

CARMEX

Mobile C arm unit for fluoroscopy
and radiography



Vers.1.2 (October 2024)

CARMEX

CARMEX is a CE approved surgical digital mobile C-Arm unit with image intensifier and CCD camera manufactured for fluoroscopic modes and radiography with digital image processing for use in orthopaedics, general surgery, interventional radiology, first aid use and Emergency room.

CARMEX is composed by a C-Arm Stand and a separate trolley unit on wheels with 2 medical grade high res 19 inch monitors and acquisition workstation with hard disk (memory device) to store acquired images, and depending on user needs it can be provided with Standard resolution TV chain or High Performance TV Chain.

The equipment allows for acquisition of X-ray images in the following modes:

- Continuous fluoroscopy (Low dose and Normal Dose)
- Pulsed fluoroscopy (Low dose and Normal Dose) lowering final radiation to patient, improving quality of single frame image and continuous working time
- Digital radiography (One shot)
- Standard radiography

CARMEX C-Arm is extremely intuitive to use and easy to move, even in very difficult and restricted areas thanks to its compact and light mechanical structure (extensive use of aluminium alloy). The reduced footprint helps the unit to move around in very small environments and the wide C-Arm opening and depth permits precise movements and avoid any interference with the operating area.

CARMEX the perfectly weight distribution C-Arm with image intensifier and x-ray tube mounted on the C shaped arm stand, does not require continuous use of brakes in normal use.

The particular unit balance, the front wheels can be easily lifted in order to overcome any small obstacle that system encounters during its movement. Unit has a wide range of movements with dedicated color coded breaks and buttons to automatically move the C-arm vertically (motorized). Rear wheels are parallel and rotate through the use of a dedicated handle on the C-arm. Front wheels are rotatable and equipped with cable pushers.

A touch screen console, placed in the top part of the system, gives the operator the complete control of all operative parameters settings and viewing all messages of alarm/fault conditions. After 5 min of total fluoro time will start an alarm.

The system is composed by a Monoblock with X-ray generator microprocessor controlled and operating at High Frequency (60 kHz) to guarantee precise and stable high-tension generation. Depending on the monoblock anode type (either stationary or rotating) two versions of CARMEX is available as version with fixed anode and version with rotating anode. Standard generator power is 4 kW and optional 5 kW and 15 kW power upgrades are available for specific applications as spine surgery.

Thanks to the Real Time processing tools like automatic Brightness/Contrast, Edge Enhancement and Recursive Filtering for noise reduction and thanks to the 1k x 1k CCD sensor, Image quality is astonishing.

MAIN CARACTERISTICS		
C-ARM STAND		
C-arm stand		
MONITOR UNIT		
Monitor unit Live monitor Reference monitor Both medical grade 19" LCD rotatable monitors Patient information, cumulative dose, kV and mAs values always possible to be monitored on the live monitor.		
TOUCH SCREEN CONSOLE		
A touch screen console, housed in the top part of the rack, gives operator the complete control of all operative parameters settings and viewing all messages of fault conditions. Touch screen is well protected and disinfectable (with no-alcholic disinfectants)		

MAIN CARACTERISTICS		
WIG-WAG ROTATION		
		
CIRCULAR (ORBITAL) MOVEMENT		
		
ROTATIONAL MOVEMENT		
		

MAIN CARACTERISTICS

ROTATING AND PROTECTED WHEELS

$\pm 90^\circ$ wheels with cable protection.



Thanks to the particular unit balance, the front wheels can be easily lifted in order to overcome small obstacles.

IMAGE INTENSIFIER (I.I.)

(9"/12") CARMEX I image intensifier with one of the 2 handles for C-arm sliding



X-RAY OPERATING

Operator interface

Touch screen display managed by a microcontroller board, which displays all operating parameters, anatomical techniques, possible system status messages (like tube temperature), system error messages and cumulative exam dose in Gy (dose that will be saved into the unit harddisk and viewed into exam information).

