



METKON

Application Note

Metallographic Preparation of fridge condenser tube

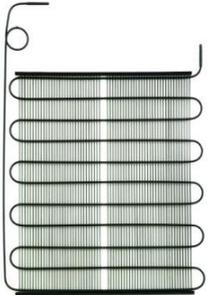


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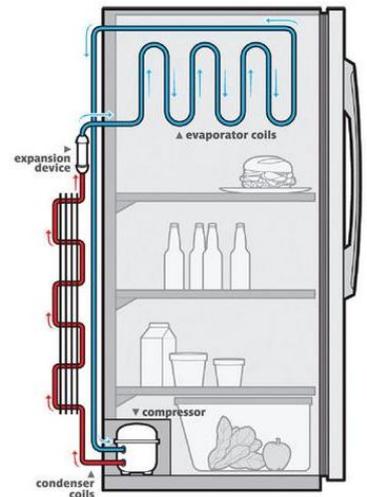
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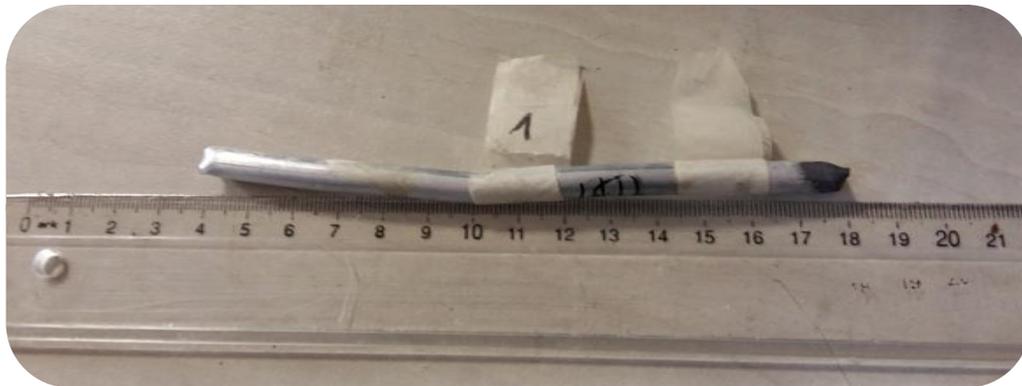
In systems involving heat transfer, a condenser is a device or unit used to condense a substance from its gaseous to its liquid state, by cooling it. In so doing, the latent heat is given up by the substance, and will transfer to the condenser coolant.



Condensers are typically heat exchangers which have various designs and come in many sizes ranging from rather small (hand-held) to very large industrial-scale units used in plant processes. For example, a refrigerator uses a condenser to get rid of heat extracted from the interior of the unit to the outside air. Condensers are used in air conditioning, industrial chemical processes such as distillation, steam power plants and other heat-exchange systems. Use of cooling water or surrounding air as the coolant is common in many condensers.

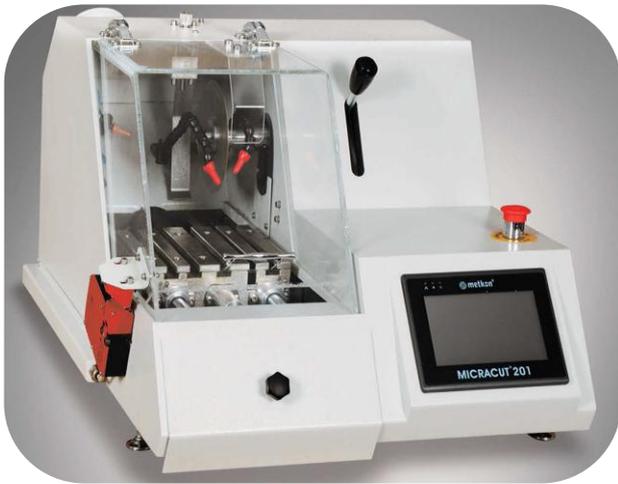


Sample and requested cutting and analyzing zones:



**In this application; above sample has been prepared in order to examine hole defects.*

SECTIONING



MICRACUT 201

Automatic High Speed Precision Cut-off Machine, Programmable with 5,7" HMI touch screen control, with Siemens PLC control unit, coloured LCD display of cutting parameter. Moving table feed system, compact cutting motor, with variable cut-off wheel speed from 500 to 5000 rpm, automatic feeding with adjustable feed speed, motorised positioning system with digital readout on the LCD, library of cutting programs for different materials, Ability to mount diamond cup grinding wheel for thin section applications with built-in recirculation cooling unit, complete and ready for operation. Without clamping tools and specimen vises. 230 V, 50 Hz, AC. Includes a standard set of cutting consumables composed of;

- *1 pc. Diamond cutting Disc 200 mm dia.
- *10 abrasive thin cut-off wheels 200 mm dia.
- *1 lt of Metcool II cooling fluid.

