

**ARRI** 

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ARRIFLEX 16 SR II

INSTRUCTION MANUAL

January 1984

# **ARRIFLEX 16 SR II-E**

The 16 SR II-E is the basic model of the 16 SR II and as such has the same primary filming functions.

This instruction manual can be used for both models, certain sections are relevant to the 16 SR II-E, others not, depending on the extent to which the camera has been upgraded. When the 16 SR II-E has been fully upgraded, only zoom lenses with diaphragm rods can fulfill their function properly.

The electrical, optical and mechanical accessories, as well as the 120 m coaxial quick-change magazines, can be used without restriction.

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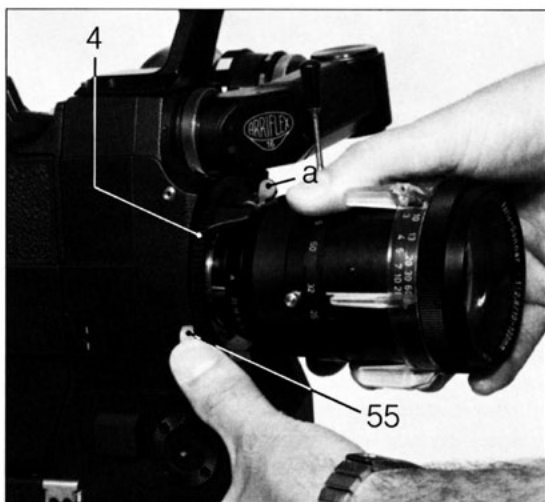


## Mounting the lenses

We supply zoom lenses with automatic diaphragm for use with the ARRIFLEX 16 SR II; when the camera is fitted with the automatic feature the lenses can be used without any restrictions for fully automatic exposure control.

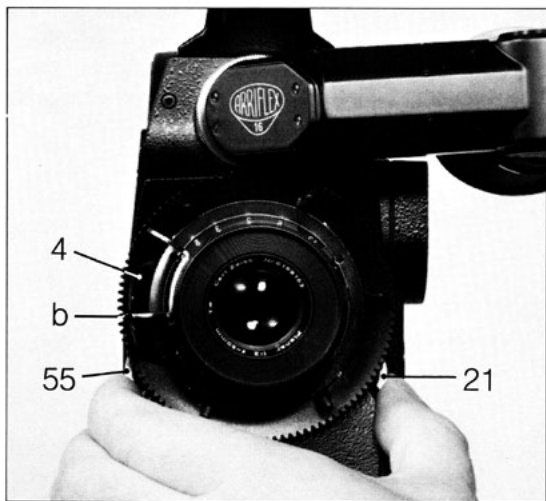
To avoid damaging the lens leader groove and the catch in the mount which fits into this groove, care must be taken that all lenses (with the white index mark facing the exposure meter side) are gently inserted.

All (unblimped) zoom and fixed focal length lenses with steel bayonet or standard mount, suitable for use with the ARRIFLEX 16 BL, can also be used with the ARRIFLEX 16 SR II without any restrictions whatsoever. *To remove lenses with steel bayonet mount: press release button (55), turn the lens in an anti-clockwise direction and pull out of the lens mount flange.*



*To mount lenses with steel bayonet mount:* insert the diaphragm lever (a) into the slot of the catch ring (4), carefully push the lens (with index mark positioned as stated before) into the lens mount flange and turn in a clockwise direction until it locks.

*To remove lenses with standard mount:* press release buttons (21, 55) together and pull the lens out of the mount flange without turning it.



*To mount lenses with standard mount:* insert diaphragm lever (b) in the slot of the catch ring (4). Press and hold together simultaneously the buttons (21, 55) and carefully push the lens (index mark positioned towards the exposure meter) carefully into the lens mount flange. The catch in the lens mount engages in the guide groove of the lens barrel; release the button and check that the lens is firmly seated.

## **Working with the taking lens**

Lenses with engraved index markings on both sides and with double scales can be operated and read easily from the left and the right hand side.

The zoom lever (2) is screwed into one of the sockets, turned in the direction desired and fastened by tightening the knurled screw (60).

## **Spring loaded diaphragm control**

The 16 SR spring loaded diaphragm mechanism functions only when 16 SR special zoom lenses are used and when the spring diaphragm is turned to »Zu/Off«. The longer, rear rod protruding from the lens (when in use, in the upper position) operates the iris diaphragm, the shorter rod sets the fully automatic exposure control. Lenses with axial or radial spring loaded diaphragm control can be used (See page 21).

## **Automatic mirror shutter stop**

Each time the camera is switched off the quartz controlled motor stops the mirror shutter so that the finder is open for viewing. The opening of the shutter is 180°. The mirror shutter can also be rotated by hand by turning the hinged knob (31).

## Changing the 120 m/400 ft coaxial magazine

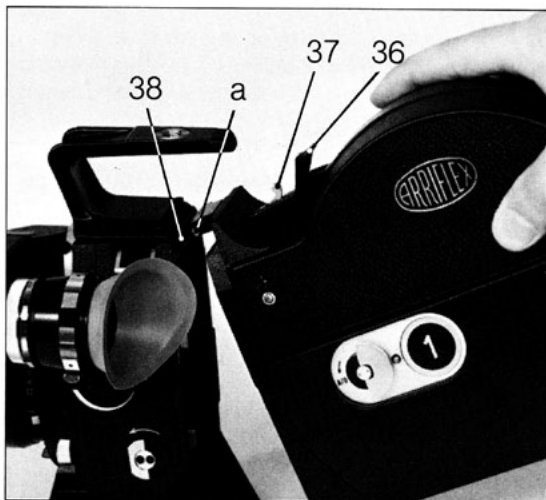
A step which can be carried out in seconds. Pull back the safety lever (37) to position »Offen/Open«, depress the release catch (36), raise the magazine and





remove it from the camera's snap catch (38).

To replace the magazine, engage the hinge pin (a) in the snap catch (38) and push the magazine down; a click is heard when the magazine snaps into position.

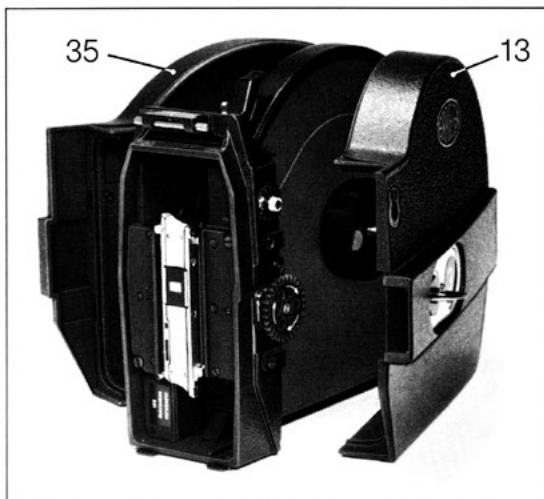


Finally, the magazine release catch (36) is locked by pushing the lever (37) back to »Lock«. Press the test button (30) to run the camera a few turns slowly until the film transport claw engages with a perforation hole.

## Loading the magazine

The film must be threaded with the emulsion side inwards. With single perforated film only B winding can be used.

Before loading the film unlock the film supply side (35) of the magazine and open up the lid. Then swing the pressure roller (a) back until it locks. The magazine must be loaded in a dark room or in a film changing bag.



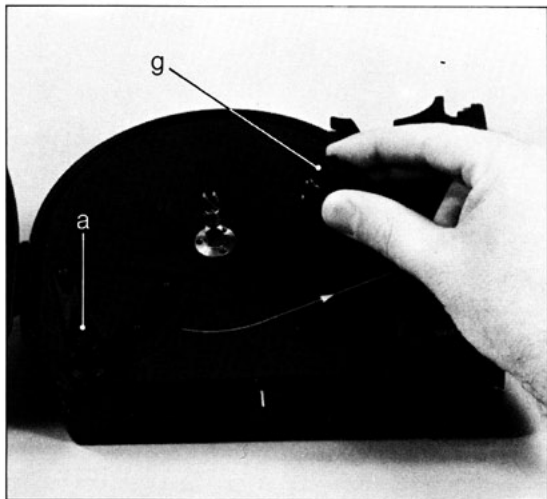
When raw stock on a plastic core is used the film core holder (g) is placed on the feed shaft and the film roll with core is pushed onto the film core holder and secured by swinging down both of the latches. Daylight loading spools are placed directly onto the feed shaft and then secured.

**CARE!** Should self-wound rolls be used (e.g. a part of a larger roll of raw stock) *do not* fold the film end over before placing it in the slit of the plastic core as it may jam in the magazine throat or film channel and cause damage.

The film head must always run in the direction of the arrow. Single perforated film is threaded with the perforation to the outside, as shown by the symbol under

the threading slot. Film run in direction of the arrow and the correct positioning of the perforations can only be obtained with single perforated film when »B winding« film is used as previously described.

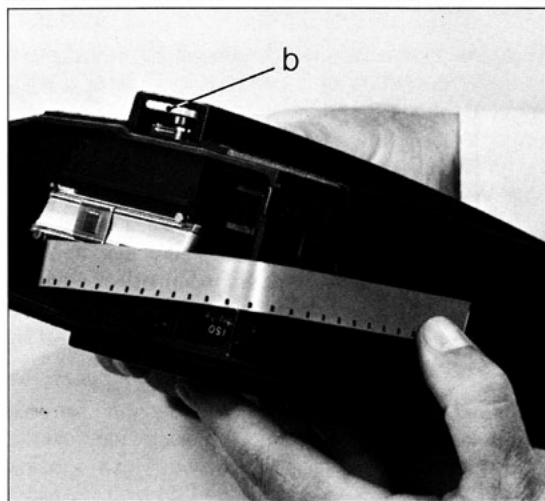
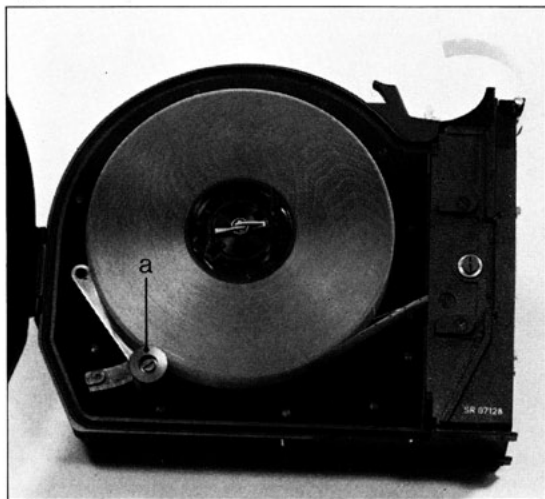
The pressure roller (a) is then placed onto the film roll so that the film roll is stabilized with the guiding edges; at the same time it also operates the film supply indicator. Not for daylight spools!



