

ARCADIS Avantic

Maintenance Instructions System

For ARCADIS Avantic

Including tests required acc. to IEC 62353
The protocol SPR2-330.832.01.10.XX is required for these instructions

Document Version

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1.1 Maintenance Intervals

There are two types of maintenance: full maintenance and partial maintenance.

Full maintenance includes all of the maintenance steps of a complete maintenance. Partial maintenance only includes the maintenance steps which are of critical importance.

If it is not possible to perform maintenance on the entire system in a single session, partial maintenance can also be performed if the specified maintenance intervals are met.

If national laws or regulations specify more frequent system checks and/or maintenance, this must be observed.

1.1.1 Maintenance planning

1.1.1.1 Full maintenance

The first full maintenance for a new system must be performed within 18 months after the system has been handed over to the customer. After that, full maintenance needs to be performed every 24 months. Full maintenance comprises the following maintenance steps:

- Full maintenance activities:
 - » See full maintenance section.



Full maintenance also includes all of the partial maintenance activities. This ensures that the critical maintenance points are performed every 12 months.

1.1.1.2 Partial maintenance

Partial maintenance is always performed in between two instances of full maintenance, initially at 30 months following start-up and every 24 months thereafter. It comprises the following maintenance steps:

- Partial maintenance activities:
 - » See partial maintenance section.

1.1.2 Replacement interval for special parts

1.1.2.1 UPS lead gel battery and imaging PC BIOS battery

Initial replacement	after 42 months during full maintenance
Thereafter	every 48 months during full maintenance

1.2 Required documents

- General safety guidelines, see system binder TD00-000.860.01...
- Main system adjustment instructions SPR2-330.842.01..
- Replacement instructions for the TFT display on hand
 - » 18" Eizo R11 color display TD00-000.841.15.01...
 - » 18" MVGD 13188 B/W display TD00-000.841.17.01...
- Spare parts list
- Replacement of parts: SPR2-330.841.01...
- Image quality quick test SPR2-330.820.01..

1.2.1 Systems equipped with a laser light localizer

- Setting instructions SPR2-330.815.02..

1.2.2 Systems equipped with an I.I. laser light localizer

- Installation and setting instructions SPR2-330.814.02.01...

1.3 Required tools, measurement and auxiliary devices



The indicated items are listed in the STC (Service Tools Catalog) unless otherwise stated (the STC is a component of the Spare Parts Catalog) with the exception of items marked with "*1".



When performing partial maintenance, normally only the tools, measuring instruments, and auxiliary devices marked with "*2" are required.

- | | | | |
|--|---------|---|----------|
| ▪ Standard tool kit* | *1 / *2 | | |
| ▪ 1 set of Allen wrenches | *1 / *2 | | |
| ▪ Spring balance rated for up to 200 N | *2 | e.g. | 04415113 |
| ▪ Safety tester for leakage current and protective conductor resistance test | | SECUTEST SIII+ or equivalent | n.a. |
| ▪ DVM | | e. g. Fluke 8060A | 09702101 |
| ▪ Luminous density measuring device | *2 | e.g. SPOTMETER for SMfit ACT | 07752848 |
| ▪ Densitometer (for available film printer) | *2 | e.g. | 04951286 |
| ▪ Dynamic test kit | *2 | | 03790156 |
| ▪ Precision X-ray filter | *2 | | 09900598 |
| ▪ Set of resolution tests | *2 | | 02871820 |
| ▪ Set of radiation filters (10 x 0.3 mm) | *2 | e.g. | 04406120 |
| ▪ Set of radiation filters | *2 | e.g. | 09798596 |
| ▪ 25 mm AL measuring stand, type 26765, in accordance with DIN 6868 Part 50* | *2 | | |
| or | | | |
| ▪ 1.2 mm Cu plus | *2 | e.g., from the set of radiation filters | 04406120 |
| ▪ 17 micrometer Cu strips | *2 | | 01167662 |
| ▪ Centering cross (only with Diamentor) | | e.g. | 09660051 |
| ▪ Sealing compound | | | 02049716 |
| ▪ Special oil Optimol Optipit (for the device lifting column spindle) | | | 05507525 |



- Special oil Slic Pac PTFE (for the device lifting column slide cylinders) 05507517
- Paint stick, MED white 03444403
- Paint stick, medical blue 05507087
- Spray paint, MED white 05507467
- Spray paint, medical blue 05507046
- Spray paint, Medium Basic 04004243

1.4 Spare parts which may be needed



- Cable deflectors for swivel castor large/ARCADIS Avantic stand
- Cable deflectors for wheels small/ARCADIS Avantic stand
- Conductive rubber (basic unit)

1.5 Emphasized text



Tab. 1 GEFAHR / DANGER

 GEFAHR	Bei einer unmittelbar drohenden Gefahr, die bei Nichtvermeidung zum Tod oder zu einer schweren Körperverletzung führt .
 DANGER	Indicates when there is an immediate danger that leads to death or serious physical injury.

