

Epoxy-System HP-E3000RI

- Hardener HP-E3RI / HP-E30RI / HP-E120RI / HP-E300RI -

Base of the **series HP-E3000RI** is an unfilled epoxy-resin, which is individually mixable with different hardeners for several applications.

A special feature of this series is a high initial glass transition temperature (T_g) when hardening at room temperature.

The special hardener **HP-E120RI** provides a higher maximum initial glass transition temperature (T_g Max) up to 98°C. This hardener has a highly transparent and therefore is well suitable for visible carbon components.

The hardeners **HP-E3RI**, **HP-E30RI** and **HP-E300RI** allow a pot life between 3 and 300 minutes.

The injection / infusion systems are characterized by a particularly low viscosity. This results in optimal impregnation and flow properties. A use in hand lamination is also possible.

Properties:

- very low viscosities, therefore excellent fibre wet-out
- pot-life adjustable between 30 (hardener **HP-E30RI**) and 300 minutes (hardener **HP-E300RI**)
- fast hardener **HP-E3RI** for very short curing cycles available
- glass transition temperature (T_g Max) up to 98 °C (hardener **HP-E120RI**)
- high dynamic and static strength

Field of Application:

- Vacuum-infusion methods (IMC/MTI, RI, VARI, SCRIMP®...)
- Pressure injection methods (RTM, RIM...)
- filament winding
- hand laminating
- optical application such as visible carbon parts (hardener **HP-E120RI**)

Processing Data -Resin-

| | | RESIN |
|---------------------------------------|------------------|---|
| <i>Name of article</i> | | HP-E3000RI |
| colouring | | colourless |
| colour index | [Gardner] | < 1 |
| mixing ratio (weight) | [parts] | 100 : 30 (hardener see next page) |
| pot life¹ (at 20°C) | [minutes] | 30 - 300 |

Processing -Hardener- :

HARDENER

| | | <i>very fast</i> | <i>fast</i> | <i>temp</i> | <i>slow</i> |
|----------------------------------|-----------|---|--|--|---|
| main features | | - very short pot life - for short cycles (RTM) | - short pot life - for low working temperatures | - higher Tg - colourless (visible carbon parts) | - long pot life - for infusions/injections |
| Name of article | | HP-3RI | HP-E30RI | HP-E120RI | HP-E300RI |
| colouring | | colourless with a slight yellow | | | |
| colour index | [Gardner] | < 5 | < 5 | < 1 | < 1 |
| colouring | | slightly yellow | | colourless, clear | |
| mixing ratio (weight) | [parts] | 100 : 30 | | | |
| mixing ratio (volume) | [parts] | 100 : 37 | | | |
| pot life ¹ (at 20°C) | [minutes] | 3 | 35 | 200 | 300 |
| pot life ¹ (at 25°C) | [minutes] | 3 | 30 | 120 | 180 |
| processing temperature (optimal) | [°C] | 15-20 | 20-25 | 20-30 | 20-30 |
| processing temperature (minimum) | [°C] | 0 | 10 | 15 | 15 |

Specifications:

| | | Resin | Hardener | | | | |
|------------------|----------------------|-------------|-------------|-------------|-------------|-------------|-----------|
| | | | E3RI | E30RI | E120RI | E300RI | method |
| density (20°C) | [g/cm ³] | 1.14 - 1.16 | 0.93 - 0.97 | 0.92 - 0.96 | 0.92 - 0.96 | 0.94 - 0.98 | PM.01.002 |
| viscosity (25°C) | [mPa s] | 600 - 900 | 20 - 50 | 30 - 50 | 40 - 60 | 8 - 13 | PM.01.003 |
| (NH)-equivalent | [g/EQ] | | 50 - 55 | 50 - 55 | 50 - 55 | 50 - 55 | calc. |
| epoxy-equivalent | [g/EQ] | 170 - 180 | | | | | calc. |

All mentioned hardener can be mixed among themselves, so that the pot-life or the heat resistance can be flexibly adjusted. Defined and quantified features underlie persistent controls.

Mechanical data / standard climate:

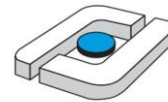
| | | HP-E3RI | HP-E30RI | HP-E120RI | HP-E300RI | method |
|------------------------------|-----------------------|---------|----------|-----------|-----------|-----------|
| density | [g/cm ³] | 1.1 | 1.1 | 1.1 | 1.1 | PM.01.002 |
| tensile strength | [MPa] | 65 | 72 | 71 | 72 | PM.01.004 |
| elongation at break | [%] | 3 - 4 | 4 - 5 | 4 - 5 | 5 - 6 | PM.01.004 |
| flexural strength | [MPa] | 105 | 110 | 110 | 110 | PM.01.005 |
| E-modulus [GPa] | [kN/mm ²] | 2.8 | 3 | 2.9 | 3 | PM.01.004 |
| glass transition temperature | [°C] | 80 | 90 | 98 | 83 | PM.01.011 |
| hardness | [Shore D] | 81 | 82 | 83 | 83 | PM.01.009 |

Physical data are found out at an unfilled sample specimen at 20°C. Tempering depends on the hardener.
 HP-E3RI, HPE30RI, HP-E300RI: curing took 24h at 20°C + 5h at 60°C + 6h at 80°C
 HP-E120RI: curing took 24h at 20°C + 2h at 100°C

References:

Infusion resin HP-E3000RI was developed in close collaboration with the University Osnabrück / Lower Saxony, Germany.

