

SHIMADZU

PRODUCT DATA

Digital
Cardiac & Vascular System **DAR-9400f**



Photo: Digital angiography system DAR-9400f and optional Remote Console for C-arm. (The desk is optional)

The DAR-9400f is a digital imaging system for X-ray angiography.

Digital images are acquired via the FPD (Flat Panel Detector), automatic brightness control and other digital processing is implemented and the image is then reproduced. High-quality digital image loops obtained by the DAR-9400f can be saved locally, or transferred to the DICOM 3.0 image server via a network.

A high-performance connection is established with the DICOM 3.0 network.

FEATURES

1. Digital images are acquired directly from the FPD. Consistently stable high-quality images are then provided with no degradation.
2. The image loop is acquired at a resolution of 1024 x 1024 pixels at up to 30 frames per second.
3. Crisp X-ray images are provided through noise reduction processing and edge enhancement.
4. The images acquired are stored on a high-speed image disk in real time. Instantaneous playback is also possible after acquisition is complete. The previous data is easy to search, by patient or by other criteria.
5. Exposure conditions are easily set from the radiography and fluoroscopy digital program menu.
6. The optimal operating environment is provided for interventions via the bedside image console, the IVR NEO.
7. Static images and image loops are stored in DICOM format on CDs, providing an economical approach to portability.

CONFIGURATION

The DAR-9400f components including the control cabinet and monitor are normally installed separately in the following three rooms.

- Examination room

Two monitors are installed for acquisition and reference. They are equivalent to the monitors in the operations room. X-Ray irradiation is controlled via a foot switch.

The IVR NEO bedside console contains setting buttons, LED indicators, and joysticks.

The FPD (Flat Panel Detector), FPD high-voltage power unit, and low-voltage power unit are installed in the C-arm.

- Operations room

A digital operations cabinet is installed here. It contains the acquisition (live) and reference monitors, the keyboard, mouse, and computer (with CD/DVD writer) for reference image playback.

The acquisition monitor displays all live images from the X-ray system. The reference monitor is used when playing back the examination. It is also used for various operations including the start and finish of examinations, annotation of images, and analysis.

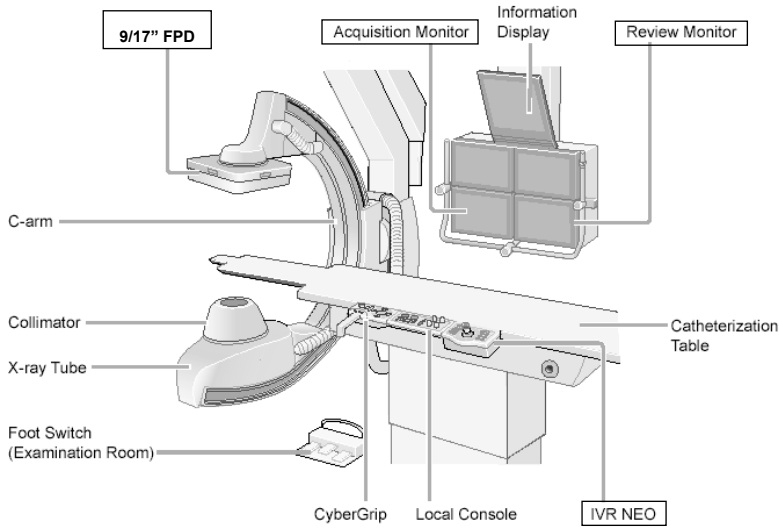
- Machine room

The FPD power control cabinet is installed here, as is the control cabinet containing the image acquisition computer, PCU (Panel Control Unit) and power transformer. These are operated via the keyboard and mouse in the operations room, and via the bedside console IVR NEO in the examination room.

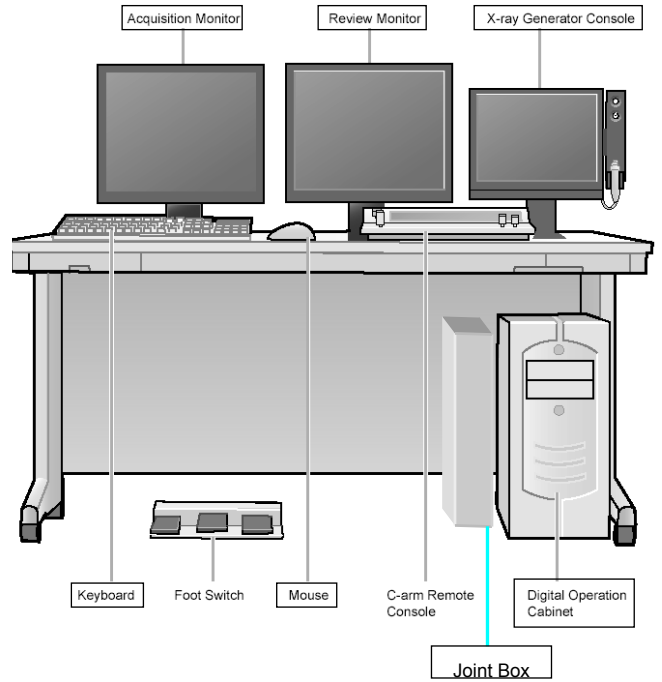
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The DAR-9400f consists of the components enclosed in the text boxes below.

