

TCX 30 A

2/3" 3-Tube Color Camera System

(PAL, NTSC, PAL-M and PAL-N)



TC 3 XK 9,
T 14 BC 93 A 1



TC XV 310 C (B)
Table-top housing



TC BH XV 93 A
Desk-top housing

Field of application

The BOSCH TCX Color Camera System is designed for universal use in medicine, training, industry, and for semi-professional television production studios. The TCX 30 A is distinguished especially by fidelity of color reproduction, high resolution. Practically all current color TV standards, as well as a standard and a studio version, combined with various pickup tubes and an extensive range of accessories, guarantee the wide application range of this system.

Brief description (general)

- 2/3" 3-tube color camera, can be equipped with Vidicon, Plumbicon[®], Chalnicon or Saticon pickup tubes.
- The separation of camera head and CCU makes simpler handling possible because basically only the optical parts are contained in the camera head, while the main electronic components are housed in the CCU which can be located as far as 300 m away.
- The outstanding color quality, with high resolution, makes semiprofessional use of the camera also possible. The color dissection in the camera head is carried out with a high-grade prism splitter.
- For live use of the camera, the B/W viewfinder monitor T 14 BC 93 A 1 (also see page 1/31) with tally light attachment for on-line indication is available.
- By means of a special "Video return" circuit, when using the viewfinder monitor it is possible to feed the actual output picture from the control room back onto the picture screen. This helps the cameraman, for example, in handling the camera according to the script.
- There is the possibility for an intercom connection between the cameraman and the CCU (control room) similar to the practice also common in professional studios.
- An extensive line of lenses, from the 10x to the 20x zoom lens, opens many possibilities for application. A special bayonet lock facilitates the changing of lenses when required.
- The iris can be adjusted by hand or automatically, and a corresponding electronic indication is shown on the screen of the viewfinder monitor. The cameraman can therefore concentrate fully on handling the camera and the lens operations of zoom and focus.
- By means of the automatic black and white balancing (only in conjunction with the TC 292 or with the TC 432 when the studio version of the CCU is used), the camera can be matched to widely varying lighting conditions (color temperatures). The handling of the camera is thereby greatly simplified. The possibility exists of recalling three additional permanently programmable white level settings.
- As result of special electronic circuits, fluctuations in the power supply and temperature have no effect on the quality of the picture produced by the camera.
- The camera and CCU electronics are designed on the basis of modular engineering and are therefore very easy to service. In addition, simple conversion of the system to meet widely varying requirements is possible by simply replacing modules in the CCU (also see the Overview of the TCX System, page 1/33).
- The CCU is supplied as a 19" plug-in module and can, if required, be inserted into a separate table-top housing (option). Two basic versions of the CCU are available, depending on the respective application:

- a) The **basic studio version TC XV 310 C** consisting of:
- 1. Power supply unit TC 252**
With the following functions: on/off, intercom, stand-by, lens operation of zoom, focus and iris, as well as level instrument for monitoring iris.
 - 2. Control board TC 432**
Combined with the studio control unit TC BH XV 93 A it enables the following functions, which can be remote controlled: color matching, black and white balance, white level switch-over, common black and level indication.
 - 3. Connection board TC AP XV 310 C**
For connection of camera, monitor (CCVS operation only if equipped with encoder), div. signal or pulse inputs and outputs, as well as a 50 pole socket for the studio control unit TC BH XV 93 A.
 - 4. 19" Module frame**
To accommodate all parts mentioned above as well as plug-in modules for completion equipment, options and alternatives (see also TCX Overview, page 1/33).
- b) The **basic standard version TC XV 310 B** consisting of:
- 1. Power supply unit TC 252** (see above).
 - 2. Connection board TC AP XV 310 B**
For connection of camera, monitor (CCVS operation only if equipped with encoder), control unit (not for TC BH XV 93 A), as well as div. signal or pulse inputs and outputs.
 - 3. 19" module frame** (see above).

TC 253 for PAL
or **TC 324 for NTSC**
or **TC 354 for PAL-M.**

- 2. Encoder**
It converts the RGB signals into a standardized CCVS signal such as is required, for example, for driving a VTR or a video mixer. In addition the encoder contains an H aperture correction circuit to improve reproduction of picture detail in the horizontal direction. Adjustable color subcarrier phase. According to the TV standard, **one** of the following plug-in modules can be used:

TC 256 for PAL
or **TC 323 for NTSC**
or **TC 353 for PAL-M**
or **TC 464 for PAL-N.**

- 3. Main amplifiers 3 x TC 255**
For electronic processing of the camera color signals red, green and blue, **without** aperture correction. The **three** plug-in modules

TC 255 red, green and blue

are required.
(Alternatively **with** H aperture correction: see TC 347).