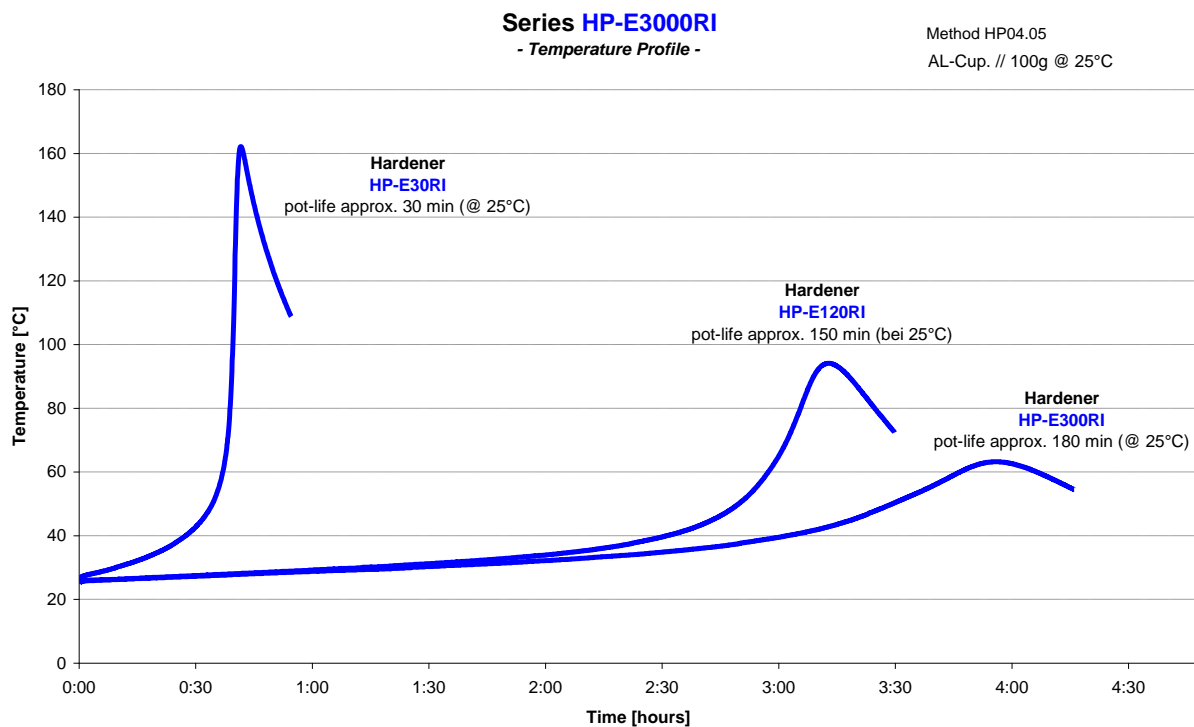
The ignition racing team uses this infusion resin e.g. for constructing their monocoque "Formular Student" racing cars.



Hochschule Osnabrück
University of Applied Sciences

Pot life:

¹ The pot life was found out by internal method (HP04.06) in which 100g mixed resin is weighed-in an aluminium bowl. The pot life time is the temporal value at reaching 40°C on the base of the bowl.



Note: higher temperatures or larger amounts reduce the pot life!

Safety Instructions:

The safety instructions are to be taken from the respective containers. Do not allow children to handle. Prevent inhalation of fumes and contact with bare skin. Wear suitable protective gloves and safety goggles. Do not eat, drink or smoke while using. During the hardening process, energy can be released in the form of heat, hence a cooling/heat exchanging should be provided in order to prevent hot spots. Only mix the components in the recommended proportions in accordance with the instructions.

The epoxy system does generally not crystallize. However, at low temperatures, the hardener may lead to crystallisation. This process is reversible, e.g. by heating it to 40°C in a water bath. All components should be liquid after that. Storage and processing at air may cause building of carbamates.

Application Instructions:

We recommend tests be performed for trials and suitability for the particular type of application.

Prior to processing, the mixed system should rest and then deaerated in a desiccator under vacuum and gentle stirring for a sufficient time at a maximum of 20 ° C.

Tempering is recommended to achieve the optimal component properties.

Optimal tempering cycles: 5h at 60°C + 6h at 80°C

For higher temperature stability ("Tg_{Max}" HP-E120RI) further 2h at 120°C.

Cleaning of work tools:

Unhardened product remains can be removed from tools by means of acetone or Thinner XB. Tools should be given a good airing after being cleaned with these solvents, in order to prevent the solvent from being retained until the tool is used again.

Hardened remains can only be removed by mechanical means e.g. by grinding.

Storage:

Threaded container tops should be kept free of material remains. Do not exchange tops/lids. Close opened containers tightly. Store in a cool and dry place. With optimal storage conditions, shelf-life should be beyond 12 months.

Deliverable quantities:

Plastic containers with safety fastening in different quantities.

Larger containers (e.g. barrels) can be obtained upon request.

Disposal:

Do not allow to enter drains, waterways or soil. Uncured product residues are hazardous waste. The cured system is construction site waste / household waste.

Further Information:

Further information can be obtained from our website, by selecting *Product Info*. Please do not hesitate to contact us by telephone or via mail if you have further queries.

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We recommend tests be performed for trials and suitability for the particular type of application.
With the newest printing of this data sheet the previous version loose validity!