MX 204 - Sorter

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General Information
Technical Specifications
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Installation

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EC declaration of conformity
as defined by machinery directive 89/392/EEC Annex II A

The manufacturer

Name/adress: Eichhorn + Hausmann GmbH
Messgerätebau
Benzstr. 7-9
D-76185 Karlsruhe
Germany

declare herewith that the supplied model of

Product: Automatic Wafer Thickness and Res t Measurement System

Type ID: MX204-608-DRA-5C

Year of manufacture: 2002

complies with the following provisions applying to it

89/392/EEC 89/336/EEC 73/23/EEC

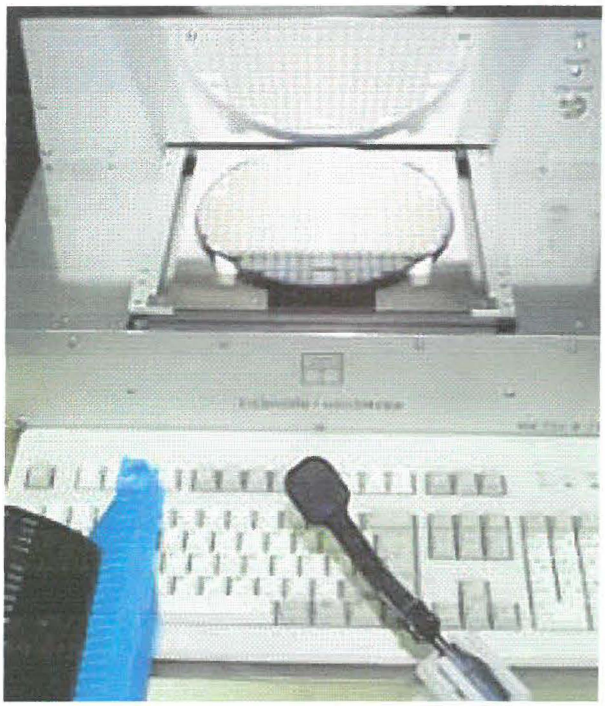
Applied national technical standarts and specifications in particular

EN 292-1
EN 292-2
EN 60 204-1
EN 50 081-1
EN 50 082-1
EN 50 081-2
EN 50 082-2

(Location, date) (Name, function) (Signature)

MX 204-8-37

Contactless Wafer Geometry Gauge



Features

- Contactless operation due to capacitive sensors
- Resolution 0.1 micrometers
- Mathematical simulation of a vacuum chuck
- Maximum measuring time per wafer: 5 Seconds
- No moving parts during the measurement
- Serial interface RS232
- Evaluation and data base program for PCs included
- Quick and easy recalibration
- Optional software for **stress** evaluation or data export to dBase

Description

The MX 204-8-37 is a compact desktop instrument for the measurement of the geometry of silicon wafers. The gauge is based on two heavy steel plates mounted opposite each other. Each plate contains a set of contactless capacitive sensors, they are arranged in a star-shaped pattern. On a kind of drawer, the wafer is automatically inserted into the air gap between the two plates, then positioned on three resting pins for the measurement. The sensors measure the distances to the wafer surface, the results are sent to the connected PC via the serial interface. Based on these distance values, our supplied PC software computes the following wafer characteristics:

- **Thickness** related: Center-, Average-, Min.-, Max.- and Local Thickness, TTV
- **Flatness** related: Local FPD, max. neg. FPD, max. pos.FPD, TIR
- **Warp** related: Local Warp, Total Warp, Bow

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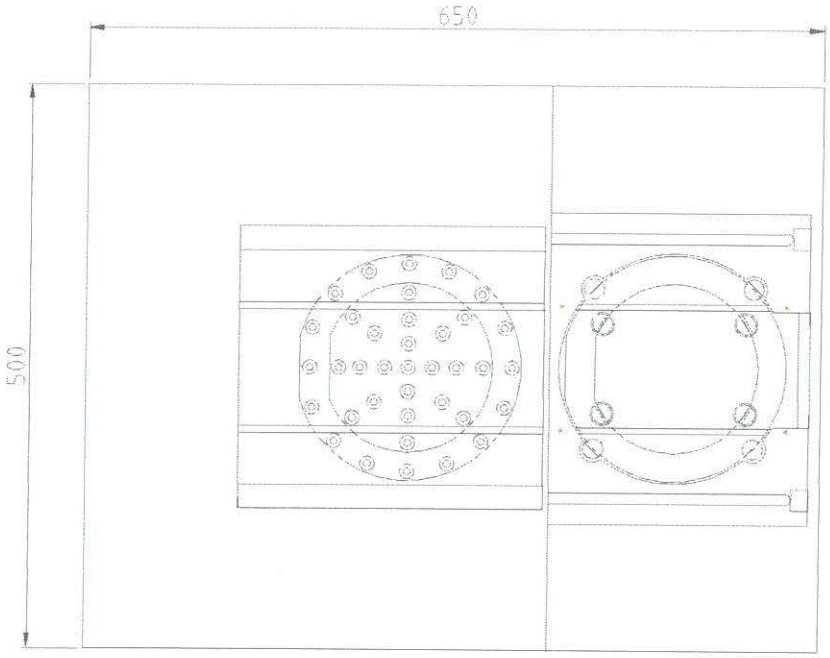