- 4. Control board TC 291** (only for basic standard version)
For generating the control voltage for gain control of the three main amplifiers as well as for the white balance and black level. Four different adjustable white levels for matching to different color temperatures, switching of the iris and/or amplifier control between manual and automatic operation. Switching from average value control to peak value control. Automatic iris control for black level for use of the camera with a multiplexer (see also page 3/5) or during microscopy.

Completion



Depending on the TV standard and the respective application, both of the above basic versions of the CCU are made into functioning units by adding the following plug-in modules (see also TCX Overview, page 1/33).

- 1. Pulse generator**
It generates the sync pulses, depending on the TV standard, which are required for operation of the camera. According to the TV standard, **one** of the following plug-in modules can be used:

Alternatives and Options

(see also TCX Overview, page 1/33)

- 1. Main amplifiers 3 x TC 347**
As for TC 255, however **with** H aperture correction and facility for driving an RGB monitor. The **three** plug-in modules

TC 347 red, green and blue

are required.

- 2. Genlock pulse generator**
Same function as pulse generators TC 253, TC 324 and TC 354; however, there is the additional possibility of synchronization to an external CCVS or black burst signal so that, for example, the CCVS signal from another color camera synchronizes the camera with the Genlock pulse generator. This enables both cameras to operate synchronously as is required, for example, for processing in a video mixer. If an ext. sync signal is not available, operation is automatically switched to internal sync. TIMING facility and input hum elimination stage. **One** of the following plug-in modules can be used, depending on the TV standard:

TC 372 for PAL
or **TC 374 for NTSC**
or **TC 375 for PAL-M**
or **TC 382 for PAL-N.**

2.1 Precision oscillator

Option for Genlock pulse generator, for generation of a highly exact, internal subcarrier frequency by means of a temperature-compensated quartz oscillator. According to the TV standard of the Genlock pulse generator, **one** of the following PCB's can be inserted in it:

TC 373 for PAL

or **TC 385 for NTSC**

or **TC 390 for PAL-M**

or **TC 409 for PAL-N.**

3. Unipulse separator

Alternative to the pulse generator or Genlock pulse generator, if only the ext. synchronization is to be carried out with a unipulse mixture from a central sync pulse generator. According to the TV standard, **one** of the following plug-in modules can be used:

TC 254 for PAL

or **TC 325 for PAL-M or NTSC.**

4. Automatic control unit TC 292 (only for basic standard version)

Alternative to control board TC 291. It provides automatic black and white balance, and in addition has three different adjustable white levels which can be recalled separately. The values of the automatic white levels are stored, and are also retained in storage in event of a power failure and when the camera is switched off (battery buffering). The duration of the balancing is shown electronically on the screen of the viewfinder monitor and on the level instrument.

5. Vertical aperture corrector

For subjective improvement of the sharpness of the image in the vertical direction. According to the TV standard, **one** of the following plug-in modules can be used:

TC 257 for PAL

or **TC 322 for PAL-M or NTSC**

or **TC 410 for PAL-N**

6. Measuring accessory

For measurement and checking of the color camera electronics, incl. grid pattern generator, color bar generator, color channel switch and circuit for measuring the black level. According to the TV standard, **one** of the following plug-in modules can be used:

TC 258 for PAL or PAL-N

or **TC 326 for NTSC or PAL-M.**

Control Units

1. Studio Control Unit Board TC BH XV 93 A



TC BH XV 93 A
Shown with desk-top housing

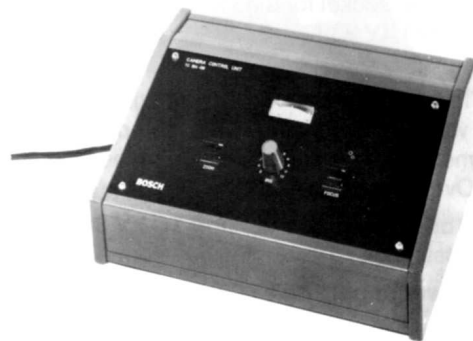
For connection to the studio CCU, for the following, remotely controllable functions: color matching, black and white balance, white level switch-over, common black, mode selection, lens operation of zoom, focus and iris as well as tally, level display instrument and intercom connection.

Desk-top housing Size 1 for TC BH XV 93 A
see page 11/4.

2. Control unit board TC BH OB 9 A 1 (not shown)

For connection to the standard CCU, for the remotely controllable functions: zoom, focus and iris as well as a level display instrument and intercom connection. Desk-top housing Size 1 for TC BH OB 9 A 1
see page 11/4.

