image through the view-

finder. (From the close-up tables, one can easily obtain the film-to-subject distance).

Depth of field

As the camera moves closer to a subject, the zone of sharpness decreases accordingly. In other words, the depth of field decreases considerably. This can be compensated for — up to a point — by stopping down the lens diaphragm. But at close distance, a very narrow zone of sharp focus must be accepted as inevitable. To obtain maximum depth of field, try to close down the diaphragm to the smallest aperture (largest f/stop number).

Subjects for close-up and macro-photography must be as nearly as possible on one plane if they are to be sharp, because the depth of field at short distances is very small.

Exposure determination

When using a separate hand-held exposure meter or a non-TTL (through-the-lens) exposure meter, point it at the subject and obtain exact combination of shutter speed and f/stop. Multiply the exposure by the exposure factor. For instance (in case of exposure factor 2) if the

meter indicates f16 at 1/30 sec. change f16 to f/11, or 1/30 sec. to 1/15 sec.

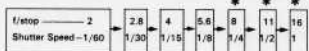
For increasing exposures according to exposure factors, change the shutter speed instead of lens aperture and keep the lens aperture closed down to get the maximum depth of field.

Exposure Factor	Adjustment
3	Adjust the shutter speed to the next lower figure, e.g. 1/125 sec. to 1/60 sec. and open up the diaphragm by a half f/stop.
4	Adjust the shutter speed to the next lower figure but one, e.g. 1/125 sec. to 1/30 sec.
6	Adjust the shutter speed (as above) and open up the diaphragm by a half f/stop.
8	Adjust the shutter speed to the next lower figure but two, e.g. 1/125 sec. to 1/15 sec.

When using a Spotmatic disregard exposure factors and determine exposures according to the

movement of the meter needle. With a Spotmatic, focus first with the diaphragm fully open for bright focusing. Turn on the meter switch. While looking through the viewfinder turn the shutter speed dial until one centres the needle, or one may slightly close down the diaphragm for exact centring of the meter needle. After centring the needle, turn off the meter switch. Then change the shutter speed to slower setting step by step while closing down the diaphragm f/stop by f/stop such as follows:

If the meter needle is centred at f2 and 1/60 sec.



In this case, the combination marked * will be proper exposures, but for macrophotography use the combination of f/16 and 1 sec.

For exposures longer than 1 sec. release the shutter at B with a cable release. Keep the cable release button depressed with the locking screw.

For long exposures, always use a cable release and a rigid tripod.

Illumination

When using the Slide Copier, always use diffused light. Do not point the lens directly against the light source. When using lamps as source of illumination, illuminate evenly a sheet of paper (non-colour reflecting paper) as illustrated. Point the lens against the white paper ensuring that the light from the lamps does not strike the ground glass of the copier.

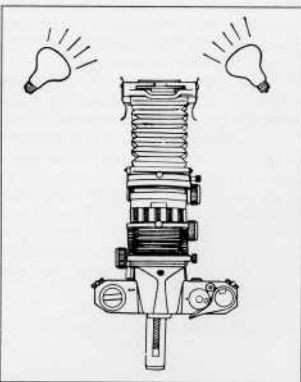
Diffused light entering the room through a window may be used, providing there is no direct sun-

so, a sheet of thin white paper, ground glass or opal, placed between the light source and the slide copier should prove satisfactory.

Copying on daylight-type colour films

When copying on daylight-type colour films, use daylight as the source of light, otherwise the result will show a red, blue, or green cast. If employing lamps as illumination, use blue daylight-colour corrected lamps.

When copying with outdoor daylight, avoid cloudy daylight, as the result will have a blue bias, and use of a 'cloud' filter will not correct this.



Without close-up tables

One can calculate approximate exposure factors as follows:

If a lens is extended until the distance from film to the front of the lens is twice the focal length, the magnification will be 1x (life size) and the exposure factor will be about 4x — strictly speaking, this depends upon the position of the lens diaphragm. In case of exposure factor 4, slow down the shutter speed by 2 stops (such as from 1/125 to 1/30).

If one extends a 55mm lens by 100mm, the film-to-lens distance is

about 3 times the focal length. From the law of the intensity of light, one gets an approximate exposure factor of 9. If the shutter speed dial indicates 1/30, slow it down to around 1/4. This calculation, which is very approximate, applies only when the lens distance is set at ∞.

Auto-Takumar Lenses (discontinued)

The diaphragm of the old Auto-Takumar lenses will also work automatically with the Auto-Bellows with the aid of the double cable release (pre-set the diaphragm) — set the diaphragm cocking lever — depress the double cable release plunger. (The diaphragm closes down

automatically and the shutter releases.)

When using an Auto-Takumar lens with a Spotmatic, do not set the diaphragm cocking lever before taking exposure reading. Leave the lever uncocked.

Pre-set diaphragm lenses

The cable (of the double cable release) for auto-diaphragm release does not work with pre-set lenses. Use a pre-set diaphragm lens as for ordinary picture taking.

Asahiflex-mount Takumar lens

If it is wished to use an old Asahiflex-mount Takumar lens (which has a different lens mount size) use an Asahi Mount Adapter.

Magnification in photomicrography

It is somewhat complicated to obtain the exact magnification ratio in photomicrography. However, it is safe to say that when using the eyepiece of the microscope the photographic magnification will be approximately 1/3 of the actual magnification of the microscope. Without using the eyepiece in photomicrography the photographed magnification will be much greater than the magnification of the microscope, and depending upon the microscope used, the magnification will sometimes be about 16x the magnification of the microscope when using a 10x objective lens. If using an extension tube set or a bellows

unit between the camera body and the microscope adapter, the photographic magnification can be further increased. To determine exact magnification, use should be made of an objective micrometer.

Exposure and focusing

The lenses of conventional microscopes are not intended for taking photographs, therefore it is extremely difficult to obtain high definition in microphotography, and it is progressively more difficult as the magnification of the microscope increases. Some manufacturers provide special eyepieces for photomicrography, and these should be used in order to obtain the best possible definition.

When the illumination is insufficient or when the object has a poor light penetrability, or reflection, focusing can be difficult. Hence it is necessary to use lighting equipment with a transformer in order to maintain illumination at a sufficient brightness level to facilitate accurate focusing. The degree of illumination should also permit the use of a shutter speed of not less than 1/60 sec. with a film rated ASA 100 (DIN 21/10).

Exposure should be determined by trial and error. It is advisable to make three exposures, one at the estimated rating, a second somewhat longer, and the third shorter. Needless to say, a careful record should be kept for reference purposes.

Microscope adapter

In use the main adapter tube is screwed into the camera body after first removing the camera lens. The microscope eyepiece is then removed and the fastener tube and coupling ring fitted over the extension tube of the microscope.

Next re-insert the microscope eyepiece or fit the light baffle tube according to working requirements. The coupling ring should be loosened and attachment made by engaging the bayonet into the coupling ring. Adjust the camera body and adapter to the desired working direction and tighten with the fastening knob. Raise the extension tube of the microscope to the required height.

As with other copying techniques use should be made of a flexible cable release or the delayed action camera mechanism in order to prevent camera movement.

The microscope adapter can be used with any microscope which has a tube of 25mm diameter. This adapter unit consists of the following parts.

- 1 Main Adapter Tube.** One end is threaded for screwing to the lens mount of the camera body, and the other end is a bayonet ring flange (male).
- 2 Bayonet** of the main adapter tube.

- 3 Coupling Ring.** One side is threaded to accept the thread of the fastener tube and the other side there is a female bayonet ring which is locked with the bayonet (2).

- 4 Fastener Tube** is slipped on and around the extension tube of the microscope and gently clamped-tightened by means of the fastening locking knob (5).

- 5 Fastening Knob.**

- 6 Light-seal Tube** prevents any light reflection occurring inside the extension tube of the microscope when the microscope eyepiece is not used.



How to Mount

1 Loosen the knob and pull out the light-seal tube.

2 Disengage the fastener tube.

3 Unscrew the lens from the camera.

4 Screw the main adapter tube to the lens mount of the camera.

5 Remove the eyepiece of the microscope.

6 Slide the fastener tube over the coupling ring to the extension tube of the microscope.

7 Insert the eyepiece or light-seal tube into the fastener tube.

8 Loosen the coupling ring and then engage the bayonet to the coupling ring.

9 Turn the camera body and the adapter set to the desired direction. Tighten the fastening knob.

10 Use of a cable release is invaluable to help prevent camera movement.



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Close-up Tables

As high speed lenses, such as f1/4, in normal position are not suitable for macrophotography, no close-up table for the 50mm f/1.4 lens in normal position is provided in this manual. The Macro-Takumar and Bellows-Takumar lenses are especially designed for close-up and macrophotography, and can be used in normal position for optimum results. Other lenses, however, should be used in reversed position for macrophotography (over 1x magnification).