Tab. 2 WARNUNG / WARNING

 WARNUNG	Bei einer Gefahr, die bei Nichtvermeidung zum Tod oder zu einer schweren Körperverletzung führen kann .
 WARNING	Indicates a risk of danger that may lead to death or serious physical injury.

Tab. 3 VORSICHT / CAUTION

 VORSICHT	Bei einer Gefahr, die bei Nichtvermeidung zu einer leichten oder mittleren Körperverletzung und/ oder zu einer Sachbeschädigung führt oder führen kann.
 CAUTION	Indicates a risk of danger that leads to slight or moderate physical injury and/or damage to property.

Tab. 4 ACHTUNG / NOTICE

ACHTUNG	Bei einer Gefahr, die bei Nichtvermeidung zu einem unerwünschten Ergebnis oder Zustand führt oder führen kann (nicht Tod, Körperverletzung oder Sachbeschädigung).
NOTICE	Indicates a risk of danger that if disregarded leads or may lead to a potential situation which may result in an undesirable result or state (not death, physical injury or property damage).

Tab. 5 HINWEIS / NOTE

HINWEIS	Ist als Tipp zu verstehen. Der Anwender muss diese Anweisung nicht unbedingt beachten. Er erfährt jedoch Vorteile, wenn er dies tut.
NOTE	Should be understood as a tip. The user does not absolutely have to observe these instructions. However, there will be advantages if he does.

1.6 Safety information and protective measures

1.6.1 General safety information (in existing documents)

WARNING

Danger of injuries, death or material damage.

Non-compliance can lead to death, injury or material damage.

Please observe:

- » The product-specific safety information in these instructions,
- » the general safety information in TD00-000.860.01... and
- » The safety guidelines prescribed by your service organization.

1.6.2 General electrical safety information

WARNING

Electrical safety!

Non-compliance can lead to severe injury or even death, as well as material damage!

- » Parts under electrical voltage are accessible when the covers are open. To avoid danger, disconnect the system from the power supply before opening the covers. Pull out the power supply plug.
- » If an uninterruptible power supply (UPS) is installed in the system, the voltage output of the UPS must also be deenergized or the voltage output plug must be disconnected.
- » If work steps must be performed using electrical power, the general safety information according to TD00-000.860.01... must be observed.

CAUTION

Electrical voltage!

Non-compliance can result in material damage!

- » When working on the system, ESD regulations must be observed.

1.6.3 Radiation safety information

**! WARNING**

X-ray radiation!

Non-compliance can lead to illness, irreversible damage to body cells and the genotype, severe injury and even death!

When work is performed on the system during which radiation must be released, all radiation protection directives and all rules for radiation protection prescribed by your service organization must be observed.

Please observe:

- » Use available radiation protection devices.
- » Wear radiation protection clothing (lead apron).
- » Stay as far away as possible from the radiation source.
- » Release radiation only if necessary.
- » Set the radiation activity as low as possible. (low kV and mA values, short radiation time)
- » Release radiation for as short a time as possible.
- » Checks requiring the release of radiation are identified by the radiation warning symbol shown on the left.

1.6.4 Safety information - risk of infection

! WARNING

Risk of infection due to pathogens!

Non-compliance can lead to severe injury and even death.

- » This product can be contaminated by infected blood or other bodily fluids.
- » Avoid all contact with blood or other bodily fluids!
- » Strictly observe the safety guidelines prescribed by your service organization, to prevent infectious diseases during customer service calls.

1.6.5 Mechanical safety information

CAUTION

Risk of burns from hot parts or components!

If not observed, minor to more severe burns, especially on the hands, can occur.

- » Parts and components (e.g., power components, cooling fins, electromagnetic brakes) that can exceed 50 degrees Celsius during operation are accessible after the covers are opened. To avoid burns, switch the system off prior to touching parts or components and allow at least 5 minutes for cooling.

CAUTION

Risk of injury from mechanical parts!

If not observed, minor to more severe injury, especially to the hands, can occur.

- » After the covers are opened, parts such as flat plugs, threaded bolts, cut-off cable ties and component edges are exposed, and if care is not taken, they can cause crushing, scrapes and cuts to the skin, particularly to the hands.
- » Perform the required work with special care and attention to detail.
- » If necessary, wear work gloves.

1.6.6 Systems equipped with an integrated I.I. laser light localizer

CAUTION

Laser emissions!

This product contains lasers of the class 1M.

Disregarding safety precautions can lead to bodily injury, especially to the retina of the eye, resulting in irreversible damage to vision.

- » Follow the safety guidelines prescribed by your service organization. When working with the laser light localizer, do not look into the laser beam directly with optical instruments.