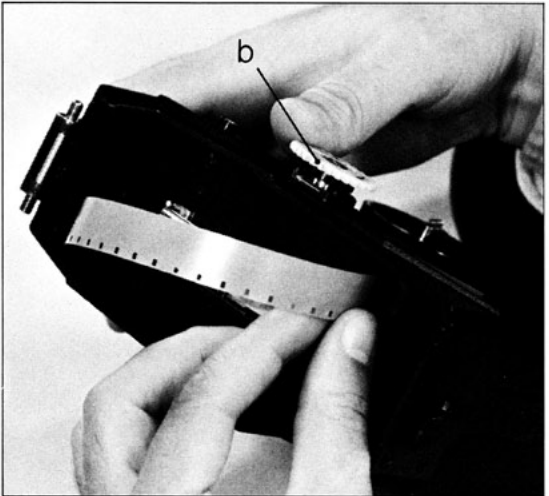
Slide the film head, which should be cut straight through the middle of a perforation hole at a right angle to the edge into the feed slot of the magazine, turning the magazine gears slightly in the direction of the arrow until a perforation hole is felt to be gripped; push the film on until the film head reappears from the magazine throat above the pressure plate. This operation can be made easier if the film head is pushed into the feed slot before the film roll or daylight loading spool is fixed to the feed shaft as described above. The magazine lid is then shut and secured by turning the hinged knob (32) to the right.

All further steps can be carried out in the light. The next step is to pull the film around the magazine until the loop length marker is reached; the wind-up magazine cover (13) is released and opened up and the exact

measured length of film is pushed, without changing its length at all, into the magazine throat of the take-up sprocket until the plastic magazine gear (b) moves in the direction of the arrow. Only then can the magazine gear be turned by hand in the same direction (so that the film length remains unchanged) until the film head appears in the take-up area.

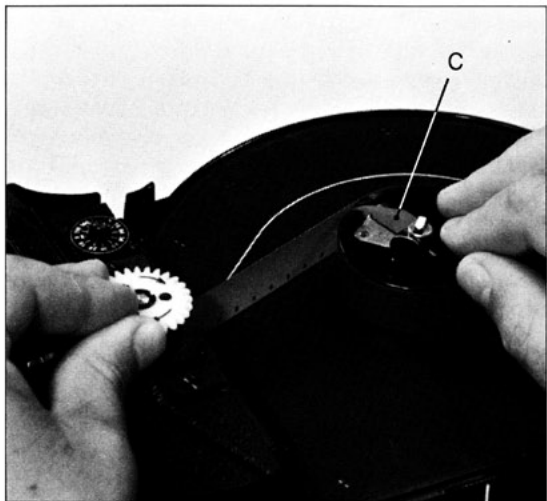


The pressure roller is then pulled back and the film attached to the standard expansion film core (c) in the take-up compartment—(see illustration). Holding the magazine gear stationary, the film core is turned in the direction of the engraved arrow (i.e. clockwise) until the film is taut; the magazine gear is then released and the film core is turned a full turn to ensure that the film is tightly gripped. Finally the pressure roller is swung back into its position so that the edges are in alignment with the film; the magazine cover then is replaced and secured.

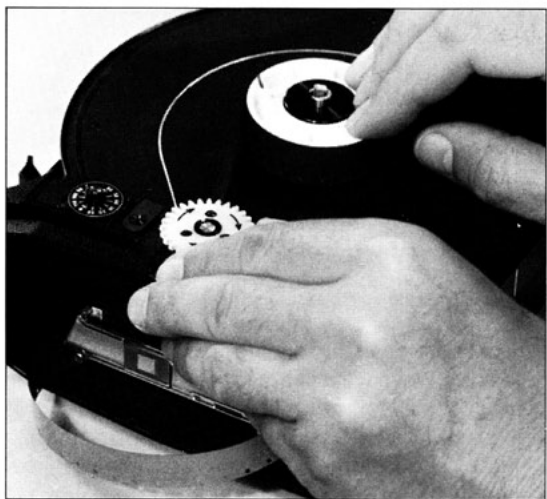


When a plastic film core is used, the standard film holder is pushed onto the wind-up pole until it engages and the plastic film core is then pushed onto it. The slit for fastening the film must point with its pointed corner in the run direction. The film head should only be folded once (NOT several times) and inserted into the film core slit; the film is then made taut as described above.

When using daylight loading spools the film core holder is removed, the film is fixed in the spool column outside of the magazine, a small amount of film is wound up, the spool is set in the magazine and the film is made taut. Contrary to the instructions for using raw stock with plastic core, the pressure roller is not swung

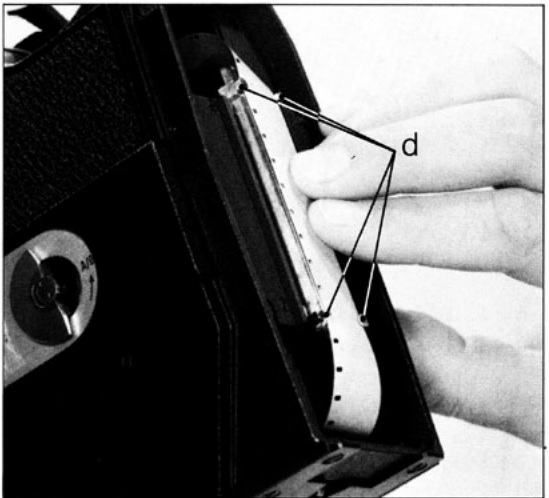


onto the spool but remains latched away from it. In this case the counter works only for the exposed film (12). It must be reset to »0« every time the film is changed.





It is important that the film which is slid under the hooks (d) of the sprung pressure plate forms equal sized film loops before and after the pressure plate.



## The film aperture cover

When there is no magazine on the camera, the film aperture cover should always be in place. It is easily fixed in position with its snap closure and prevents the film aperture from being damaged or becoming dirty.



## The magazine loop protector

This protects the film loop, the magazine throat and the guide rails from dirt and possible damage. With light pressure it can be swung upwards to the magazine or pulled down again. The loop protector should always be in place on a loaded or empty magazine until it is fixed on the camera.



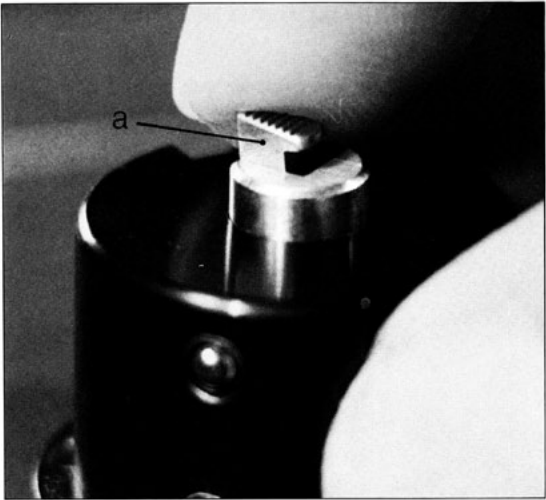
## Removing the exposed film from the magazine

This must take place in a darkroom or in a changing bag. First open the magazine lid (13) by pressing the



safety knob (33) and at the same time turning the knob (32) to the left.

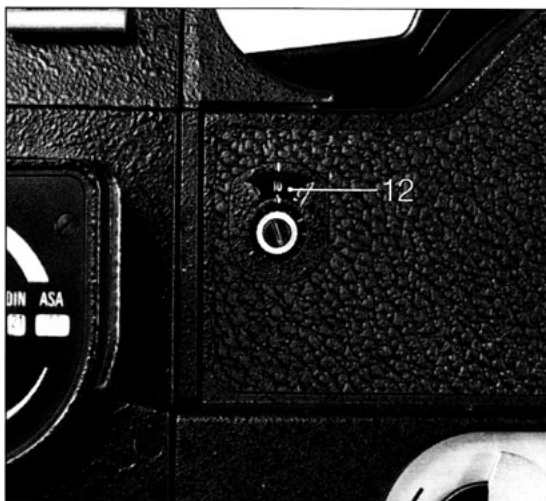
The pressure roller is swung back and the film, together with plastic core, is removed from the film core holder. The film core holder cannot be accidentally removed with the core because it is locked onto the shaft. As with the daylight spools and expansion film cores, the core holder can only be removed when the retaining latch (a) is pushed to the side.



When expansion film cores are used the clamp lever is pressed and the film end is released; at the same time the diameter of the core is decreased so that the film roll can be removed easily. The easiest way to remove the roll is to turn the magazine over and let the film slip out onto the palm of your hand. Place a plastic bobby in the film roll afterwards; it is sufficient to keep the film stabilized even though it sits very loosely. *Under no circumstances whatsoever* should the film be pulled to make it sit tightly on the core as this only leads to scratches on the exposed film.

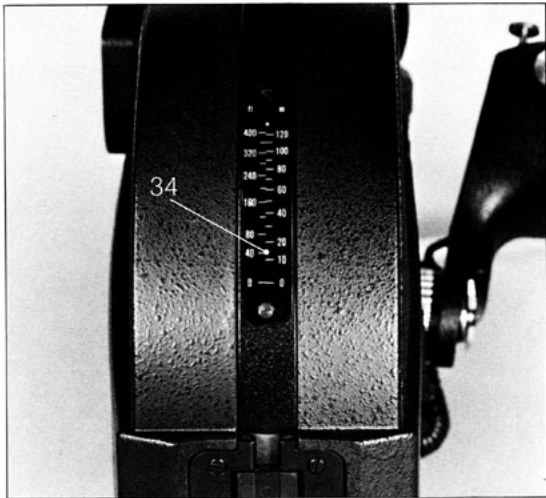
## Counter for exposed film

This works with daylight loading spools as well as with raw stock on a plastic core and must be reset to zero after every film change. The reading is given in meters. For readings in feet, a scale is also supplied which can be stuck over the meter scale.



## The film supply indicator for raw stock

is governed by the pressure roller which rests on the unexposed film; the quantity of raw stock available can be read from the back of the magazine.