Some of the close-up tables of this manual contain extra data for beyond the maximum lens extension permissible with Auto-Bellows. This extra data is for application when using additional bellows or extension tubes.

Normal lens position

Distance Scale set at ∞ **Super-Takumar 35mm f/3.5**

Magnification	Lens extension	Picture area	Film-to-subject distance	Exposure factor
	mm			
1.11	39	32.3 × 21.5	14.9	× 3.4
1.14	40	31.5 × 21.0	15.0	× 3.5
1.43	50	25.2 × 16.8	15.3	× 4.4
1.71	60	21.0 × 14.0	15.9	× 5.3
2.00	70	18.0 × 12.0	16.6	× 6.4
2.29	80	15.8 × 10.5	17.4	× 7.5
2.57	90	14.0 × 9.3	18.2	× 8.7
2.86	100	12.6 × 8.4	19.1	× 10.1
3.14	110	11.5 × 7.6	20.0	× 11.5
3.43	120	10.5 × 7.0	20.9	× 13.0
3.71	130	9.7 × 6.4	21.8	× 14.6

Super-Takumar 55mm f/1.8 and f/2

Magnification	Lens extension	Picture area	Film-to-subject distance	Exposure factor
	mm			
0.69	39	52.4 × 35.0	23.1	× 2.8
0.70	40	51.1 × 34.1	23.0	× 2.8
0.88	50	40.9 × 27.3	22.4	× 3.4
1.06	60	34.1 × 22.7	22.3	× 4.1
1.23	70	29.2 × 19.5	22.6	× 4.8
1.41	80	25.6 × 17.0	23.0	× 5.6
1.58	90	22.7 × 15.1	23.6	× 6.4
1.76	100	20.4 × 13.6	24.2	× 7.3
1.94	110	18.6 × 12.4	24.9	× 8.3
2.11	120	17.0 × 11.4	25.7	× 9.3
2.29	130	15.7 × 10.5	26.4	× 10.4

Super-Takumar 85mm f/1.9

Magnification	Lens extension	Picture area	Film-to-subject distance	Exposure factor
	mm			
0.46	39	78.3 × 52.2	38.9	× 2.6
0.47	40	76.4 × 50.9	38.5	× 2.6
0.59	50	61.1 × 40.7	35.9	× 3.1
0.71	60	50.9 × 33.9	34.5	× 3.7
0.82	70	43.6 × 29.1	33.8	× 4.3
0.94	80	38.2 × 25.5	33.5	× 5.0
1.06	90	33.9 × 22.6	33.5	× 5.7
1.18	100	30.6 × 20.4	33.7	× 6.4
1.30	110	27.8 × 18.5	34.1	× 7.2
1.41	120	25.5 × 17.0	34.5	× 8.1
1.53	130	23.5 × 15.7	35.1	× 9.0

Super-Takumar 105mm f/2.8

Magnification	Lens extension	Picture area	Film-to-subject distance	Exposure factor
	mm			
0.37	39	96.9 × 64.6	54.2	× 2.4
0.38	40	94.5 × 63.0	53.6	× 2.5
0.48	50	75.6 × 50.4	49.1	× 2.9
0.57	60	63.0 × 42.0	46.4	× 3.4
0.67	70	54.0 × 36.0	44.8	× 4.0
0.76	80	47.3 × 31.5	43.8	× 4.5
0.86	90	42.0 × 28.0	43.3	× 5.2
0.95	100	37.8 × 25.2	43.1	× 5.8
1.05	110	34.4 × 22.9	43.1	× 6.5
1.14	120	31.5 × 21.0	43.2	× 7.3
1.24	130	29.1 × 19.4	43.5	× 8.0

Super-Takumar 135mm f/3.5	Magnification	Lens extension	Picture area	Film-to-subject distance	Exposure factor
		mm	mm	cm	
0.28	39		124.6 × 83.1	78.8	× 2.2
0.30	40		121.5 × 81.0	77.7	× 2.2
0.37	50		97.2 × 64.8	69.6	× 2.6
0.44	60		81.0 × 54.0	64.5	× 3.0
0.52	70		69.4 × 46.3	61.2	× 3.4
0.59	80		60.8 × 40.5	58.9	× 3.9
0.67	90		54.0 × 36.0	57.4	× 4.4
0.74	100		48.6 × 32.4	56.4	× 4.9
0.81	110		44.2 × 29.5	55.7	× 5.5
0.89	120		40.5 × 27.0	55.3	× 6.0
0.96	130		37.4 × 24.9	55.2	× 6.6
1.04	140		34.7 × 23.1	55.2	× 7.3
1.11	150		32.4 × 21.6	55.3	× 8.0
1.19	160		30.4 × 20.3	55.5	× 8.6
1.26	170		28.6 × 19.1	55.9	× 9.4
1.33	180		27.0 × 18.0	56.3	× 10.1
1.41	190		25.6 × 17.1	56.7	× 10.9
1.48	200		24.3 × 16.2	57.2	× 11.7

Super-Takumar 150mm f/4	Magnification	Lens extension	Picture area	Film-to-subject distance	Exposure factor
		mm	mm	cm	
0.26	39		138.5 × 92.3	96.9	× 2.4
0.27	40		135.0 × 90.0	95.6	× 2.4
0.33	50		108.0 × 72.0	85.3	× 2.9
0.40	60		90.0 × 60.0	78.8	× 3.4
0.47	70		77.1 × 51.4	74.5	× 3.9
0.53	80		67.5 × 45.0	71.4	× 4.5
0.60	90		60.0 × 40.0	69.3	× 5.1
0.67	100		54.0 × 36.0	67.8	× 5.7
0.73	110		49.1 × 32.7	66.8	× 6.4
0.80	120		45.0 × 30.0	66.1	× 7.1
0.87	130		41.5 × 27.7	65.6	× 7.9
0.93	140		38.6 × 25.7	65.4	× 8.7
1.00	150		36.0 × 24.0	65.3	× 9.5
1.07	160		33.8 × 22.5	65.4	× 10.4
1.13	170		31.8 × 21.2	65.5	× 11.3
1.20	180		30.0 × 20.0	65.8	× 12.2
1.27	190		28.4 × 18.9	66.2	× 13.2
1.33	200		27.0 × 18.0	66.6	× 14.2

Super-Takumar 200mm f/4	Magnification	Lens extension	Picture area	Film-to-subject distance	Exposure factor
		mm	mm	cm	
0.19	39		184.6 × 123.1	153.5	× 2.1
0.20	40		180.0 × 120.0	151.1	× 2.1
0.25	50		144.0 × 96.0	132.1	× 2.4
0.30	60		120.0 × 80.0	119.7	× 2.8
0.35	70		102.9 × 68.6	111.2	× 3.2
0.40	80		90.0 × 60.0	105.1	× 3.6
0.45	90		80.0 × 53.3	100.5	× 4.0
0.50	100		72.0 × 48.0	97.1	× 4.5
0.55	110		65.5 × 43.6	94.4	× 5.0
0.60	120		60.0 × 40.0	92.4	× 5.5
0.65	130		55.4 × 36.9	90.9	× 6.0
0.70	140		51.4 × 34.3	89.7	× 6.6
0.75	150		48.0 × 32.0	88.7	× 7.2
0.80	160		45.0 × 30.0	88.1	× 7.8
0.85	170		42.4 × 28.2	87.6	× 8.4
0.90	180		40.0 × 26.7	87.3	× 9.1
0.95	190		37.9 × 25.3	87.1	× 9.7
1.00	200		36.0 × 24.0	87.1	× 10.5

Tele-Takumar 200mm f/5.6	Magnification	Lens extension	Picture area	Film-to-subject distance	Exposure factor
		mm	mm	cm	
0.19	39		184.7 × 123.1	153.9	× 1.7
0.20	40		180.1 × 120.1	151.4	× 1.8
0.25	50		144.1 × 96.0	132.4	× 2.0
0.30	60		120.1 × 80.0	120.0	× 2.2
0.35	70		102.9 × 68.6	111.5	× 2.5
0.40	80		90.4 × 60.0	105.3	× 2.8
0.45	90		80.0 × 53.4	100.8	× 3.0
0.50	100		72.0 × 48.0	97.3	× 3.3
0.55	110		65.5 × 43.7	94.7	× 3.7
0.60	120		60.0 × 40.0	92.7	× 4.0
0.65	130		55.4 × 36.9	91.1	× 4.3
0.70	140		51.5 × 34.3	89.9	× 4.7
0.75	150		48.0 × 32.0	89.0	× 5.0
0.80	160		45.0 × 30.0	88.3	× 5.4
0.85	170		42.4 × 28.2	87.9	× 6.0
0.90	180		40.0 × 26.7	87.5	× 6.2
0.95	190		37.9 × 25.3	87.4	× 6.6
1.00	200		36.0 × 24.0	87.3	× 7.1