The Wafer Centering Feature

In front of the wafer geometry station there is a wafer centering station, on which the operator lays down the wafer he wants to measure. Four posts with beveled ends center and support the wafer. When the operator has pressed the button on the front panel of the instrument to start the measurement, these posts retract and lay down the wafer on the vacuum chuck bars of the drawer. Provided the chuck has clamped the wafer, an electric motor pulls the tray into the geometry station and lowers it there in order to lay down the wafer on the lower probe plate.

This feature allows also the automatically loading by robot (example: MX 204-8-21-VR).

Technical Specifications

Wafer Diameters	150	mm
	200	mm
Measuring Points		
150 mm Wafer	21	
200 mm Wafer	37	

Sensor Characteristics

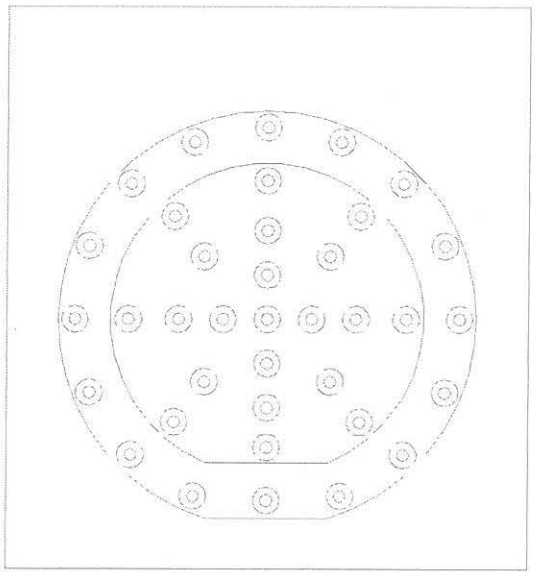
Measuring Range of One Sensor	1725	µm
Resolution	14	Bits
Repeatability	± 0.15	µm (2σ)
(distance measurement, wafer at rest, constant temperature)		

Gauge Accuracy (at calibration temperature)

Absolute Thickness Accuracy	± 0.5	µm
TTV	± 0.3	µm
Precision	± 0.15	µm (1σ)
(measuring one wafer ten times)		
Bow-bf / Warp Accuracy	± (3 µm + 5% of reading)	
Bow-bf / Warp Precision	± (0.3 µm + 0.3% of reading) (1σ)	
Warp according to ASTM, Warp and Bow-bf gravity-corrected		

Measuring Time	max. 5 sec. / wafer		
Dimensions	Width	500	mm
	Height	250	mm
	Depth	600	mm
Weight		40	kgs
Mains	110 – 240 V selectable, 50/60		Hz
Power Consumption		20	W

Probe Head



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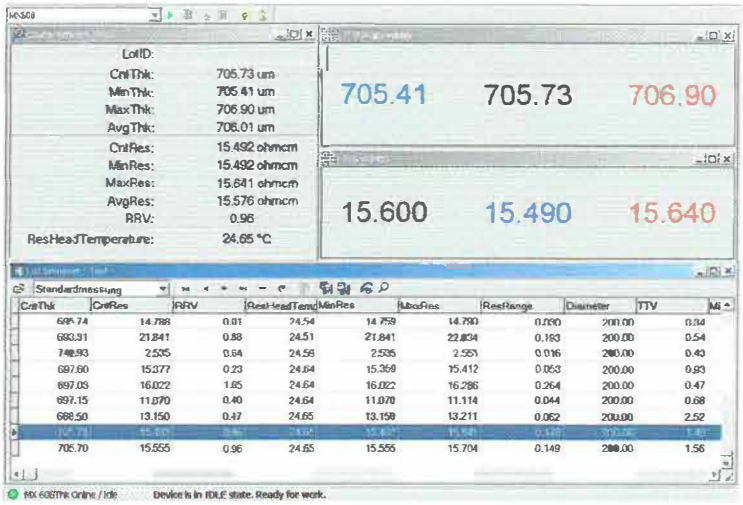
MX608

Contactless Wafer Gauge for Resistivity, Thickness and P/N



Operation and Mechanical Structure

The gauge is a compact desktop instrument for the contactless measurement of thickness and resistivity of silicon wafers. For the measurement, the wafer is moved automatically into the interior of the instrument. On it's way there, it passes one resistivity and one thickness sensor. These sample one value each in the center of the wafer, and other points selectable by receipe, up to 15 points in one row and optionally an identical scan after 90° rotation. At one point from top, the dopant type is determined by means of a contactless P/N sensor. The yielded values are sent to a WINDOWS computer via the instruments serial interface. There, results are computed, and displayed on the screen, the software also provides lot data management and printout options (s. MXNT description).