Examination room



Operations room



*The C-arm in the photograph is the ceiling suspended C-arm MH-200S system. The equipment can also be combined with the floor-mounted C-arm MH-300 system.

Name of Component	Installation Location	Quantity
Digital operations cabinet: reference image playback computer is built-in	Operations room	1 (1)
Digital Acquisition cabinet: the image acquisition computer, PCU (Panel Control Unit) and PSU are built-in	Machine room	1 (2)
FPD power cabinet (PSU)		1 (2)
FPD cooler	Machine room	1 (2)
Monochrome LCD monitor	Operations room Examination room	2 (4) 2 (4)
X-ray Generator Console	Operations room	1 (1)
Keyboard, mouse	Operations room	1 (1)
IVR NEO bedside console	Examination room	1 (1)
FPD (Flat Panel Detector)	Examination room	1 (2)
FPD high-voltage power unit, and low-voltage power unit	Examination room	1 (2)
Joint Box	Operations room	1 (1)

Note) The numerals in the parenthesis are a quantity in case of bi-plane system.

The system includes 4GB RAM and 480 GB min. hard-drive space.

The FPD high-voltage power unit and low-voltage power unit are installed on the C-arm system.

SPECIFICATIONS

(1) 9" FPD

X-ray conversion system Materials	Direct conversion a-Se
Total pixel	1536×1536
Effective pixel	1472×1472
Acquisition rate(DA)	30/15/7.5fps
Acquisition rate (DSA option) *1	30/15/7.5/5/3/2 fps
Fluoroscopy	30/15/7.5/3.75fps
Effective FOV (side/diagonal)	9" (22.1/31cm) 7.5" (19.2/27cm) 6" (15.3/21cm) 4.5" (11.5/16cm)
External dimensions	30 x 30 x 10 cm
Pixel pitch	150 μm
Dynamic range (A/D)	14 bit
Transfer system	Optical fiber
Backlight	Built-in
Cooling system	Liquid cooling

(2)17" FPD

X-ray conversion system Materials	Direct conversion a-Se
Total pixel	3072×3072
Effective pixel	2880×2880
Acquisition rate(DA)	30/15/7.5fps
Acquisition rate(DSA) *1	30/15/7.5/5/3/2 fps
Fluoroscopy	30/15/7.5/3.75fps
Effective FOV (side/diagonal)	17"(43.2 / 61.1 cm) 15"(38.4 / 54.3 cm) 12"(30.7 / 43.4 cm) 9"(23 / 32.6 cm) 6"(15.3/21cm) *2
External dimensions	53 x 53 x 8 cm
Pixel pitch	150 μm
Dynamic range (A/D)	14 bit
Transfer system	Optical fiber
Backlight	Built-in
Cooling system	Liquid cooling

*1) 30/15 fps is available for rotational DSA

*2) 6" field of view for 17" FPD is optional. In order to use this function, SURE option is necessary.

(3) Image Processing

Image input	Concentration resolution: 12 bits/4,096 gradation
Image operational performance	1024 x 1024 image processing (including noise reduction filtering) and image processing (window level adjustment and edge enhancement) are implemented at up to 30 frames per second.
Display D/A converter	8 bits/256 gradation

(4) Image Display

Output video signal	Non-interlaced
Display image matrix	1280 x 1024
Display gradation	256 gradations
Display brightness	400 cd/m ² min. (monochrome LCD monitor)
Image processing	Noise reduction processing Window level adjustment Edge enhancement Negative/positive inversion Gamma correction Image magnification Re-masking Re-registration
Character display	Fixed format (patient information etc.) Free format (annotation etc.)
Image analysis	QCA (Quantitative Coronary Analysis) LVA (Left Ventricle Analysis)