Super-Takumar 300mm f/4

Magnification	Lens extension	Picture area	Film-to-subject distance	Exposure factor
	mm			
0.13	39	276.9 × 184.6	306.9	×1.5
0.13	40	270.0 × 180.0	301.3	×1.5
0.17	50	216.0 × 144.0	257.3	×1.6
0.20	60	180.0 × 120.0	228.3	×1.8
0.23	70	154.3 × 102.9	207.8	×1.9
0.27	80	135.0 × 90.0	192.8	×2.0
0.30	90	120.0 × 80.0	181.3	×2.2
0.33	100	108.0 × 72.0	172.3	×2.4
0.37	110	98.2 × 65.5	165.1	×2.5
0.40	120	90.0 × 60.0	159.3	×2.7
0.43	130	83.1 × 55.4	154.5	×2.9
0.47	140	77.1 × 51.4	150.6	×3.1
0.50	150	72.0 × 48.0	147.3	×3.3
0.53	160	67.5 × 45.0	144.5	×3.5
0.57	170	63.5 × 42.4	142.2	×3.7
0.60	180	60.0 × 40.0	140.3	×3.9
0.63	190	56.8 × 37.9	138.6	×4.1
0.67	200	54.0 × 36.0	137.3	×4.3

Tele-Takumar 300mm f/6.3

Magnification	Lens extension	Picture area	Film-to-subject distance	Exposure factor
	mm			
0.13	39	277.1 × 184.8	309.3	×1.5
0.13	40	270.2 × 180.1	303.6	×1.5
0.17	50	216.2 × 144.1	259.5	×1.7
0.20	60	180.1 × 120.1	230.5	×1.9
0.23	70	154.4 × 102.9	210.0	×2.0
0.27	80	135.1 × 90.1	194.9	×2.2
0.30	90	120.1 × 80.1	183.4	×2.4
0.33	100	108.1 × 72.1	174.4	×2.6
0.37	110	98.3 × 65.5	167.2	×2.8
0.40	120	90.1 × 60.0	161.4	×3.0
0.43	130	83.1 × 55.4	156.6	×3.2
0.47	140	77.2 × 51.5	152.6	×3.4
0.50	150	72.1 × 48.0	149.4	×3.6
0.53	160	67.6 × 45.0	146.6	×3.9
0.57	170	63.6 × 42.4	144.3	×4.1
0.60	180	60.0 × 40.0	142.3	×4.4
0.63	190	56.9 × 37.9	140.7	×4.6
0.67	200	54.0 × 36.0	139.3	×4.9

Macro-Takumar 50mm f/4

Magnification	Lens extension	Picture Area	Film-to-subject distance	Exposure factor
	mm			
1.76	39	20.5 × 13.7	22.4	× 8.5
1.78	40	20.3 × 13.5	22.5	× 8.6
1.97	50	18.3 × 12.2	23.2	× 9.9
2.16	60	16.6 × 11.1	24.0	× 11.2
2.36	70	15.3 × 10.2	24.8	× 12.7
2.55	80	14.1 × 9.4	25.6	× 14.2
2.74	90	13.1 × 8.7	26.5	× 15.9
2.94	100	12.3 × 8.2	27.3	× 17.6
3.13	110	11.5 × 7.7	28.2	× 19.4
3.33	120	10.8 × 7.2	29.1	× 21.3
3.52	130	10.2 × 6.8	30.1	× 23.3
3.71	140	9.7 × 6.5	31.0	× 25.4
3.91	150	9.2 × 6.1	31.9	× 27.6
4.10	160	8.8 × 5.9	32.8	× 29.8
4.29	170	8.4 × 5.6	33.8	× 32.2
4.49	180	8.0 × 5.3	34.7	× 34.6
4.68	190	7.7 × 5.1	35.7	× 37.1
4.88	200	7.4 × 4.9	36.6	× 39.8

Specially computed for close-up and macrophotography, this special lens focuses from life-size (1x magnification) to infinity. The data in the close-up tables for this lens is computed on the basis of its closest focusing distance.

Bellows-Takumar 100mm f/4

Magnification	Lens extension	Picture area	Film-to-subject distance	Exposure factor
	mm			
0.02	40	1797.1 × 1198.1	518.7	×1.0
0.12	50	299.5 × 199.7	104.4	×1.3
0.22	60	163.4 × 108.9	67.6	×1.6
0.32	70	112.3 × 74.9	54.5	×1.9
0.42	80	85.6 × 57.1	48.1	×2.2
0.52	90	69.1 × 46.1	44.5	×2.6
0.62	100	58.0 × 38.6	42.4	×2.9
0.72	110	49.9 × 33.3	41.2	×3.4
0.82	120	43.8 × 29.2	40.5	×3.8
0.92	130	39.1 × 26.0	40.2	×4.3
1.02	140	35.2 × 23.5	40.1	×4.8
1.12	150	32.1 × 21.4	40.2	×5.3
1.22	160	29.5 × 19.6	40.5	×5.8
1.32	170	27.2 × 18.2	40.9	×6.4
1.42	180	25.3 × 16.9	41.4	×7.0
1.52	190	23.6 × 15.8	41.9	×7.6
1.62	200	22.2 × 14.8	42.5	×8.3

Designed for close-up and macrophotography to be used with the standard Bellows Unit or the Auto-Bellows, the lens itself has no extension helicoid. When mounted on the bellows fully folded, this lens focuses at infinity.

Super-Takumar 28mm f/3.5 (reversed)

Magnification	Lens extension mm	Picture area mm	Film-to-subject distance cm	Exposure factor
2.61	65	13.8 × 9.2	16.7	× 54.8
2.78	70	12.9 × 8.6	17.1	× 61.4
3.13	80	11.5 × 7.7	18.0	× 75.6
3.48	90	10.3 × 6.9	18.9	× 91.3
3.84	100	9.4 × 6.3	19.8	× 108.5
4.19	110	8.6 × 5.7	20.8	× 127.2
4.54	120	7.9 × 5.3	21.7	× 147.4
4.89	130	7.4 × 4.9	22.7	× 169.0
5.24	140	6.9 × 4.6	23.6	× 192.2
5.59	150	6.4 × 4.3	24.6	× 216.8
5.94	160	6.1 × 4.0	25.6	× 242.9
6.29	170	5.7 × 3.8	26.5	× 270.5
6.64	180	5.4 × 3.6	27.5	× 299.6
6.99	190	5.1 × 3.4	28.5	× 330.1
7.34	200	4.9 × 3.3	29.5	× 362.2

Reversed lens position

The 'lens extension' for reversed lens position indicates the distance from the surface of the lens mount of the camera body to the grooved index for the scale on top of the front board.

Super-Takumar 35mm f/3.5 (reversed)

Magnification	Lens extension mm	Picture area mm	Film-to-subject distance cm	Exposure factor
1.99	57.5	18.6 × 12.1	16.6	× 13.1
1.06	60	17.5 × 11.7	16.8	× 13.8
1.34	70	15.4 × 10.2	17.6	× 16.7
2.63	80	13.7 × 9.1	18.4	× 20.0
2.91	90	12.4 × 8.2	19.3	× 23.5
3.20	100	11.2 × 7.5	20.2	× 27.3
3.49	110	10.3 × 6.9	21.1	× 31.3
3.77	120	9.5 × 6.4	22.0	× 35.7
4.06	130	8.9 × 5.9	23.0	× 40.3
4.34	140	8.3 × 5.5	23.9	× 45.3
4.63	150	7.8 × 5.2	24.8	× 50.5
4.91	160	7.3 × 4.9	25.8	× 56.0
5.20	170	6.9 × 4.6	26.8	× 61.8
5.49	180	6.6 × 4.4	27.7	× 67.8
5.77	190	6.2 × 4.2	28.7	× 74.2
6.06	200	5.9 × 4.0	29.7	× 80.8

Super-Takumar 50mm f/1.4 (reversed)

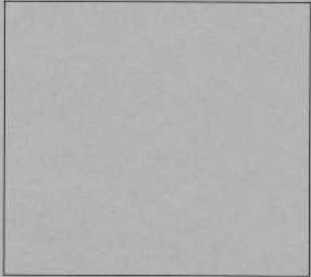
Magnification	Lens extension mm	Picture area mm	Film-to-subject distance cm	Exposure factor
1.15	62	31.2 × 20.8	19.7	× 6.3
1.31	70	27.5 × 18.3	20.0	× 7.3
1.51	80	23.9 × 15.9	20.5	× 8.9
1.70	90	21.1 × 14.1	21.1	× 10.5
1.90	100	19.0 × 12.6	21.8	× 12.3
2.10	110	17.2 × 11.4	22.5	× 14.2
2.29	120	15.7 × 10.5	23.3	× 16.2
2.49	130	14.5 × 9.6	24.1	× 18.3
2.69	140	13.4 × 8.9	25.0	× 20.6
2.88	150	12.5 × 8.3	25.8	× 23.0
3.08	160	11.7 × 7.8	26.7	× 25.6
3.26	170	11.0 × 7.3	27.6	× 28.3
3.47	180	10.4 × 6.9	28.6	× 31.1
3.67	190	9.8 × 6.5	29.5	× 34.1
3.87	200	9.3 × 6.2	30.4	× 37.1