## **The functions of the camera release on the housing**

The camera release button (28) is coupled with the mirror reflex function so that the camera is quickly ready for shooting.

In the »0« position the camera is switched off and the iris diaphragm (when spring-loaded diaphragm control lenses are used) is fully open. When the release is moved to the measuring position (27), the iris diaphragm will close to the value preselected on the diaphragm ring and the light exposure meter switches on at the same time. The manual adjustment of the iris diaphragm can be carried out now according to the diaphragm aberration shown in the viewfinder image.

When the release is brought into the »start« position (26), the camera run is switched on. When spring-loaded diaphragm control lenses are used with cameras fitted with a built-in automatic exposure meter, the necessary diaphragm opening is automatically set and can be controlled in the viewfinder.

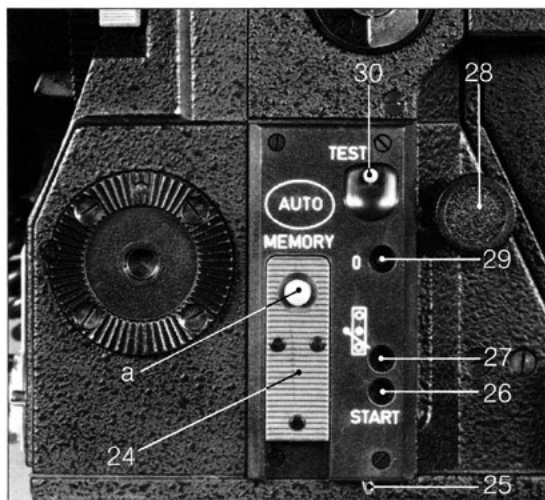
When the camera is switched off (»0« position), the diaphragm will return to the fully open position. If the camera is again released, the diaphragm will close to the measuring position of the last shot which is stored. The information is stored until the automatic control system receives new information through the taking lens.

The »memory button« (24) enables the cameraman to retain a momentary f-stop. This is of great value for selective exposure measuring with zoom lenses and for panning, when momentary fluctuations of the automatic exposure control, caused by the subject, should be avoided.

When the release (28) is moved in the measuring position (27) and the red knob (a) pressed, the memory button (24) can be pulled downwards (switch on). When the release is returned to the »0« position, the memory button is simultaneously brought upwards and so switched off.

When the release (28) is in the measuring position, it is also possible to swing the retaining lever (25) forwards to restrict the release. The release can now only be moved between »measuring« and »start« positions, for example, when shooting over a long period of time with lenses without spring loaded diaphragm. The iris diaphragm must be manually opened for accurate focusing. The exposure meter is in constant operation as long as it is connected to a battery.

When the retaining lever in the release »0« position is swung forwards, the release is blocked. The camera and the exposure meter can no longer be switched on. This is a safety measure to prevent the camera being accidentally switched on during transport and discharging the battery.



When the camera has been unused for a longer period of time or when it is cold, the inching system should be switched on for a short time to prevent damage to

parts which have become sluggish. The inching system can be switched on by depressing the small red test button (30).

If the mechanical parts should jam (e.g. too cold, or a film jam) then an overload fuse switches the power to the camera motor off within ca. 3 seconds.

If this happens, the camera must be switched off at the housing switch and the cause of the overload must be located and eliminated (e.g. film jam) before switching the camera on again.

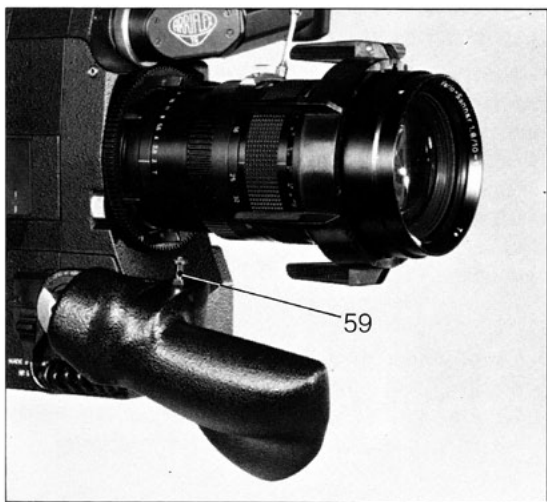
### **The drive motor and its electrical control system, pilot tone and start marking**

A quartz controlled 12 V DC motor drives the camera. Frame rates of 24 and 25 fps can be selected (see para.: switching over from 24–25 fps, and/or 50–60 Hz). Pilot frequencies of between 50 and 60 Hz, proportional to the camera motor speed, can also be selected. Synchronous double system recording is possible with this camera using the following methods:

1. Conventional pilot tone method, including start-marking (with cable).
2. Quartz pilot frequency method, without start-marking, using a quartz synchronous tape recorder.

## The standard handgrip

The standard handgrip with electrical press button release (59) to start the camera is screwed onto the right hand side of the camera to the rosette (53) and electrically connected with the 4-pole plug (51). The special screw mount allows the handgrip to be adjusted upwards and downwards and to be displaced laterally. The standard handgrip is used mainly when there is no special need in having the combined one hand operation of automatic diaphragm and camera start, or when standard lenses without automatic diaphragm are used.



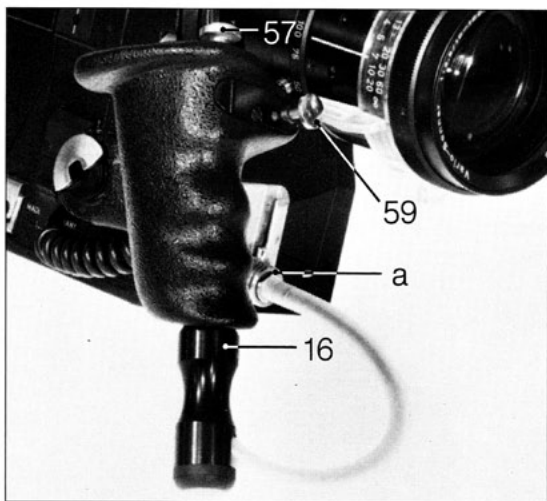
On request we can supply a left-hand standard handgrip which is fixed to the left rosette (22).

To start the camera with the press button release, the camera housing release (28) must be in the measuring position (27) otherwise the camera will not start. This is to prevent unintentional running of the camera with open diaphragm.



## The universal handgrip

The universal handgrip with electrical press button release (59) to start the camera and additional cable release (57) to operate the automatic diaphragm, is, like the standard handgrip, fastened to the right-hand side rosette (53) and electrically connected with the 4-pole plug (51). The protecting collar prevents damage to the flexible cable when the camera is carelessly set down. The adjustable universal handgrip is of special use for cameras with automatic exposure control and with lenses with automatic diaphragm. The handgrip rosette should first be positioned in the desired setting and then fixed to the camera. The plug (51) is placed in the socket (52) and then held securely in position with the safety catch. The flexible cable (a) is then pulled back and the square connector plate is pushed upwards into the shoe for the lightweight support until resistance is felt. Finally, the protecting



collar (16) is placed into the handgrip hole until it locks. To remove – follow steps in reverse order.

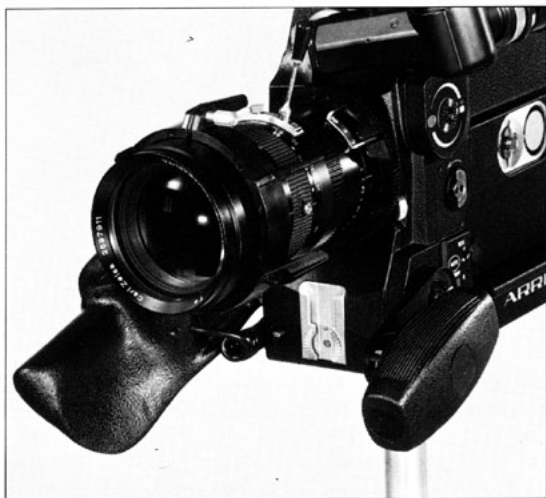
The press button (57) for operating the automatic diaphragm must be pressed before starting the

camera run as the press button is also a control mechanism against accidental release. At the same time the exposure meter is set in operation. With cameras with automatic exposure meter control and with the lens diaphragm ring set to position »A« (automatic), the iris diaphragm is automatically set according to the lighting conditions. Only then can the camera run be switched on. By pressing the press button release (59) once again it springs back to its previous position, switching the camera run off and releasing the previously pressed button for operating the automatic diaphragm.

## The auxiliary handgrip

An auxiliary handgrip is also available; it can be mounted on either the left or the right hand side of the camera and fastened to the rosette. It has no release function and is intended for such situations as when the camera man needs to be able to hold the camera with both hands. The handgrip can be moved vertically, parallel to the camera, to find the most comfortable position.

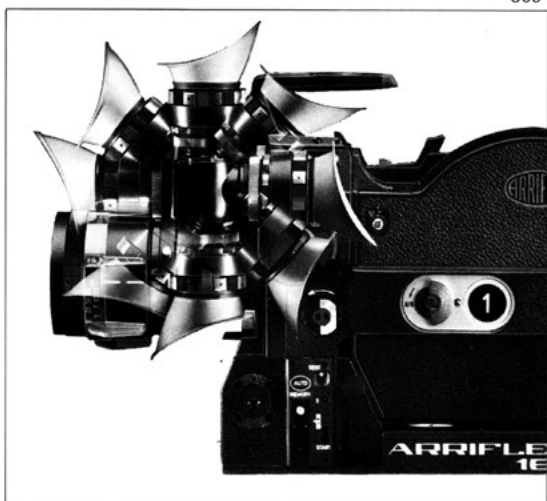
If the camera is going to be held with two hands, two auxiliary handgrips or any combination with any of the other three handgrips may be used. To extend the handgrip, a vertical swivel intermediary piece is available which can be fitted to the left or right hand rosette on the camera.



## The rotating + pivoting viewfinder

The universal application of the camera is backed up by the 16 SR viewfinder (5) which can be turned and swivelled and has fully automatic image compensation. The viewfinder can be turned and swivelled on three planes and it can be used for viewing with the left or the right eye; it can also be steplessly moved from the left to the right end stop and is ready for operation in every position. The viewfinder can also be swung to the side. The three dimensional mobility allows optimal positioning of the viewfinder.