1.6.7 Systems equipped with a single tank laser light localizer

 **CAUTION****Laser emissions!**

This product contains class 2 lasers. (USA: class 2 laser).

Disregarding safety precautions can lead to bodily injury, especially to the retina of the eye, resulting in irreversible damage to vision.

- » Follow the safety guidelines prescribed by your service organization. When working with the laser light localizer, do not look directly into the laser beam.

**Laser emissions!**

There is no direct hazard to the eye (blinking reflex). Nevertheless do not look directly into the laser beam.

1.7 Abbreviation descriptions

Abbrev.	Description
SI	Safety Inspection
SIE	Electrical Safety
SIM	Mechanical Safety
PM	Preventive Maintenance
PMP	Periodic Preventive Maintenance
PMA	Preventive Maintenance Adjustments
PMF	Preventive Maintenance, Operating Value Check, Function Check
Q	Quality Check
QIQ	Image Quality
QSQ	System Quality Check
SW	Software Maintenance

The steps identified by these abbreviations are part of the maintenance protocol and should be checked off upon completion.

2.1 Partial maintenance activities

2.1.1 Mechanical Safety

SIM C-Arm

- Perform all C-arm movements, checking for play in the bearings and bearing noises.

SIM Foot brake

- Check the braking effect of the foot brakes of the ARCADIS Avantic stand and monitor trolley on a flat surface.



It is not necessary to measure and document the braking force of the foot-activated brake.

SIM Angulation brake



- Using the spring scale, check whether the angulation brake reaches the required braking value when in braked state (values: see Replacement of Parts manual for ARCADIS Avantic).

SIM Orbital Brake



- Using the spring scale, check whether the orbital brake reaches the required braking value when in braked state (values: see Replacement of Parts manual for ARCADIS Avantic).

SIM Horizontal lift brake



- Using the spring scale, check whether the horizontal lift brake reaches the required braking value when in braked state (values: see Replacement of Parts manual for ARCADIS Avantic).

SIM Swing brake



- Using the spring scale, check whether the swing brake reaches the required braking value when in braked state (values: see Replacement of Parts manual for ARCADIS Avantic).

2.1.2 IQ quick test

SIE Image quality (IQ) quick test

- Perform the image quality test according to the ARCADIS Avantic image quality quick test instructions, and record the results of the test.
 - » Also test any other external monitors (if applicable) as well.

2.1.3 Final work steps / checks in accordance with IEC 62353

2.1.3.1 General Measurement Notes



According to IEC 62353, the measured values must be compared to the old values. The old values can be seen in the

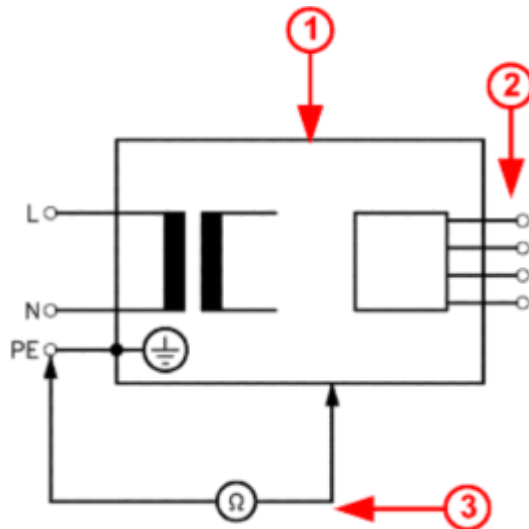
- * Startup Certificate
- * old Maintenance Certificate
- * old Test Certificate per IEC 62353.

If significant differences are found, corrective measures may be necessary.

Perform the following measurements:

1. Grounding conductor measurement

Fig. 1: Ground wire



- (1) Medical device
- (2) Application part type B if present
- (3) Measurement instrument

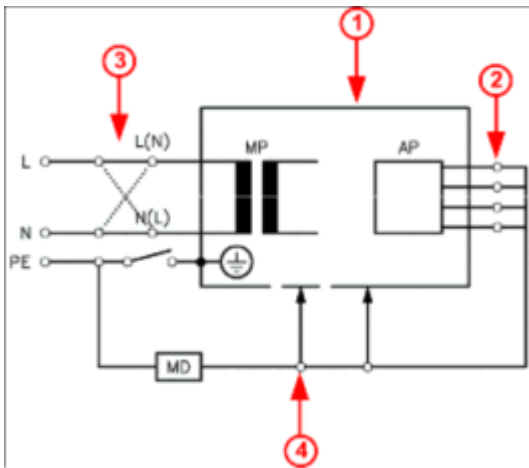
2. Device leakage current measurement



Two different methods of measurement can be used.