Super-Takumar 55mm f/1.8 and f/2 (reversed)

Magnification	Lens extension mm	Picture area mm	Film-to-subject distance cm	Exposure factor
0.74	61	48.4 × 32.2	22.8	× 3.1
0.90	70	39.9 × 26.6	22.4	× 3.7
1.08	80	33.4 × 22.3	22.4	× 4.5
1.25	90	28.7 × 19.1	22.6	× 5.3
1.43	100	25.2 × 16.8	23.1	× 6.1
1.61	110	22.4 × 14.9	23.6	× 7.1
1.78	120	20.2 × 13.5	24.3	× 8.1
1.96	130	18.4 × 12.3	25.0	× 9.1
2.13	140	16.9 × 11.2	25.8	× 10.3
2.31	150	15.4 × 10.4	26.5	× 11.5
2.49	160	14.5 × 9.7	27.4	× 12.7
2.66	170	13.5 × 9.0	28.2	× 14.0
2.84	180	12.7 × 8.5	29.1	× 15.4
3.01	190	11.9 × 8.0	30.0	× 16.9
3.19	200	11.3 × 7.5	30.9	× 18.4

Super-Takumar 105mm f/2.8 (reversed)

Magnification	Lens extension mm	Picture area mm	Film-to-subject distance cm	Exposure factor
0.06	130	6279.1 × 4186.1	1853.5	× 1.0
0.10	140	356.5 × 237.7	127.1	× 1.1
0.17	150	183.5 × 122.3	77.6	× 1.2
0.29	160	123.5 × 82.3	61.1	× 1.4
0.39	170	94.0 × 62.1	53.2	× 1.6
0.48	180	74.7 × 49.8	48.9	× 1.8
0.58	190	62.4 × 41.6	46.3	× 2.0
0.67	200	53.5 × 36.7	44.7	× 2.1



Section 19
Depth of Field Tables

Depth of Field Tables

distance	f3.5	f4.0	f5.6	f6.0	f8.0	f11.0	f16.0	f22.0
Fish-eye Takumar 1:4.0 f = 17mm								
							unit = meter	
0.20		0.19 0.21	0.19 0.21		0.18 0.22	0.18 0.23	0.17 0.24	0.16 0.27
0.22		0.21 0.23	0.21 0.24		0.20 0.25	0.19 0.26	0.18 0.28	0.18 0.32
0.25		0.24 0.27	0.23 0.28		0.22 0.29	0.21 0.31	0.20 0.35	0.19 0.41
0.30		0.28 0.33	0.27 0.34		0.26 0.37	0.24 0.40	0.23 0.48	0.21 0.65
0.40		0.35 0.46	0.34 0.50		0.32 0.55	0.30 0.66	0.27 0.96	0.24 2.38
0.50		0.43 0.61	0.40 0.68		0.37 0.80	0.34 1.06	0.30 2.38	0.27 ∞
0.70		0.55 0.97	0.51 1.16		0.46 1.64	0.41 3.57	0.35 ∞	0.30 ∞
1.10		0.76 2.09	0.68 3.33		0.58 38.42	0.50 ∞	0.41 ∞	0.34 ∞
2.00		1.07 22.25	0.91 ∞		0.74 ∞	0.61 ∞	0.47 ∞	0.38 ∞
∞		2.13 ∞	1.53 ∞		1.07 ∞	0.79 ∞	0.55 ∞	0.40 ∞

Super-Takumar 1:3.5 f = 24mm								
							unit = meter	
0.25		0.2436 0.2567	0.2400 0.2610	0.2361 0.2661		0.2314 0.2729	0.2241 0.2853	0.2161 0.3022
0.30		0.2896 0.3112	0.2838 0.3185	0.2776 0.3274		0.2702 0.3393	0.2590 0.3618	0.2470 0.3940
0.35		0.3347 0.3669	0.3263 0.3781	0.3174 0.3919		0.3069 0.4109	0.2913 0.4478	0.2749 0.5037
0.45		0.4224 0.4820	0.4076 0.5039	0.3922 0.5318		0.3746 0.5719	0.3492 0.6565	0.3235 0.8035
0.60		0.5478 0.6644	0.5211 0.7110	0.4939 0.7739		0.4640 0.8716	0.4224 1.1111	0.3824 1.6851
0.80		0.7046 0.9280	0.6583 1.0285	0.6129 1.1759		0.5649 1.4377	0.5010 2.3193	0.4427 0.7024
1.30		1.0519 1.7123	0.9455 2.1235	0.8486 2.9419		0.7537 5.7677	0.6375 ∞	0.5406 ∞
3.00		1.9006 7.3373	1.5629 62.6462	1.3021 ∞		1.0804 ∞	0.8460 ∞	0.6757 ∞
∞		4.9583 ∞	3.1194 ∞	2.2000 ∞		1.6149 ∞	1.1273 ∞	0.8348 ∞

distance	f2.0	f2.8	f3.5	f4.0	f5.6	f8.0	f11.0	f16.0	f22.0
Super-Takumar 1:3.5 f = 28mm unit = meter									
0.40		0.38	0.38	0.38	0.37	0.36	0.34	0.32	
		0.42	0.42	0.43	0.44	0.46	0.50	0.55	
0.45		0.43	0.43	0.42	0.41	0.39	0.37	0.35	
		0.47	0.48	0.49	0.51	0.53	0.58	0.66	
0.50		0.47	0.47	0.46	0.44	0.43	0.40	0.37	
		0.53	0.53	0.55	0.57	0.61	0.68	0.79	
0.60		0.56	0.56	0.54	0.52	0.49	0.46	0.42	
		0.65	0.65	0.68	0.72	0.78	0.90	1.12	
0.80		0.73	0.72	0.69	0.65	0.61	0.55	0.50	
		0.89	0.90	0.96	1.04	1.18	1.53	2.38	
1.00		0.89	0.87	0.83	0.77	0.71	0.63	0.56	
		1.15	1.18	1.27	1.44	1.73	2.62	7.27	
1.20		1.03	1.02	0.96	0.88	0.80	0.70	0.61	
		1.43	1.47	1.62	1.92	2.49	5.03	∞	
1.50		1.25	1.22	1.13	1.03	0.92	0.79	0.67	
		1.89	1.97	2.25	2.88	4.46	62.58	∞	
2.00		1.56	1.52	1.38	1.23	1.07	0.89	0.75	
		2.79	2.96	3.67	5.79	21.36	∞	∞	
3.00		2.10	2.01	1.78	1.52	1.29	1.03	0.84	
		5.31	5.98	10.00	∞	∞	∞	∞	
7.50		3.57	3.32	2.72	2.15	1.70	1.27	0.98	
		∞	∞	∞	∞	∞	∞	∞	
∞		6.66	5.83	4.17	2.93	2.14	1.48	1.08	
		∞	∞	∞	∞	∞	∞	∞	

Super-Takumar 1:2.0 f = 35mm unit = meter									
0.40	0.3945	0.3924		0.3893	0.3852	0.3793	0.3722	0.3610	0.3486
	0.4055	0.4078		0.4113	0.4161	0.4235	0.4331	0.4505	0.4735
0.45	0.4427	0.4399		0.4357	0.4303	0.4225	0.4132	0.3987	0.3828
	0.4575	0.4605		0.4653	0.4717	0.4818	0.4952	0.5194	0.5523
0.55	0.5383	0.5338		0.5272	0.5187	0.5065	0.4921	0.4701	0.4465
	0.5622	0.5672		0.5750	0.5858	0.6028	0.6256	0.6683	0.7289
0.65	0.6329	0.6264		0.6168	0.6046	0.5872	0.5670	0.5366	0.5045
	0.6680	0.6756		0.6872	0.7035	0.7295	0.7652	0.8339	0.9362
0.80	0.7730	0.7628		0.7479	0.7291	0.7028	0.6726	0.6281	0.5825
	0.8290	0.8413		0.8604	0.8875	0.9317	0.9940	1.1202	1.3254
1.00	0.9565	0.9402		0.9168	0.8875	0.8471	0.8019	0.7370	0.6726
	1.0479	1.0684		1.1009	1.1476	1.2261	1.4317	1.5952	2.0726
1.40	1.3124	1.2804		1.2355	1.1805	1.1069	1.0275	0.9189	0.8168
	1.5007	1.5453		1.6177	1.7260	1.9199	2.2363	3.0969	5.8353
2.00	1.8203	1.7575		1.6711	1.5688	1.4375	1.3023	1.1276	0.9733
	2.2203	2.3231		2.4970	2.7751	3.3357	4.4745	10.5471	∞
3.00	2.6044	2.4744		2.3025	2.1081	1.8723	1.6442	1.3694	1.1436
	3.5410	3.8175		4.3256	5.2638	7.8247	∞	∞	∞
5.00	3.9433	3.6729		3.2998	2.9076	2.4698	2.0812	1.6528	1.3295
	6.7559	7.8654		10.4464	18.6332	∞	∞	∞	∞
10.00	6.5590	5.7683		4.8872	4.0632	3.2468	2.5992	1.9564	1.5142
	21.1755	38.4239		∞	∞	∞	∞	∞	∞
∞	18.7788	13.4296		9.4177	6.7431	4.7371	3.4606	2.3968	1.7585
	∞	∞		∞	∞	∞	∞	∞	∞