Measurement Principles

Thickness
Resistivity
Dopant Type

Capacitive Sensors
Eddy Current Principle
Surface Photo Voltage System

MX608

Also available with robot loading

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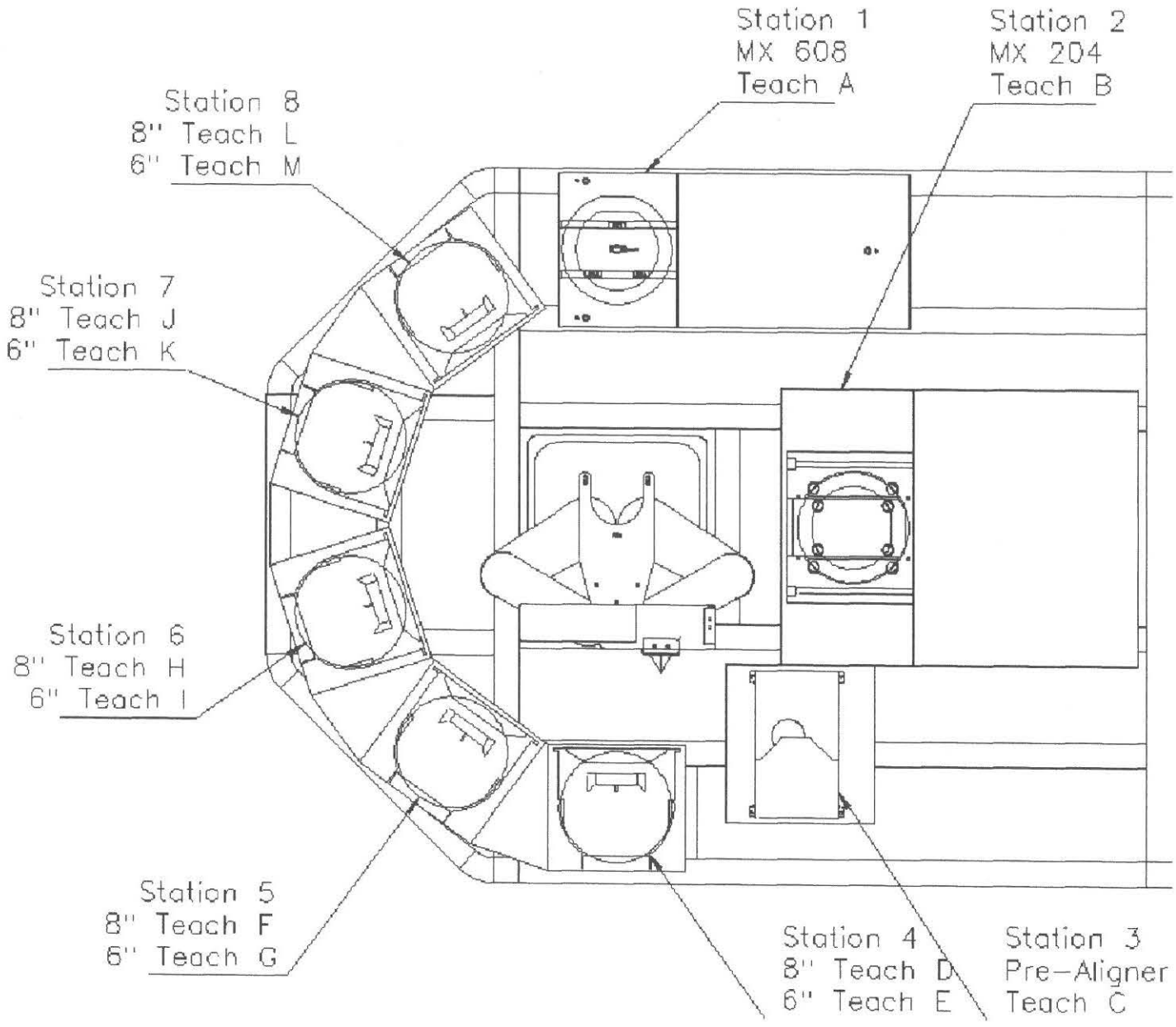
Technical Specifications

Wafer Diameters		150 + 200 mm
Thickness		500 – 800 µm
Max. Warp		100 µm
Resistivity		0.001 – 200 Ohm-cm
Type check		0.020 – 200 Ohm-cm
Thickness Measurement		
Accuracy °)		+/- 0.3 µm
TTV Accuracy		+/- 0.1 µm
Precision *)		+/- 0.05 µm
Restivity Measurement		
Accuracy °)	0.001 – 80 Ohm-cm	+/- 1 % “)
	200 Ohm-cm	+/- 5 %
Precision *)	0.001 – 80 Ohm-cm	+/- 0.2 %
	200 Ohm-cm	+/- 2 %
Edge Exclusion		
max. FQA (6”)		130 mm
max. FQA (8”)		180 mm
Throughput		
1 Point (center)		5 sec.
5 Points (1 scan)		10 sec.
9 Points (2 scans)		20 sec.
Particle Performance	All moving parts are below the wafers Backside contact material is PEEK (maybe an exhaust and laminarflow necessary)	
Dimensions		
Width		280 mm
Depth		660 mm
Hight		280 mm