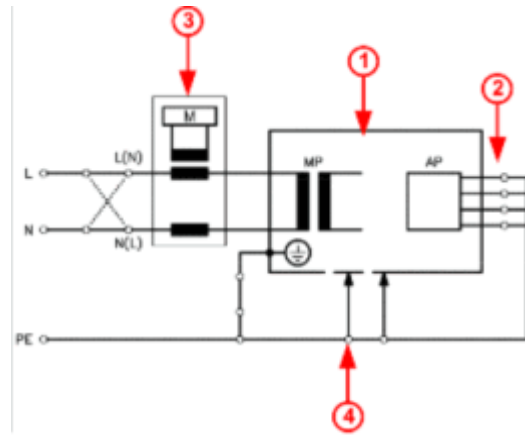
Device leakage current (direct measurement) or (differential current measurement procedure).

Fig. 2: Direct current measurement



- (1) Medical device
- (2) Application part type B if present
- (3) Measurement setup (integrated in measurement equipment)
- (4) Additional connections if present

Fig. 3: Differential current measurement



- (1) Medical device
- (2) Application part type B if present
- (3) Measurement instrument
- (4) Additional connections if present

2.1.3.2 Grounding conductor measurement

- Switch off power to the system.



According to IEC 62353, the measured values must be compared to the old values. The old values can be seen in the

- * Startup Certificate
- * old Maintenance Certificate
- * old Test Certificate per IEC 62353.

If significant differences are found or if the measured values exceed 180 mOhms, it may be necessary to initiate corrective measures.

Usually, the problem is that the ground wires are not connected, or incorrectly connected.

- Test procedure:
 - Measure between all accessible conductive parts of the components and the plug. If using direct current, repeat the measurement with the opposite voltage polarity. Both measured resistance values may not exceed the permissible value.



During the protective earth resistance measurement, move flexible power supply cords section-by-section over their entire length to check for any possible wire breaks.

- Varying measured values arising during moving of the power supply cord indicate breakage of the protective earth conductor.
- If necessary, replace the power supply cord.



If significant differences are found between the old and new values or if the measured values exceed 180 mOhms, it may be necessary to initiate corrective measures.

Usually, the problem is that the ground wires are not connected, or incorrectly connected.

- » Maximum value: 0.2 Ω (observe country-specific regulations!)



Exceptions:

Components with voltage less than/equal to 24 volts

Cover panels that cover electrical components with voltages less than/equal to 24 V.

SIE Ground wire status (in milliohms)

2.1.3.3 Device leakage current measurement

Prerequisites for device leakage current (direct measurement):

- To prevent measurement errors during direct measurement of the device leakage current, the ME equipment/other equipment must be isolated during the measurement.



WARNING

Since the protective earth conductor cannot fulfill its function during direct measurement of the device leakage current, there is a potential hazard to the tester or other personnel during the measurement.

Observe the following safety precautions:

- » The leakage current measurement may only be performed after the protective earth test has been passed successfully.
- » Access to the ME equipment or other equipment by personnel other than the tester must be prevented (blocking, measurement in a separate room).
- » During the measurement, the tester may not touch the ME equipment or other equipment.

Prerequisites for device leakage current (direct measurement):

- If the device leakage current is measured according to the differential current measurement procedure, the protective function of the protective earth conductor is maintained. There is no danger for the tester or other persons.

Measurement

- Switch on the system.
- Test procedure:
- The device leakage current measurement must be performed twice: First measurement -> L and N at power plug, second measurement -> L and N reversed at power plug.



Limit values in accordance with IEC 62353:

The maximum leakage currents are:

- * Device leakage current (direct measurement) 0.5 mA
- * Device leakage current (differential current measurement) 0.5 mA

SIE Device leakage current (in milli A)

2.1.3.4 Function check

SIE Perform function check

3.1 Full maintenance activities

3.1.1 Inspection of exterior

SIM Damage

Inspect the entire system for damage, such as damage to the housing or paint.

3.1.2 Safety Inspection

3.1.2.1 Mechanical safety

SIM Covers

- Remove the covers from the ARCADIS Avantic stand and monitor trolley.
- Check the covers for mechanical damage.

SIM Cable deflectors

- Inspect the cable deflectors on the stand and on the monitor trolley and replace them if necessary.

SIM I.I. removable grid - mechanics

- Check to make sure the I.I. removable grid is properly secured.

SIM I.I. laser light localizer mechanics (if present)

- Check the label on the I.I. laser light localizer for completeness.
 - Inspect the I.I. laser light localizer for mechanical damage.
 - Install the I.I. laser light localizer on the I.I. and ensure that it locks into place and is seated properly.
 - When doing this, pay special attention to the tension band and its closure.
 - Check the I.I. ring for damage and make sure it is screwed in all the way.
 - Open the battery compartment and check for leaking batteries.
 - If battery acid has leaked out but the battery contacts are not oxidized:
 - Wear moisture-proof gloves (plastic or latex disposable gloves).
 - Remove the old batteries (if they are still there).
 - Wipe out the battery compartment with a absorbent cloth (paper towel).
 - Afterwards, wipe it out again with a fresh, slightly damp cloth.
 - Dispose of the contaminated cloths and gloves.
 - Insert new batteries and close the battery compartment.
 - If batteries have leaked and the battery contacts have oxidized:
 - » We recommend replacing the I.I. laser light localizer.
- Even when the battery contacts are cleaned well, the oxidation usually progresses.