360°



190°

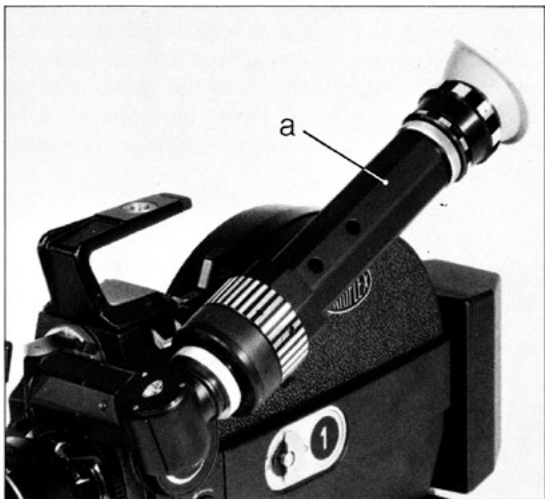


25°



**The viewfinder extension** is intended for use when shooting from a bird's or worm's eye view, or when shooting from the hip or over obstacles. The extension tube (a) is fitted between the camera and the viewfinder eyepiece. Neither the universal panning/pivoting feature of the viewfinder unit nor the image compensation is effected. As with the viewfinder eyepiece, be careful not to cross-thread the large mounting ring when installing the extension and be sure to seat the locating nipples before tightening.

**CARE!** The mounting ring has a double thread. If it doesn't tighten easily at once, unscrew and start again. Do not use force. The same care must also be taken when fitting the viewfinder eyepiece.



## Operating the TTL-Si Exposure Meter

The exposure meter is powered by the camera battery. The measuring range is 13–31 DIN/16–1000 ASA at 5–75 fps. The film speed is selected by turning the knurled knob (23). The reading field indicator needle is visible in the viewfinder, to the left. When the film speed has been selected, the indicator needle is brought into the centre mark by adjusting the iris diaphragm. The two outer indicator marks, + and –, indicate approximately 2 stops over or under exposure. When an external control unit (e.g. VSU for variable speeds) is used, with the release (28) in measuring position (27) the diaphragm value to be set, dependent on the preselected frame speed, can be read even when the camera is not running. The indicator is compensated between when stationary and when running, that is, a stop value which is selected before the camera is running need only be changed when the lighting conditions of the scene change. When the camera starts running the indicator jerks slightly, but after ca. one second returns to its previous position.



If filters are used there is no need to take them into consideration, as, due to their positioning, they are automatically taken into account. Only when polaroid filters are used must the light be measured beforehand and the filter factor then taken into consideration during shooting as polaroid filters effect the light measuring. Regardless of the focal length of the lens used, in this exposure metering system about 25% of the central image area is measured (see also service info at the end of this manual »HMI lighting« :).

## **Fully automatic exposure control**

The ARRIFLEX 16 SR II is also available with fully automatic exposure control; cameras without this feature can be fitted with it at a later date.

Automatic iris diaphragm control is only possible with 16 SR spring-load diaphragm lenses (which have a rod to adjust the diaphragm).

The exposure meter is set previously described.

The change-over to fully automatic exposure control is made on the lens itself by turning the diaphragm ring to index position A. When this is effected, the automatic control circuit is activated when the camera switch is in the measuring position together with the exposure meter. A servo motor in the system moves the iris diaphragm until the optimal setting is obtained. When filming with automatic exposure control, the diaphragm ring must remain in position A. If the camera is switched off, the diaphragm automatically opens fully again. As with manual exposure control, for speed, the setting is held in a memory. This information is held in the memory until new information is fed to the lens.

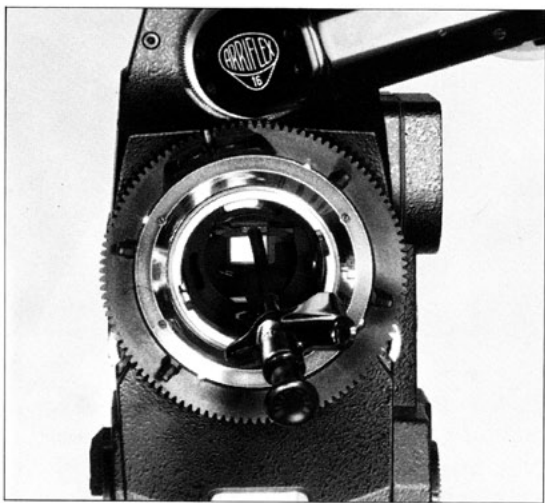
When filming with manual exposure control the lens is »locked« to prevent accidental switch-over to position »A« for fully automatic exposure control. On the other hand, the change-over from fully automatic operation to manual exposure measurement is simply achieved

by turning the diaphragm ring to 22 without »unlocking«. In this way the cameraman can react to special lighting conditions without any delay.



## Changing the fibre optic viewing screen

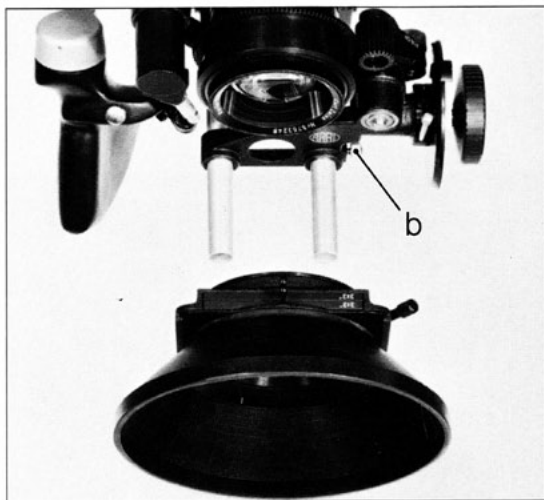
In the 16 SR II instead of the conventional ground glass a fibre optic viewing screen is used to reproduce the reflex image. With the fibre optic viewing screen definition is better, especially with stopped down lenses, as no ground glass grains are visible. The fibre optic viewing screen has markings for film and television formats and light meter scale.



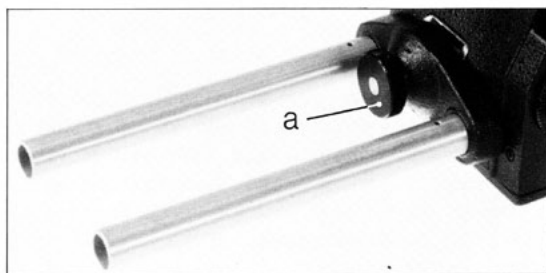
Should it be necessary to remove the fibre optic viewing screen this operation is carried out with a special clamp inserted in the lens bore. Care must be taken when reinserting the fibre optic viewing screen that it is securely seated, otherwise the image reproduced on the film and the image seen in the viewfinder will not be identical.

## Lightweight support

The lightweight support has been constructed as an alternative to the tripod bridge plate, for filming from the shoulder. It is used as a support for the lightweight follow focus system as well as for the bellows matte box when standard lenses are used.



The lightweight support is placed in the camera shoe (19) and fastened with the knurled screw (a) which is found between the two support rods. The accessories can now be pushed on the rods, positioned as required, and held secure by tightening the screw (b).



## The bridge plate

With the bridge plate the cameraman can evenly distribute the weight of the camera when it is being used on a tripod. It is mainly used with extremely long lenses or when several accessories are used at the same time. The base plate (a) of the bridge plate (b), is fastened with the tripod thread to the tripod. The upper part, to which the camera is secured, can be moved forwards and backwards on the dove-tail guide until the optimal centre of gravity is found, and then fastened. When the clamping lever (c) is released the camera can be removed in seconds from the tripod.

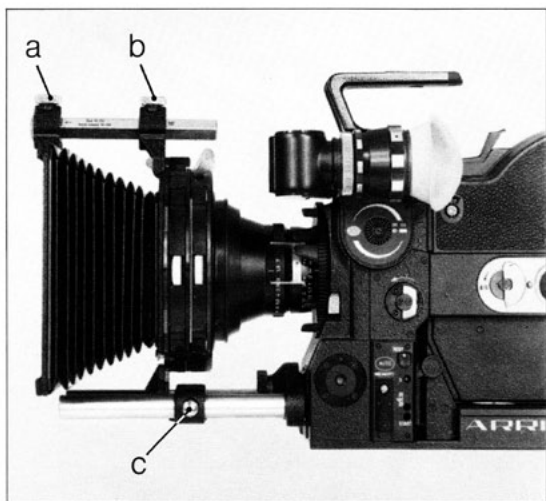
The bridge plate support rods (d) can be adjusted and are used to support the following accessories: universal follow focus system, servo zoom, lens supports and the production matte box.



## Matte boxes

In addition to the bellows matte box which was developed for use with the ARRIFLEX 16 SR II (it can also be used with the 35 III), the 16 St bellows matte box can also be used; the old holder must be replaced with a new guide rail which fits onto the lightweight support. Only certain lenses can be used; the 16 St universal matte box cannot be modified.

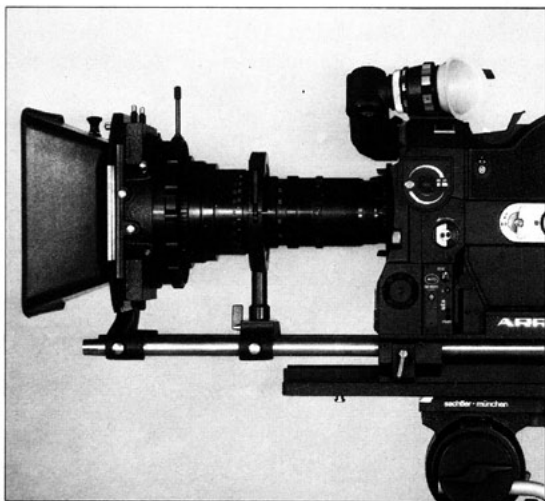
**The bellows matte box** is secured in two places: the upper part is fixed to a matte box rod and beneath it is supported on the lightweight support; it is secured in the required position with the screws a, b, c. It has a fixed slot and a rotatable stage for two 3" x 3" or 4" x 4" or 94 mm dia. filters. With the suitable adapter ring this matte box can be used with short focal length (e.g. the 8 mm Distagon) as well as with long focal length lenses (e.g. the 10–150 mm Angénieux-Zoom).