Selectable languages

Italian, French, Spanish, English, German, etc.

Operating modalities

Radiography:
2 points technique (kV and mAs)

Fluoroscopy:
0 point technique with automatic control of kV, mA
1 points technique with manual control of kV

X-ray command

Radiography:
Remote control with double click hand switch (PREP-X-RAY) and extension cable (4 m)

Fluoroscopy:
Remote control with multifunction footswitch (2 m)

Accessories

24x30 cm cassette holder and sterile drapes for Image Intensifier and tube, UPS (optional)

I.I. field selection

Selection of the Electronic Zoom according to the I.I. fields number. In this case the Iris collimator limits the X-Ray Field according to the selected I.I. field

Safeties (controlled by microprocessor)

- Electricity Supply
- mA_{min} and mA_{max}
- kV
- Max exposure time
- X-ray tube max temperature
- X-ray tube head thermal units count
- Current Filament
- Starter
- Anode rotation
- Microprocessor self control
- Real time tube warming up indicator directly reported on the touch screen control panel
- Automatic line compensation

TECHNICAL SPECIFICATIONS

MECHANICAL DATA

C-ARM	9S	12S	9R	12R
Image intensifier size	9"	12"	9"	12"
Vertical run (motorized)	45 cm			
Horizontal run (motorized)	22 cm			
Wig-wag	±12°	±12°	±12°	±12°
Arc rotation	±270° (total 540°)			
Orbital rotation	+90° / -45° (135°)			
SID	106,7 cm	100,4 cm	106,7 cm	100,4 cm
Arc depth	70 cm	67.8 cm	70 cm	67.8 cm
Usable space between x-ray tube head and II (clearance).	86 cm	80,3 cm	86 cm	80,3 cm
Min/max length	179/242,5 cm			
Max width	77,5 cm			
Min/max height	178,5/227 cm	185,2/230,2 cm	178,5/227 cm	185,2/230,2 cm
Control console height	81 cm			
Movement	Steering handle enables forward, lateral or diagonal movement. Parallel steering back wheels with parking position for movements along the patient table Rotating anterior wheel			
Braking system	Color coded breaks for every movement with locking system.			
Cable pushers	Equipped with cable pushers on C-arm & monitor cart wheels			
Paint	Smooth and easily disinfected paint permits easy cleaning. Sterile drapes for tube head and image intensifier			

TECHNICAL SPECIFICATIONS

RADIOLOGICAL DATA

COLLIMATOR

Type	Remote controlled adjustable collimator from the control console with rotating parallel and iris blades
Aperture	Continuously adjustable - Automatic adjustment to suit I.I. field with on screen indicators
Control	From stand control panel
DOSIMETER ^(*)	On board dose measuring device: Kermax Plus 120-122
Active area	72 mm
Minimal dose resolution	1 mGycm ²
Maximal measurable dose	999.999 mGycm ²
Dose value store	Fluoro cumulative dose is reported on the exam and Radiography Dose value is directly stored in the image dicom header and saved in the workstation hard disk
LASER POINTER ^(*)	
Laser pointer	Unit is provided with a laser cross mounted on tube side and pointing towards the image intensifier