3. Lens control unit TC BH OB 9 A



For connection to the standard CCU, technically the same as TC BH OB 9 A 1, but without intercom connection and incl. desk-top housing Size 1.

4. Lens control unit TC BH OB 9 B



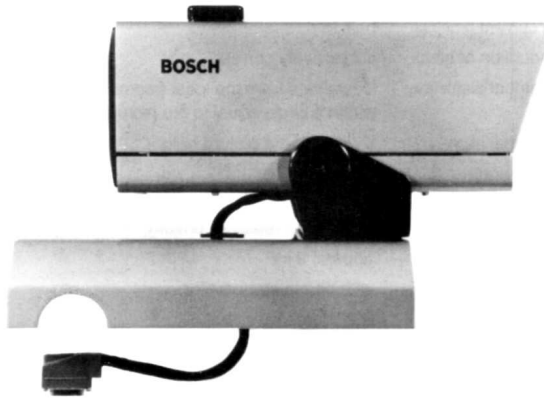
For connection to the camera head, for the functions: zoom, focus and iris, as well as switch-over between two white levels. The TC BH OB 9 B can only be operated together with control board TC 291 (see also page 1/29).

5. Lens control unit TC BH OB 9 C



For connection to the camera head, for the functions: zoom, focus and iris, as well as activation of automatic black and white balance. The TC BH OB 9 C can only be operated together with the automatic control unit TC 292 (see above).

14 cm B/W Viewfinder Monitor T 14 BC 93 A 1



The B/W video monitor T 14 BC 93 A 1 was developed specially for use as a viewfinder monitor in conjunction with the 3-tube color camera TCX and can be easily

adapted both mechanically and electrically to every TCX camera.

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Brief description

- Fully transistorized printed circuits with most advanced IC technology guarantee high reliability.
- The mechanical adaptation of the viewfinder monitor to the TC X camera is carried out through a panning bracket (self-locking).
- All operating controls are accessible from the front panel.
- Operating mode switching between CCVS, R, G, or B color component.
- Tally lamp built in as standard feature.
- Level indication added electronically to picture for iris control.
- Contour switch for improved reproduction of picture details.

Technical data (TCX 30 A)

Camera dimensions:	without viewfinder length: 330 mm width: 275 mm height: 135 mm	with viewfinder 410 mm 275 mm 300 mm
Weight:	without viewfinder abt. 6.5 kg without lens	with viewfinder abt. 11 kg without lens
Power consumption:	60 VA without viewfinder 110 VA with viewfinder	
Power supply:	110, 120, 220, 240 V AC $\pm 5\%$, 50/60 Hz	
Pickup tubes:	all commercial 2/3" pickup tubes, magnetically focussed, for ex. Plumbicon®, vidicon	
TV standard:	1. PAL 625 lines, 50 Hz 2. PAL/M 525 lines, 60 Hz 3. PAL/N 625 lines, 50 Hz 4. NTSC 525 lines, 60 Hz	
Synchronization:	1. internal sync with built-in pulse generator 2. external sync with unipulse mixture 3. external sync (Genlock) with CCVS or black-burst (switches automatically to internal sync if no input signal received)	
Inputs:	power; 1 x CCVS into Z = 75 Ω (video return); 1 x unipulse (can be looped through) when the camera is fitted with the unipulse separator; 1 x CCVS/TV with Genlock operation	
Outputs:	3 x CCVS 1 V _{pp} /75 Ω 1 x CVS 1 V _{pp} (only with measuring accessory) 1 x C 2 V _{pp} /75 Ω 1 each blanking, sync, flag, 4 V _{pp} /75 Ω 1 x unipulse 1 V _{pp} /75 Ω 1 each NCV(S) R, G, B	
Depth of modulation:	when transmitting a 4-MHz bar pattern and with optimum adjustment in the center of the picture without aperture correction $\geq 50\%$ with Vidicon, typ. 70% or $\geq 45\%$ with Plumbicon, typ. 55% measured in luminance channel. With aperture correction = 100% (depending on tubes) with color subcarrier trap.	
Sensitivity:	Plumbicon® abt. 600 lux vidicon abt. 3,000 lux with 200 nA in the green channel, with aperture f 1.8 and reflection factor 0.6; can be switched to twice the sensitivity with 6-dB switch, for tubes with $\gamma = 1$	