- If you want to try to remove the oxidation residue and battery acid anyway:
 - Wear moisture-proof gloves (plastic or latex disposable gloves).
 - Remove the old batteries (if they are still there).
 - Remove the oxidation residue from the battery contacts with a small file.
 - Wipe out the battery compartment with a absorbent cloth (paper towel).
 - Afterwards, wipe it out again with a fresh, slightly damp cloth.
 - Dispose of the contaminated cloths and gloves.
 - Insert new batteries and close the battery compartment.

SIM I.I. laser light localizer function (if present)

- Check the function of the laser diodes.
- Make sure the laser diodes automatically shut off after approx. 1 minute.
- Check the adjustability of the laser light compartments at the center of the single-tank cover.

SIM Laser light localizer, close to tube - mechanics (if present)

- Check the label of the integrated laser light localizer for accuracy and legibility.
- For systems equipped with the I.I. attachment (delivered until March 2006):
 - Check the I.I. attachment of the laser light localizer for mechanical damage.
 - Check the I.I. ring for damage and make sure it is screwed in all the way.
 - Place the I.I. attachment of the laser light localizer on the I.I. Make sure it locks into place and is seated properly.

SIM Integrated laser light localizer, close to tube - function (if present)

- Check the function of the laser diodes.
- Make sure the laser diodes automatically shut off after approx. 5 minutes.
- When laser light localizer is present, delivered until March 2006:
 - Check the accuracy of the laser light localizer with the I.I. attachment. See Setting Instructions RXR2-130.032.01... .
 - If needed, adjust the laser light compartments with the I.I. attachment. See Setting Instructions RXR2-130.032.01... .
- When laser light localizer is present, delivered in or after April 2006:
 - Check the function of the laser diodes.
 - Check the adjustability of the laser light fan beams centered on the image intensifier.

SIM C-Arm

- Perform all C-arm movements, checking for slackness of the bearings and bearing noises.

SIM Foot brake

- Check the braking effect of the foot brakes of the ARCADIS Avantic stand and monitor trolley on a flat surface.



It is not necessary to measure and document the braking force of the foot-activated brake.

SIM Angulation brake

- Using the spring scale, check whether the angulation brake reaches the required braking value when in braked state (values: see Replacement of Parts manual for ARCADIS Avantic).

SIM Orbital Brake

- Using the spring scale, check whether the orbital brake reaches the required braking value when in braked state (values: see Replacement of Parts manual for ARCADIS Avantic).

SIM Horizontal lift brake

- Using the spring scale, check whether the horizontal lift brake reaches the required braking value when in braked state (values: see Replacement of Parts manual for ARCADIS Avantic).

SIM Swing brake

- Using the spring scale, check whether the swing brake reaches the required braking value when in braked state (values: see Replacement of Parts manual for ARCADIS Avantic).

SIM Wheels and castors

- Move ARCADIS Avantic straight on a flat surface.
- Evaluate the straight and quiet movement of the ARCADIS Avantic.
- Replace any defective wheels.

SIM Lifting column for basic unit

There may not be any additional weight on the C-Arm, e.g. lead aprons or other covers, during these checks and adjustments.

- Visually inspect the exterior visible part and interior visible part of the lifting column for damage.
- Switch the system on.
- Lubricate the basic unit lifting column.
 - » Lubricate the spindle of the lifting column with special oil - Optimol Optipit.
 - » Lubricate the running surfaces of both slide cylinders (lifting column guide) with special oil -Slic Pac PTFE.

- Electrically move the lifting column over its entire lift range.
 - Listen for noises and check for play in the bearings.
 - The lifting column movement must switch off automatically when the end positions are reached.

SIM Emergency stop switch

- Press the emergency stop switch
The lifting column must not move when the "raise" and "lower" buttons on the main unit control panel are pressed.
- Unlock the emergency stop switch by pressing it lightly and turning to the left.
The basic unit lifting column can be moved again.

SIM Motorized monitor trolley lifting column (if present)

- Visually inspect the exterior visible part and interior visible part of the motorized monitor trolley lifting column for damage.
- Move the motorized monitor trolley lifting column over its entire lift range.
 - While doing this, note any movement noises and bearing play.
 - The lifting column movement must switch off automatically when the end positions are reached.

SIM TFT monitor(s)

- Check monitor(s) for damage.
- Check monitor(s) for proper attachment to the monitor trolley.

SIM SIEMENS logos

- Check all SIEMENS logos to ensure they are affixed securely and in a good physical state.
 - » Replace any SIEMENS logos that are damaged or have protruding edges.

