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1 Introduction

In the development of the cameras CF 142, CF 143 and CF 144 it was of great importance for us that the user has no difficulties to operate the camera-internal digital control technique. This is realized with clear and easy to handle operating functions.

Composite video signal and Y/C (S-VHS, Hi8) signal are alternatively available.

The control functions on the camera meet the requirements of a wide range of applications in industry and science.

The standard equipment is:

- 1 camera CF 142, CF 143 or CF 144
- 1 hexagon pin key
- 1 operating manual

Please read this operating manual and the operating manuals of the connected instruments before operating the instruments.



2 Description of the CF 142, CF 143 and CF 144 Cameras

The main features are described In following.

Resolution:

With a resolution of 480 TV lines the cameras lie in the upper range of the color one-chip-cameras.

Sensitivity:

The minimum necessary illuminance is 0.12 lux (1/2" standard configuration) so that the camera can be used even under poor light conditions. This makes it suitable for darkfield and polarization processes as well as for incident light and oblique light processes. An additional automatic integration time control and gain control adjust the exposure time and the video amplification to different or changing light conditions. The combination of integration time control and gain control has a volume-range ratio of 1:10000.

Color Balance:

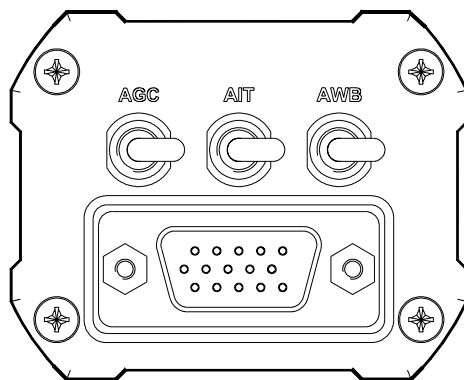
The correct color display is obtained by an automatic white-balance which can be stored alternatively on a fixed value.

3 Installation and Operation

The power for the camera and the video signals are transmitted via a one-cable-connection. Possible combinations of instruments and some examples for the connection of additional instruments are described in the following.

- Camera; camera power supply KTN CSI or NT CSI; video cable; monitor (fig. 1).
- Camera; camera power supply NT CSI; video cable; video printer; video cable; monitor (fig. 2).
- Camera; camera supply cable; measuring system; video cable; video printer; video cable; monitor (fig. 3).
- Camera; camera supply cable; monitor with integrated camera power supply (CFM-combination) (fig. 4).

Before starting the instrument set the switches of the camera CF 142, CF 143 and CF 144 to the following positions (standard positions):



Switch	Position
AGC	ON
AIT	ON
AWB	ON

Operation with Power Supply KTN CSI

If you use the camera power supply KTN CSI, connect the camera supply cable which is fixed to the power supply to the KAPPA CSI socket of the camera. The composite video signal or the Y/C signal is alternatively available on the outputs of the power supply (fig. 1).

Operation with Power Supply NT CSI

If you use the power supply NT CSI, the camera supply cable can be plugged to both sides: to the camera and to the power supply (fig. 1).

Operation with Measuring System

If you use a KAPPA measuring system a separate camera power supply is not necessary because it is already integrated into the measuring system. For a detailed description please see the operating manual of the corresponding measuring system. A connection example is shown in fig. 3.

Operation with CFM-Monitor

If you use a KAPPA CFM-monitor a separate camera power supply is not necessary because it is already integrated into the monitor (fig. 4). Additional instruments, e.g. monitor or video printer, can be connected to the power supply, see fig. 1 and 2.