**The lightweight matte box** is fastened to the front of the lens with a clamp ring. To ensure a close fit there are lens adapter rings for the different lenses. For zoom lenses (with the exception of the Zeiss-Vario-Sonnar f 1.8/10–100) a round rubber hood should be used; for fixed focal length lenses (and the before-mentioned Zeiss-Vario-Sonnar) a rectangular rubber tube should be used. As the lightweight matte box is used mainly for news reporting, a rotatable filter stage is unnecessary. A holder takes two 3" x 3" filter frames. Should the Vario-Sonnar f 2.8/10–100 mm be used, the focus lever can be extended forwards with an extension. With fixed focal length standard lenses which have a rotatable front ring for setting the iris diaphragm, we recommend the use of the additional support for attaching the lightweight matte box to the lightweight support.



**The 4" x 4" production matte box** for 16 mm zoom, standard and high speed lenses, with its three filter planes, affords optimal operation versatility for motion picture productions. Two 4" x 4" filter frames are rotatable and slidable for graduated filters. The likewise rotatable filter ring which can be replaced by a reflex prevention ring, is designed to take 4<sup>1</sup>/<sub>2</sub>" round filters. The production matte box is fastened to the support rods of the bridge plate (see also »The bridge and support plate«) or the support plate and can be swung away through 90° to change the lens.



## The camera power supply

A 12 V, 1,2 Ah battery is plugged into the back of the camera and requires no cable. At 20°C its capacity is sufficient to expose a maximum of 6 x 120 m of film. When using this battery, a special battery adapter is plugged into the power connection socket (47) and tightened with a screw, the battery is pushed into the adapter and tilted onto the hinges of the magazine. The camera is now ready for operation.



The camera can also be run from a 12 V battery connected with a power cable (model KCU). The 4-pole battery connector and its cabling is identical to that used with the ARRIFLEX 16 BLEQ and the ARRIFLEX 35 BL. The camera battery is used to run the quartz controlled drive motor, the exposure meter and automatic diaphragm control as well as all the electrical accessories.

## The voltage control display

When sufficient capacity is available the battery voltage lies between 9.5 and 14.5 volts. The battery can be checked by pressing the red inching button (30) or when the release (28) is in position »Start«, the voltage control display (61) will light up. If insufficient, that is under 9.5 V, then the LED display will not light up and the battery must be changed or recharged.

### Care!

If the battery voltage is more than 18 V the LED display will not light up either. Do not operate!

To recharge the plug-in battery the double charger NCL SR II is available in our programme. This charger can be used for normal and quick charging and has an automatic time switch off feature and automatic selection for mains 110/220 V. Also available is the Energy Set comprising the camera battery (NC 12/4 E) with a capacity of 4 Ah and a completely insulated charger (NCL 12/4 E) with automatic mains selection 110/120 V. It can also be set to 50/60 Hz. The battery can be carried or used with a shoulder belt.

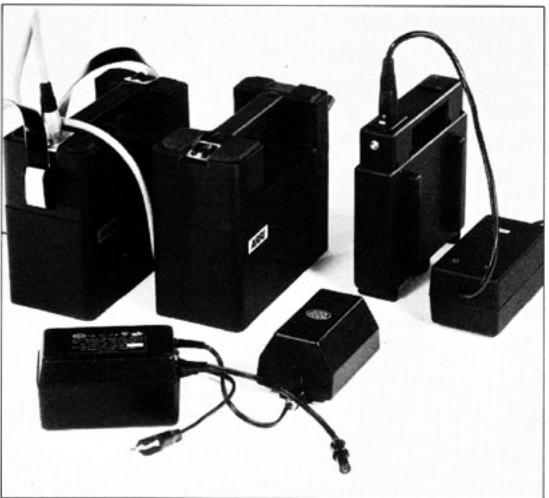
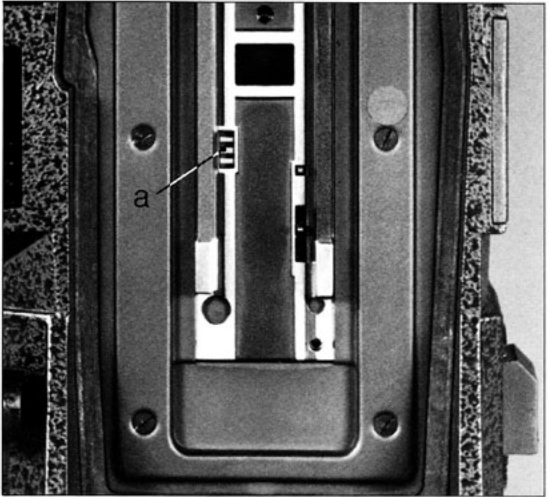
The ARRIFLEX NC battery programme has a new NC 12/7 R battery with plastic housing and thermal protection for each cell during charging, as well as a voltage test feature. The charger NCL 08 R also has a plastic housing which is resistant to knocks and has a feature which checks charge current/charge time/overheating. It has automatic mains selection and is fitted with an automatic switchover feature for maintained charging with accelerated charging. The battery as well as the charger have waterproof bases.

The compact 12 V high energy dry battery PPL is used mainly when charging would not be possible; it cannot be recharged. Suitable for ca. 20–30 x 120 m film, that is 20–30 magazine loads. (see Fig. Page 41).



## The 16 SR time code

The ARRIFLEX 16 SR II is ready to be fitted with the EBU time code system; the film is exposed on the opposite side of the claw, two frames below the gate (a).



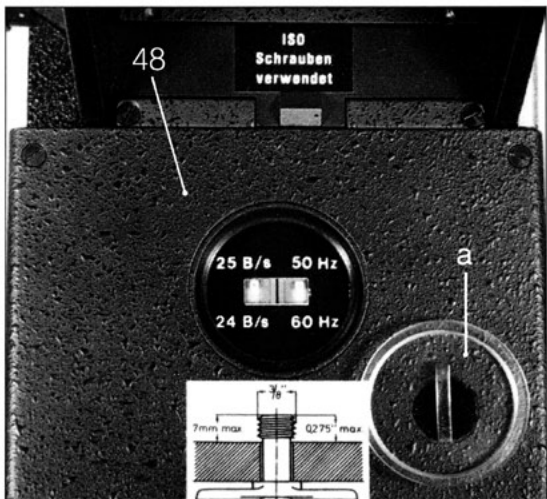
Plug connections and internal wiring in the camera are already fitted for the plug-in, electronic quartz controlled time code system (b).



An additional plug connection inside the camera is provided to connect the recorder diode module. This is also used as a connector for the conventional full frame start marking lamp, the signal for which is taken from the motor control unit.

## Camera speed switch 24/25 fps or 50/60 Hz

The switches are to be found in the camera base plate and are visible when the magazine is removed (48): The switches lie beneath the clear plastic cover (a). This allows one to see if the camera is set for 24 or 25 fps or 50 or 60 Hz. To change over, remove the plastic cover and set as required, then replace the cover. The switch over can, of course, only be effected when the camera is switched off and the battery disconnected from the camera.



## Pilot tone output

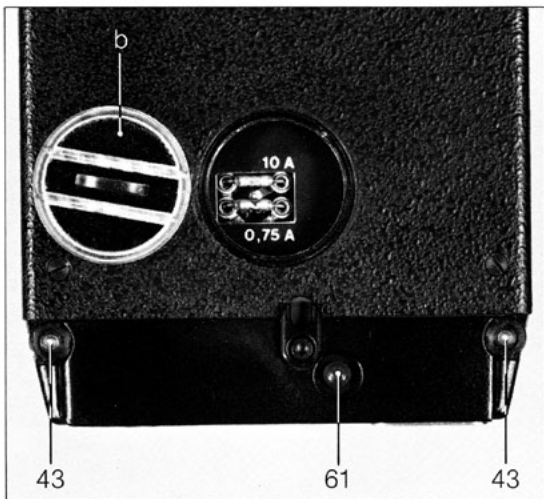
On the left side of the rear base is the standard 5-pin pilot tone output (44) for the standard ARRIFLEX pilot tone cable. For all ARRIFLEX cameras there are standard pilot tone cables.

## Fuses

To protect the electronics and the internal camera wiring the motor as well as the electronics are secured with plug-in fuses – motor fuse = 10 A, electronics fuse = 0.75 A.

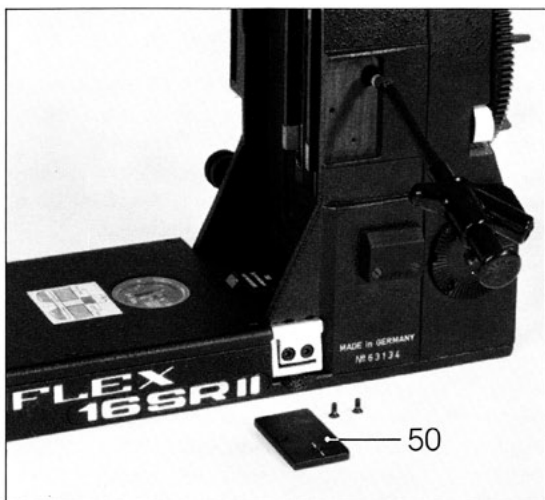
Remove the magazine and disconnect the battery; using a coin remove the plastic cover (b). The fuses are now accessible and can be easily removed with a special clamp.

2 reserve fuses are located in the plastic cover. When they are removed their ends must be bent at right angles so that they fit easily into place. Replace the plastic lid and procure new fuses.



## Full frame start marking lamp

The full frame start marking lamp is to be found under a cover plate (50) on which the film plane marking is also engraved.



To replace the lamp, first remove both countersunk screws. When the magazine is removed the cover plate (50) can be lightly pulled up so that the threads for the full frame start marking lamp are visible.

With a special clamp the complete full frame start marking lamp can be lifted out and replaced with a new one. The new lamp must be securely positioned. The cover can then be replaced. The lamps are long-term lamps and are operated at below their rated voltage and so have a service life of several hundred hours. A lamp change should be a seldom occurrence.

**Note:** After the lamp has been changed carry out a check of the functions as the lamp's silver contacts may have oxidized and need to be cleaned.

## Electrical accessories

### a) Panhandle switch model RCSR

The panhandle switch can also be used with the ARRIFLEX 35 BL, the 16 BLEQ and the 16 St with universal motor; its cable plug is inserted into the middle socket (45) of the camera's rear plug board and enables the camera to be switched on and off at the panhandle.

The camera can only be started from the panhandle when the camera release (28) is placed in the »measuring position« or the push button (57) on the universal hand grip is operated. This electrical locking function prevents the camera being switched on in error as well as filming with open diaphragm.