°) Deviation of real value, average of repeated measurements are within these limits, at calibration temperature +/- 2 K, gradient < 1 K/h

*) Repeatability including handling, 1 sigma STD of repeated measurements is within these values

“) Depends on quality of calibration samples


Station 1
MX 608
Teach A
Station 2
MX 204
Teach B
Station 8
8" Teach L
6" Teach M
Station 7
8" Teach J
6" Teach K
Station 6
8" Teach H
6" Teach I
Station 5
8" Teach F
6" Teach G
Station 4
8" Teach D
6" Teach E
Station 3
Pre-Aligner
Teach C

Safety Notes

General References:
Read the Safety and operating notes thoroughly and pay attention to them in the practical use!

The conditions of use have to be kept. Ignore of the references or thing-adverse use of the MX-204-608-DRA-5C can damage

- the user
- or the gauge

Points out, that for damages and breakdowns as a result of the disregard of the operating instruction no liability is taken over (see Operator Instruction).

Injury Danger

- The MX-204-608-DRA-5C may be practised only in the concluded and operable condition! There is no danger in this case, which could be exist for lives and health of the operating personnel!

Electric Safety

Caution: Danger of the electrical shock!

- Contacts in the electric plant of the MX-204-608-DRA-5C are dangerous! (Mains voltage 110VAC)
- The opening of the case at turned on MX-204-608-DRA-5C is prohibited for customers and should be done if necessary exclusively through trained customer personnel (see Maintenance Instruction)!
- Modifications and interruptions of the protective earth are forbidden within and outside of the MX-204-608-DRA-5C!
- Use only the prescribed fuses with the gauge. You can remove them only at turned off MX-204-608-DRA-5C!
- The MX-204-608-DRA-5C may be connected only to an earthed socket of the protection class 1!
- There are no with hand attainable parts at the closed and turned on device, which have more than 24V dc. However, it could be possible, that you approach the plug contacts with a small screwdriver or thin metallic objects, which have the mains voltage. Fundamentally you should turn off the gauge and disconnect it for any maintenance operation!

It's exist no danger of the electrical shock for the service personnel during the measurements at the testing sockets of the electronic rack module (the gauge is in the turned on state)!

It's exist no danger of the electrical shock for the service personnel during the measurements at the distributor board B196 (the gauge is in the turned on state)!

The main switch (rear) must be put into the "OFF" position for all connective or service jobs at the electrical parts (see Electrical Counters and their effect).

Damaged wires should be replaced immediately. The device must be disconnected from the power net for these jobs.

Caution: Sensitive electronics !

All interface cables have to de connected with the device only in the voltage less state!

Safety devices
Safety devices must not be deactivated and/or replaced, because of damages at the MX-204-608-DRA-5C or at the wafers!

Dangers that start from touching parts
The movements of measuring head and should not be hindered! Nevertheless, it's exist no danger because of the small strengths.

Dangers through vacuum
It's exist no danger for the service personnel during any jobs with the parts, which are connected with the vacuum supply.