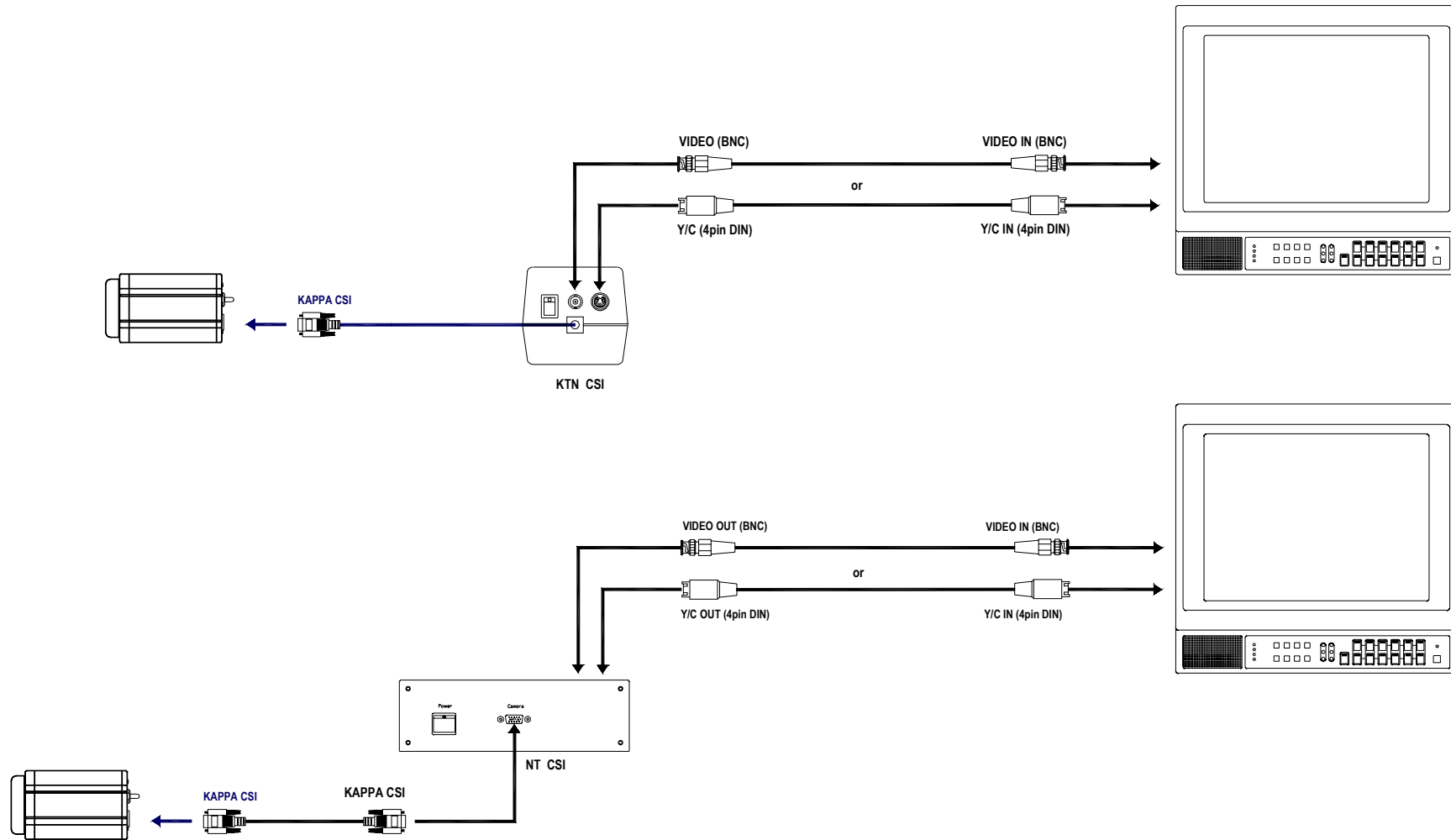


Fig. 1: CF 142, CF 143 and CF 144 Camera Power Supply KTN CSI/NT CSI and Monitor