SIM Warning signs

- Ensure that all required warning labels are attached and in good condition.
 - Replace any illegible labels or markings.

SIM ID labels

- Ensure that all required ID labels are attached and in good condition.
 - Replace any illegible labels or markings.

3.1.2.2 Electrical safety

SIE Cables and plugs

- Check visible system cables and plugs for damage.

SIE Fluoroscopy timer

- Check: See "Compulsory radiation switch off" section.

SIE Acoustic warning signal

- Check: See "Compulsory radiation switch off" section.

SIE Compulsory radiation switch off

- Connect the base system to the monitor cart, switch on the system, and wait for it to boot.
- Test the functioning of the audible warning signal and compulsory radiation switch off (if required) according to the country-specific regulations. Also check functioning of the fluoroscopic timer in this process.
- Open local service at the imaging system PC.
- Click <Mainsystem>.
- The the Main System window that is displayed, select the correct system and click <Next>.
- Under <Configuration>, click the <Buzzer> menu.
- Read out and record the configurations saved under "Buzzer settings" and "Blocktime settings".



With the installation of the VC10A SP1 software updates, the possible configurations for the buzzer and block time settings were adapted to the current national standards and regulations and expanded accordingly.

The online help contains corresponding explanations regarding the functions that can be configured.

Refer to the functions corresponding to the configuration for the acoustic warning signal and mandatory shutdown of radiation.

This information is also published in the system start-up instructions.

- Refer to the functions corresponding to the configurations.
- In accordance with the the local configuration, check the the acoustic warning signal function and the mandatory shutdown of radiation function. Also check the fluoroscopy clock function.

SIE Check the radiation release switch

- Check the functioning of the hand and foot switches for radiation release.
- Check the cables of the radiation release switches for mechanical damage.
- Move the cables and inspect them for breakage.

**SIE** Radiation indicator

- Activate fluoroscopy briefly.

The radiation indicator on the operating part of the ARCADIS Avantic stand and the radiation indicator on the monitor cart must light.

- Switch the system off.

**SIE** Iris collimator

- Check the iris collimator and correct it if necessary.
 - Select I.I. full format and activate fluoroscopy briefly.



- The collimator blades must be clearly visible at the edges of the image.
- Select a zoom format and release fluoroscopy briefly.
- The collimator blades must be clearly visible at the edges of the image.

SIE Air kerma meter (if present)

- Check the air kerma meter and test its accuracy (see Main System Adjustment Instructions SPR2-330.842.01...).

SIE Dose area product meter (if present)

- Check the dose-area product meter and the calibration (see Main System Adjustment Instructions SPR2-330.842.01...).

SIE Voltage discharge rubber

- Check the voltage discharge rubber on the ARCADIS Avantic stand and the wheels and castors of the monitor trolley for damage or contamination, and replace or clean them as necessary.

3.1.3 Maintenance, Operating Values, Functional Inspection, and Maintenance

3.1.3.1 Maintenance

PMF UPS battery replacement

- The lead gel battery integrated into the UPS has to be replaced for the first time after 42 months, and thereafter every 48 months on a preventive basis.
 - » The replacement procedure is described in the operator manual from the manufacturer as well as in the Replacement of Parts manual SPR2-330.841.01.

PMF Imaging PC BIOS battery replacement

- The Imaging PC BIOS battery has to be replaced for the first time after 42 months, and thereafter every 48 months on a preventive basis.
 - » The replacement for ARCADIS Gen2 systems (PC types M450, M460, M470 and M720) is described in the Replacement of Parts manual TD00-400.841.40... (PC Concept), and for the ARCADIS Gen1 systems (PC types M420, M430, M450, and M720) in the Replacement of Parts manual SPR2-330.841.01... .

PMP System ventilation

- Clean the ventilation slots of the ARCADIS Avantic stand and monitor trolley.

PMP Cleaning the system

- Clean the entire system:
 - Visible cables
 - Exterior surfaces
 - Contact surface of wheels
 - Interior space

3.1.3.2 Operating Values, Inspection

PMF Event log

- Read out and evaluate the system event log.

3.1.3.3 Functional inspection

PMF Laser camera connection (if present)

- Check the function of the laser camera connection.

PMF Check the operating function.

- Check all system operating functions.

PMF Monitor display of the iris collimator aperture

- Select I.I. full format.
- Close the iris collimator (X-iris) completely.
- Mark the diameter of the iris collimator aperture displayed on the monitor.
- Release fluoroscopy briefly. The actual diameter of the iris collimator is visible. The monitor display previously shown must coincide in position and diameter with the actual iris collimator aperture.



- Open the iris collimator completely.

- Mark the diameter of the iris collimator aperture displayed on the monitor.

- Release fluoroscopy briefly. The actual diameter of the iris collimator is visible. The monitor display previously shown must coincide in position and diameter with the actual iris collimator aperture.