distance	f1.4	f2.0	f2.8	f3.5	f4.0	f5.6	f8.0	f11.0	f16.0	f22.0
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Super-Takumar 1:3.5 f = 35mm

unit = meter

0.45				0.44 0.47	0.43 0.47	0.43 0.48	0.42 0.49	0.41 0.50	0.39 0.53	0.37 0.57
0.50				0.48 0.52	0.48 0.52	0.47 0.53	0.46 0.55	0.45 0.57	0.43 0.61	0.41 0.66
0.60				0.57 0.63	0.57 0.63	0.56 0.65	0.54 0.67	0.52 0.71	0.49 0.77	0.46 0.87
0.70				0.66 0.74	0.66 0.75	0.64 0.77	0.62 0.81	0.59 0.86	0.56 0.96	0.52 1.12
0.80				0.75 0.86	0.74 0.87	0.72 0.90	0.69 0.95	0.66 1.02	0.61 1.17	0.57 1.42
1.00				0.92 1.10	0.91 1.11	0.88 1.16	0.83 1.25	0.79 1.39	0.72 1.69	0.65 2.31
1.20				1.08 1.35	1.07 1.37	1.02 1.45	0.96 1.60	0.90 1.83	0.81 2.41	0.72 3.95
1.50				1.32 1.74	1.30 1.78	1.23 1.93	1.14 2.20	1.05 2.67	0.93 4.19	0.81 13.61
2.00				1.68 2.46	1.65 2.55	1.54 2.87	1.40 3.53	1.26 4.98	1.09 16.06	0.93 ∞
3.00				2.33 4.22	2.26 4.48	2.06 5.59	1.82 8.94	1.59 36.06	1.31 ∞	1.09 ∞
5.00				3.37 9.81	3.22 11.37	2.82 23.35	2.38 ∞	1.99 ∞	1.57 ∞	1.25 ∞
10.00				5.04 ∞	4.71 ∞	3.89 ∞	3.09 ∞	2.46 ∞	1.84 ∞	1.42 ∞
∞				10.04 ∞	8.79 ∞	6.29 ∞	4.41 ∞	3.22 ∞	2.22 ∞	1.63 ∞

Super-Takumar 1:1.4 f = 50mm

unit = meter

0.45	0.45 0.45	0.45 0.45	0.44 0.46		0.44 0.46	0.44 0.46	0.44 0.47	0.43 0.47	0.42 0.48	0.41 0.50
0.50	0.50 0.50	0.50 0.51	0.49 0.51		0.49 0.51	0.49 0.51	0.48 0.52	0.47 0.53	0.46 0.54	0.45 0.56
0.55	0.55 0.55	0.54 0.56	0.54 0.56		0.54 0.56	0.53 0.57	0.53 0.58	0.52 0.59	0.50 0.61	0.49 0.63
0.60	0.59 0.61	0.59 0.61	0.59 0.61		0.59 0.62	0.58 0.62	0.57 0.63	0.56 0.65	0.54 0.67	0.53 0.70
0.70	0.69 0.71	0.69 0.71	0.69 0.72		0.68 0.72	0.67 0.73	0.66 0.75	0.65 0.77	0.62 0.80	0.60 0.85
0.80	0.79 0.81	0.79 0.81	0.78 0.82		0.77 0.83	0.76 0.84	0.75 0.86	0.73 0.89	0.70 0.94	0.67 1.00
0.90	0.89 0.91	0.88 0.92	0.87 0.93		0.86 0.94	0.85 0.96	0.83 0.98	0.81 1.02	0.77 1.08	0.73 1.18
1.00	0.98 1.02	0.98 1.02	0.97 1.03		0.95 1.05	0.94 1.07	0.91 1.11	0.88 1.15	0.84 1.24	0.79 1.36
1.20	1.18 1.23	1.17 1.24	1.15 1.25		1.13 1.28	1.11 1.31	1.07 1.36	1.03 1.43	0.97 1.57	0.91 1.78
1.50	1.46 1.54	1.45 1.56	1.43 1.58		1.40 1.62	1.36 1.68	1.30 1.77	1.24 1.89	1.15 2.16	1.06 2.58
2.00	1.93 2.07	1.90 2.11	1.87 2.16		1.81 2.23	1.75 2.34	1.66 2.52	1.56 2.80	1.42 3.42	1.28 4.69
3.00	2.84 3.18	2.78 3.26	2.70 3.37		2.59 3.57	2.46 3.86	2.28 4.40	2.09 5.34	1.84 8.31	1.61 5.36
5.00	4.57 5.52	4.41 5.78	4.21 6.16		3.94 6.84	3.64 8.03	3.26 10.87	2.88 19.53	2.42 ∞	0.03 ∞
10.00	8.40 12.36	7.86 13.75	7.24 16.19		6.48 22.05	5.68 42.68	4.80 ∞	4.02 ∞	3.16 ∞	0.53 ∞
∞	51.75 ∞	36.24 ∞	25.90 ∞		18.14 ∞	12.97 ∞	9.10 ∞	6.63 ∞	4.57 ∞	3.34 ∞

distance	f1.8	f2.0	f2.8	f4.0	f5.6	f8.0	f11.0	f16.0	f22.0
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Macro-Takumar 1:4.0 f = 50mm

unit = meter

0.208			0.20 0.21	0.20 0.21	0.20 0.21	0.20 0.21	0.20 0.21	0.20 0.21	0.20 0.21
0.210			0.21 0.21	0.21 0.21	0.21 0.21	0.21 0.21	0.21 0.21	0.21 0.21	0.21 0.21
0.215			0.21 0.22	0.21 0.22	0.21 0.22	0.21 0.22	0.21 0.22	0.21 0.22	0.21 0.22
0.225			0.22 0.23	0.22 0.23	0.22 0.23	0.22 0.23	0.22 0.23	0.22 0.23	0.22 0.23
0.240			0.24 0.24	0.24 0.24	0.24 0.24	0.24 0.24	0.24 0.24	0.24 0.24	0.23 0.25
0.270			0.27 0.27	0.27 0.27	0.27 0.27	0.27 0.27	0.27 0.27	0.26 0.28	0.26 0.28
0.300			0.30 0.30	0.30 0.30	0.30 0.30	0.29 0.31	0.29 0.31	0.29 0.31	0.29 0.31
0.350			0.35 0.35	0.35 0.36	0.34 0.36	0.34 0.36	0.34 0.36	0.34 0.36	0.33 0.37
0.400			0.39 0.41	0.39 0.41	0.39 0.41	0.39 0.41	0.38 0.42	0.38 0.42	0.37 0.43
0.500			0.49 0.51	0.49 0.51	0.48 0.52	0.48 0.53	0.47 0.54	0.47 0.54	0.46 0.56
0.700			0.68 0.72	0.67 0.73	0.66 0.74	0.65 0.76	0.63 0.79	0.63 0.79	0.61 0.83
1.00			0.96 1.05	0.94 1.07	0.92 1.10	0.89 1.14	0.85 1.22	0.85 1.22	0.81 1.33
2.00			1.82 2.22	1.76 2.32	1.68 2.48	1.58 2.73	1.45 3.29	1.45 3.29	1.31 4.36
∞			∞	∞	∞	∞	∞	∞	∞