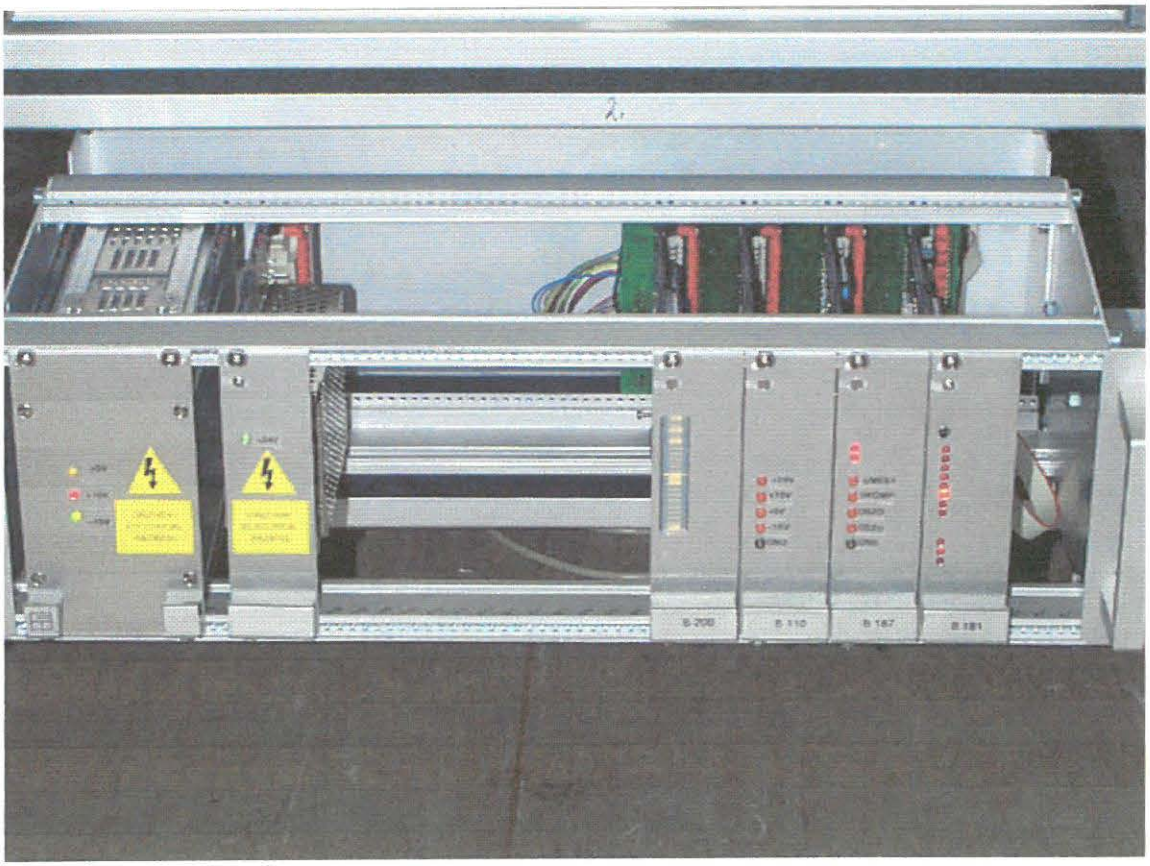
Electrical counters and their effect
"EMERGENCY STOP" is actuated:
Power supply to the electronic rack module is disturbed. Measurements and movements are not possible. Other parts of the gauge still have the mains voltage, for example the built-in socket groin and the devices, which are feeded from this groin (computer & monitor).

Employed safety symbols

In order to guarantee a faultless market and correct functioning of the MX-204-608-DRA-5C, there are some specific places and components by the gauge, which are characterized with this safety symbol:

Caution: Danger of the electrical shock!

CAUTION: Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. **A CAUTION** also alerts the user to unsafe practices and potential for property-damage accidents.



The MX-204-608-DRA-5C must be operated and serviced only from the skilled personnel. In the case of maintenance or repair the gauge plastic cover and some metal sheets must be removed from the device frame. These activities should be carried out only by instructed & educated personnel, too!

Installation Instructions for the E+H MX software package

1. Ensure enough space on drive C: of the PC where you want to install the software (at least 100MB).
2. Copy the folder EH_APP\ from the CD to C:\EH_APP on the local computer
3. Copy the folder MX-NT\ from the CD to C:\Program Files\MX-NT
4. **Important:** Because of all files and folder on the CD do have the file attribute READ-ONLY set, this attribute must be reset for ALL files and folders and subfolders copied to your hard disk! Use the windows explorer to mark all files of a directroy and the files|property dialog to reset the READ-ONLY flag.
5. Open the file MXNT.CFG with a text editor and modify the IP address in the line "PASSIVE ENTITY IPADDRESS 192.168.0.141" (the IP address may be different) to the local IP address of the computer where you have installed MX-NT. Ensure before that the TCP/IP protocoll is already installed and the network is working (you may try to ping the local computer). For a detailed configration of the GW and our SECS interface read also our Remote Host Interface Specification.
6. Create a shortcut for the file "C:\Program Files\MX-NT\MXNT.EXE" on your desktop and rename it to "MX-NT #<SerNo>" where <SerNo> is the serial numer of the MX (you'll find the serial number on the top of the power supply connector of the MX).
7. Click on the shortcut with the right mouse button and select properties. Switch over to the SHORTCUT tab and add to the entry TARGET the text "/CNF:<CNF-Filename>" where <CNF-Filename> is the appropriate file name of the MX-NT configuration file for your MX (e.g. MX102-1069.CNF).
   Example:
   C:\Program files\MX-NT\MXNT.EXE /CNF:MX102-1069.CNF
8. Install your GW-NT drivers in the MX-NT installation directory. The files SDR.EXE, SDR.DLL, GWGEM.EXE, GWGEM.DLL, CFGSDR.EXE, CW3220.DLL have to be present.
9. Double Click onto the shortcut on your desktop. MX-NT should start up without errors. It'll try to contact the SECS host and the MX device. If no SECS host is active at that time you may cancel the "waiting for host" dialog and switch over to LOCAL MODE with the appropriate button on the tool bar of MX-NT.
10. The installation is complete.

Annotations:

You'll find two additional programs within the software package. The first one is UNIPAS.EXE in the MX-NT installation directory. The purpose of this program is to administrate the access rights to program functions in other E+H software.
The second program is a standalone version of the maintenance program EHMaster.EXE. This program is normally part of MX-NT but can be used as a separate program too.