	Order Code	Description
Equipment Used	17 06	MICRACUT 201
Clamping Device	GR 0548	Quick acting clamping vise assembly
	GR 0400	Universal Specimen vise
Cooling Fluid	19 905	METCOOL II Cooling Fluid, 1 lt.
Cutting Disc	18-150	TRENO HP Ø150 mm

MOUNTING



ECOPRESS 100

Programmable Automatic Mounting Press with one cylinder, 5,7" HMI touch screen control, with Siemens PLC control unit, programmable with coloured LCD display, program based mounting sequences, electro hydraulic pressure (requires no air), pressure upto 300 bar, temperature upto 200 OC, operation time upto 59:99 minutes, short cycle time, thermostatically controlled heating power of 1250W, automatic cooling cycle with two three modes of cooling rates(fast standard cooling,slow cooling and based on time), programmable preheating and preloading, selectable mould sizes from

25 mm to 50 mm, audible warning signal, ready for operation. 230 V, 1-phase, 50 Hz. Mould assemblies are ordered separately. Includes a standard set of mounting consumables composed of 3 different hot mounting compounds; 1 kg of each and a total of 3 kg.

	Order Code	Description
Equipment Used	25 07	ECOPRESS 100
	26 06-02	Mould Assembly, 40mm
Mounting Powder	29-010	NET - Acrylic

GRINDING & POLISHING



FORCIPOL 2V

Grinding and Polishing Machine

Double wheel, suitable for 200 mm and 250 mm wheel size, standard interface for FORCIMAT automatic specimen mover variable speed between 50-600 rpm, with digital display, 3/4 HP motor with overload protection, including water inlet and outlet. 230 V, 1-phase, 50 Hz.

Includes a standard set of grinding & polishing consumables;

*An assortment of 100 grinding papers (various grits), 250 mm dia.

*An assortment of 5 polishing cloths with 250 mm dia.

*Diamond suspensions, one of each of 6 mic. and 1 mic., plus lubricant

FORCIMAT

Automatic Specimen Mover

Microprocessor controlled, pneumatically adjustable individual force loading system, upto 6 specimens, 100 Watt DC motor, variable rotational speed between 50-150 rpm, front panel with touch-pad controls, audible warning signal, communication capability with all FORCIPOL machines, with steel mounting column.

Complete and ready for operation.

230 V, 1-phase, 50 Hz.

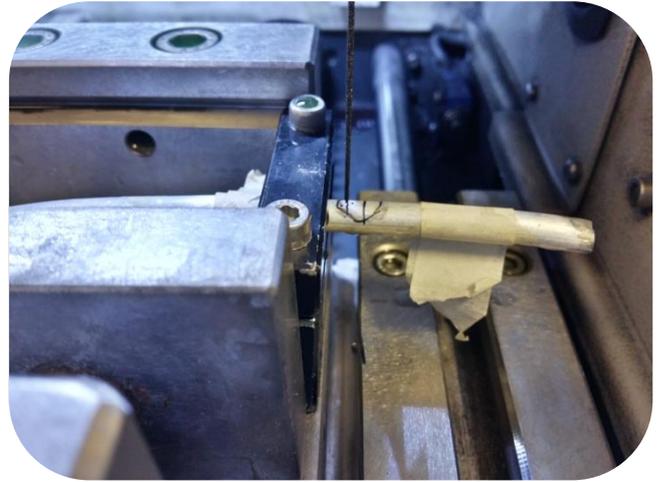
	Order Code	Description
Equipment Used	36 09-250 / 30 09	FORCIPOL 2V / FORCIMAT
Accessories	31 22	Aluminum Disc, 250 mm
	31 63	Splash Guard, 250 mm
	39-003-250	Ø 250 mm, Special Magnetic Foil
	39-093-250	Ø 250 mm, Thin Metal Plate(5 pcs)
Sample Holder	33 01	Sample holder, 6 x Ø40 mm

