

# MIDAS

## TECHNOLOGY, INC

for microelectronic rework since 1986

## 2016 HGRS-V & 1J *HOT* GAS Rework Systems

### WHAT ARE HGRS SYSTEMS?

..Answer; an advanced workstation for removing strongly-attached microelectronic components from complex, high-value circuits. The HGRS gives you precisely localized high temperatures combined with time-proven controls and device-protective features. HGRS achieves release temperature in seconds, rather than minutes. With a controlled thermal footprint and built-in shear system, operators remove targeted devices quickly and safely, without the heat, impact shock, and scratching damage common to traditional processes.



### WHO ARE THEY FOR?

HGRS was conceived in the mid-1980s when hot air guns and lead solder were good enough for everything but advanced packaging lab projects. But since then, the demands of aerospace, telecommunications, optical and medical electronics have changed. And we have changed with them, improving the HGRS through 5 generations of enhancements. Now our flagship HGRS-V reworks today's highest performance epoxies, solders and eutectic bonds so safely it's required by advanced US military processes, and our equipment is found in microelectronics facilities worldwide. And the newly introduced HGRS-1J is ideal for facilities on a budget that need die removal, but the not advanced suite of monitoring and control tools built into the HGRS-V.

*NOTE: If you can't remove 80/20-attached die, or if you're still tackling stubborn die with 15-minute bakes, hammer, screwdrivers, and chisels - the HGRS is for you!*

## WHY HGRS IS NECESSARY

### THE BASIC ISSUES OF COMPONENT REMOVAL

- ⦿ The attach material between the component and substrate must be weakened, so component removal (such as impact shock) does not damage the substrate or adjacent components.
- ⦿ Heating is the most effective means of weakening attach materials (epoxies to glass transition, solders and eutectics to reflow temperatures)
- ⦿ Rapid heating is usually more effective than slow heating for weakening attach; on epoxies especially, slow heating can cure them to stronger states.
- ⦿ Today's circuits are thermally very conductive, so heat applied to one component rapidly spreads to adjacent components.
- ⦿ Good component temperature limits must not be exceeded when removing bad ones.



### HGRS IS THE ANSWER

- ⦿ **TIME IS KEY:** by reducing process time we limit the spread of heat in the circuit.
- ⦿ **HIGH TEMPERATURES REDUCE PROCESS TIME** the hotter the top of the target component gets, the faster its attach layer reaches release temperature
- ⦿ **HGRS JETS PROVIDES HIGH TEMPERATURE, FAST** Our shaped chamber ceramic jets provide near-instant high temperatures; 400C within seconds, normal operating range 200-750C, with higher temperatures easily achieved.
- ⦿ **HGRS PRECISELY TARGETS GAS** Our easily-changed nozzles (from .02”-.240”) and fully adjustable positioners allow users to create thermal footprints that maximize impact on target die, and avoid overheating nearby components.
- ⦿ **HGRS PROTECTIVE SYSTEMS** provide device cooling, N2 flooding and max temperature protection capabilities which can be combined into sophisticated application solutions for the most complex component removal problems.

## WORKHOLDING & HEATING

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**PREHEATED WORKHOLDER:** We provide a convenient “universal” fixture for substrates and modules, consisting of a spring-loaded 4”x4” pin grid with moveable wedges and a height-adjustable backstop. The grid can be preheated (PID controlled to 180C standard, more optional) to avoid thermal shock and reduce heat losses in thermally-conductive assemblies. The HGRS-V pin-grid and heater block mount on a 6”x6” travel air-bearing stage, which vacuum-locks into place when the operator knob button is released. The entire stage can be fine-adjusted (working around wirebonds, for example) by a convenient right side knob.

*The simpler HGRS-1J has a preheated 3” grid, manual X-axis slide, and Y-axis leadscrew which drives workholder and part against stationary shear.*



**GAS NOZZLES:** our standard quartz-glass nozzles range from .02” - .24” orifice size, and come angled (to blow directly down) and straight. For special applications we can make rectangular shapes, with or without baffles, and custom shapes as well. Nozzles changes take 1-2 minutes.



**GAS HEATING & CONTROL:** Our **HOT** gas comes from one (1J) or two (-V) independently controlled heater jets. These proprietary, shaped-chamber ceramic kilns are flash-heated by pure tungsten windings on extreme-duty cores, and bring your N2 or forming gas to high temperature in seconds. Gas temperature is linked to sophisticated PID controllers through fast-reaction thermocouples located in the nozzle exits. Gas flow through each jet is also independently controllable.