Sensitivity control:	max. 1 : 4 with automatic gain control, larger variations are compensated by automatic iris control
S/N ratio:	> 46 dB with 200 nA (unweighted in the luminance channel)
Bandwidth: (-3 dB)	red channel > 4 MHz green channel > 5 MHz blue channel > 3 MHz
Color registration:	max. deviation of the positions of the three color pictures from each other is 1 picture point within a circle with a diameter d _i = 90% of the picture height
Geometrical distortion:	deviation from ideal geometry $\pm 1\%$
Interference signals:	compensated
Gamma correction:	adjustable γ 0.4-1
Camera cable:	7 mm diam. up to max. 10 m 13 mm diam. up to max. 300 m
Lenses:	manually operated or motorized zoom lenses; accessories: 2x range extender special lens, 1 diopter, for close-up shots neutral density filter for light reduction matching parts for microscopes operating room microscopes, optical link for endoscopy and multiplexer are available
Lens control unit:	can be located max. of 100 m from CCU
Lens lock:	bayonet

Technical data (Viewfinder Monitor)

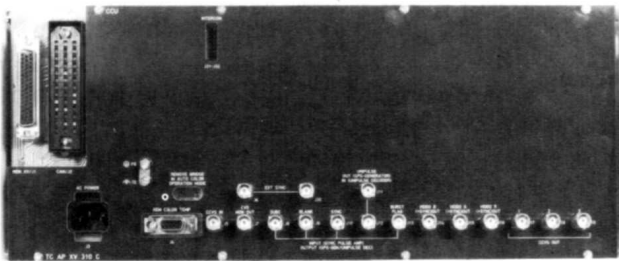
Type:	T 14 BC 93 A 1, B/W viewfinder monitor
Construction:	Special housing, for TC 3 XK 9 camera head
Weight:	approx. 4 kg
Power supply: (from camera head)	+ 30 V DC/approx. 90 mA + 15.5 V DC/approx. 1.2 A with Tally lamp /approx. 0.9 A without Tally lamp
TV standard:	625 lines/50 Hz (CCIR) or 525 lines/60 Hz
Picture tube:	M 14-100 W, 90° deflection angle
Picture brightness/ resolution:	max. 440 cd/m ² for 5 MHz within a circle equal to the picture height

Screen diagonal: min. 126.5 mm
 Picture ratio: 4 : 5 (88 : 110 mm)
 Controls on front: Contrast and brightness, contour with switcher, key selection for color components and color difference signals
 Inputs: CCVS (complete color signal)
 R (red signal)
 G (green signal)
 B (blue signal)
 Level signal (symmetric)
 TALLY
 Level indication: Level shown in viewfinder, $\pm 30\%$ from nom. value ($0.7 V_{pp}$ B) in selected field
 Gain: max. approx. x 80 (adjustment range 1 : 10)
 Frequency response: up to 5 MHz ± 1 dB
 up to 7 MHz ± 0 dB
 - 3 dB
 Pulse response/tilt: < 3% at 50 Hz
 < 3% at 15 kHz, 250 kHz

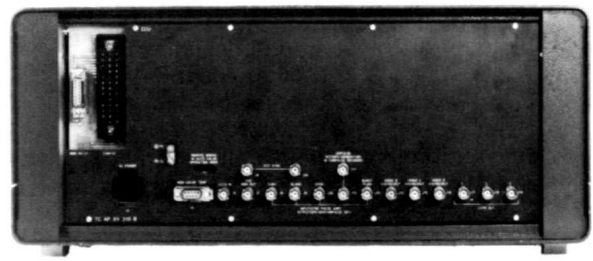
Linearity: ≥ 0.9 at $0.35 V_{pp} \dots 1 V_{pp}$ NCV (control voltage at cathode of picture tube: $20 V_{pp}$)
 Retrace blanking: vertical in video, horizontal at 2nd grid of picture tube
 Beam current limiting: built in
 Reproduction of black: subjectively correct
 Geometrical distortion: Deviations from the ideal geometry < 2% within a circle equal to the picture height
 Geometrical hum: < $2 \text{ }^{\circ}/_{00}$ of the picture height
 Environmental temperature: $0^{\circ}\text{C} \dots + 45^{\circ}\text{C}$
 Humidity: up to 90% relative humidity
 High voltage: approx. 9 kV
 Horizontal sync: with phase comparator
 D-c restoration: with clamping circuit
 Raster size: stabilized

Connection Boards

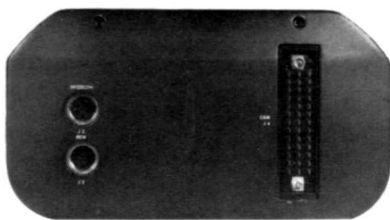
1. CCU TC AP XV 310 C
 (studio version)



2. CCU TC AP XV 310 B
 (standard basic version)



3. Camera head TC 3 XK 9 . .



4. Control unit TC BH XV 93 A
 (studio version)