(5) Image Storage

Magnetic disk	Magnetic disk 1024 x 1024 pixel (12-bit): 100,000 frames
Media	<u>CD-R (650MB)</u> 512 x 512 pixel (8-bit): 4,800 frames max. per disc 1024 x 1024 pixel (12-bit): 600 frames max. per disc <u>DVD-R (4.7GB)</u> 512 x 512 pixel (8-bit): 30,000 frames max. per disc 1024 x 1024 pixel (12-bit): 4,000 frames max. per disc

(6) Networks and other function

DICOM storage
DICOM image receive
DICOM image storage commitment
DICOM image print
DICOM modality work list
IHE : SWF, PIR
HIPAA : A login certification function

FUNCTIONS**(1) Image acquisition**

- DA mode
Serial imaging is possible at up to 30 frames per second (12-bit image acquisition). Acquired images can be played back instantly. For example, the flow of the contrast media within the patient's body is easily observable.
- RSM-DSA mode
RSM-DSA (Real-time Smoothed Mask DSA) is an imaging method that enhances visualization of the high-frequency component of images through special image processing. This is useful for acquisition while moving the bed and arm, and for imaging of the lower extremities and other mobile body parts.
- DSA mode (Optional)
DSA acquisition up to 7.5 frames/sec. is possible (for 12 bit image acquisition). Acquired images can be reviewed immediately.

(2) Fluoroscopy

- Automatic brightness adjustment
The fluoroscopic image is automatically displayed with stabilized contrast.
- Movement detection-type noise reduction
Movement of the patient's body is detected, and noise is minimized.
- Real-time edge enhancement
Distinct fluoroscopic images are acquired by emphasizing edges through spatial frequency emphasis. Convolution processing or unsharp processing can be selected as the method of spatial frequency emphasis.

(3) Fluoroscopic Recording

- Images can be stored both during fluoroscopy and in subsequent playback.

(4) Image processing

- Serial animated display (looped display)
Serial animation is enabled at up to 30 frames per second.
- Real-time edge enhancement
Distinct images are acquired by emphasizing edges through spatial frequency emphasis. Convolution processing or un-sharp processing can be selected as the method of spatial frequency emphasis.
- Negative/positive inversion display
Images can be displayed as they were acquired (positive image), or inverted (negative image).
- Gamma correction

The image gamma is selectable.

- Image magnification and displaced display
The display image can be magnified and displaced.
- Automatic gradation adjustment
Images are displayed with brightness and contrast stabilized automatically.
- Noise reduction processing
Image noise is reduced.

(5) Image analysis

- QCA (Quantitative Coronary Analysis)
The level of angiostenosis can be quantitatively analyzed. If the stenotic region is specified, the vascular walls are automatically determined, and the stenosis rate is displayed.
- LVA (Left Ventricle Analysis)
The left ventricle functioning can be quantitatively analyzed. If the inner walls of the left ventricle are specified, the left ventricle capacity and ejection fraction can be calculated.

(6) Network (optional)

- DICOM storage
Images are automatically sent to the image server via the DICOM network.
- DICOM image receive
The image server can be searched, and images are received via the DICOM network.
- DICOM image storage commitment
Images are sent to the image server via the DICOM network based on the image storage commitment function. If the storage commitment function confirms that the image was received by the image server properly, then the image is completely erased from the local system.
- DICOM image print
- DICOM modality work list
The patient name and other exam-relevant information can be acquired from the work list server. In this way when a new examination is implemented, the time needed to register patient information can be reduced.
- IHE (Standard Work Flow / Patient Information Reconciliation)
- PPS (when IHE is effective)

(7) Image Storage

- CD-R/DVD-R
Examinations, including static images and image loops, can be stored on a CD-R or DVD-R.

(8) HIPAA

- A login certification function

ENVIRONMENTAL CONDITIONS

Installation and Operation

(1) Main power

FPD unit: single-phase 200 V AC, 4 kVA, 50/60 Hz

Other units: single-phase 200 V AC, 4 kVA, 50/60 Hz

Separate power supplies are needed for the C-arm system and X-ray high-voltage generator.