^(*) Optional

TECHNICAL SPECIFICATIONS

RADIOLOGICAL DATA

X-RAY TUBE	"S" (stationary)	"R" (rotating) 3,5 or 5kW	"R" (rotating) 15kW
	CEI OX/110/5	IAE X20 P	IAE RTM70H
Tube type	Dual focus		
Anode type	Stationary	Rotating	
Anode speed	-	3000 rpm @ 50 Hz	
Anode heat capacity	30 kHU	107 / 200 kHU	300 kHU
Anode cooling capacity	22.68 kHU/min	25,2 kHU/min	104 kHU/min
Focal spots	2	2	
Focal spot size	0,5 x 0,5 mm (small focus) 1,5 x 1,5 mm (large focus)	0,3 x 0,3 mm (small focus) 0,6 x 0,6 mm (large focus)	
Focal spot power	P _{max} = 1,3 kW (small focus) P _{max} = 4 kW (large focus)	P _{max} = 5 kW (small focus) P _{max} = 17 kW (large focus)	P _{max} = 6 kW (small focus) P _{max} = 25 kW (large focus)
Total filtration	> 3 mm Al		
Additional filtration	1mm Al		
MONOBLOC	"S"	"R"	"R"
Monoblock type	Monoblock with tube and generator located both on C-arm system		
Generator type	Single phase 230V high frequency microprocessor controlled inverter type		
Generator operating frequency	60kHz		
Power	4 kW	3,5 / 5 kW	15kW
kV range (radiography)	40 ÷ 110 kV	40 ÷ 125 kV	
Max. current (radio mode)	65 mA	65 mA	
Current range continuous mode	0.2 – 5 (8 mA)	0.2 – 5 (10 mA)	
Current range pulsed mode	0.2 – 5 (8 mA)	0.2 – 5 (10 mA)	
Current range in digital radiography (one shot) @ 1pps	0.2 - 8 mA (10mA)	0.2 - 10 (12mA)	0.2 - 200 mA (40mS)
Pulsed fluoro rate	Up to 2 pps		
Monoblock Heat capacity	(720kJ) 960 kHU	(720kJ) 960 kHU	(880kJ) 1200kHU
Continuous thermal distribution	85W		
Exposition time	1s in digital radiography, no time limitation in fluoroscopy		
mAs range	1 ÷ 250 mAs (more than 40 steps)		
Anatomical programs	Up to 20 anatomical programs, divided per anatomical part of the body. Manual and automatic control of kV, mAs		
Anatomical techniques	Radiography: 2 points (kV, mAs)		
	Fluoroscopy: 0 point technique with automatic control for kV and mA 1 points technique with manual control of kV		

(*) Optional

TECHNICAL SPECIFICATIONS

IMAGE ACQUISITION SYSTEM

IMAGE INTENSIFIER (I.I.)		9"	12"
Image field:	Nominal: Working:	3 fields: 9"/6"/4" 215 mm/160 mm/120 mm	3 fields: 12"/9"/6" 290 mm/215 mm/160 mm
Type	Be with low persistence		
Output image diameter	20 mm		25 mm
Typical central resolution	64, 60, 52 lp/cm (4", 6", 9")		56, 50, 44 lp/cm (6", 9", 12")
Contrast ratio	30:1, 25:1, 23:1 (4", 6", 9")		30:1, 25:1, 22:1 (6", 9", 12")
DQE @59,5 keV	65% (IEC standard)		
Scintillator	Caesium Iodide (CsI)		
Conversion factor (typical)	250 Cd/m ² /mR/s		

GRID

SID	90 cm
Interspace	Al
Ratio	8:1
Line rate	103 lines/inch (40 Lines/cm)

IMAGE DISPLAY SYSTEM (TV CAMERA)

SYSTEM VERSION	RTP High Res (optional)	
Type	CCD Sensor	
Matrix (pixel)	1024x1024	
Standard video	Digital serialized	
A/D Conversion	16 bit	
Bandwidth	20 MHz	
Aspect	1:1	
TV MONITORS on mobile trolley	N°1 Medical Grade Color 24" TFT/LCD	N°2 Medical Grade Color 19" TFT/LCD (Monochrome optional)
Type	Monochrome touch screen	Color medical grade non touch screen
Monitor position	Monitors are positioned on a separate mobile trolley	
Angle of view	Vertical and horizontal 178°, anti reflex	
Resolution	1920x1200	1280x1024
Contrast ratio	1000:1 (typ.)	800:1 (typ.)
Brightness	300 Cd/m ²	400 Cd/m ²
Height adjustment	10 cm	20 cm
Monitor rotation	180° horizontal (tilt up and down)	180° horizontal (tilt up and down)
Viewing angle	180°	180°