Super Takumar (A) 1:1.8 f = 55mm

unit = meter

0.45	0.45 0.45	0.45 0.45	0.45 0.45	0.44 0.46	0.44 0.46	0.44 0.46	0.44 0.47	0.43 0.47	0.42 0.48
0.50	0.50 0.50	0.50 0.50	0.49 0.51	0.49 0.51	0.49 0.51	0.49 0.52	0.48 0.52	0.47 0.53	0.46 0.54
0.55	0.55 0.55	0.55 0.55	0.54 0.56	0.54 0.56	0.54 0.56	0.53 0.57	0.53 0.58	0.52 0.59	0.50 0.61
0.60	0.59 0.61	0.59 0.61	0.59 0.61	0.59 0.61	0.58 0.621	0.58 0.62	0.57 0.63	0.56 0.65	0.54 0.67
0.65	0.64 0.66	0.64 0.66	0.64 0.66	0.64 0.66	0.63 0.67	0.63 0.68	0.61 0.69	0.60 0.71	0.58 0.74
0.70	0.69 0.71	0.69 0.71	0.69 0.71	0.68 0.72	0.68 0.72	0.67 0.73	0.66 0.75	0.64 0.77	0.62 0.80
0.80	0.79 0.81	0.79 0.81	0.78 0.82	0.78 0.82	0.77 0.83	0.76 0.85	0.74 0.87	0.72 0.90	0.70 0.95
0.90	0.89 0.91	0.89 0.91	0.88 0.92	0.87 0.93	0.86 0.94	0.85 0.96	0.83 0.99	0.80 1.03	0.77 1.09
1.00	0.98 1.02	0.98 1.02	0.98 1.03	0.97 1.04	0.95 1.05	0.93 1.08	0.91 1.11	0.87 1.17	0.84 1.25
1.20	1.18 1.22	1.17 1.23	1.16 1.24	1.15 1.26	1.13 1.28	1.10 1.32	10.7 1.37	1.02 1.47	0.96 1.60
1.50	1.46 1.54	1.46 1.54	1.44 1.56	1.42 1.59	1.39 1.63	1.34 1.70	1.29 1.79	1.22 1.96	1.14 2.22
2.00	1.93 2.07	1.92 2.08	1.89 2.12	1.85 2.17	1.80 2.25	1.73 2.38	1.64 2.57	1.52 2.95	1.40 3.60
3.00	2.84 3.18	2.83 3.20	2.76 3.28	2.67 3.42	2.56 3.63	2.41 3.99	2.24 4.55	2.02 5.96	1.80 9.54
5.00	4.57 5.52	4.53 5.59	4.36 5.86	4.13 6.33	3.87 7.09	3.53 8.65	3.18 11.93	2.73 32.75	2.34 ∞
10.00	8.39 12.38	8.24 12.72	7.70 14.27	7.01 17.48	6.27 24.97	5.41 70.27	4.62 ∞	3.71 ∞	3.01 ∞
∞	51.27 ∞	46.15 ∞	32.98 ∞	23.10 ∞	16.52 ∞	11.58 ∞	8.44 ∞	5.82 ∞	4.25 ∞

distance	f1.9	f2.0	f2.8	f4.0	f5.6	f8.0	f11.0	f16.0	f22.0
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Super-Takumar 1:1.9 f=85mm

unit = meter

0.85	0.85	0.85	0.84	0.84	0.84	0.83	0.82	0.81	0.80
	0.85	0.86	0.86	0.86	0.86	0.87	0.88	0.89	0.91
0.90	0.89	0.89	0.89	0.89	0.88	0.88	0.87	0.86	0.84
	0.91	0.91	0.91	0.91	0.92	0.92	0.93	0.95	0.97
1.00	0.99	0.99	0.99	0.99	0.98	0.97	0.96	0.95	0.93
	1.01	1.01	1.01	1.01	1.02	1.03	1.04	1.06	1.09
1.10	1.09	1.09	1.09	1.08	1.08	1.06	1.05	1.03	1.01
	1.11	1.11	1.11	1.12	1.13	1.14	1.15	1.18	1.21
1.20	1.19	1.19	1.18	1.18	1.17	1.16	1.14	1.12	1.09
	1.21	1.21	1.22	1.22	1.23	1.25	1.26	1.30	1.34
1.40	1.39	1.38	1.38	1.37	1.36	1.34	1.32	1.29	1.25
	1.42	1.42	1.42	1.43	1.45	1.47	1.49	1.54	1.60
1.60	1.58	1.58	1.57	1.56	1.54	1.52	1.49	1.45	1.40
	1.62	1.62	1.63	1.64	1.66	1.69	1.73	1.79	1.87
1.80	1.77	1.77	1.76	1.75	1.73	1.70	1.66	1.61	1.55
	1.83	1.83	1.84	1.86	1.88	1.92	1.96	2.05	2.16
2.00	1.97	1.97	1.95	1.93	1.91	1.87	1.83	1.76	1.69
	2.03	2.03	2.05	2.07	2.10	2.15	2.21	2.32	2.47
2.50	2.45	2.45	2.43	2.40	2.36	2.30	2.23	2.13	2.02
	2.55	2.56	2.58	2.61	2.66	2.74	2.84	3.04	3.30
3.00	2.93	2.92	2.89	2.85	2.79	2.71	2.62	2.47	3.22
	3.08	3.08	3.12	3.17	3.24	3.36	3.52	3.82	4.27
4.00	3.87	3.86	3.81	3.73	3.63	3.49	3.33	3.10	2.86
	4.14	4.15	4.22	4.32	4.46	4.69	5.01	5.66	6.72
5.00	4.79	4.78	4.70	4.58	4.43	4.22	3.99	3.66	3.32
	5.23	5.24	5.35	5.51	5.74	6.14	6.71	7.96	10.26
8.00	7.47	7.44	7.24	6.95	6.61	6.15	5.66	5.00	4.39
	8.62	8.65	8.94	9.42	10.15	11.47	13.70	20.34	48.80
15.00	13.20	13.12	12.49	11.66	10.71	9.54	8.40	7.01	5.85
	17.37	17.51	18.77	21.04	25.10	35.32	72.12	∞	∞
∞	108.41	102.99	73.59	51.54	36.84	25.81	18.80	12.59	9.44
	∞	∞	∞	∞	∞	∞	∞	∞	∞

Bellows-Takumar 1:4.0 f=100mm

unit = meter

1.00				0.99	0.99	0.98	0.97	0.96	0.95
				1.01	1.01	1.02	1.03	1.04	1.06
1.10				1.09	1.08	1.08	1.07	1.05	1.04
				1.11	1.12	1.13	1.14	1.15	1.17
1.20				1.19	1.18	1.17	1.16	1.14	1.12
				1.22	1.22	1.23	1.24	1.26	1.29
1.30				1.28	1.28	1.26	1.25	1.23	1.21
				1.32	1.33	1.34	1.35	1.38	1.41
1.50				1.48	1.47	1.45	1.43	1.41	1.37
				1.53	1.54	1.55	1.57	1.61	1.65
1.70				1.67	1.65	1.64	1.61	1.58	1.54
				1.73	1.75	1.77	1.80	1.85	1.91
2.00				1.95	1.94	1.91	1.88	1.83	1.77
				2.05	2.07	2.10	2.14	2.21	2.30
2.50				2.43	2.40	2.36	2.31	2.23	2.14
				2.58	2.61	2.66	2.73	2.85	3.02
3.00				2.89	2.85	2.79	2.72	2.61	2.49
				3.12	3.17	3.25	3.35	3.54	3.80
4.00				3.80	3.73	3.62	3.50	3.32	3.12
				4.22	4.31	4.47	4.67	5.06	5.62
5.00				4.69	4.58	4.42	4.23	3.96	3.68
				5.35	5.51	5.76	6.11	6.81	7.88
8.00				7.22	6.95	6.58	6.17	5.59	5.03
				8.97	9.43	10.21	11.40	14.16	19.96
15.00				12.44	11.64	10.63	9.58	8.24	7.05
				18.91	21.11	25.60	34.87	88.44	∞
∞				71.30	50.96	35.70	25.99	17.90	13.05
				∞	∞	∞	∞	∞	∞

distance	f2.5	f2.8	f4.0	f5.6	f8.0	f11.0	f16.0	f22.0
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Super-Takumar 1:2.8 f = 105mm

unit = meter

1.20	1.19 1.21	1.19 1.21	1.18 1.22	1.17 1.23	1.16 1.24	1.15 1.26	1.13 1.28
1.30	1.29 1.31	1.28 1.32	1.28 1.32	1.27 1.33	1.26 1.35	1.24 1.37	1.22 1.39
1.50	1.48 1.52	1.48 1.52	1.47 1.53	1.46 1.55	1.44 1.56	1.42 1.59	1.39 1.63
1.70	1.68 1.72	1.67 1.73	1.66 1.74	1.64 1.76	1.62 1.79	1.59 1.83	1.55 1.88
2.00	1.97 2.03	1.96 2.04	1.94 2.06	1.92 2.09	1.89 2.12	1.84 2.19	1.79 2.27
2.50	2.45 2.55	2.43 2.57	2.41 2.60	2.37 2.65	2.32 2.71	2.25 2.81	2.17 2.95
3.00	2.93 3.07	2.90 3.11	2.86 3.15	2.81 3.22	2.75 3.31	2.64 3.47	2.53 3.69
4.00	3.87 4.13	3.82 4.20	3.76 4.28	3.66 4.41	3.55 4.59	3.38 4.92	3.19 5.39
5.00	4.80 5.22	4.72 5.32	4.62 5.45	4.47 5.67	4.30 5.98	4.05 6.56	3.77 7.44
7.00	6.61 7.44	6.45 7.65	6.26 7.94	5.99 8.43	5.68 9.13	5.24 10.61	4.79 13.19
10.00	9.21 10.94	8.91 11.40	8.54 12.08	8.03 13.27	7.48 15.13	6.72 19.75	5.99 31.29
25.00	13.27 17.25	12.65 18.44	11.90 20.30	10.94 23.94	9.93 30.87	8.62 59.81	7.44 ∞
30.00	23.75 40.76	21.80 48.17	19.66 63.62	17.13 122.74	14.77 ∞	12.01 ∞	9.82 ∞
∞	112.61 ∞	78.86 ∞	56.36 ∞	39.48 ∞	28.74 ∞	19.78 ∞	14.42 ∞