(2) Usage environment

• Examination room

Ambient temperature: 20°C to 27°C

Relative humidity: 15% to 75% with no condensation

• Operations room

Ambient temperature: 10°C to 30°C

Relative humidity: 15% to 75% with no condensation

• Machine room

Ambient temperature: 10°C to 30°C

Relative humidity: 15% to 75% with no condensation

(3) Grounding

Ground resistance: max. 100 ohms

(4) Heat generation

• Machine room

FPD control cabinet: 500 Kcal/h

Digital control cabinet: 1060 Kcal/h

FPD cooler: 1000 Kcal/h

• Operations room

Digital operations cabinet: 470 Kcal/h

LCD monitor: 48 Kcal/h

Storage and Transportation

(1) Units other than FPD

Temperature	-10°C to 60°C
Humidity	10% to 95%
Atmospheric pressure	700 hPa to 1060 hPa

(2) FPD unit

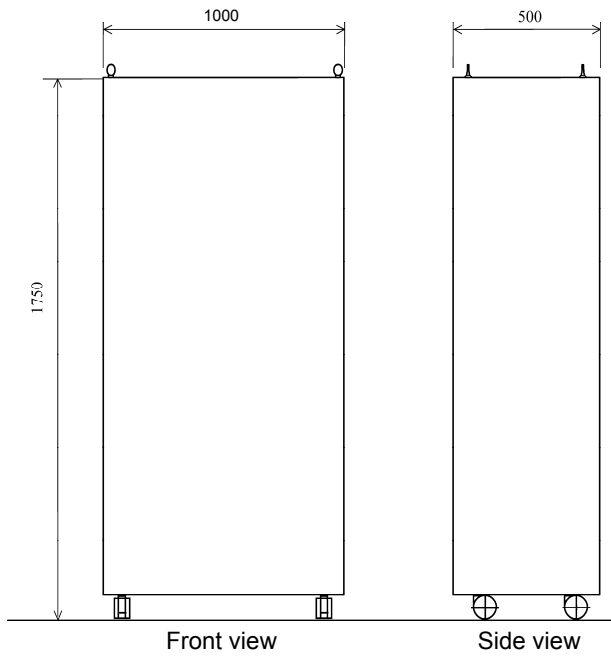
Temperature	15°C to 30°C
Humidity	10% to 75%
Atmospheric pressure	700 hPa to 1060 hPa

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EXTERNAL DIMENSIONS

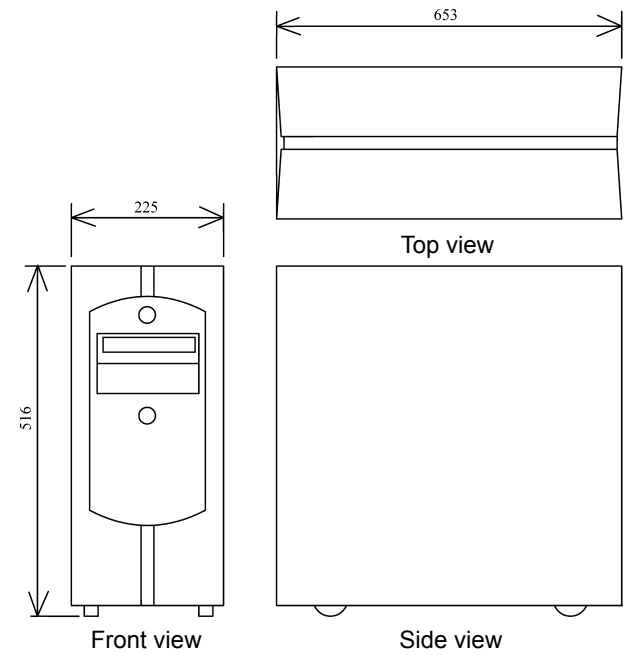
Digital Acquisition Cabinet

Mass: 400 kg



Digital Operations Cabinet

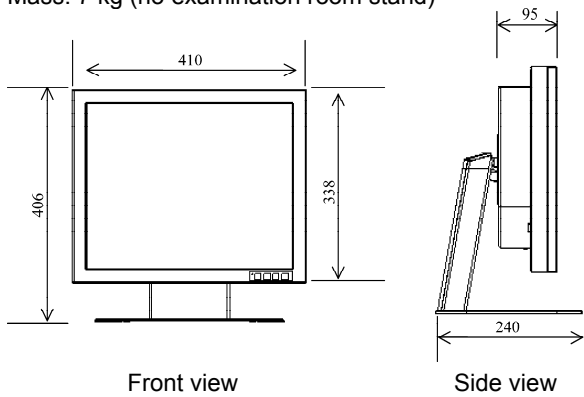
Mass: 35 kg



Monitor

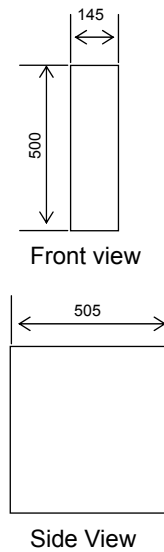
Mass: 10 kg (with operations room stand)