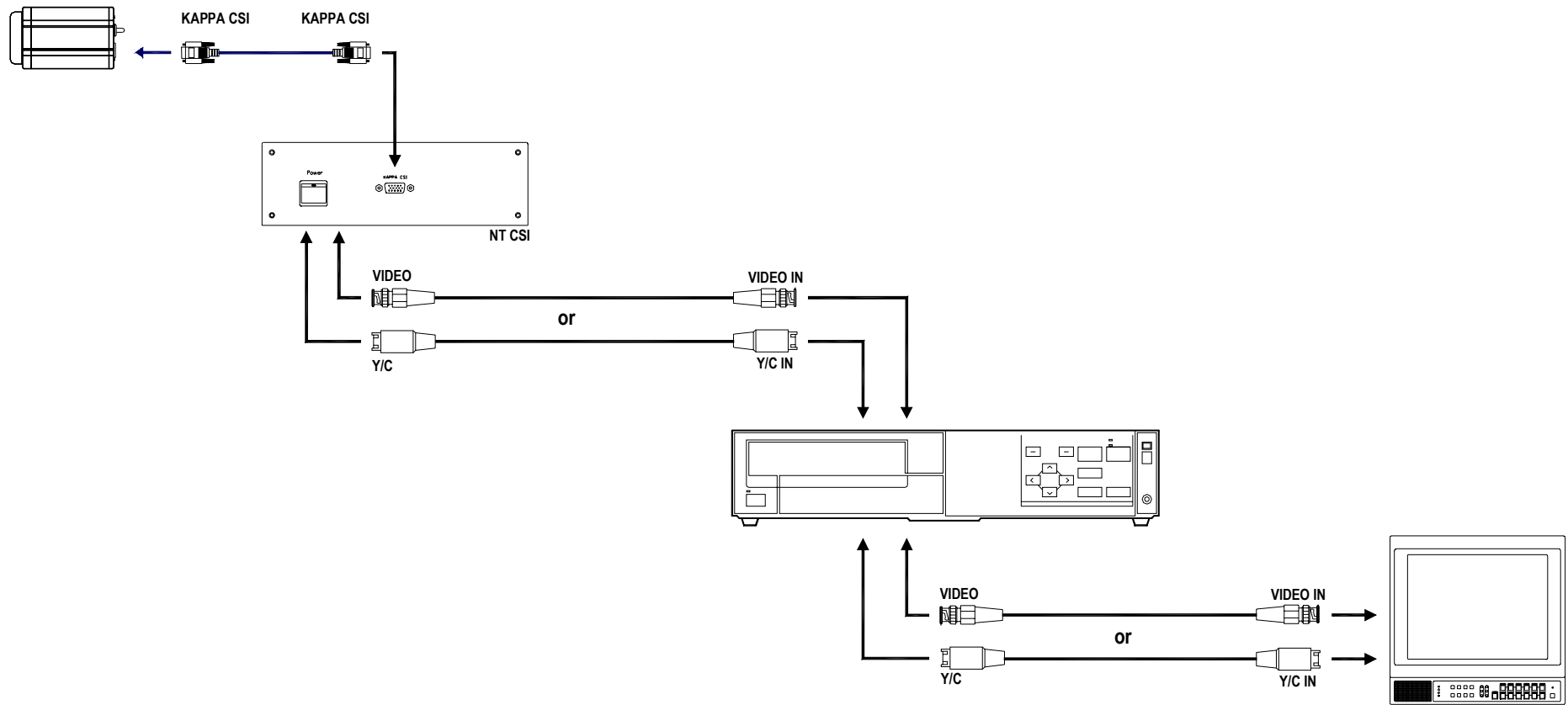


Fig. 2: CF 142, CF 143 and CF 144, Camera Power Supply NT CSI, Video Printer and Monitor