Super-Takumar 1:2.5 f = 135mm

unit = meter

1.50	1.49 1.51	1.49 1.51	1.49 1.51	1.48 1.52	1.47 1.53	1.47 1.54	1.45 1.55	1.43 1.57
1.60	1.59 1.61	1.59 1.61	1.59 1.62	1.58 1.62	1.57 1.63	1.56 1.64	1.54 1.66	1.52 1.69
1.80	1.79 1.81	1.79 1.81	1.78 1.82	1.77 1.83	1.76 1.84	1.75 1.86	1.72 1.88	1.70 1.92
2.00	1.98 2.02	1.98 2.02	1.98 2.03	1.97 2.04	1.95 2.05	1.93 2.07	1.91 2.11	1.87 2.15
2.50	2.47 2.53	2.47 2.53	2.46 2.54	2.44 2.56	2.42 2.58	2.39 2.62	2.35 2.68	2.29 2.75
3.00	2.96 3.04	2.96 3.04	2.94 3.06	2.92 3.09	2.88 3.13	2.84 3.18	2.78 3.27	2.70 3.38
4.00	3.93 4.07	3.92 4.08	3.89 4.12	3.85 4.16	3.79 4.24	3.71 4.33	3.60 4.51	3.47 4.73
5.00	4.89 5.11	4.88 5.13	4.83 5.19	4.76 5.26	4.67 5.39	4.55 5.55	4.38 5.84	4.18 6.23
7.00	6.78 7.23	6.76 7.26	6.66 7.38	6.53 7.54	6.35 7.80	6.14 8.15	5.81 8.81	5.47 9.76
10.00	9.56 10.49	9.51 10.55	9.31 10.80	9.06 11.16	8.71 11.75	8.30 12.58	7.71 14.26	7.11 16.99
15.00	14.01 16.14	13.90 16.29	13.48 16.92	12.95 17.83	12.24 19.40	11.45 21.80	10.34 27.48	9.27 40.05
30.00	26.24 35.02	25.85 35.74	24.41 38.93	22.72 44.20	20.58 55.48	18.42 81.52	15.68 376.72	13.31 ∞
∞	208.42 ∞	186.10 ∞	130.31 ∞	93.12 ∞	65.22 ∞	47.47 ∞	33.68 ∞	23.80 ∞

distance	f3.5	f4.0	f5.6	f8.0	f11.0	f16.0	f22.0
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Super-Takumar 1:3.5 f = 135mm

unit = meter

1.50	1.49	1.49	1.48	1.48	1.47	1.45	1.44
	1.51	1.51	1.52	1.53	1.53	1.55	1.57
1.70	1.69	1.68	1.68	1.67	1.66	1.64	1.61
	1.71	1.72	1.72	1.73	1.75	1.77	1.80
2.00	1.98	1.98	1.97	1.95	1.94	1.91	1.88
	2.02	2.02	2.03	2.05	2.07	2.10	2.14
2.50	2.47	2.46	2.45	2.42	2.40	2.35	2.30
	2.54	2.54	2.56	2.58	2.61	2.67	2.74
3.00	2.95	2.94	2.92	2.89	2.85	2.78	2.71
	3.05	3.06	3.09	3.12	3.17	3.26	3.37
4.00	3.91	3.89	3.85	3.79	3.72	3.61	3.48
	4.10	4.11	4.16	4.23	4.33	4.50	4.72
5.00	4.85	4.83	4.77	4.67	4.56	4.39	4.19
	5.16	5.18	5.26	5.38	5.54	5.82	6.21
7.00	6.70	6.66	6.54	6.36	6.15	5.83	5.49
	7.32	7.37	7.53	7.79	8.13	8.78	9.71
10.00	9.40	9.32	9.07	8.72	8.32	7.73	7.13
	10.69	10.79	11.15	11.73	12.54	14.19	16.86
15.00	13.66	13.49	12.97	12.26	11.48	10.37	9.31
	16.63	16.89	17.79	19.34	21.70	27.26	39.42
30.00	25.03	24.45	22.77	20.64	18.49	15.75	13.38
	37.45	38.83	44.02	55.08	80.35	343.87	∞
∞	148.91	130.31	93.12	65.22	47.47	32.68	23.80
	∞	∞	∞	∞	∞	∞	∞

Super-Takumar 1:4 f = 150mm

unit = meter

1.80	1.79	1.78	1.77	1.76	1.75	1.73
	1.81	1.82	1.83	1.84	1.86	1.88
2.00	1.98	1.97	1.96	1.95	1.93	1.91
	2.02	2.03	2.04	2.05	2.08	2.11
2.25	2.23	2.22	2.20	2.19	2.16	2.13
	2.27	2.28	2.30	2.32	2.35	2.39
2.50	2.47	2.46	2.44	2.42	2.38	2.34
	2.53	2.54	2.56	2.59	2.63	2.68
3.00	2.95	2.94	2.91	2.88	2.83	2.77
	3.05	3.07	3.09	3.13	3.20	3.28
3.50	3.44	3.41	3.38	3.33	3.26	3.18
	3.57	3.59	3.63	3.69	3.78	3.90
4.00	3.92	3.88	3.84	3.78	3.69	3.58
	4.09	4.12	4.18	4.25	4.38	4.54
5.00	4.87	4.81	4.74	4.65	4.50	4.34
	5.14	5.20	5.29	5.41	5.63	5.91
7.00	6.73	6.63	6.48	6.31	6.04	5.74
	7.29	7.42	7.61	7.87	8.35	9.00
10.00	9.45	9.24	8.95	8.61	8.10	7.57
	10.63	10.90	11.34	11.94	13.09	14.83
15.00	13.76	13.33	12.72	12.04	11.05	10.06
	16.48	17.16	18.30	19.95	23.49	29.87
30.00	25.36	23.88	21.97	19.97	17.35	14.99
	36.74	40.37	47.42	60.68	113.87	∞
∞	160.73	114.95	80.51	58.59	40.33	29.37
	∞	∞	∞	∞	∞	∞

distance	f4.0	f5.6	f8.0	f11.0	f16.0	f22.0
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Super-Takumar 1:4.0 f = 200mm

unit = meter

2.50	2.48 2.52	2.48 2.52	2.47 2.53	2.46 2.54	2.44 2.56	2.42 2.59
2.70	2.68 2.72	2.67 2.73	2.66 2.74	2.65 2.75	2.63 2.78	2.60 2.81
3.00	2.98 3.02	2.97 3.03	2.95 3.05	2.94 3.07	2.91 3.10	2.87 3.14
3.50	3.47 3.53	3.45 3.55	3.43 3.57	3.41 3.60	3.37 3.64	3.32 3.70
4.00	3.95 4.05	3.94 4.07	3.91 4.09	3.88 4.13	3.83 4.19	3.76 4.27
4.50	4.44 4.56	4.42 4.58	4.38 4.62	4.34 4.67	4.28 4.75	4.20 4.85
5.00	4.93 5.08	4.90 5.11	4.86 5.15	4.80 5.21	4.72 5.32	4.62 5.45
6.00	5.89 6.11	5.85 6.16	5.79 6.23	5.71 6.32	5.59 6.48	5.45 6.68
7.50	7.33 7.68	7.26 7.76	7.16 7.87	7.04 8.02	6.85 8.29	6.64 8.63
10.00	9.69 10.34	9.57 10.48	9.39 10.69	9.18 10.98	8.86 11.50	8.49 12.18
15.00	14.29 15.79	14.02 16.13	13.64 16.67	13.19 17.39	12.51 18.76	11.78 20.72
20.00	18.74 21.45	18.28 22.09	17.63 23.12	16.88 24.57	15.76 27.42	14.61 31.88
30.00	27.22 33.43	26.24 35.03	24.91 37.75	23.42 41.80	21.31 50.95	19.23 69.15
50.00	42.65 60.43	40.29 65.94	37.20 76.39	33.95 95.30	29.64 162.46	25.73 1067.91
∞	285.91 ∞	204.28 ∞	143.06 ∞	104.10 ∞	71.63 ∞	52.15 ∞