You may contact E+H (Tel. ++49-721-83118-0) or the software development company Daniel Raseghi Software and Hardware Design (Tel. ++49-721-9703016 or Mobile ++49-179-6972894) in the case of any problem during the installation.

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FIRMWARE UPDATE INSTRUCTIONS FOR MX DEVICES

After installing the new application/firmware files on your PC (*as described in the installation instructions*), you should proceed as follows:

1. Start EHMaster with the correct command line parameters (as described in the command line parameters summary) and login as usual.
2. If EHMaster detects a newer firmware, it will automatically ask for the installation of this firmware. In this case, allow the reprogramming of the equipment's flashdisk.
3. If EHMaster would not detect the newer firmware, select <F>irmware|<P>rogram from the main menu.
4. In both cases, wait (about 20-30 seconds), until the equipment becomes reidentified. You may trace the reidentification by watching the caption (window title) of the EHMaster window.
5. If you should have also received a newer parameters setup file with your update (files of the type <nnnn>.set in the root directory \EH_APP, where <nnnn> indicates the serial number of your equipment, e.g. 1234.set), or if you should have found a written notification about the necessity of a setup parameters update, you should also program the parameters by selecting <P>arameters|<P>rogram from the main menu. In this case, please also wait for the equiment's reidentification.

Now everything should be ready to work with the new firmware.

GLOBAL DEFAULT CUSTOMER LOGIN CODES FOR

MXNT.exe and EHMaster.exe

(preset for new delivered equipment)

These default codes are preset for all shipped equipment and concern the programs *MXNT.exe* and *EHMaster.exe*.

a) Level "Local administrator" (top customer level)

NAME	**LocalAdministrator**
PASSWORD	

b) Level "Engineer"

NAME	**Engineer**
PASSWORD	

c) Level "Maintenance"

NAME	**Maintenance**
PASSWORD	

d) Level "Operator" (lowest customer level)

NAME	**Operator**
PASSWORD	

Please note, that *both* the NAME and the PASSWORD must be in accordance in order to gain access to full functionality and special features of *MXNT.exe* and *EHMaster.exe*. As can be seen above, the default passwords are empty.

Notes:

- The passwords may be modified with the optionally delivered program *UniPas.exe*. Only members of the "LocalAdminstrator" or "Engineer" groups will be permitted to inspect or edit priorities in *UniPas.exe*.

FREQUENTLY ASKED QUESTIONS (FAQ)

concerning EHMaster.exe and MXNT.exe

1. **MXNT or EHMaster terminate immediately without further notifications after start.**

   Context: Application launching.
   Reason(s): Erroneous Windows OS or OEM printer handling or drivers. We encountered this effect in very rare cases, and the problem can not be solved or worked around by our software, since the provoked crashes originate in the drivers and the OS. Note, that for such buggy drivers, the attempt to get access to the printer properties will also fail (in the OS printer configuration menu, locate the mouse over the selected printer, press the right mouse and select "properties". This will pop up an OS error window).
   Solve: Make sure, that a valid printer is configured at all, and ensure its validity best by printing out a Word document. If a printer connection is not desired, install and activate a default printer driver (e.g. a HP Laserjet) for access at local LPT1 (do not leave the printer unconfigured).

2. **EHMaster stuck in "Primary identification".**

   Context: Software attempts to identify a MX device.
   Reason(s): Connection to the wrong comport, swapped comports, defective cable or equipment not switched on.
   Solve: Check the connection to the correct comport, the cable and ensure, that the equipment is switched on.