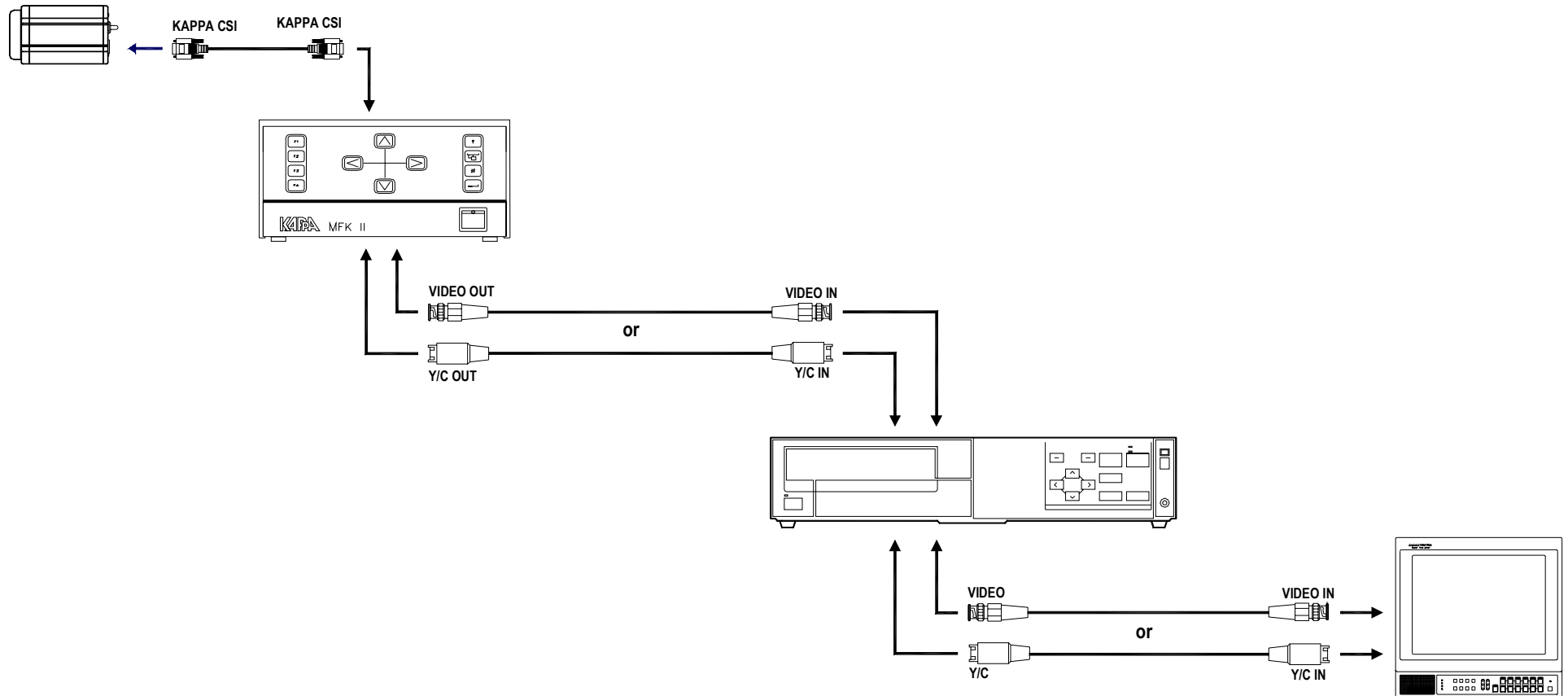


Fig. 3: CF 142, CF 143 and CF 144, MFK II, Video Printer and Monitor

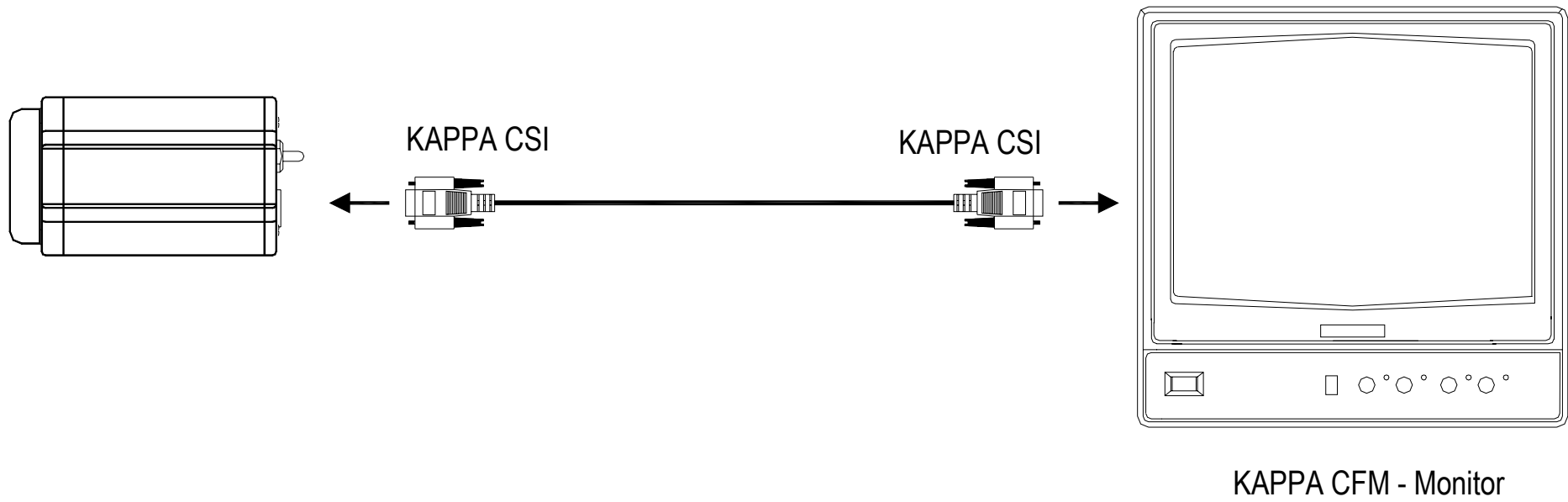


Fig. 4: CFM-Combination

4 Input Terminal Resistance

The image taken with the camera can be processed in many ways. Fig. 3 shows the connection to another video instrument. This can be a video recorder, a video printer or a KAPPA measuring system.

You have to observe the correct adjustment of the 75 Ω input terminal resistance when you connect several video instruments.

A video line system consists of the video signal source, the video line and the termination of this video line (video input of an instrument). The output resistance of the video source, the impedance of the video line as well as the terminal resistance (input of a video instrument) must be 75 Ω each.

The camera and the video line connected to it have the proper resistance of 75 Ω . You have to watch the third item, the terminal resistance.

There are two groups of video instruments. The operating manual of an instrument or the manufacturer informs you about which group your video instrument belongs to.

The *first* group contains all instruments that have a direct connection between their video input and output. You must switch the input resistance of these instruments to high-resistance (High-Z), if these instruments are between two other video instruments. If such an instrument is the last one in a series, you must switch the input resistance to 75 Ω . This ensures that the video line system contains only one terminal resistance.

You must also switch the input resistance to high-resistance (High-Z), if such a video instrument is connected to the line system via a T-connection. However, we do not recommend this arrangement.

The camera CF 142, CF 143 and CF 144 belongs to the *second* group of instruments which have a built-in video output amplifier. These instruments have a fixed input resistance of 75 Ω . There is no direct connection between video input and output. The output of such an instrument represents a video source, and it begins a new video line system.



5 C-Mount and Flange Distance

The C-mount is normally used for video cameras. It is a film industry standard with a one inch thread and a flange distance of 17.526 mm. The flange distance is the optical distance between the sensor (CCD chip) and the surface of the lens.

The KAPPA cameras CF 142, CF 143 and CF 144 is fitted with a C-mount. This means, that lenses for this camera must have a C-mount or a C-mount adapter.

The flange distance is adjusted in our factory according to the norm. If you use a lens which has a different flange distance the picture will be blurred. Then the flange distance must be corrected as described in the following. This adjustment is only valid for this lens. When using the camera in connection with a microscope and the images in the ocular and on the monitor are not sharp at the same time, the flange distance has to be corrected.