- Select I.I. zoom format.

- Close the iris collimator (X-iris) completely.

- Mark the diameter of the iris collimator aperture displayed on the monitor.

- Release fluoroscopy briefly.

The actual diameter of the iris collimator is visible. The monitor display previously shown must coincide in position and diameter with the actual iris collimator aperture.

- Open the iris collimator completely.

- Mark the diameter of the iris collimator aperture displayed on the monitor.

- Release fluoroscopy briefly.

The actual diameter of the iris collimator is visible. The monitor display previously shown must coincide in position and diameter with the actual iris collimator aperture.



PMF PMF Monitor display of the slot diaphragm positions

- Select I.I. full format.
- Completely close the slot diaphragm and rotate the slot diaphragm from its home position.
- Mark the distance and angle of rotation of the displayed slot diaphragm position on the monitor.



- Release fluoroscopy briefly.

The actual position (distance of the blades and angle of rotation) of the slot diaphragm is visible. The monitor display previously shown must correspond in position and angle of rotation with the actual slot diaphragm position.

- Open the slot diaphragm completely and rotate it again.
- Mark the distance and angle of rotation of the displayed slot diaphragm position on the monitor.



- Release fluoroscopy briefly.

The actual position (distance of the blades and angle of rotation) of the slot diaphragm is visible. The monitor display previously shown must correspond in position and angle of rotation with the actual slot diaphragm position.

- Select I.I. zoom format.
- Completely close the slot diaphragm and rotate the slot diaphragm from its home position.
- Mark the distance and angle of rotation of the displayed slot diaphragm position on the monitor.



- Release fluoroscopy briefly.

The actual position (distance of the blades and angle of rotation) of the slot diaphragm is visible.

- The monitor display previously shown must correspond in position and angle of rotation with the actual slot diaphragm position.
- Open the slot diaphragm completely and rotate it again.
- Mark the distance and angle of rotation of the displayed slot diaphragm position on the monitor.



- Release fluoroscopy briefly.

The actual position (distance of the blades and angle of rotation) of the slot diaphragm is visible. The monitor display previously shown must correspond in position and angle of rotation with the actual slot diaphragm position.



Perform this check with the lowest possible kV values so that the front edges of the slot diaphragm plate are effectively visualized.

3.1.3.4 Upkeep

PMP Upkeep

- Entire system: Touch up any paint damage as needed.

3.1.4 IQ quick test

SIE Image quality (IQ) quick test

- Perform the image quality test according to the ARCADIS Avantic image quality quick test instructions, and record the results of the test.
 - » Test any additional external monitors (if applicable) as well.

3.1.5 Final work steps / checks in accordance with IEC 62353

3.1.5.1 General Measurement Notes



According to IEC 62353, the measured values must be compared to the old values. The old values can be seen in the

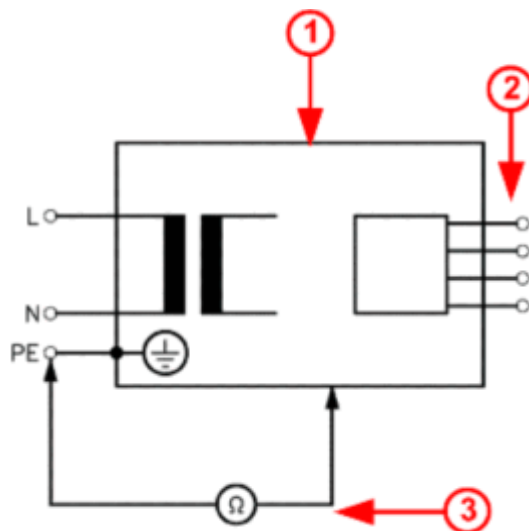
- * Startup Certificate
- * old Maintenance Certificate
- * old Test Certificate per IEC 62353.

If significant differences are found, corrective measures may be necessary.

Perform the following measurements:

1. Grounding conductor measurement

Fig. 4: Ground wire



- (1) Medical device
- (2) Application part type B if present
- (3) Measurement instrument

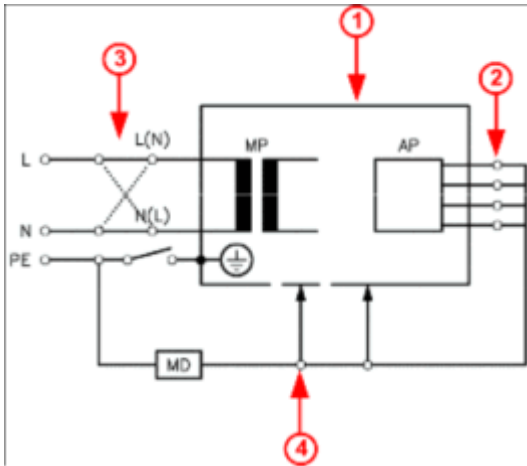
2. Device leakage current measurement



Two different methods of measurement can be used.

