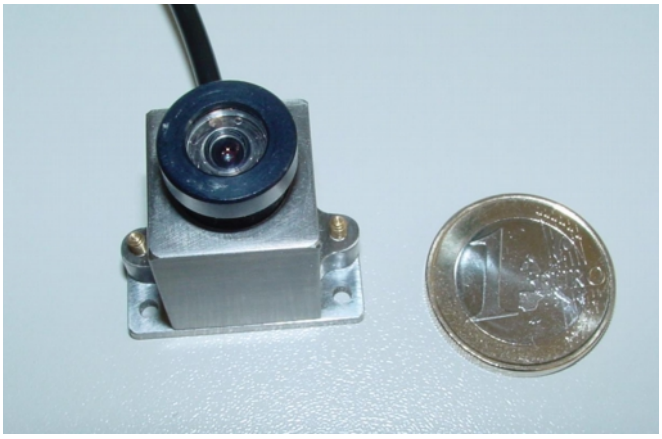
MR-compatible camera „12M“

User manual



1. Intended use

Our MR compatible video cameras are designed to view and record video images of subjects in an MR scanner. They can also be used for the monitoring of objects and instruments. The cameras can be used inside the bore of the scanner. They can be equipped with different exchangeable lenses. The correct orientation of the cables, the correct installation of the filter box, and the correct grounding should be checked before the application. Respective descriptions can be found in this user manual.

The cameras are not equipped with an automatic alert in case of an interruption of the video stream. That is why they are not intended to identify critical states or situations.

2. System components

- Camera
- Filter box (with optical isolation of video signal)
- Camera connection cable (length: 10 m, 2 m at the camera + 8 m elongation cable)
- Power supply (length: 1.8 m)
- BNC cable (length: 2 m)
- BNC/Cinch adapter
- Earth ground cable for provisional installation

3. Video camera and lens

Figure 1 shows the camera housing and the connected lens.

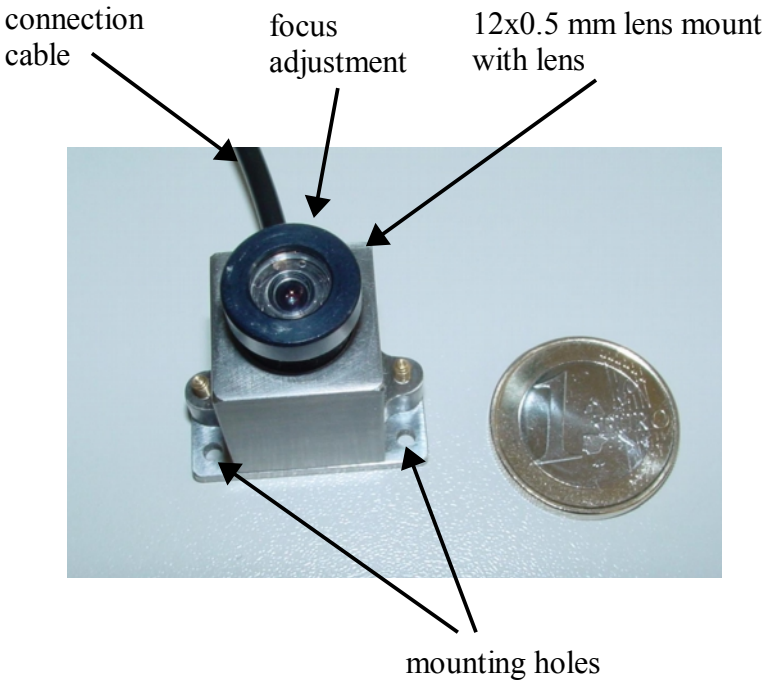


Figure 1:
Video camera with lens

The lens is connected to the standard **M12 mount** in the housing.

- The **focus adjustment** is done by screwing the lens in and out. Care should be taken not to screw out the lens too far, as the lens may fall out of the thread.

The camera is connected to the filter box via a connection cable which must be plugged into the **"MR CAM Signal IN"** connector.

It can be mounted directly to any suitable object via the two 2mm holes in the camera backplate.

4. Mounting options

Standard mounting options are:

1. direct mounting of the camera using the mounting holes
2. use of a ball joint mount (optional accessory) e.g. for use inside the MR bore
3. use of an articulated arm (optional accessory) for mounting the camera e.g. to the head coil
4. use of a tripod adapter (optional accessory) for mounting the camera on a tripod

You can find photos of the optional accessories in section 10 of this manual.