(*) Optional

TECHNICAL SPECIFICATIONS

IMAGE DISPLAY SYSTEM

SYSTEM VERSION	RTP Std Res	RTP High Res (optional)
Processor	Intel processor	Intel processor
RAM	4 Gbyte (expandible to 8Gbyte)	4 Gbyte (expandible to 8Gbyte)
Operative system	Windows Embedded	Windows Embedded
Hard disk memory	250 GByte (average of 100.000 images) – optionally upgradeable to 500 GByte	
Acquisition frame rate	2 frame/sec (pulsed fluoroscopy)	
Fluoroscopy limitation	Dimension of the. More than 1 hour acquisition @ 1f/s	
USB 2.0 ports	2	
CD/DVD recorder	Included	
REAL TIME PROCESSING		
Patient and Exam management	X	
Virtual collimator	X	
Automatic dose rate regulation	X	
Automatic Contrast/Brightness control (ABC)	X	
Edge enhancement	X	
Subtraction (D.S.A.) with Max Opacification, Landmarking, Pixel shift, Remasking, Roadmap ^(*)	X (*)	
Noise reduction	X	
Recursive Filter for motion artifacts	X	
Left to right, top to bottom image reversals	X	
Optical magnification	X	
Digital zoom	X	
360° Digital rotation	X	
Virtual/Digital Collimation	X	
Last Image Hold	X	
Object detection ^(*)	X (*)	
Automatic image save	X	
Patient & Exam Data Management	X	
Horizontal/Vertical image flip / Rotation	X	
Contrast / Brightness control	X	
Crop	X	
Reverse polarity (grey scale)	X	
Fluoro loop (Cine loop) speed adjustable	X	
Digital Zoom and Roaming	X	

CARMEX

Text annotations, length, angles, entering patient demographic data	X
Overview (mosaic)	X
Video out ^(*)	X
USB export in BMP format	X

TECHNICAL SPECIFICATIONS

IMAGE DISPLAY SYSTEM

DICOM FUNCTIONS	DICOM 3.0 compliance
Store SCU	X
Print SCU	X
Worklist SCU (in order to receive exams from RIS/HIS)	X
Media storage CD/DVD w DICOM viewer ^(*)	X
USB Recorder w DICOM viewer ^(*)	X
MPPS (Modality Performed Procedure Step)	X
Query/Retrieve ^(*)	X
Storage/Commitment ^(*)	X
DICOM transmission type ^(*)	Cable or Wireless
Dose report	Possibility to print a dose report at the end of the examination
Printer ^(*)	Sony printer models UP898, UP971, and UP 991
UPS ^(*)	Dedicated UPS with 20 min backup time for safe system switch off

^(*) Optional

TECHNICAL SPECIFICATIONS

INSTALLATION DATA

Power supply	230 Vac +/- 10%, 50/60 Hz Single phase
Max power consumption	6 A (fluoroscopy mode) 22 A (radiography mode)
General Dimensions	Max Width: 85,4 cm Max Length: 247,1 cm Max Height: 226,4 cm Min Height (transport position): 178,7 cm Wheels diameter: 30 cm Max Weight:
Unit class and type for EN 60601-1	Class I type B
Unit class and type for 9342/CE	Class II type B
Unit certification	CE Certified
Compliance with the standards	EN 60601-1, EN 60601-2
Voltage stabilizer	Possible voltage stabilizer provided with the unit