6 Adjustment of Flange Distance

As the depth of focus of a microscope is very low it is often necessary to correct the flange distance of the camera to obtain sharp images in the ocular and on the monitor at the same time.

The adjustment should be done by a person with normal vision or by someone who knows the exact extent of his visual defect.

The flange distance is adjusted as follows:

1. Mount the camera on the microscope.
2. Adjust the oculars of the microscope to 0 or to your diopter values.
3. Adjust the image when you look directly into the microscope. If the image on the monitor is sharp no further adjustment is necessary. If the image on the monitor is not sharp proceed as follows.
4. On the bottom side of the camera next to the C-mount ring is a flush-mounted internal hexagon screw. Loosen this screw with the attached pin key.
5. Loosen the C-mount adapter of the microscope so that you can turn it.
6. Turn the C-mount adapter of the microscope carefully while holding the camera in place until the image on the monitor is also sharp.
7. Tighten the hexagon screw and the locking screw of the C-mount adapter of the microscope.

7 Functions of Controls and Connections

The controls and connections of the camera are on the rear side:

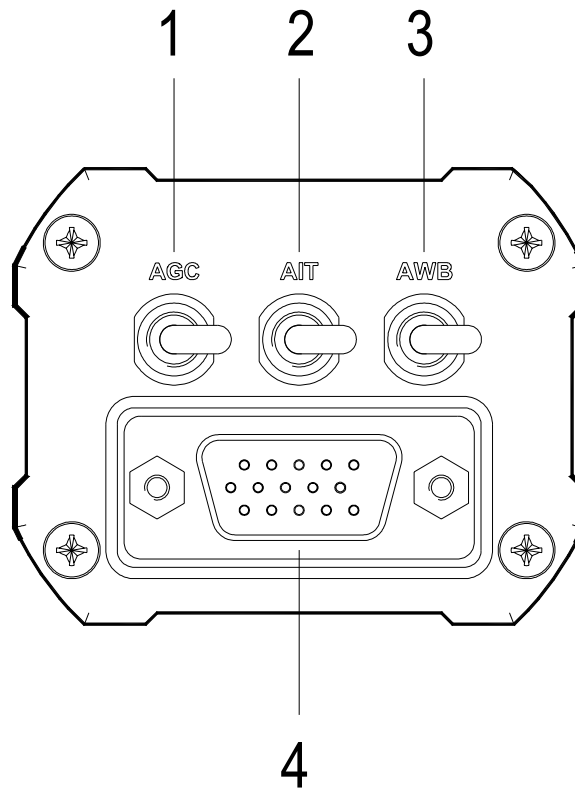


Fig. 5: Camera Rear Side

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- 1 **AGC** In position **ON** the automatic gain control is active. It adjusts the average value of the video signal to the norm video signal level in a limited range (0 ... 14 dB).

 - 2 **AIT** In position **ON** the automatic integration control is active. According to the brightness of the scene the integration time is between 1/50 s to 1/100 000 s.
In position **OFF** the integration is 1/50 sec.

 - 3 **AWB** (Automatic White Balance) To get correct color pictures at different color temperatures the camera must be adjusted to the light in use.
There are two possibilities:
ON Automatic Tracking: The camera tries to get information for the white set from the respective picture contents and from the color temperature of the light in use. This works good when the copy contains parts of the whole color spectrum. If certain colors are dominant the white set must be done with a white object and must be fixed with **LOCK**.
LOCK Adheres to the value found last in the **ON** mode.

 - 4 **KAPPA CSI** (KAPPA Camera System Interface) Connection of the KAPPA system cable (one-cable-connection).



8 Repairs

The camera was manufactured in accordance with stringent standards and was subject to constant quality control during production. Only high quality material and selected electronic equipment were used in production. System failure is therefore highly unlikely. If this should still happen you can check the following:

Defects and Remedy

Defects	Remedy
Camera without functions:	Check connections between camera and monitor and camera and power supply. Check fuses on the power supply (NT CSI). Check adjustments of the connected instruments (e.g. monitor).
Interferences:	Move camera and cables away from power cables or other electrical instruments.
Unsharp image:	Use proper optical equipment, adjust, remove condensation. Adjust flange distance as described in chapter 6.