**JET POSITIONING:** Each HGRS-V heater jet is mounted on a swing-out arm with horizontal (leadscrew) and vertical (rack & pinion) positioning with adjustable stops, and each can be rotated to access corners and clear package features. The -1J offers vertical rack & pinion with adjustable stop, and rotation. Angled nozzles can also be rotated in their holders to provide additional coverage options. Operators can easily align nozzles with the target die, and bring them as close as necessary to control overflow.



**PROCESS TIMING:** Your process can be manually controlled via footswitch (with the duration captured on the controller) or on the HGRS-V, set to automatically repeat over a preset length of time. Timer Control mode is announced on illuminated panel switch next

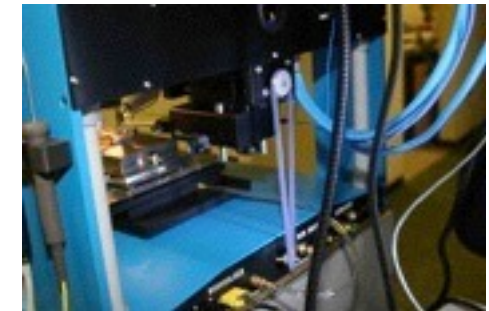
**HGRS-V MAX TEMPERATURE MONITORING/ LIMITATION:** In normal operation, temperature sensed by the included manual probe is displayed on the panel probe controller. A separate panel switch engages and alerts "Probe Control" mode, which connects any fixture-mounted thermocouple to the panel controller, so you can enter a max allowed temperature. If the thermocouple reaches your preset max, an audible alarm will sound and heater jet power will be automatically dropped to a preset safe level.

**SPOT COOLING/N2 FLOODS:** A separate pushbutton engages N2 Flood, which routes ambient temperature N2 through one (1J) or two flexible wands with stainless steel tips. These can be positioned to cover devices next to the one being removed, to prevent hot gas from reaching sensitive areas; or they can fill a well to maintain a moving N2 atmosphere over your device. The flow rate is adjustable, and the well temperature can be probe-monitored for protecting FPAs and double-sided devices.

**SHEAR :** as soon as your target device is heated to release temperature (normally 3-15 seconds depending on size), it can be safely removed with the built-in shear system controlled by a knob comfortably located under the operator's right hand (or centered on the 1J) while the left hand controls tool height with both well away from hot gas. HGRS-V shear force can be limited by adjusting stage vacuum to avoid cold-shear.

A full set of shear tools (from .02" to .20" width, straight and wedge shaped) comes with each basic machine, and they can be changed in seconds. For optional tools see "Customization" below.

*Our HGRS-V NO-SLIP Sprocket and Chain Shear Drive debuted in 2010, with improved rigidity and increased shear range, plus vertical adjustment for improved deep access and flat alignment for fragile substrates.*



**OPTICS:** The HGRS-V comes with a 3X stereo zoom microscope with 10X eyepieces, focus mount, post, elbow, and easy-sliding dual-boom mount. Self-standing optics are available for the HGRS-1J at additional cost.

**ILLUMINATION** The HGRS-V includes a dimmable, scope-mounted LED light ring.

**VACUUM PENCIL:** The HGRS-V configuration includes an NC vacuum pencil with a selection of tips. Vacuum is provided by the built-in continuous-duty pump which also locks the workholder.