Tele-Takumar 1:5.6 f = 200mm

unit = meter

2.50	2.48 2.52	2.47 2.53	2.46 2.54	2.44 2.56	2.42 2.59
3.00	2.97 3.03	2.95 3.05	2.94 3.07	2.91 3.10	2.88 3.14
3.50	3.45 3.55	3.43 3.57	3.41 3.60	3.37 3.64	3.32 3.70
4.00	3.94 4.07	3.91 4.09	3.88 4.13	3.83 4.19	3.76 4.27
5.00	4.90 5.11	4.86 5.15	4.80 5.21	4.72 5.32	4.62 5.45
6.00	5.85 6.16	5.79 6.23	5.71 6.32	5.59 6.48	5.45 6.68
8.00	7.73 8.30	7.61 8.43	7.48 8.60	7.26 8.91	7.02 9.31
10.00	9.57 10.48	9.39 10.69	9.18 10.98	8.86 11.49	8.50 12.18
15.00	14.02 16.13	13.64 16.66	13.20 17.39	12.51 18.75	11.79 20.71
20.00	18.28 22.08	17.63 23.12	16.88 24.56	15.77 27.41	14.62 31.86
30.00	26.25 35.02	24.91 37.73	23.43 41.78	21.31 50.91	19.23 69.05
50.00	40.30 65.91	37.21 76.35	33.96 95.21	29.65 162.08	25.74 ∞
∞	204.49 ∞	143.20 ∞	104.20 ∞	71.70 ∞	52.20 ∞

distance	f4.0	f5.6	f6.3	f8.0	f11.0	f16.0	f22.0
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Super-Takumar 1 :4.0 f =300mm

unit = meter

5.50	5.4609 5.5396	5.4455 5.5556		5.4225 5.5799	5.3941 5.6105	5.3474 5.6624	5.2926 5.7261
6.00	5.9525 6.0482	5.9337 6.0678		5.9058 6.0974	5.8714 6.1348	5.8149 6.1984	5.7486 6.2765
6.50	6.4432 6.5578	6.4209 6.5812		6.3876 6.6167	6.3465 6.6616	6.2793 6.7380	6.2007 6.8322
7.0	6.9332 7.0681	6.9069 7.0958		6.8678 7.1377	6.8196 7.1909	6.7408 7.2815	6.6489 7.3934
8.00	7.9107 8.0914	7.8755 8.1286		7.8235 8.1851	7.7594 8.2570	7.6551 8.3797	7.5338 8.5322
9.00	8.8849 9.1182	8.8398 9.1664		8.7729 9.2397	8.6909 9.3332	8.5577 9.4934	8.4035 9.6935
10.00	9.8560 10.1484	9.7996 10.2091		9.7163 10.3016	9.6143 10.4197	9.4491 10.6229	9.2586 10.8781
12.00	11.7886 12.2194	11.7062 12.3095		11.5849 12.4473	11.4368 12.6241	11.1986 12.9308	10.9262 13.3198
15.00	14.6639 15.3523	14.5339 15.4980		14.3431 15.7221	14.1119 16.0118	13.7432 16.5198	13.3262 17.1751
20.00	19.3944 20.6456	19.1625 20.9160		18.8252 21.3354	18.4203 21.8846	17.7838 22.8670	17.0772 24.1719
30.00	28.6299 31.5102	28.1168 32.1584		27.3814 33.1832	26.5153 34.5613	25.1895 37.1358	23.7664 40.7898
50.00	46.2484 54.4213	44.9023 56.4191		43.0253 59.7095	40.8908 64.4100	37.7726 74.1548	34.6120 90.6473
100.00	85.8898 119.6945	81.3059 129.9423		75.2838 149.1064	68.9105 182.8511	60.4015 293.8698	52.6211 1089.0609
∞	601.1879 ∞	429.5554 ∞		300.8310 ∞	218.9155 ∞	150.6525 ∞	109.6947 ∞

Tele-Takumar 1 :6.3 f =300mm

unit = meter

5.50		5.44 5.56	5.43 5.58	5.40 5.60	5.36 5.65	5.30 5.71
6.00		5.93 6.07	5.91 6.09	5.88 6.13	5.83 6.19	5.76 6.26
6.50		6.42 6.59	6.39 6.61	6.38 6.65	6.29 6.73	6.22 6.81
7.00		6.90 7.10	6.88 7.13	6.83 7.18	6.76 7.26	6.67 7.37
8.00		7.87 8.14	7.83 8.17	7.77 8.24	7.68 8.36	7.56 8.50
9.00		8.83 9.18	8.79 9.22	8.71 9.31	8.58 9.46	8.44 9.65
10.00		9.79 10.22	9.73 10.28	9.64 10.39	9.48 10.58	9.30 10.82
12.00		11.69 12.33	11.61 12.42	11.47 12.58	11.25 12.87	10.99 13.23
15.00		14.51 15.53	14.38 15.67	14.17 15.94	13.82 16.41	13.42 17.02
20.00		19.12 20.97	18.90 21.24	18.51 21.75	17.91 22.66	17.24 23.85
30.00		28.03 32.28	27.54 32.95	26.72 34.22	25.45 36.56	24.09 39.85
50.00		44.67 56.79	43.42 58.95	41.39 63.20	38.39 71.85	35.32 85.99
100.00		80.55 131.92	76.54 144.37	70.36 173.26	62.03 260.12	54.32 654.72
∞			409.12 ∞	322.24 ∞	234.44 ∞	161.27 ∞

distance	f4.5	f5.6	f8.0	f11.0	f16.0	f22.0
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Tele-Takumar 1:5.6 f = 400mm

unit = meter

8.00	7.93 8.07	7.91 8.10	7.87 8.13	7.82 8.19	7.75 8.27
9.00	8.92 9.09	8.88 9.12	8.84 9.17	8.76 9.25	8.68 9.35
10.00	9.89 10.11	9.85 10.16	9.79 10.22	9.70 10.32	9.60 10.44
12.00	11.84 12.16	11.78 12.23	11.70 12.32	11.56 12.47	11.41 12.66
15.00	14.75 15.26	14.65 15.37	14.52 15.52	14.31 15.76	14.07 16.07
20.00	19.55 20.47	19.36 20.68	19.13 20.95	18.76 21.42	18.34 22.00
30.00	28.97 31.10	28.55 31.60	28.05 32.25	27.24 33.39	26.34 34.87
50.00	47.16 53.21	46.04 54.71	44.72 56.71	42.67 60.41	40.45 65.53
100.00	89.13 113.91	85.16 121.14	80.68 131.58	74.18 153.67	67.64 192.49
∞	809.03 ∞	566.44 ∞	412.06 ∞	283.42 ∞	206.23 ∞

Takumar 1:4.5 f = 500mm

unit = meter

10.00	9.95 10.05	9.94 10.06	9.91 10.09	9.88 10.13	9.82 10.19	9.76 10.26
12.00	11.92 12.08	11.91 12.10	11.87 12.14	11.82 12.19	11.73 12.28	11.64 12.39
15.00	14.88 15.13	14.85 15.16	14.78 15.22	14.70 15.31	14.57 15.46	14.42 15.63
20.00	19.77 20.23	19.72 20.29	19.60 20.41	19.46 20.57	19.22 20.85	18.94 21.19
30.00	29.48 30.54	29.35 30.68	29.08 30.98	28.76 31.36	28.22 32.02	27.61 32.85
50.00	48.53 51.56	48.18 51.96	47.45 52.85	46.55 54.01	45.14 56.05	43.56 58.72
100.00	94.18 106.59	92.86 108.34	90.11 112.36	86.89 117.82	82.01 128.22	76.83 143.44
200.00	177.82 228.54	173.12 236.80	163.70 257.09	153.28 287.94	138.59 360.01	124.31 514.78
∞	1587.81 ∞	1276.01 ∞	893.36 ∞	649.85 ∞	446.93 ∞	325.18 ∞

distance	f8.0	f11.0	f16.0	f22.0
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Tele-Takumar 1:8.0 f = 1000mm

unit = meter

30.00	29.77 30.24	29.68 30.33	29.54 30.48	29.37 30.66
35.00	34.68 35.33	34.56 35.45	34.36 35.66	34.13 35.92
40.00	39.58 40.43	39.42 40.60	39.16 40.88	38.85 41.22
50.00	49.33 50.69	49.08 50.96	48.67 51.41	48.19 51.95
60.00	59.02 61.01	58.66 61.40	58.07 62.06	57.38 62.87
75.00	73.46 76.61	72.90 77.23	71.98 78.29	70.91 79.60
100.00	97.25 102.92	96.25 104.06	94.64 106.01	92.78 108.46
200.00	189.10 212.25	185.31 217.24	179.33 226.10	172.64 237.75
500.00	436.43 585.32	416.58 625.36	387.23 705.86	357.06 834.89
∞	3408.68 ∞	2471.52 ∞	1704.83 ∞	1240.14 ∞

There exists no depth-of-field table for the Super-Takumar-Zoom 70-150mm f/4.5 lens

The same depth-of-field tables are used for: Super-Takumar 55mm f1.8 = 55mm f2 lens. Macro-Takumar 50mm f4 = Super-Macro-Takumar 50/4