

From Eye to Insight

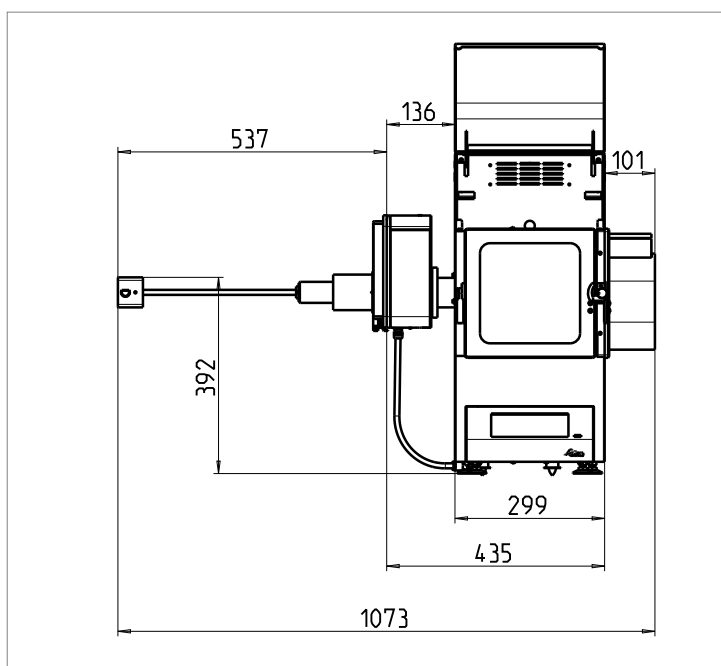
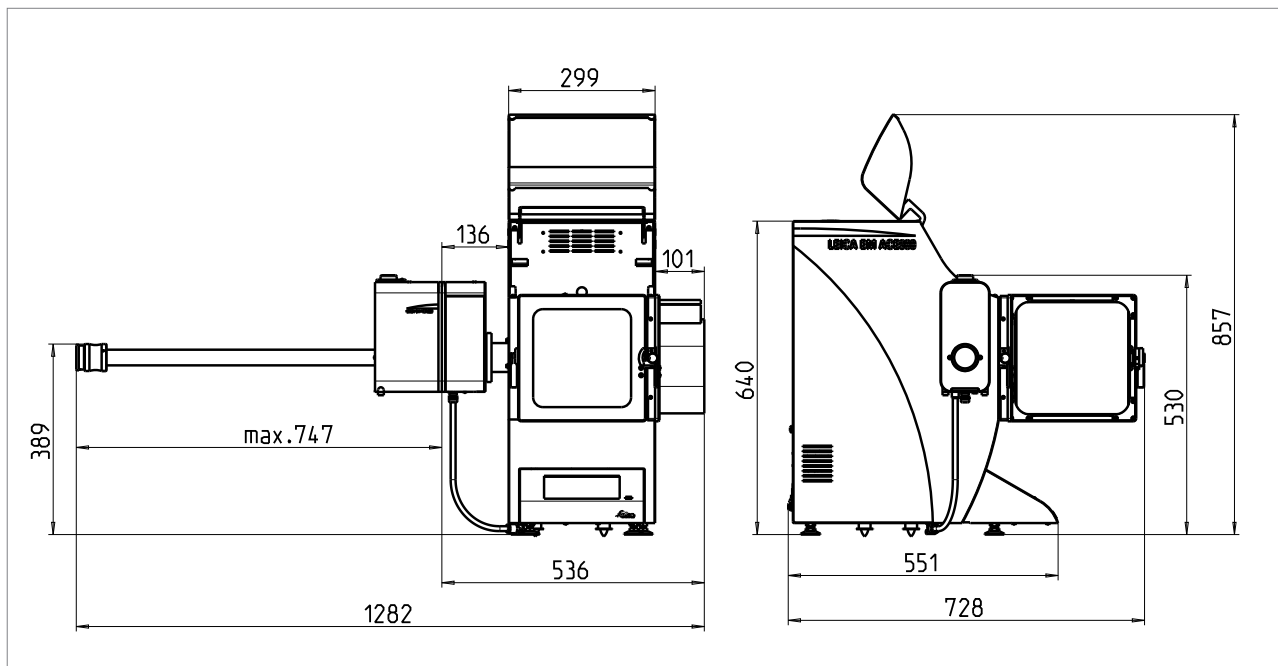
**Leica**  
MICROSYSTEMS