### b) Variable speed unit VSU

The VSU unit, which is attached to the panhandle, is also plugged into the middle socket (45) of the camera's rear plug board. As with the panhandle switch RCSR the camera is also switched on and off by pressing the round button. Close to it is to be found a toggle switch; when in position »cam. ref«. (camera reference), the camera operates at a constant quartz controlled speed; when in position »var« (variable) the camera can be operated between 5–75 fps (with the ARRIFLEX 16 SR-HS II, 10–150 fps).

### c) Phase shifter unit PHU

With the phase shifter unit the phase relationship of the quartz-controlled camera can be corrected when filming from television monitors by pressing the button. The connection for the PHU is the middle socket (45) of the camera's rear plug board.

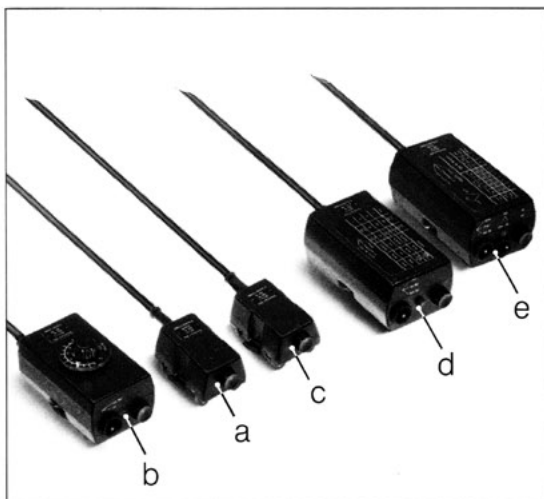
### d) EXS II external synchronizer

The EXS II external synchronizer with BAs signal, camera on/off switch, out-of-synch indicator, camera type selection switch and built-in phase shifter button is used for synchronizing the camera with another camera, with the mains, or with a monitor signal (signal  $50/60 \text{ Hz} \geq 2 V_{ppr} \leq 10 V_{ppr}$  signal form sinus or impulse BAs, impulse minimum 1 ms, impulse ratio

1 : 10). Also supplied is a monitor sync cable KMS. The connection for the EXS II is the middle socket (45) of the camera's rear plug board.

### e) Remote control unit FSZ

The remote control unit FSZ fulfills all the functions of the EXS II; additionally, with this unit, the frame rate can be set quartz synchronously in steps from 6–75 fps. External synchronization is also possible at 25, 50 and 75 fps, for synchronization with the lighting supply mains. For mains synchronization with the FSZ or EXS II the mains sync transformer NSYTR 2 for primary 220 V, secondary 1 V<sub>sec</sub> is necessary. The above-mentioned external accessories can be connected simultaneously with the frame and meter counter EFC via the ZV accessory connector.



## The ARRIFLEX image stabilizer

When this accessory is used a steady, upright image can be produced in the viewfinder and on the film in situations when the camera is shaken and jolted.

The Stabilizer is light and so is ideally suited for hand-held shots. The Stabilizer works on a gyroscope principle which must be borne in mind when panning the camera. The maximum panning speed is  $4^{\circ}/\text{sec}$ . The Stabilizer can be used horizontally or vertically; it is fixed onto the bridge plate rods and, according to the length of the lens used, is held in position with a clamp screw. The ARRI lightweight matte box provides sufficient shade; if required, an additional lightweight matte box holder can be mounted on the rear clamp ring of the Stabilizer for inserting filters between the lens and the Stabilizer.



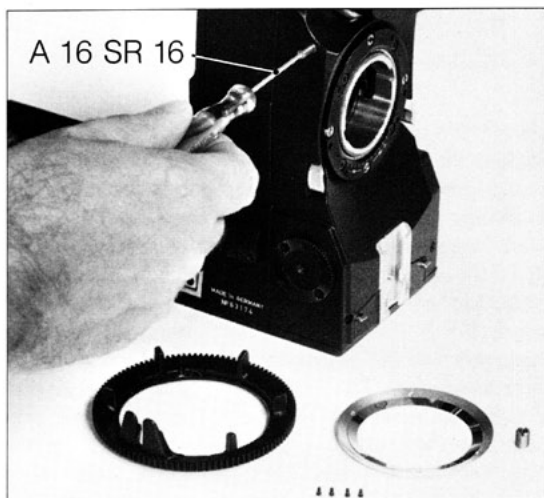
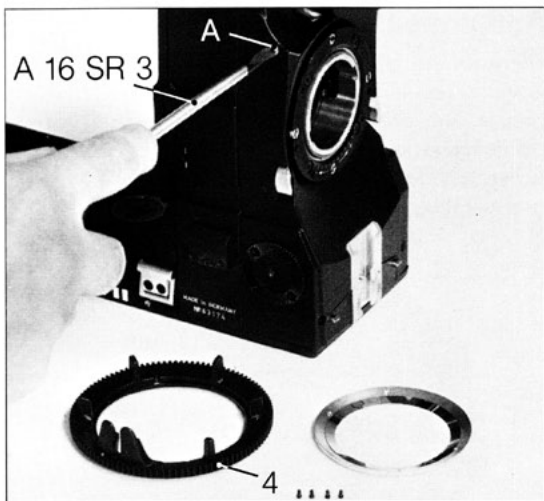


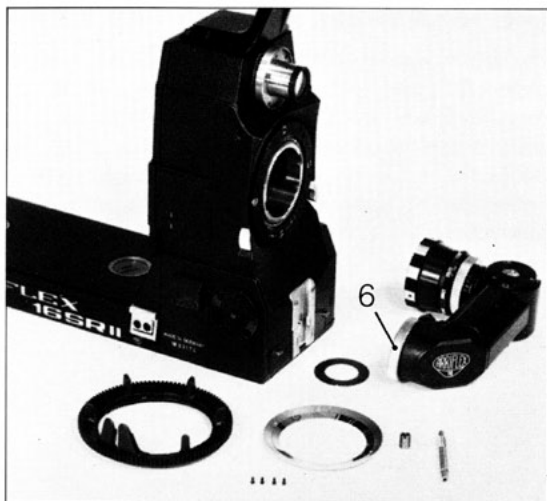
## Adaptation of a video system

The video adaptation enables the director and others working on the production to view the finder image, before and during shooting, independently of the cameraman, on any desired number of monitors in accurately framed, true perspective. The rotating and pivoting viewfinder is replaced with the video



adaptation and is fastened with the collar nut (6). To remove the rotating and pivoting viewfinder, unscrew the chrome plated cover plate with engraved index markings and then remove the geared catch ring (4); then loosen the bushing (A) with a special wrench (S 16 SR-3) and turn the worm (friction adjustment) about ten turns anticlockwise with a hex socket screw driver SW 2 (A 16 SR-16). The bushing can now be removed and the worm also after a few anti-clockwise turns more. The collar nut is unscrewed (6), the viewfinder being held securely. The viewfinder can now be pulled out forwards; the friction disc (pertinax ring) between the viewfinder and the primary optics





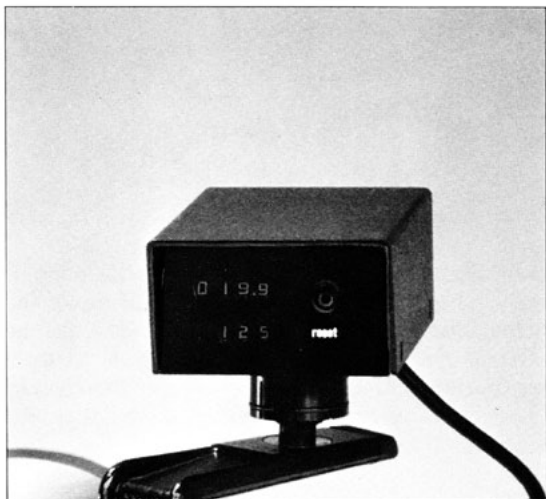
must also be removed. The video adaptation is mounted reversing the above described steps. The friction disc is not used. Care must be taken that the adapter arm for securing the viewfinder (seen in taking direction) is on the left side of the camera housing. It is not possible to turn the video adaptation through 180° for left eye viewing.

**Note:**

Cameras with modified friction disk do not need to have this disk removed. Simply turn the friction disk so that the milled edge of the gear ring lies below the retaining nut. The viewfinder can be screwed outwards now.

## EFC 16 SR digital counter

The frame speed and amount of film exposed in meters (or in feet with the alternative model) can be read from the new EFC 16 SR digital counter. The counter can be adapted to cameras with 24 fps or, alternatively, 25 fps. A memory, powered with a battery lasting approximately six months, retains the amount of film exposed when the camera is separated



from its battery. The EFC-16 SR can be connected directly via a cable with the camera's electronic shoe. (Socket 45); when the VSU is used with the EFC-16 SR, the accessory distributor ZV is necessary. The counter is attached to the additional thread (40) on the camera carrying handle; the ball and socket joint connection enables the EFC-16 SR to be positioned in any direction for easy reading.

## Film plane indicator

The film plane indicator (50) is used for precise evaluation of the taking distance, with close shots, between the camera and the subject or for deciding the distance for the microphone. The indicator is engraved in the cover of the full frame start marking lamp which is found on the right hand side of the camera (seen in taking direction).

## The asynchronous diode

When the camera is started a red-lamp lights up on the right-hand side of the viewfinder image, and after a short while disappears. This is a signal sent by the asynchronous diode which keeps the red lamp visible until the camera has reached the selected frame speed.

If the camera is running not completely sync with the selected frame speed then the lamp lights up again. When external frame speed selection is used then the lamp lights up also when the frame range of the exposure meter is not reached (e.g. break of cable for the external frame speed selection). The asynchronous diode is connected inversely with the camera run control (43) – that means that when the asynchronous diode lights up in the viewfinder then the two red control lamps for camera run go out.

The asynchronous diode **cannot** be used as a control for the battery voltage.

## The time counter

The time counter, when the camera is fitted with this function, is to be found above the 4-pole plug (51). It is a graded rod in which there is a mercury column with marker. When the camera is operated for 100 hours the marker travels from left to right, and then travels in the opposite direction in the next 100 hours or operation. The exact operating time of the camera can be determined and controlled.

## Service

For a trouble-free film run, especially with regards to steadiness of image, the camera side film channel must be kept absolutely clean. Always check that no emulsion deposit has built up. Emulsion deposits on the film gate can alter film focal distance which, when lenses with a very short focal length are used, can lead to unsharpness.