SAMPLE PREPARATION PROCESSES

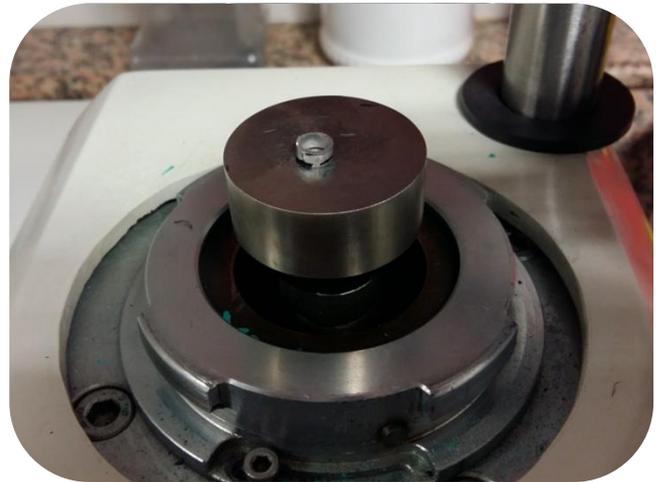
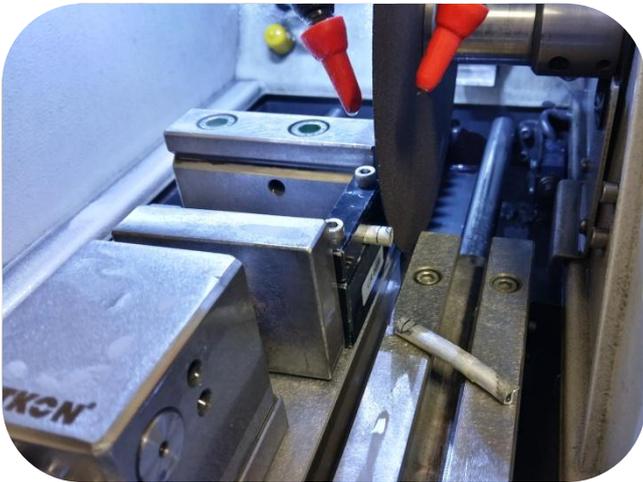
First, sample has cut from requested area with the help of GR 0548 Quick acting clamping vise and GR 0400 Universal specimen vise.



GR 0400



GR 0548 & GR 0548



Cutting Parameters are:

Feed rate: 50 μ /sec.

RPM: 3000 r/min.

Cutted samples mounted with the these parameters on the ECOPRESS 100.

Heating Temperature : 190°C

Pressure : 260 bar

Heating Time : 3 mins.

Cooling Type : Slow cooling for acrylic
(Open:5 sec., Close:30 sec.)

Cooling Temperature :35°C

In the grinding and polishing step, samples were prepared by performing operations 30 seconds. Between each step, samples were controlled under the microscope.

Grinding and polishing steps can be seen below:

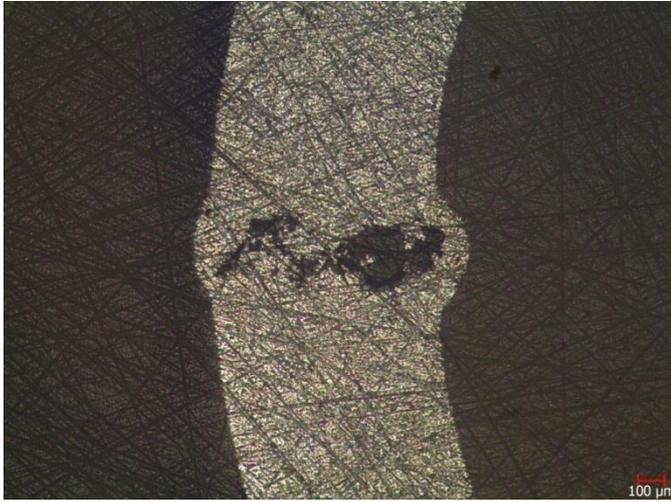
	Surface	Abrasive	Lubricant	Force per Sample, (N)	Time (min.)	Disc speed (rpm) Rotation	Head Speed (rpm) Rotation
Grinding Step 1	DEMPAX [38-040-320]	320 grit SiC	Water	5 N	3x30 sec	250 CW	100 CW
Grinding Step 2	DEMPAX [38-040-600]	600 grit SiC	Water	5 N	2x30 sec.	250 CW	100 CW
Final Grinding	DEMPAX [38-040-1200]	1200 grit SiC	Water	5 N	2x30 sec.	250 CW	100 CW
Polishing Step 1	METAPO-B [39-033-250]	DIAPAT-M 3 μ [39-420-M]	DIAPAT [39-502]	5 N	30 sec.	150 CW	75 CCW