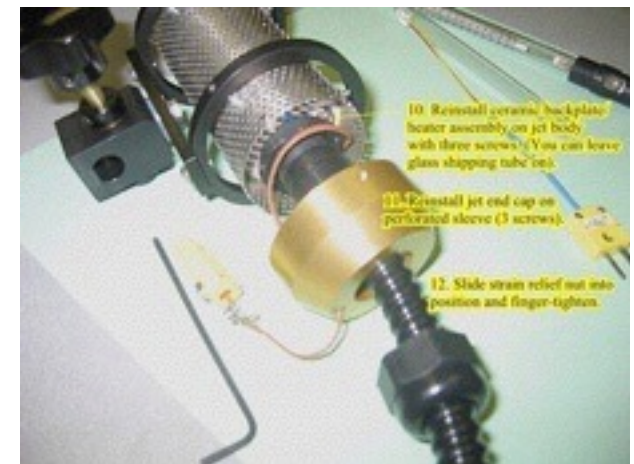
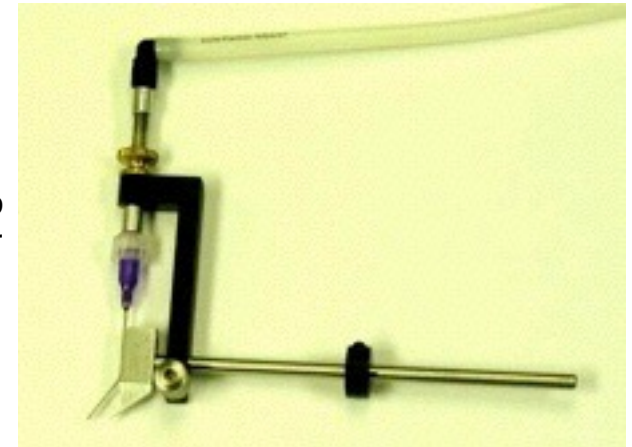
**VACUUM PICKUP:** The HGRS-V also has an intermittent-duty accessory vacuum, with a back-panel tubing connection. It is activated by a pushbutton on the left-hand tool-height lever. The standard toolkit includes the illustrated pickup tip bracket, which fits onto the shear rod. This setup can also be used as a die retainer, by installing a bent microtip to press on the die when the shear tool is in position - see the photo at right for an example.

**SET FLOW CIRCUIT:** A special switch on the HGRS-V front panel allows balancing hot and cold gas flows by running all engaged jets without heating; this is useful when using N2 floods to protect adjacent devices from hot gas. SET-FLOW also provides quick cool for nozzle changing.

**AUTO-PURGE CIRCUIT:** The HGRS-V automatically runs cooling N2 through the hot jets when the machine is powered off, to prevent oxidation of the heating elements that could occur if air were allowed to backfill as the jet cavities cool and contents contract. Once cooled, the machine completes its full shutoff automatically.

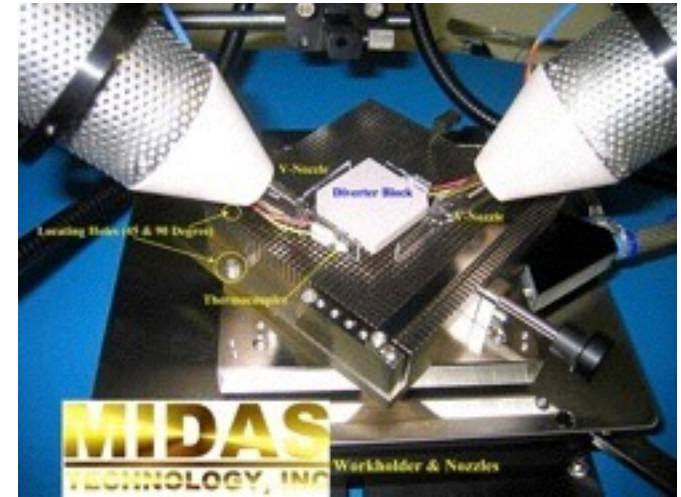
**SETUP TOOLKIT:** We include a toolbox with metric and SAE allen keys, special tools for adjusting heater jet pivot tension and shear rod collars, spare fuses, panel switch bulbs and bulb puller, as well as a silicon-rubber nozzle removal pad.

**MANUAL:** HGRS customers will receive on-line access to the latest fully illustrated manual and maintenance guide in electronic form on completion.



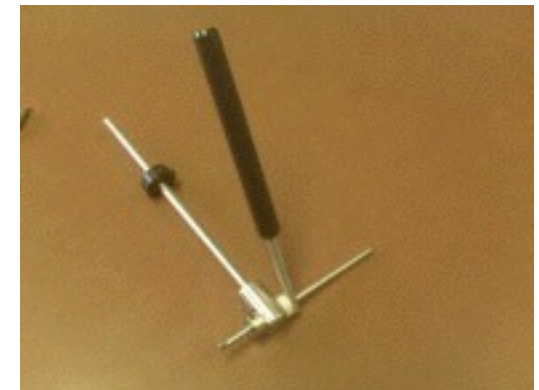
## OPTIONS & CUSTOMIZATION

**ROTATING WORKHOLDER:** For some applications, it is very useful to rotate your work, to approach a task from a different direction. One example is removing AuSn-sealed lids from packages. For this, we route gas along the lid seal (using V-nozzles and a ceramic block) and lift the lid from the back corner. We have a variety of techniques for orienting workholders.