5. Connection of camera to filter box

The camera is connected to the filter box via the camera connection cable, which includes power and signal lines as well as shielding.

The filter box prevents the transmission of disturbing signals into the MR cabinet. It avoids interferences in the video signals and the MRI imaging.

The filter box includes a low pass filter that suppresses frequencies higher than 1 MHz with over 100 dB. This filter prevents damage and interferences caused by the high frequency signals of the MR scanner. Additionally an optical isolation is included in the filter box. In that way a full separation of the MRI equipment from the external power network is guaranteed.

Figure 2: Filter box (front side)

6. Filter box installation

For a permanent installation, the filter box should be screwed onto the panel board by means of the feed through **camera connector** (see figure 2). Figure 3 illustrates the recommended configuration:

- A 12 mm through hole in the panel board is required.
- The **camera connector** is guided through this hole.
- The camera connector provides the ground connection to the shielding of the MR cabinet.

For temporary use, the camera cable can be brought into the MR cabinet by other means, e.g. through a service entry hole ("waveguide"). In this case, an additional grounding cable should be used to connect the camera connector to the shield panel grounding. The camera connector must completely protrude into the MR cabinet and the video cable must not jut out.

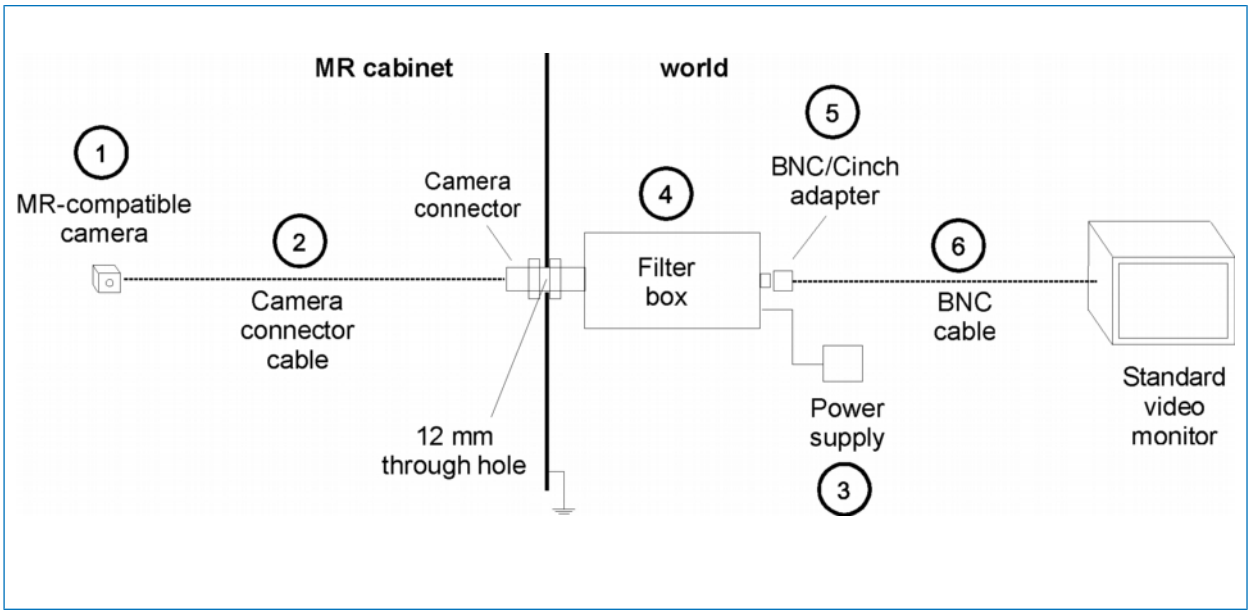


Figure 3: Device and cable configuration

7. Connection of power supply

The power for the camera is transmitted via the video cable. Therefore, the power supply is connected to the filter box (see figure 4).

Figure 4: Filter box (rear side)