End of the all operations, hole impact become apperent:

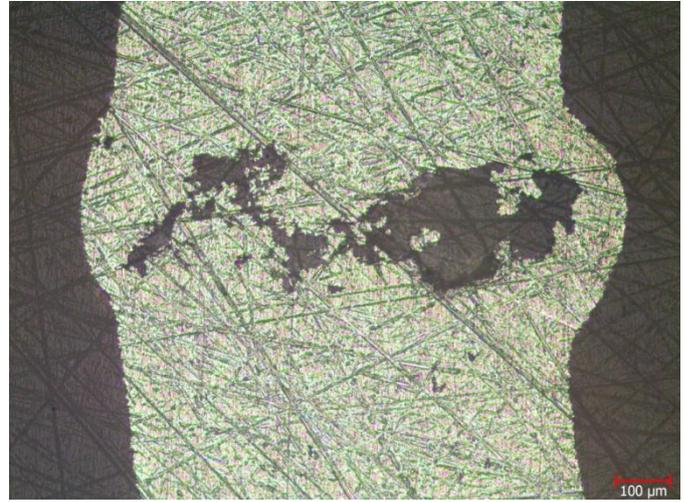


Images of the samples under the microscope are as follows:

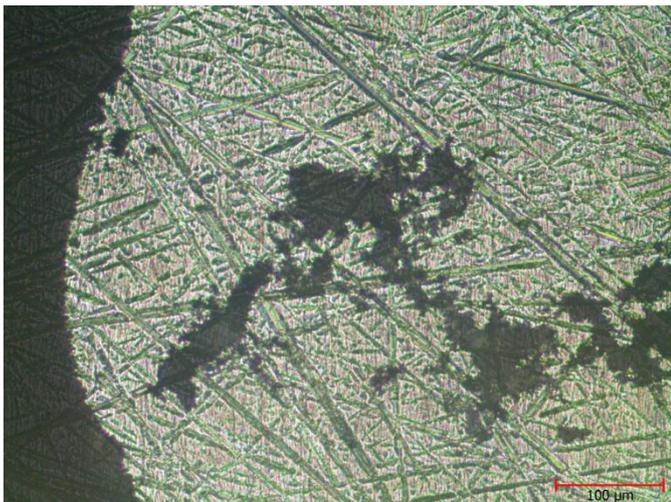
Sample 1:



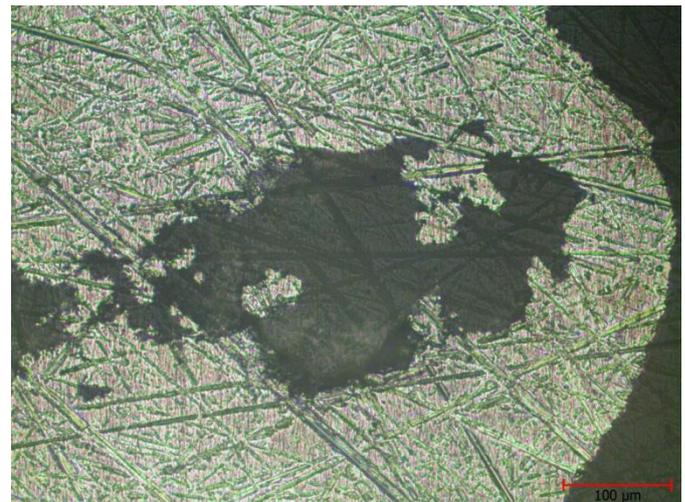
50x



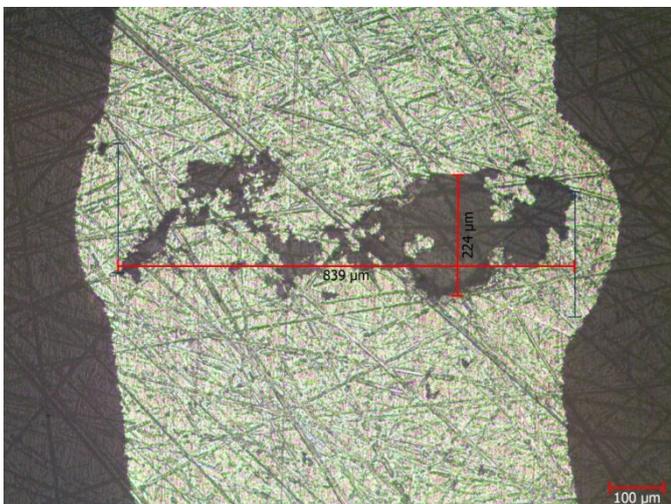
100x



200x

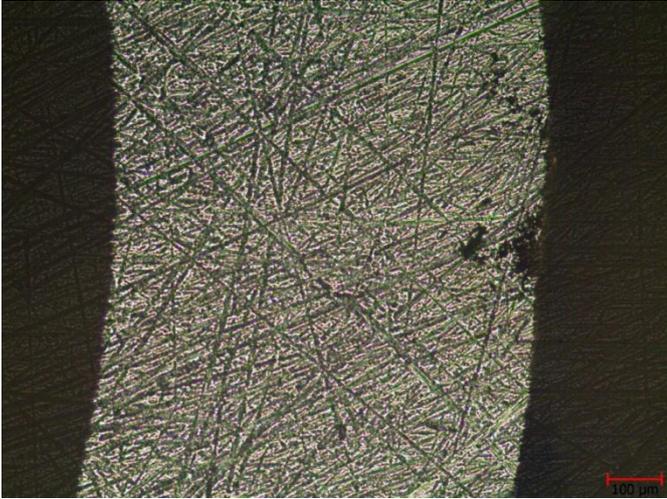


200x

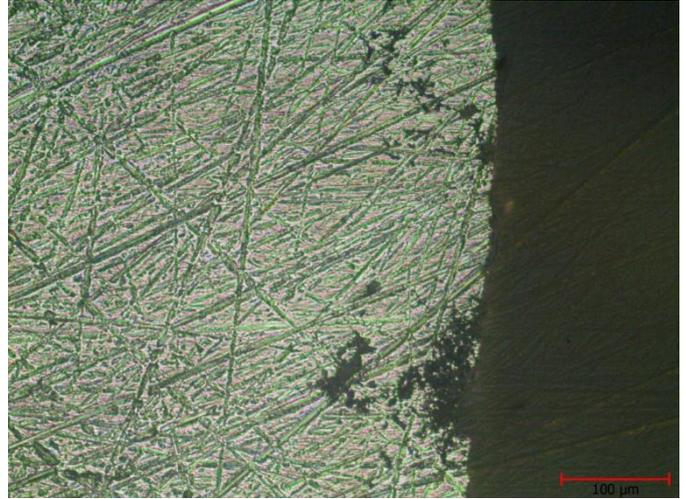


100x -measurement

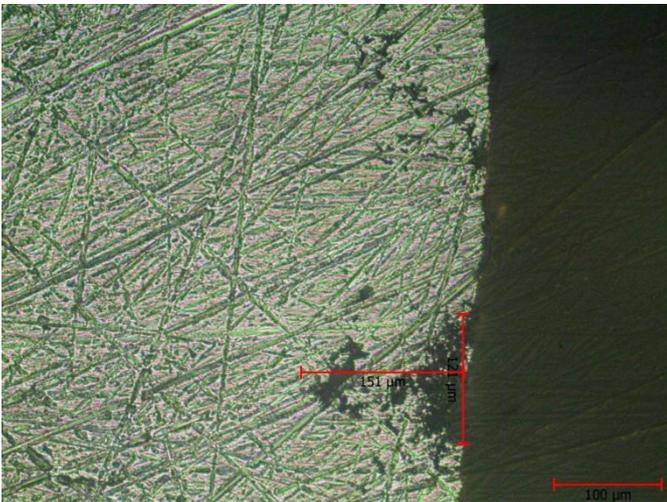
Sample 2:



100x



200x



200x-measurement

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Technology behind Specimen