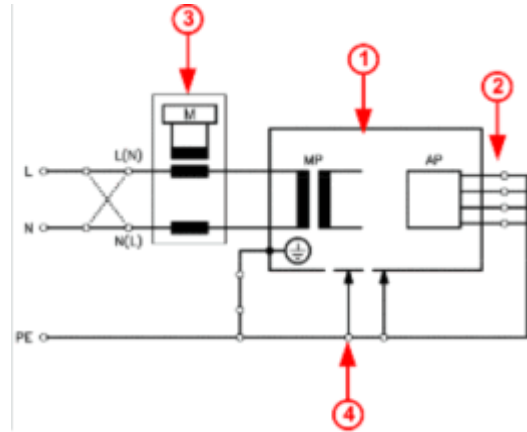
Device leakage current (direct measurement) or (differential current measurement procedure).

Fig. 5: Direct current measurement



- (1) Medical device
- (2) Application part type B if present
- (3) Measurement setup (integrated in measurement equipment)
- (4) Additional connections if present

Fig. 6: Differential current measurement



- (1) Medical device
- (2) Application part type B if present
- (3) Measurement instrument
- (4) Additional connections if present

3.1.5.2 Grounding conductor measurement

- Switch off power to the system.



According to IEC 62353, the measured values must be compared to the old values. The old values can be seen in the

- * Startup Certificate
- * old Maintenance Certificate
- * old Test Certificate per IEC 62353.

If significant differences are found or if the measured values exceed 180 mOhms, it may be necessary to initiate corrective measures.

Usually, the problem is that the ground wires are not connected, or incorrectly connected.

- Test procedure:
 - Measure between all accessible conductive parts of the components and the plug. If using direct current, repeat the measurement with the opposite voltage polarity. Both measured resistance values may not exceed the permissible value.



During the protective earth resistance measurement, move flexible power supply cords section-by-section over their entire length to check for any possible wire breaks.

- Varying measured values arising during moving of the power supply cord indicate breakage of the protective earth conductor.
- If necessary, replace the power supply cord.



If significant differences are found between the old and new values or if the measured values exceed 180 mOhms, it may be necessary to initiate corrective measures.

Usually, the problem is that the ground wires are not connected, or incorrectly connected.

- » Maximum value: 0.2 Ω (observe country-specific regulations!)



Exceptions:

Components with voltage less than/equal to 24 volts

Cover panels that cover electrical components with voltages less than/equal to 24 V.

SIE Ground wire status (in milliohms)

3.1.5.3 Device leakage current measurement

Prerequisites for device leakage current (direct measurement):

- To prevent measurement errors during direct measurement of the device leakage current, the ME equipment/other equipment must be isolated during the measurement.



WARNING

Since the protective earth conductor cannot fulfill its function during direct measurement of the device leakage current, there is a potential hazard to the tester or other personnel during the measurement.

Observe the following safety precautions:

- » The leakage current measurement may only be performed after the protective earth test has been passed successfully.
- » Access to the ME equipment or other equipment by personnel other than the tester must be prevented (blocking, measurement in a separate room).
- » During the measurement, the tester may not touch the ME equipment or other equipment.

Prerequisites for device leakage current (direct measurement):

- If the device leakage current is measured according to the differential current measurement procedure, the protective function of the protective earth conductor is maintained. There is no danger for the tester or other persons.

Measurement

- Switch on the system.

- Test procedure:
- The device leakage current measurement must be performed twice: First measurement -> L and N at power plug, second measurement -> L and N reversed at power plug.



Limit values in accordance with IEC 62353:

The maximum leakage currents are:

- * Device leakage current (direct measurement) 0.5 mA
- * Device leakage current (differential current measurement) 0.5 mA

SIE Device leakage current (in milli A)

3.1.5.4 Function check

SIE Perform function check

Defect	Chapter	Changes
288082	All	Electronic report for completion improved
288082	Partial maintenance	Final work steps / checks in accordance with IEC 62353
288082	Full maintenance	Final work steps / checks in accordance with IEC 62353

The work times given below are approximations. Actual work time for the various tasks (cleaning, for example), will vary from system to system.

Tab. 6 ARCADIS Avantic

Maintenance step	Required work time in minutes
Partial maintenance	75
Visual inspection, external	15
Safety inspection	240
Maintenance inspection, operating value inspection, and functional inspection	60
Final result inspection, quality inspection, and general maintenance	105

It is not recommended to further subdivide the maintenance beyond the categories of full maintenance and partial maintenance, since this could cause an unnecessary increase in work (because of IEC 62353, for example).

There are no Hazard IDs in this document.

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Print No.: SPR2-330.831.01.10.02 | Replaces: SPR2-330.831.01.09.02
Doc. Gen. Date: 06.18 | Language: English
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