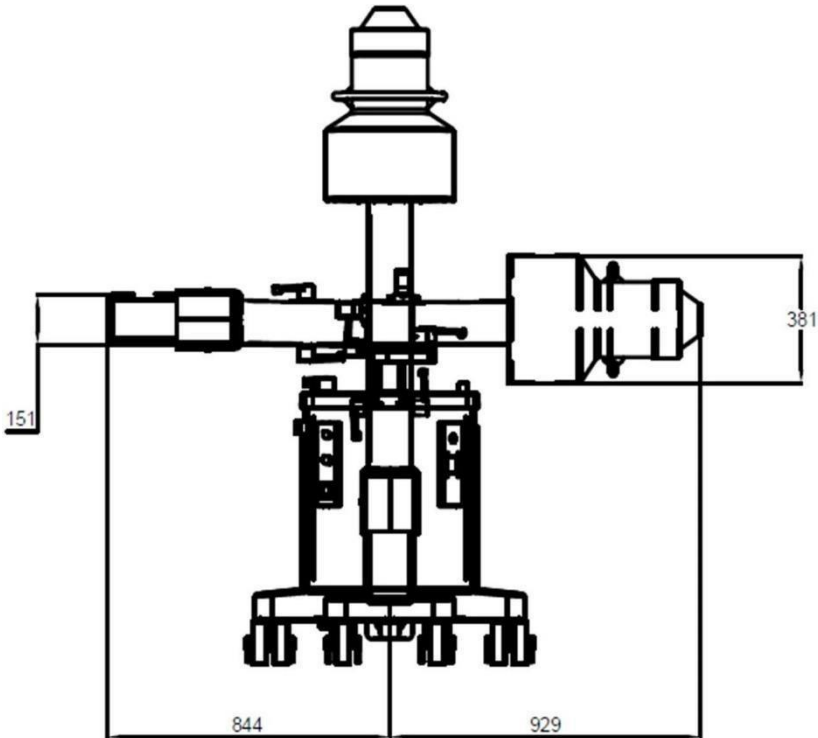
ENVIRONMENTAL CONDITIONS

OPERATING	
Temperature	10°C ÷ +40°C
Humidity	30% ÷ 75%
Atmospheric Pressure	700 hPa ÷ 1060 hPa
TRANSPORT AND STORAGE	
Temperature	-10°C ÷ +55°C
Humidity	20% ÷ 90%
Atmospheric Pressure	500 hPa ÷ 1060 hPa