## EM ACE600 Technical Data Sheet

# EM ACE600

High Vacuum Coater





#### OPERATIONAL AND GENERAL DATA

specimen tables (diameter)	Ø 104 mm, flat with 25 holes for standard (12,7 mm/ 1/2") SEM stubs opt. Ø 104 mm planetary for 6 x 4 SEM stubs Ø 60 mm, low angle rotary shadowing and grid stage, especially for high angled e-beam coating
angled sources	25°
stage tilt	auto stage: 0 to ± 60°
QSG Film Thickness Monitoring Resolution	one decimal (0.1 nm accuracy) new quartz crystal: 6 MHz
user interface	integrated touch panel, up to 100 protocols, material files and sequences can be stored
USB port	usable for ≤ 32 GB USB 2.0 memory sticks
VCT100 adaptor plate	pressured air 5.8 - 6.2 bar

#### OPERATING GAS CONNECTION

venting gas	N <sub>2</sub> , 0.2 - 0.5 bar, 99.99% purity (optional)
connection for N <sub>2</sub> gas	Ø 6 mm push-fit connector for polyamide hose

#### ELECTRICAL DATA

supply/connecting voltage	100 / 115 / 230 Vac
frequency	50 / 60 Hz
power consumption while pumping	100 W
idle power consumption	~ 25 W (turbo-pump in stand-by)
power consumption during coating	Sputter, Carbon Thread: 200 W, E-Beam, Carbon Rod: 1000 W

## VACUUM SYSTEM

ultimate vacuum	$\leq 2 \times 10^{-6}$ mbar**
ultimate vacuum with Meissner Trap	$\leq 7 \times 10^{-7}$ mbar**
pumping time to $5 \times 10^{-5}$ mbar	approx. 15 min.*
pumping	oil-free, 4-stage diaphragm pump (13 l/min) and (67 l/s) turbo-molecular drag pump
maintained vacuum with inactive pumps	~ 1 mbar

\* after 8 min (= pumps on full speed) a clean instrument reaches a vacuum better than  $1 \times 10^{-4}$  mbar (this is suitable for running a process)

\*\*Reached within 24 hours pumping once the instrument has reached  $2 \times 10^{-6}$  mbar after installation and is kept clean

## DIMENSIONS AND WEIGHT

	WIDTH	DEPTH	HEIGHT	NET WEIGHT
basic unit	~ 300 mm	~ 540 mm	~ 640 mm	~ 65 kg
basic unit e-beam	~ 300 mm	~ 660 mm	~ 640 mm	~ 70 kg
vacuum chamber	200 mm	150 mm	195 mm	
instrument packed (one box)	600 mm	800 mm	920 mm	~ 74 kg
with dewar	~ 400 mm	~ 540 mm	~ 640 mm	
with dewar & VCT500 dock	~ 540 mm	~ 540 mm	~ 640 mm	
with VCT500 Shuttle	~ 1290 mm	~ 540 mm	~ 640 mm	
with load lock	~ 1080 mm	~ 540 mm	~ 640 mm	

## SPUTTER

materials	Aluminium, Chrome, Cobalt, Copper, Gold, Gold/Palladium, Iridium, Molybdenum, Nickel, Platinum, Platinum/Palladium, Silver, Tungsten, Titanium
sputter target	thickness max. 1 mm, Ø 54 mm
working distance	30 - 100 mm
coating time	1 - 1800 s
coating thickness	0.1 - 1000 nm
sputter current	15 - 150 mA
sputter vacuum	$8 \times 10^{-3}$ to $1 \times 10^{-1}$ mbar
base vacuum	$1 \times 10^{-6}$ to $1 \times 10^{-2}$ mbar
purge cycles	0 - 50
pre-sputter	ON/OFF
pre-sputter current	10 - 150 mA
pre-sputter time	1 - 300 s
process gas	Argon (99.999% purity) at 0.5 bar (two-stage reduction valve recommended)
connection for Argon gas	Ø 6 mm push-fit connector for polyamide hose
gas consumption	18 SCCM

## GLOW DISCHARGE

discharge current	5 - 15 mA
discharge time	1 - 1800 s
working distance	10 - 100 mm
process vacuum	1E-1 to 5E-1
base vacuum	1E-6 to 1E-2