8. Connection of TV set, VCR, frame grabber, or video card

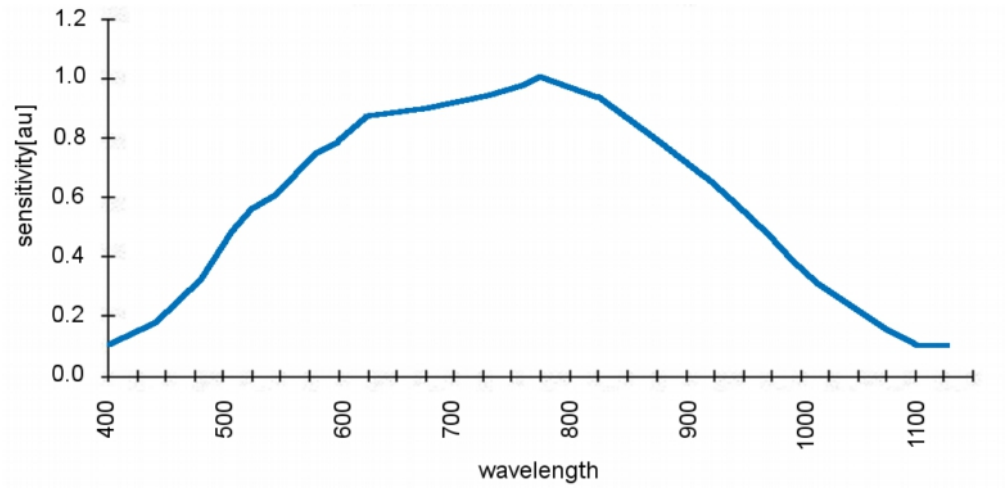
A BNC/Cinch adapter and a standard BNC cable are used to transfer the video output signal to a TV set, VCR, frame grabber, or video card. The BNC cable is plugged via the adapter to the video connector at the filter box (see figure 4).

The video signal can be directly viewed with a TV set or recorded with a VCR. To view and store the images with a PC, the BNC/Cinch cable must be connected to a frame grabber or video card within the PC. Any software for analog video viewing should be appropriate to process the signals.

9. Technical data

Sensor Type:	B/W or color CMOS Sensor 1/3 inch
Output:	EIA(NTSC) video signal with 60 Hz half frame rate or CCIR(PAL) video signal with 50 Hz half frame rate
Sensitivity:	0.2 Lux for f#1.2 (B/W)

Spectral sensitivity (B/W camera)



Housing dimensions

Dimensions:	28 mm x 18 mm; height ≈ 23 mm + lens
Connector for lens:	12 x 0.5 mm mount
Mounting thread:	2x 2 mm Ø, distance 23 mm
Weight:	22 g

Lenses

Type:	fixed focal length with fixed aperture, exchangeable
Mount:	12 x 0.5 mm
Focal length:	a big number of different focal lengths are available
Standard delivery:	focal lengths: 4.3 mm, 6 mm, 8 mm (other lenses on request)
Aperture:	e.g. 2.4
Sensor format:	1/3 inch
Minimal object distance:	50 mm (typical, depending on the chosen lens)

Electronics

Power supply:	200 mA, 6-12 V DC
Output impedance:	75 Ω
Type:	Friwo FW7555M/06, 6 V (medical power supply)

Filter box

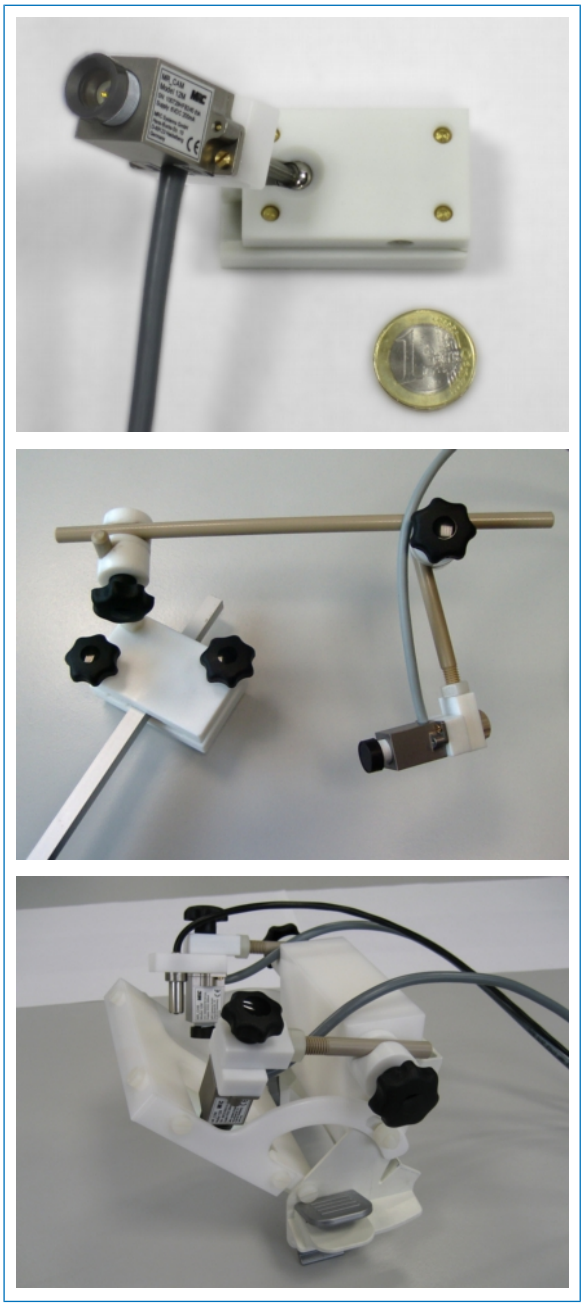
Dimensions:	80 mm x 120 mm x 80 mm
Weight:	approx. 700 g