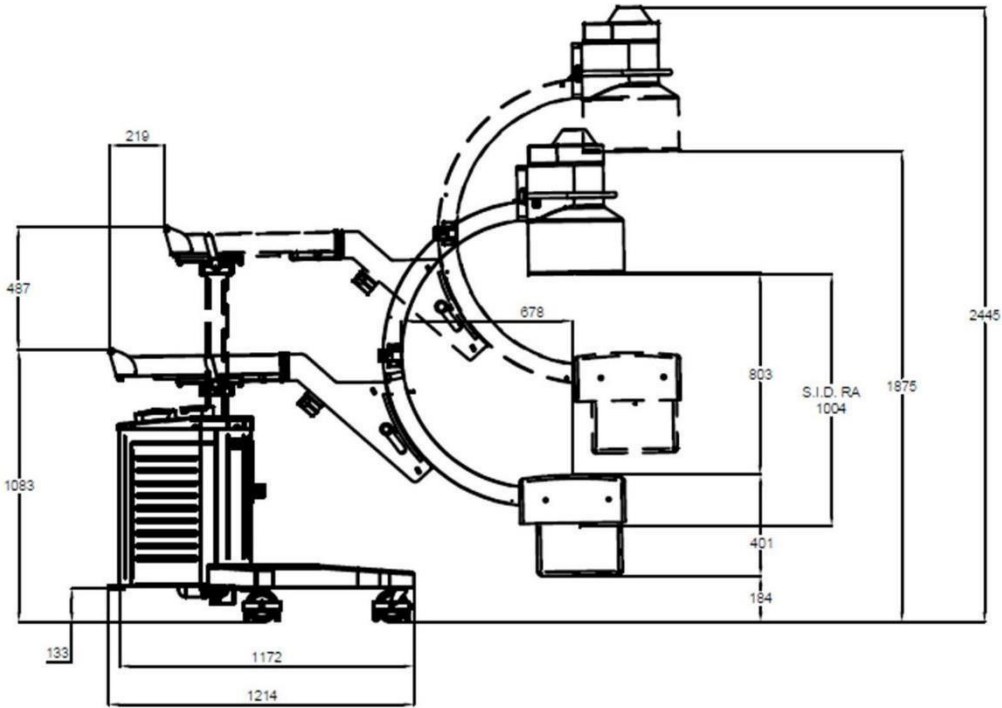
SIZE AND DIMENSIONS

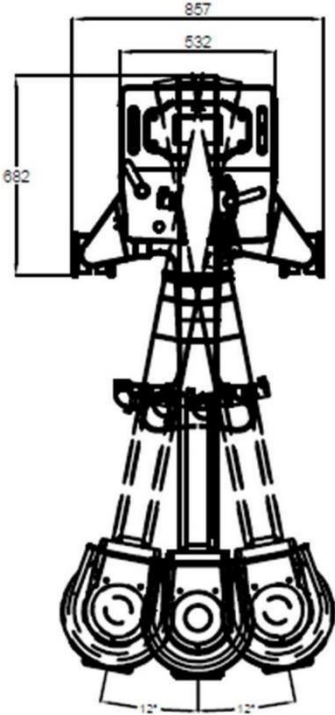
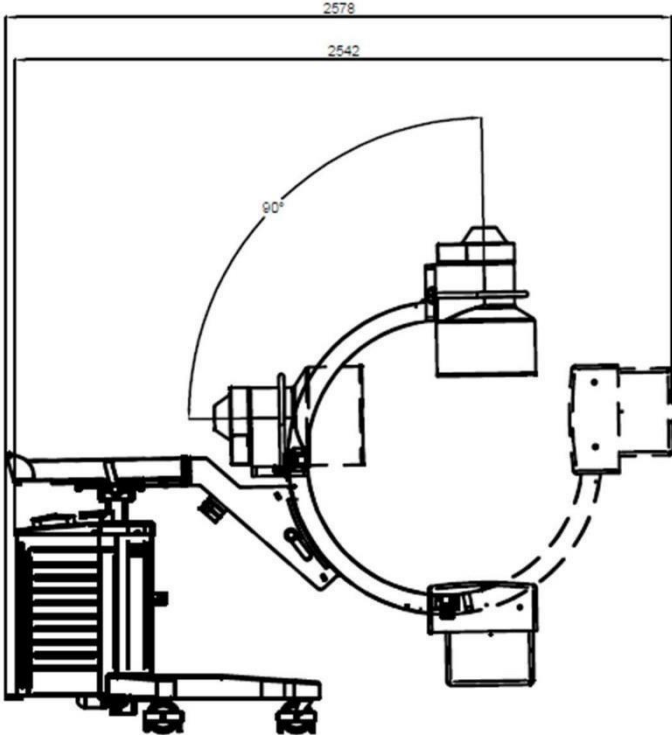
CARMEX with 12" image intensifier