## CARBON THREAD

material	Leica Carbon Thread (~ 0.25 g/m), 4 sections
methods	pulse / flash
double thread	YES / NO
coating thickness	0 - 100 nm
number of pulses	20 - 100
number of flashes	1 - 4
coating rate	approx. 0.3 nm/s (pulsing)
base vacuum	1E-6 to 1E-2 mbar
heat current	1 - 40 A
heat voltage	3 - 18 V
heat time	0 - 120 s
pulse power	0 - 720 W
pulse wait time	5000 - 15800 ms
pulse on time	10 - 2000 ms
flash current	1 - 40 A
flash voltage	3 - 18 V

## ENVIRONMENTAL CONDITIONS

usage	indoor use, altitude up to 2000 m
temperature range	+15 to +30 °C
humidity	max. 80% RH (no condensation)
pollution degree (IEC 61010-1)	2
operating environment	Air or Nitrogen only

## CLEANING

All surfaces can be cleaned with a damp cloth moistened with either aqueous cleaning agents or 50% ethanol. Do NOT use ACETONE! To clean the vacuum chamber the Leica cleaning product is recommended.

## E-BEAM

materials	Carbon and Platinum/Carbon
high voltage	max. 1.15 kV
emission current	max. 400 mA
coating time	1 - 1800 s
coating thickness	0.1 - 100 nm
coating angle	auto stage: 1 ° to > 90 ° cryo stage: 34 ° to > 90 °
distance to specimen	auto stage: 164 - 191 mm cryo stage: 164 - 175 mm
carbon feed	10 mm Ø 3 mm rod, density 2.45 g/cm <sup>3</sup>
platinum / carbon feed	10 mm Ø 2 mm rod with recess for PT insert, density 19.45 g/cm <sup>3</sup>
cathodes	Tungsten (W) Cathodes
maximum coating rate	Carbon 0.3 nm/s, Platinum/Carbon 0.06 nm/s
QSG Film Thickness monitoring resolution	0.1 nm
target power	30 - 300 W
degas	ON / OFF
degas power	50 - 150 W
degas time	30 - 300 s
base vacuum	1E-6 to 1E-4 mbar

## CARBON ROD

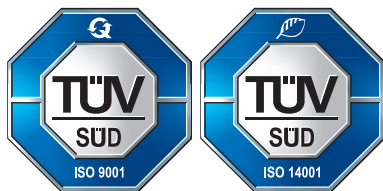
materials	Carbon
high voltage	max. 1.15 kV
emission current	max. 400 mA
coating time	1 - 1800 s
coating thickness	0.1 - 100 nm
working distance	30 - 100 nm
carbon feed	25 mm Ø 3 mm rod, density 2.45 g/cm <sup>3</sup>
maximum coating rate	approx. 0.3 nm/s
tilt angle	auto stage: ± 60°
voltage	1.2 - 7.2 V
base vacuum	1E-6 to 1E-2 mbar
pre-heat	ON / OFF
pre-heat voltage	1.2 - 4.5 V
pre-heat time	30 - 3600 s

## CRYO STAGE / FREEZE FRACTURE &amp; ETCHING

minimum temperature (dewar)	-190 °C
temperature control stage	-170 °C to -80 °C heat up to +60 °C for 1 hour
knife temperature	-160 °C
time for cooling from 20 °C to -180 °C	approx. 45 min
freeze etching rate (app. guideline)	at $2 \times 10^{-6}$ mbar at -100 °C about 2 nm/s
freeze etching hold time	max. 4 hours
stage tilt	cryo stage: $\pm 27^\circ$
knife feed	1-100 $\mu\text{m}$ / s
cutting distance	0 - 6000 $\mu\text{m}$
dewar size	0.75 l
Hazard notes	normal operational state specification of gaseous nitrogen peak emission (this occurs mainly during cool down from room temperature to cryo) 4 m <sup>3</sup> /h Please see safety introduction of the operating manual

## TRANSFER: VCT500 / LOAD LOCK

transfer feed through	Ø 50 mm
transfer stages	cryo stage or motorized stage with table to receive 4 VCT holder
VCT500 base vacuum	< 1E-4 mbar
VCT500 pump time	20 - 120 s
VCT500 purge time	5 - 30 s
VCT500 purge cycles	0 - 30
VCT500 time out attach	20 - 300 s
VCT500 shuttle waiting time	5 - 30 s
VCT500 pressure threshold	5E0 to 5E+1
load lock pump time	20 - 120 s
load lock purge time	5 - 30 s



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