10. Accessories

We offer different camera holders and light sources as accessories to the MR compatible camera. Examples are shown in the photos below. We can also produce customised solutions. More information can be found in the specific product descriptions.

On request, we can also offer additional equipment like displays or video cards.

Camera holders



Camera holder with ball joint for easy alignment

Flexible camera holder based on articulated arm

Camera holder at head coil

Figure 5: Selection of MR compatible camera holders

LED light source

For applications of the video camera in dark environments we offer a compact light source with infrared or white light. It can be mounted next to the camera by means of a plastic fixture.

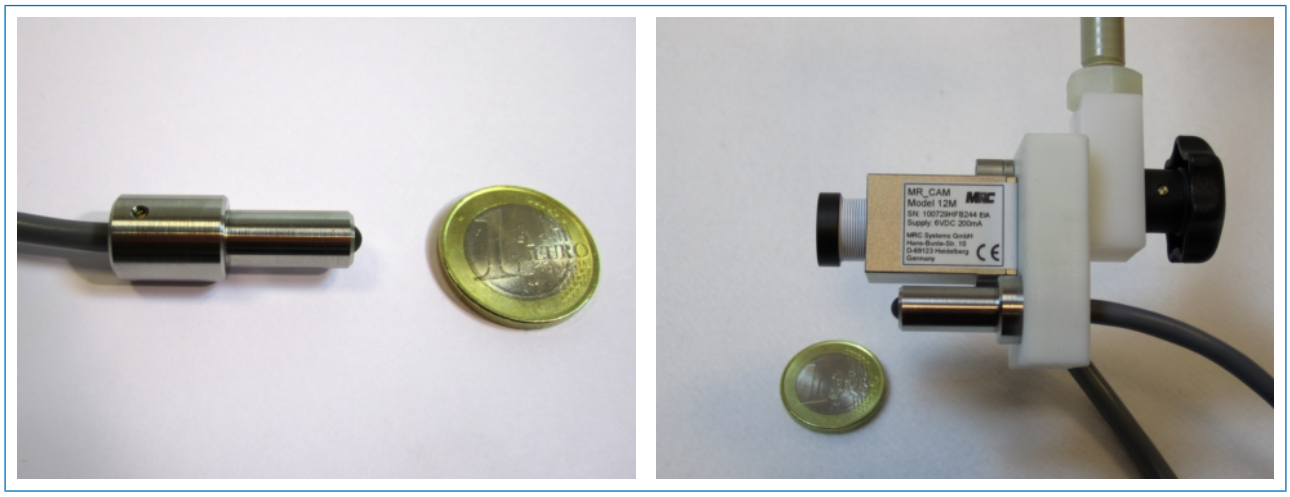
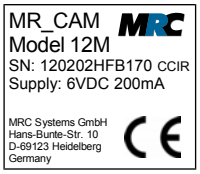
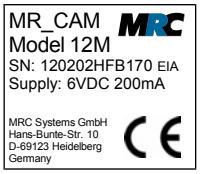


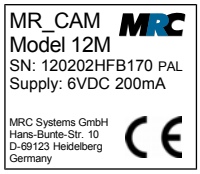
Figure 6: MR compatible LED light source, in the right photo mounted to the articulated arm besides the video camera

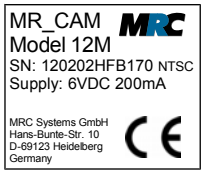
11. Labelling

A label on the camera housing includes the information about the embedded video sensor (black&white: CCIR[50Hz], EIA[60Hz], color: PAL[50Hz], NTSC[60Hz]). The following copies are enlarged:

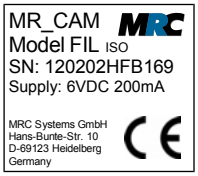








In addition, there is a label on the filter box:



12. Contact

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