If you use a different monitor, you can determine, if the cause of the problem is the camera or the monitor. Further troubleshooting on location is not possible. Please contact KAPPA if you cannot solve the problem.

Repairs may be carried out only by KAPPA or by an establishment expressly authorized by KAPPA. Otherwise warranty is void.

9 Safety Guidelines

Observe the following precautions:

- Connect the camera when it is switched off.
- Do not bend the electric cables in a very small radius.
- Do not try to open the camera. There will be the risk of an electric shock.
- Handle the camera with care. Avoid shocks, falls and strong vibrations. The camera can be damaged if it is not treated or stored appropriately.
- Do not expose the camera to water or high humidity or operate it in places where there is such a risk.
- If you direct the camera into the sun or into the beam of a search light, there will be an overshoot or blurring in the shape of vertical stripes in the image. This is **not** a defect of the camera and disappears immediately after turning the camera away from the light. If you direct the camera into the sun for a long time, the sensor can be damaged.
- Only operate the camera within the range of the specified values for temperature, humidity and voltage. See technical data!
- Read all safety and operating manuals before using this and connected instruments.
- Keep the safety and operating manuals so that you can look up things later.
- Observe all warnings on the instrument and in the operating manuals.
- Follow all instructions in the operating manuals.
- Cleaning: Pull the plug of the camera out of the socket before cleaning. Observe the cleaning instructions that are specified for your instrument.
- Only use the proper connections, other connections are dangerous for the safety of your instrument and hazardous for your own safety.
- Do not put the camera on an unstable trolley, pillar, bracket or table. The instrument could drop, be damaged and cause serious injuries.
- Supply the camera with the indicated voltage only. If you are not sure about voltage in your facilities, please ask the vendor of your instrument or the local power company.

- Cables should be arranged so that you cannot step on them and they will not be caught by things. Please pay attention to the cables at the plugs and the sockets.
- For additional protection of the unit, disconnect the plug when you experience thunderstorms or when the unit is not supervised or used for a longer period. This helps to protect the product against damages by lightning or accidental damage.
- Do not overload the socket or the power cables. They could become hot and cause a fire or an electric shock.
- Maintain the unit only in a way described in the chapter "Maintenance". If you open or remove the covers, make sure you disconnect the power cable. Please leave all maintenance to qualified personnel.
- Defects requiring maintenance: Pull the power plug out of the outlet and leave the maintenance to qualified personnel when the following conditions occur:
 - When the cable of the power supply or the plug is damaged.
 - When liquids or objects have gotten into the camera.
 - When the camera was exposed to water.
 - When the camera does not work normally according to the operating manual.
 - When the camera was dropped or when the housing has been damaged.
 - When the camera's performance is reduced.
- Use only spare parts approved by the manufacturer. If you use unapproved parts, there can be a fire, electric shock or other dangers. Also, the warranty becomes void.
- Safety checks: After every maintenance job or repair ask your maintenance engineer to perform safety checks to ensure that the product is in proper operating condition.

10 Maintenance

The video camera is nearly maintenance free. From time to time, wipe off the housing with a soft and clean cloth. Never use any cleaning fluids, chemicals or wax. Always transport the camera with caps protecting the sensor. If necessary, clean the sensor with a soft brush.