Version 1.01, 04/2001

MINIMUM REQUIREMENTS FOR E+H APPLICATIONS

[Alternatives are stated in brackets]
Version 1.15, 11/2002

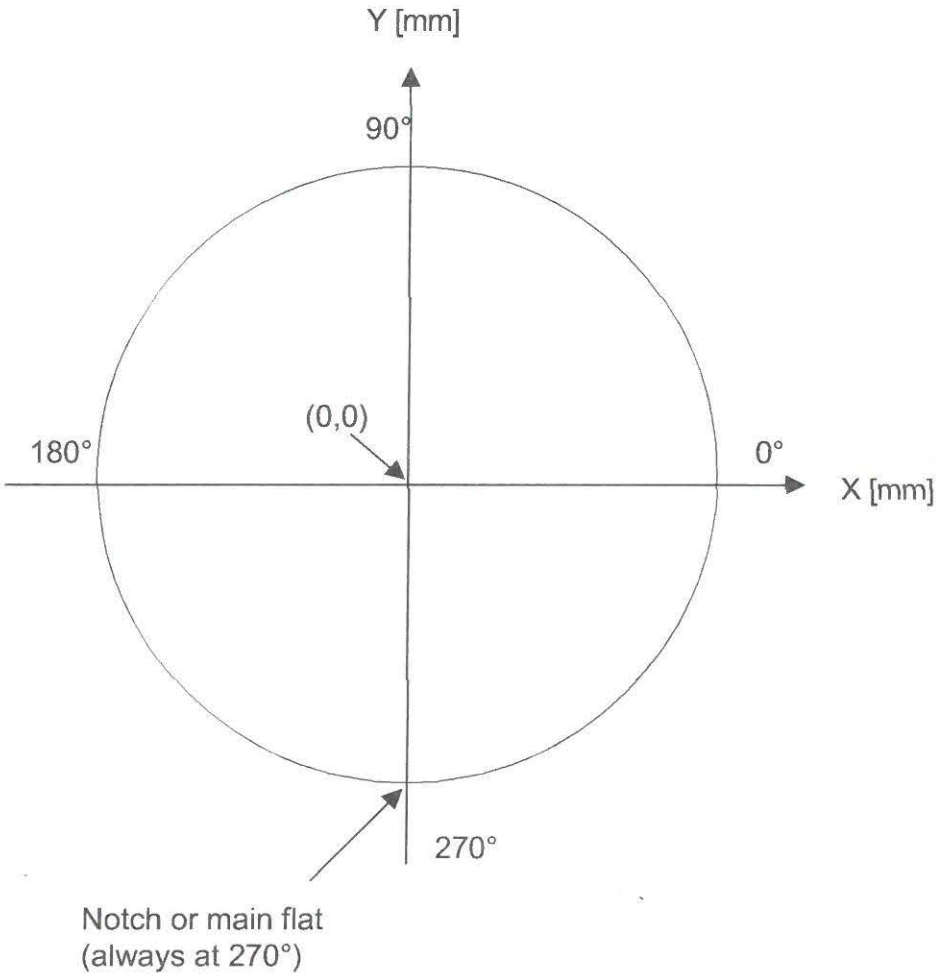
	EHMaster (Plug-and-play standalone maintenance & measurement program for special MX devices)	MXNT (Measurement & calibration program for most MX devices and multirobot systems)	WVV (2D & 3D wafer video viewer)	DOS programs (Diverse)
Operating system (OS)	Win 98, NT 4.0 SP6a, Win 2000 SP3, Win XP (Home & Professional) SP1	NT 4.0 SP6a, Win 2000 SP3, Win XP SP1	Win 98, NT 4.0 SP6a, Win 2000 SP3, Win XP (Home & Professional) SP1	DOS
Minimum installed memory	64 MB	256 MB	64 MB	64 MB
Recommended installed memory		256++ MB (depending on O/S and RDBMS)		
CPU (Intel or AMD)	500 MHz	800 MHz	500 MHz	Pentium 133
Mouse	Standard	Standard	Standard	<none>
Free hard disk space	150 MB min.	5 GB min.	150 MB min.	150 MB min.
Hard disk space consumed by application	5 MB typ.	20 MB typ.	5 MB typ.	3 MB typ.
Removeable media drives	1.44 MB Floppy + CD	1.44 MB Floppy + CD	ad lib.	1.44 MB Floppy
Recommended additional drives	100/250 MB internal ZIP	ad lib.	ad lib.	ad lib.
Minimum screen resolution	1024 * 768 @ 24 bit [16 bit]	1024 * 768 @ 24 bit [16 bit]	1024 * 768 @ 24 bit [16 bit]	Vesa BIOS VGA
OpenGL compatible graphics card	AGP with 3D-Accelerator	AGP with 3D-Accelerator	AGP with 3D-Accelerator	<none>
Serial ports	COM1: or COM2:	>>> INQUIRE <<<	<untouched>	>>> INQUIRE <<<
Network interface	<none>	Ethernet comp. NIC	<none>	<none>
Supported network protocols	<none>	TCP/IP	<none>	<none>
Recommended printer	Color printer [Standard printer]	Color printer [Standard printer]	Color printer [Standard printer]	HP LaserJet III compatible (*)
Additionally installed software	Acrobat Reader 5.0	Acrobat Reader 5.0	Acrobat Reader 5.0	<none>

Additional notes:

(1) DOS programs are not Compaq® compatible.
(2) Some virus scanners can cause serious operating system crashes or software hangups.
Tested incompatibility list: PC-CILLIN 2000
(3) Since the NT printer handling due to OS or OEM driver versions may be buggy, it should be ensured by the client, that a *tested* printer driver is configured *before running E+H software.*

(*) All HP printers we have tested so far (including the DeskJet series) are compatible to the LaserJet III control codes and may be used instead for DOS.

THE STANDARD WAFER COORDINATE SYSTEM USED BY E+H



Notes:

1. All positions and angles are referenced to the wafer, not to the gauge. The wafer center is at (0,0). The notch or main flat is always at the bottom of the coordinate system.

2. The correct insertion angle of the wafer (positioned onto the gauge drawer or turntable in its ejected load position) is stated in the equipment handbook and must be followed strictly.