**CUSTOM NOZZLES:** We can create nozzles and fixtures to route gas wherever your application requires. We have made nozzles in specific shapes, such as baffled nozzles to flow around devices, or "L" nozzles to heat AuSN lid seals.

**CUSTOM SHEAR TOOLS:** We have decades of experience tooling up difficult applications. From razor tools and hardened wedges to cam tools for cavities, we have machined what customers need to accomplish their component removal tasks.



**CUSTOM APPLICATIONS:** When simple tooling is not enough, we have developed sophisticated solutions that tie together all the HGRS-V features. The example illustrated here is a setup to remove high-value legacy substrates, intact & undamaged, from outdated or damaged packages.



*For applications support, call your local Midas representative, or contact us directly.*

## COMMONLY ORDERED ITEMS

[sales@midastechnology.com](mailto:sales@midastechnology.com)

Midas #	Description	Price
H5	HGRS-V Workstation with Optics, Setup Tools, 2 Nozzles, Standard Sheartool Set	<i>For a Detailed</i>
HJ	HGRS-1J Single Jet System with Setup Tools, 2 Nozzles, Standard Sheartool Set	<i>Quote,</i>
H5JANSnnP	Straight Quartz Nozzle & Thermocouple, Orifice "nn" = .02"-.14" or .24". Order 7 to complete set	<i>contact</i>
H5JANAnnP	Angled Quartz Nozzle & Thermocouple, Orifice"nn"=.02"-.14" or .24", Order 7 to complete set	<i>your</i>
H5WHSCSS	Combo Shearfoot, Straight Profile, Small (.02" & .05" Widths) - <i>included with HGRS-V</i>	<i>local</i>
H5WHSCSL	Combo Shearfoot, Straight Profile, Large (.10" & .20" Widths) - <i>included with HGRS-V</i>	<i>distributor</i>
H5WHSCWS	Combo Shearfoot, Wedge Profile, Small (.02" & .05" Widths) - <i>included with HGRS-V</i>	<i>or</i>
H5WHSCWL	Combo Shearfoot, Wedge Profile, Large (.10" & .20" Widths) - <i>included with HGRS-V</i>	<i>Midas</i>
H5JAJT05	Generation-5 Heater Element, pure tungsten, tight-wound on extreme-duty core for easier nozzle change. <i>2 included with HGRS-V, order extras as desired for spares.</i>	<i>Technology</i>
H5WHRS	Rotating Workholder Modification, Typical (Ordered with HGRS-V)	
H5OPOMIT	Credit for omitting Microscope and Mounting Components from HGRS-V Order	
H5ILOMIT	Credit for omitting Light Source & Light Guides from HGRS-V Order	
H5INSTALL	On-Site Installation & Training by Factory Staff, North America (excluding overnight logistics)	

*Due to our policy of continual improvement, all specifications and prices are subject to change. Export equipment requires physical modifications and additional charges. Distributor support is available in most world markets. Please contact us for a review of your application requirements and a detailed quotation.*

## ABOUT US

We're a privately-held specialty manufacturer incorporated in 1986, operating since 1987 in a modern industrial park north of Boston, MA, USA. Our products are marketed and supported by a world-wide network of exclusive regional representatives and distributors.



**de-lidder™** machines remove lids from hermetic packages non-destructively, leaving a particle-free cavity and reseal-ready surface so product can be reworked and resealed. We have multipurpose and dedicated models for rectangular, round, and optical fiber modules.



**HGRS *HOT* Gas Workstations** safely remove components from assembled circuits with momentary jets of precisely localized very hot Nitrogen. A full suite of tools also make these machines the ideal “thermal workbench” for prototypes & advanced applications.

We sell to manufacturers and users of high-value, high-reliability microelectronics. As microelectronic packaging technologies have spread from **defense/aerospace** into **telecommunications**, **optoelectronics**, and **medicine**, our customer base has expanded into all these fields world-wide; wherever the time and materials invested in such products make them worth reworking.

for answers to any technical questions and a technical review of your application. Our regional representatives can help you arrange samples and demonstrations.

## CONTACT US

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