11 Technical Data

Sensor			
Camera:	CF 142 (PAL) CF 142 N (NTSC)	CF 143 (PAL) CF 143 N (NTSC)	CF 144 (PAL) CF 144 N (NTSC)
Type:	Interline-transfer-CCD with complementary color filter		
	1/2" CCD optionally EXview HAD CCD*	1/3" Super HAD CCD* optionally EXview HAD CCD*	1/4" CCD optionally EXview HAD CCD*
Size of sensing area:	6,4 (H) x 4,8 (V) [mm]	4,9 (H) x 3,6 (V) [mm]	3,6 (H) x 2,7 (V) [mm]
Pixel size:	8,6 (H) x 8,3 (V) [µm] (PAL) 8,4 (H) x 9,8 (V) [µm] (NTSC)	6,5 (H) x 6,25 (V) [µm] (PAL) 6,35 (H) x 7,4 (V) [µm] (NTSC)	4,85 (H) x 4,65 (V) [µm] (PAL) 4,75 (H) x 5,55 (V) [µm] (NTSC)
Number of picture elements:	752 (H) x 582 (V) (PAL), 768 (H) x 494 (V) (NTSC)		
Sensitivity:	(measured at 20 ms integration time, 50 % video level, gamma 0.45)		
	< 0,12 lux at 14 dB < 0,03 lux at max. gain	< 0,17 lux at 14 dB < 0,04 lux at max. gain	< 0,36 lux at 14 dB < 0,09 lux at max. gain
Spectral sensitivity:	380 to 780 nm		
Filter:	optical lowpass and infrared blocking filter, not removable		
Signal Processing			
System:	10 bit digital signal processing		
Signal/noise ratio:	> 50 dB (measured in a dark image at 20 ms integration, 0 dB gain)		
Resolution:	480 lines (horizontal)		
Signal output:	Y/C (S-VHS), composite		

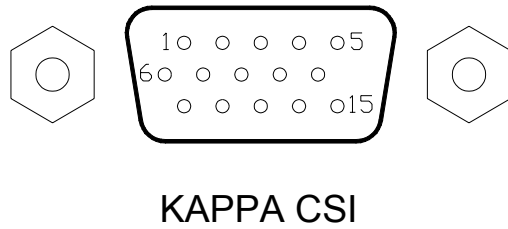
Integration:	1/50 s (PAL) 1/60 (NTSC) to 1/100 000 s automatic (AIT)
Gain:	0 to 14 dB automatic (AGC), 0 dB fixed , 0 – 26 dB (RS 232 adjustable)
Measuring window AIT and AGC:	centred integral
Gamma:	0,45
White-set:	auto
Synchronization:	intern
Adjustments via RS 232:	Integration time, gain, AIT, AGC, gamma, white-set, backlight compensation
Switch:	AIT on/off, AGC on/off, white-set set/lock
General	
Power supply:	9 – 36 V DC, 3W
Connections:	KAPPA CSI (HD-Sub 15pin)
Lens mount:	C-mount, focal plane adjustable
Iris:	Output for mechanical Iris control
Operating temperature:	-20° C to +60° C
Storage temperature:	-50° C to + 90°C
Vibration:	random: 7,5g rms (20Hz to 2KHz)
Shock:	100g (0,5ms halfsine)
Relative humidity:	10 % to 90 %, no condensing

Housing dimensions (BxHxL):	50 x 40 x 77 [mm]
Weight:	approx. 200 g
Standard equipment	camera, operating manual (CD)
Order no.:	CF 142 (PAL) & CF 142 N (NTSC): 961-1400 & 961-1400 N CF 143 (PAL) & CF 143 N (NTSC): 961-1401 & 961-1401 N CF 144 (PAL) & CF 144 N (NTSC): 961-1402 & 961-1402 N
* Super & EXview HAD CCD = Sony trademark for improved sensitivity CCDs (EXview including near infrared region) by incorporation of new SONY semiconductor technology (HAD = Hole Accumulation Diode).	

We are constantly checking the accuracy of the technical data. We are prepared to provide more detailed information on request.

Technical data are subject to change without notice ! 07/04

12 Pin Connection



Pin	Signal	Pin	Signal
1	NC	9	GND
2	NC	10	TXD
3	NC	11	RXD
4	Y	12	NC
5	Chroma	13	NC
6	GND	14	composite video
7	GND	15	+ 9...36 VDC
8	GND		