The film channel is easily accessible and can be cleaned with a PVC rod. We recommend the use of the ARRI plastic film track cleaning rod. Under no circumstances attempt to use metal or other hard tools.

The function of the magazine film guide is also of great importance. Special care must be taken of the film pressure block. When the magazine is placed on the camera this automatically forms a protective film guide. The film is pressed against the pressure gate with a carefully measured force. To adjust this force a special unit is necessary which also can be used to control the movement of the pressure block.

Apart from these steps, the ARRIFLEX 16 SR II is basically maintenance free. Neither oil nor grease is necessary.

Authorized ARRI repair shops are available for servicing.

## Breakdown help when the automatic diaphragm and shutter drive are defective

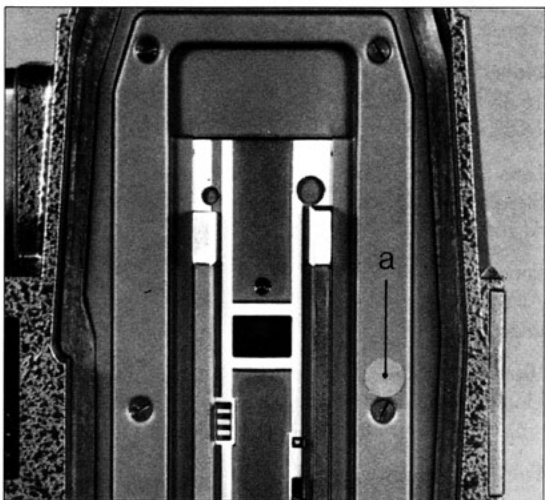
Should the servo motor used for the automatic diaphragm setting become defective, the automatic diaphragm and iris shutter functions can still be operated when the following steps are taken:

First remove the magazine from the camera (see changing 120 m magazine) so that the film channel is visible.

Then remove the black round sticker (a) which is found to the right of the film channel on the cover plate. Beneath it is a screw; turn it clockwise through approx. 90° and replace the sticker.

The camera can now be used again and the automatic diaphragm function is again operative.

The iris shutter f-stop must however be manually set in conjunction with the manual exposure meter.



## Technical data

### ARRIFLEX 16 SR II/16 SR-HS II

#### Measurement

Length, measured from lens flange

Viewfinder horizontal LxHxW 264x195x160 mm

Viewfinder vertical LxHxW 264x287x100 mm

#### Weight

Camera body, 3,2 kg (7.05 lbs) 120 m magazine 2,2 kg (4.85 lbs)

#### Magazine

120 m coaxial quick-change magazine for use with film on plastic bobby, »Winding B« or (with increased noise level) 60 m daylight loading spools; hinged lid

#### Film movement

Kinematic, jointed pulldown; registration pin; image steadiness is  $\leq 1\%$  of frame height. Registration pin position +3

#### Shutter

180° one-piece, mirror shutter intersects optical axis 9 mm before the focal plane at 45°, reflection upwards.

#### Noise level

16 SR II 25 + 1 dB (A)

16 SR-HS II 32 dB (A) at 24 fps, 56 dB (A) at 150 fps

#### Lens mounting flange

Steel bayonet, flange focal distance 52 mm, opening 41 mm  $\varnothing$

#### Lenses

All standard unblimped ARRIFLEX 16 BL lenses can be used

#### Viewfinder

Universally adjustable with automatic image compensation, removable eyepiece, 10 fold magnification

#### Focusing screen

Interchangeable fibre optic screen for TV or cinema format



**Exposure control**

Electronically governed. Data input only for film speeds 13–31 DIN/1000 ASA. Indication range  $\pm 2$  stops

**Fully automatic exposure control**

Available with or without automatic exposure control, suitable for later fitting for fully automatic exposure control

**Power**

(permitted)  $> 9.5 \text{ V} < 14.5 \text{ V}$   
12 Volt, Connector: 4-pin DIN 15931

**Plug-in battery**

12 Volt, 1,2 Ah

**Camera motor**

DC quartz precision motor, 1500 rpm at 25 fps, 1440 rpm at 24 fps, quartz accuracy  $5 \times 10^{-6}$

**Frame speeds**

Quartz 24/25 fps

**Manual speed control**

With variable speed unit (VSU) Variable 5–75 fps (16 SR-HS II 10–150 fps)

**Power consumption**

to max. 1.5 A at room temperature

**Switch off**

Automatic switch-off if film jams etc.

**Release**

2 step release for diaphragm operation

**Temp. range**

$-20^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$  ( $-4^{\circ}\text{C}$  to  $+122^{\circ}\text{F}$ )

**Pilot tone**

Pilot tone supply DIN 15575, pilot frequency 50 or 60 Hz

**Start marking**

Automatic full frame start marking

**Time Code**

Prepared to accept a time code generator

## The ARRIFLEX 16 SR-HS II

The ARRIFLEX 16 SR-HS II is a development of the 16 SR-HS. The exposure control system is the same as in the 16 SR II, the automatic exposure control is, however, a standard fixture.

Both manual exposure control and automatic exposure control (when using lenses with spring loaded diaphragm) can thus be used. The frame speed of the 16 SR-HS II can be adjusted steplessly from 10–150 fps with the Variable Speed Unit (VSU). There is a special scale graded from 10–150 fps available for use with the VSU, but the standard 16 SR II scale graded from 5–75 fps can also be used; the set reading need only be doubled to obtain the actual frame speed. With the exposure meter, the frame speed is automatically taken into account.

The noise level, at 25 fps 32 dB (A) and at 150 fps 56 dB (A), is relatively low.

A trouble-free run for the complete frame speed range can only be guaranteed when the threaded film is not colder than  $-5^{\circ}\text{C}$  ( $23^{\circ}\text{F}$ ). The camera is also fitted with a rev limiter which automatically switches the camera off when a speed of 165 fps is reached. With the exception of the magazines, the complete range of the 16 SR mechanical, optical, electronic and electrical accessories can be used with the 16 SR-HS II.

The standard magazines for the 16 SR II are built with a spring-loaded pressure plate and for a focal plane measurement of 52 mm. The 16 SR-HS II needs a special magazine with a rigid pressure gate and the high speed film run makes a film channel with a focal plane measurement of 51,970 mm necessary. To avoid confusion with the magazines, the 16 SR-HS II magazines are finished in an attractive grey.

# Service-Info

## 16 SR II exposure meter used with HMI lighting

### 1. General

Over the past years ARNOLD & RICHTER has developed a new exposure meter for the A 16 SR. Technically it had to reflect the state of the art and had to possess the largest metering range possible to meet the requirements of modern film materials.

The exposure meter we introduced in 1981 fulfills these conditions as fully as possible; the camera rotational speed is automatically taken into account and the high stability and precision of the former exposure meter reading is maintained.

A parallel occurrence was the introduction of lighting equipment using HMI bulbs. The HMI discharge lamps supply an intermittent light; the film camera, as is widely known, intermittently exposes the film. The cameraman must be aware of this and take into consideration the fact that two intermittent processes are taking place when he is filming with HMI lighting. This information sheet is intended as an aid.

### 2. Use of exposure meter under normal conditions

When using the exposure meter under normal lighting conditions i.e. daylight or incandescent lighting, the instructions given in the 16 SR II instruction manual can be followed without restriction.

### **3. Use of exposure meter in conjunction with HMI lighting fed from a 50 Hz mains supply**

#### **3.1 Shutter opening 180° / 25 fps / 50 Hz**

The exposure time is 20 ms. The HMI light period is 10 ms, that is, for 2 light periods one frame is exposed. Result: no flicker effect as independent of the phase relationship the same amount of light per image is given to the film. The exposure meter receives light at different points of the HMI light period, which, under certain circumstances can lead to a fluctuating indication error of  $\pm 1$  stop.

Aid:

with circumstances as above, light metering only when camera is not running. Do not use automatic exposure meter control. Fluctuation of indicator after camera is switched on does not produce light fluctuations on the film. When lighting or scene is changed, a new reading must be taken when the camera is not running. See diagram.

#### **3.2 Shutter opening 180° / 24 fps / 50 Hz**

Exposure time is 20,83 ms. The light period is 20 ms, that is 10 ms per half wave. Result: light variation (flicker effect) on the film and in the reading as in 3.1.

Aid:

use HMI constant light (AR 200) or incandescent light or only a minimal proportion of HMI light with daylight filming.

### **3.3 Shutter opening 180°/variable speed/50 Hz**

Exposure time is variable.

Result:

light variation (flicker effect) on the film and in the reading as in 3.1.

Aid:

HMI constant light or incandescent light.

### **3.4 Shutter opening 172,8°/24 fps/50 Hz**

Exposure time is 20 ms.

Result:

no light variation on the film, but variation in the reading as in 3.1.

Aid:

metering only when camera is not running. Do not use automatic exposure control. Fluctuation of indicator after camera is switched on does not produce light fluctuations on the film. When lighting of scene is changed, a new reading must be taken when the camera is not running.

## **4. Use of exposure meter with HMI 60 Hz supply**

### **4.1 Shutter opening 180°/24 fps**

Exposure time is 20,83 ms, light period is 16,6 ms.

Result:

light variation on the film and in the reading.

Aid:

HMI constant light or incandescent light.



## 4.2 Shutter opening 144°/24 fps

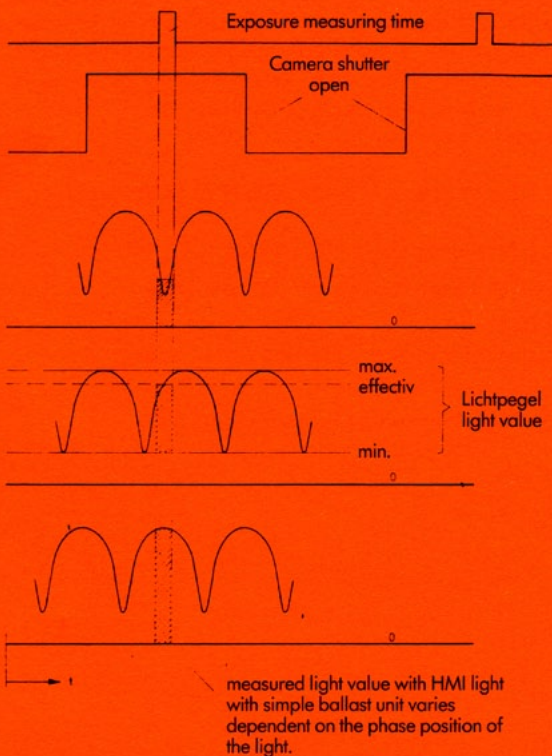
Exposure time is 16,6 ms, light period is 16,6 ms.