FRONT VIEW



LATERAL VIEW

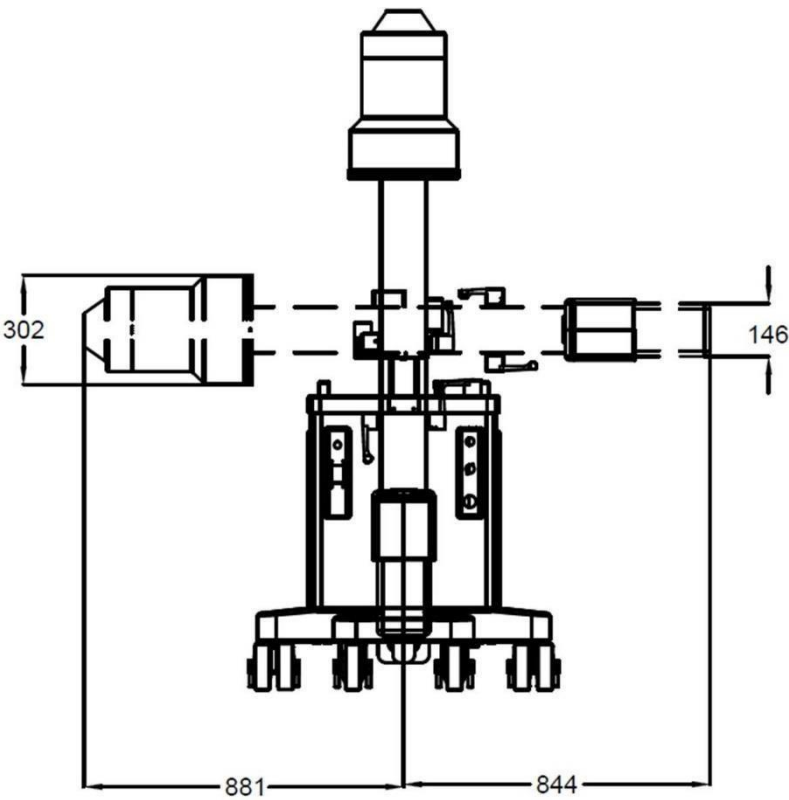


SIZE AND DIMENSIONS		
CARMEX with 12" image intensifier		
TOP VIEW		
SIDE VIEW		

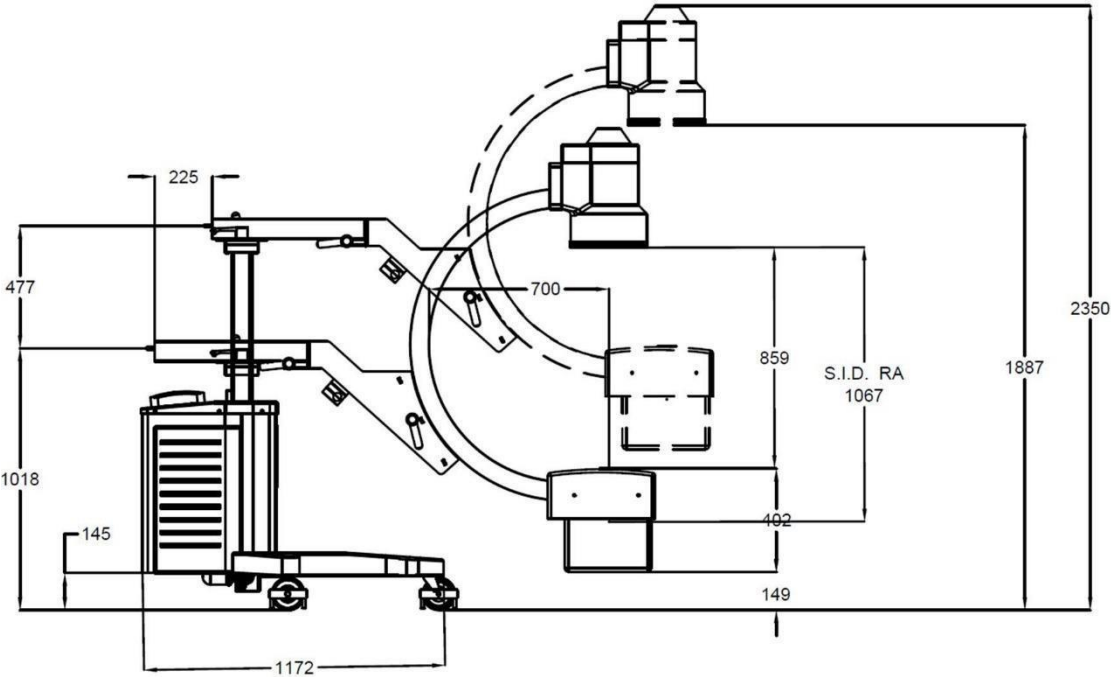
SIZE AND DIMENSIONS

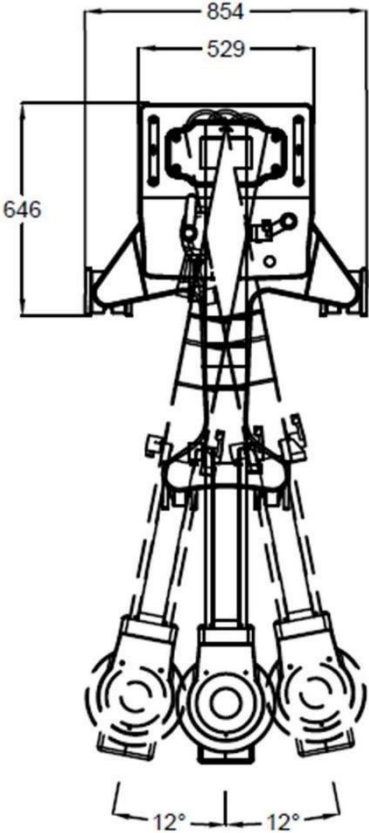
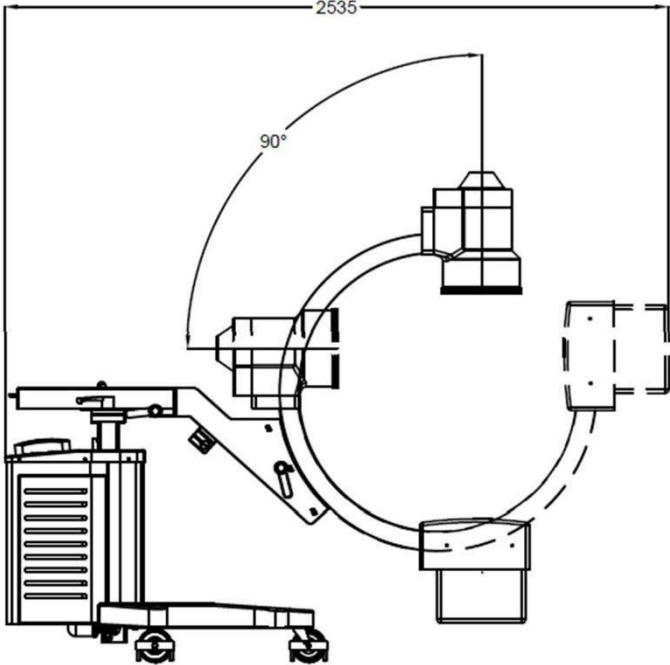
CARMEX with 9" image intensifier

FRONT VIEW



LATERAL VIEW



SIZE AND DIMENSIONS		
CARMEX with 9" image intensifier		
TOP VIEW	 The top view diagram shows the CARMEX system from above. It features a central vertical column with three articulated arms extending downwards. The arms are positioned at 12° angles from the central axis. The main body of the system has a width of 854 and a height of 646. A smaller section within the main body has a width of 529.	
SIDE VIEW	 The side view diagram shows the CARMEX system from the side. It illustrates the range of motion of the articulated arms, which can move through a 90° arc. The total width of the system is 2535. The diagram also shows the base of the system, which includes a control console and a support structure.	

ACCESSORIES

LASER LOCALIZER/DOSIMETER^(*)

The X-Ray Tube Head with Collimator where Laser Localizer and Dosimeter can be positioned



THERMAL PRINTER^(*)

Workstation unit with monitors on mobile trolley



^(*)Optional

ITALRAY reserves the right to make modifications without any prior notice		
	Via Del Parlamento Europeo 9/D 50018 Scandicci Firenze Tel. +39/055/7228511 fax. +39/055/7228512	info@italray.it italray.it