3. Angles are in 0°..360° degrees and polarized mathematically (CCW) instead of clockwise.

4. X and Y are in signed millimeters.

5. Radius properties are in postive millimeters.

6. The unit of the Z dimension depends on the measurements and calculations performed. For thickness and geometry, the unit is µm; for resistivity, the unit is Ωcm. The units of specialized dimensions are stated the equipment handbook.

7. All properties are IEEE floating-point, unless otherwise stated.

How To Parametrize A Particular MX Instrument

The setup software installs shortcuts for multiple E+H instruments using MXNT software, because they are all supposed to be installed at the same time on the same site. Therefore, the 'Eichhorn+Hausmann' Start menu group will contain multiple shortcuts for different instruments. Before you run MXNT clickiung one of the shortcuts, verify the type and serial no. of the MX instrument you are dealing with. (It is best to eventually remove all unneeded shortcuts from the Start menu.)

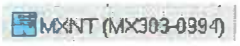
Example: 

Fig. 1: Start Menu Item

Once launched, depending on the Start menu item selected, MXNT reads the appropriate set of configuration files. MXNT displays instrument type and serial number in the center of its main window.

Fig.2: Instrument Type And Serial No. Read From Configuration File

Before you attempt to to use the MX for measuring, you should make shure that the instrument was correctly programmed and parametrized.
Watch the lower left corner on the screen. If MXNT has established a connection to the MX, it will read instrument type and serial number information out of the instrument and display it there. Please, compare those two sets of information (a future version of the software will do this automatically).

Fig.3: Instrument Type And Serial No. Read From Inside The Instrument

If the numbers do not match (as in the above case) you either connected the wrong instrument or you launched MXNT clicking the wrong shortcut.

Note: The mismatch may also be caused by using the wrong B181 processor PCB.

In any of those cases, quit MXNT and correct the problem before you continue.

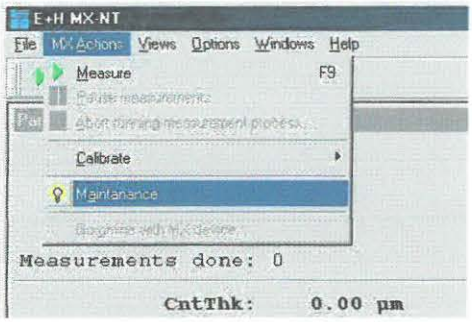


Fig.4: Maintenance

Select the menu item **MX Action > Maintenance** from MXNT's main menu.

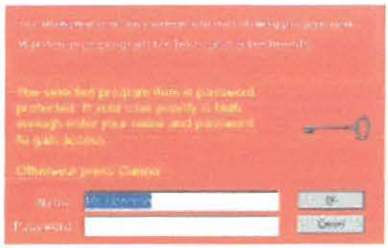


Fig.5: Password Input Box

You may later on use our utility „Unipas" to change user names and passwords. MXNT comes preconfigured as follows:

Name: engineer
Password:

Don't enter a password. The maintenance window pops up.

(1) Reprogramming the firmware

The firmware is the internal microprocessor software developed for a particular instrument (MX102, MX303). Open the menu item **Software > Program**

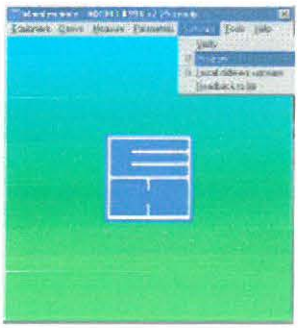


Fig.6: Reprogramming The Firmware

Two warning windows pop up on the screen:

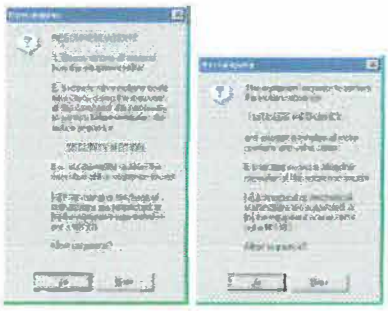


Fig.7: Confirmations

Provided you have removed all wafers, and instrument and software match, you may confirm both messages by clicking **Yes**.

Note! It may take up to ten seconds to transmit all the data to the MX instrument. During this time, the LEDs on board B181 do not blink regularly, and there is no way to select the menu bar of the maintenance window. Please, stand by until this process is finished.

(2) Parametrizing the instrument

This will cause the instrument specific data (set up for an instrument with a particular serial number) to be reprogrammed. Open the main menu item **Parameters > Program**.

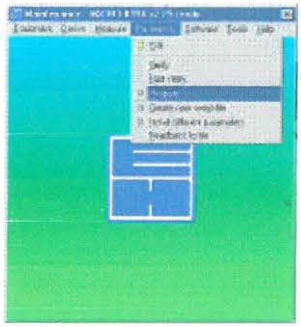


Fig.8: Parametrizing The Instrument

The same confirmation windows as described above pop up.

Once you are finished with these steps, you may start measuring wafers.