Result:

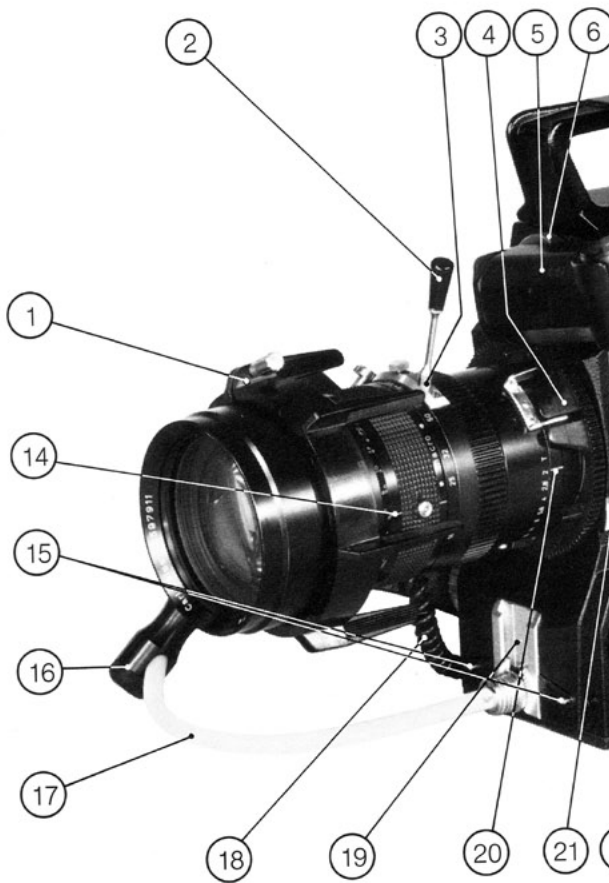
no light variation on the film but variation in the exposure meter reading.

Aid:

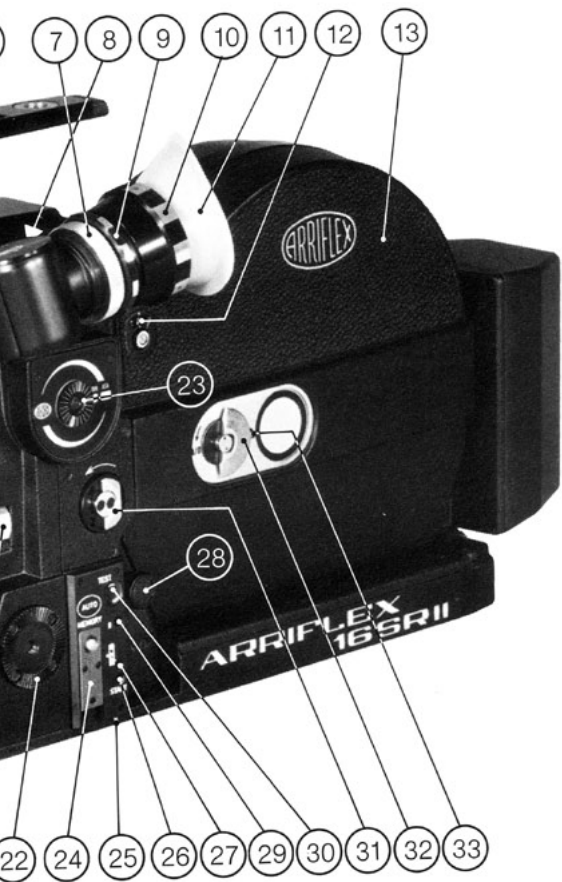
metering only when the camera is not running. Do not use automatic exposure control. Fluctuation of indicator after camera is switched on does not produce light fluctuations on the film. When lighting or scene is changed, a new reading must be taken when the camera is not running.







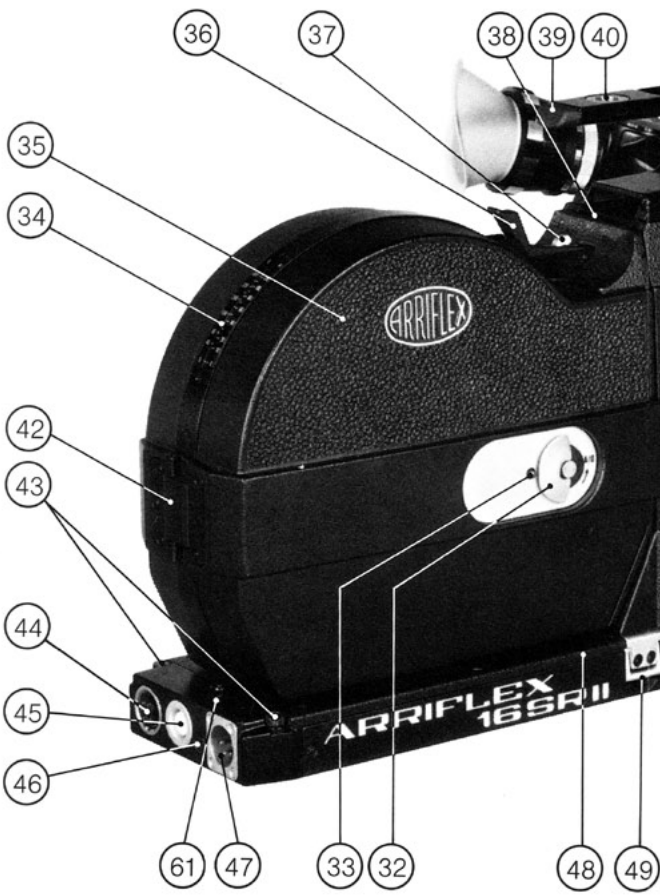


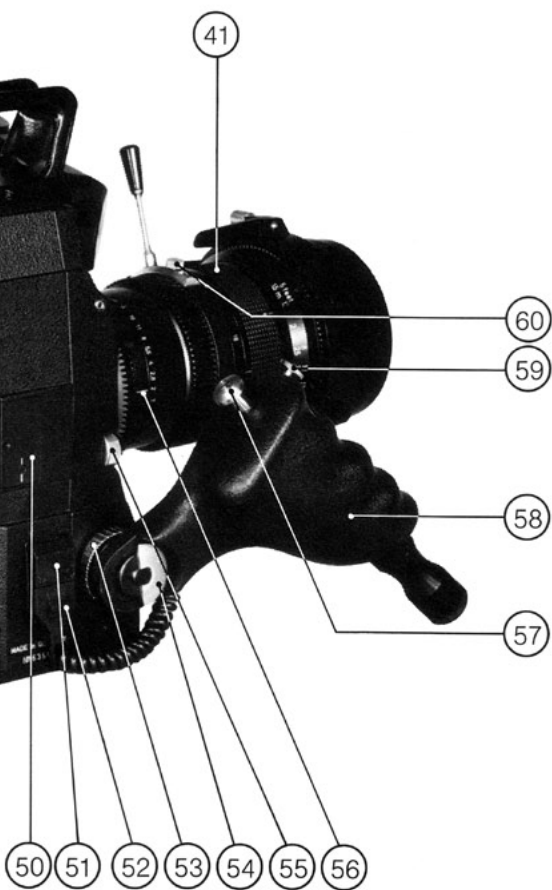


## Illustration guide

- 1 Focusing ring
- 2 Zoom lever
- 3 Screw thread for zoom lever
- 4 Driver rings for diaphragm and focusing
- 5 Rotating and pivoting viewfinder
- 6 Collar nut for fitting the viewfinder to the camera  
(this can only be carried out in an authorised  
ARRI Service Centre)
- 7 Collar nut for fitting the eyepiece
- 8 Eyelet for carrying strap
- 9 Lock ring for diopter adjustment
- 10 Diopter adjustment
- 11 Eyecup
- 12 Exposed film counter
- 13 Wind-up cover, 120 m coaxial magazine
- 14 Lens index mark, white (focal length, focus)
- 15 Retension pin for lightweight support
- 16 Protecting collar
- 17 Flexicable with spring-loaded holder  
for connector plate
- 18 Universal handgrip cable with 4 pin plug  
and safety stirrup
- 19 Cameras shoe for lightweight support  
and flexicable connector plate
- 20 Lens index mark, white (diaphragm)
- 21 Lens release button (left)
- 22 Rosette for fastening an additional handgrip  
(left side)
- 23 Setting for DIN/ASA
- 24 Memory button (only cameras with built-in  
automatic exposure control)
- 25 Retaining lever
- 26 Camera release »start« position
- 27 Camera release »measuring« position
- 28 Camera release button
- 29 Camera release »0« position
- 30 Camera release »test« position for inching and  
voltage control display
- 31 Hinged knob for turning mirror shutter by hand
- 32 Hinged knob for locking magazine
- 33 Safety knob for magazine lock







- 34 Film supply indicator, raw stock
- 35 Film supply side (magazine cover)
- 36 Release lever (magazine)
- 37 Magazine safety lock
- 38 Magazine snap catch
- 39 Carrying handle
- 40 3/8" thread for electrical accessories
- 41 Zoom ring
- 42 Magazine cover hinges
- 43 Running control light
- 44 Connector for pilotone
- 45 Connector for electrical accessories
- 46 Thread for mounting adapter
- 47 Battery connection
- 48 Cover for electronics compartment
- 49 Eyelet for carrying strap
- 50 Film plane indicator and cover plate over full frame start marking lamp
- 51 4-pole plug for handgrip with electrical camera release (see pos. 18) or with time counter
- 52 4-pole socket
- 53 Rosette for fitting handgrip
- 54 Folding grip for fastening handgrip
- 55 Lens release button (right)
- 56 Additional lens index (red)
- 57 Press button for cable release (in flexicable for operating spring loaded diaphragm control and preparing exposure control—measuring position—simultaneously for unlocking release button 59)
- 58 Universal handgrip
- 59 Press button for camera release
- 60 Knurled screw for zoom lever
- 61 Voltage control display



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**ARRI** 

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ARNOLD & RICHTER CINE TECHNIK  
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