Mass: 7 kg (no examination room stand)



Joint Box

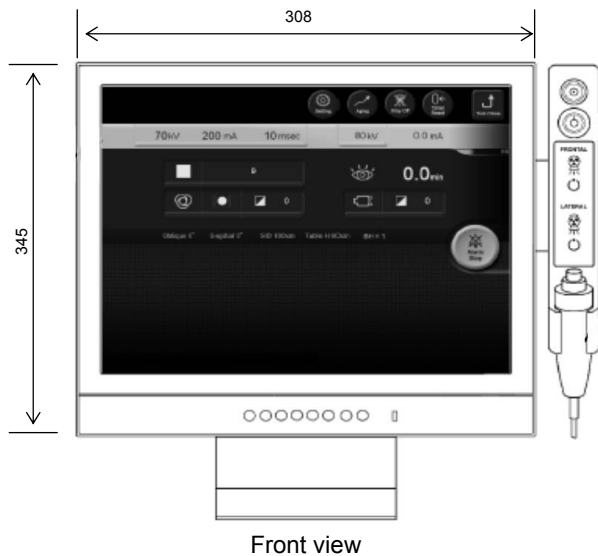
Mass: 20kg



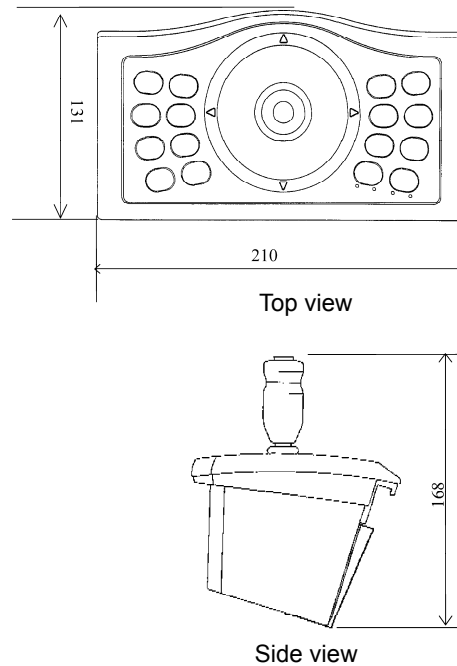
* Dimensional units: mm
The diagram shows the standard dimensional values.

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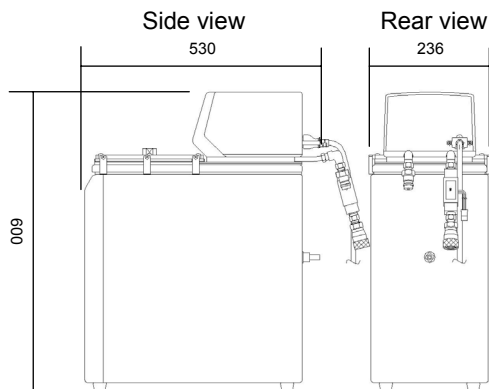
X-ray Generator Console
Mass: 2.5 kg



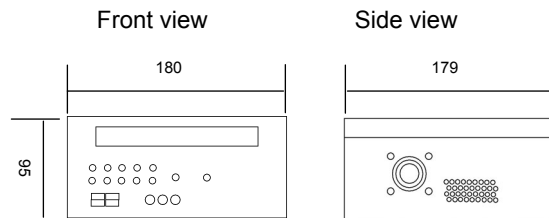
IVR NEO Console



FPD cooler
Mass: 70 kg



Maintenance PC
Mass: 6 kg



* Dimensional units: mm
The diagram shows the standard dimensional values.

Remarks

- * Every value in this Product Data Sheet is a standard value, and it may vary a little from the actual at each site.
- * The appearances and specifications are subject to change for reasons of improvement without notice.
- * Certain configurations may not be available pending regulatory clearance. Contact your Shimadzu representative for information on specific configurations.



SHIMADZU CORPORATION. International Marketing Division

3. Kanda-Nishikicho 1-chome, Chiyoda-ku, Tokyo 101-8448, Japan Phone: 81(3)3219-5641 Fax: 81(3)3219-5710

URL <http://www.shimadzu.com>



Shimadzu Corporation Medical Systems Group has been certified by TUV Rheinland as a manufacturer of medical equipment and systems in compliance with ISO9001: 2000 Quality Management Systems and EN ISO13485: 2003 Medical Equipment Quality Management Systems.