

High Phi-Factor Test Cell Catalog

For use in H.E.L Process Safety systems, to carry out hazard screening, and adiabatic calorimetry.



Solutions in Process Safety

In industries ranging from pharmaceuticals to fine chemicals, scaling-up bench-top chemical reactions to production volumes carries many risks and challenges.

H.E.L Group has a complete range of solutions to help you identify and quantify thermal hazards at the laboratory scale, which supports your process safety and scale-up requirements.

- **TSu: Thermal and pressure hazard screening platform**
- **Phi-TEC I: Bench-top, high phi-factor, adiabatic calorimeter**
- **Phi-TEC II: Bench-top, low phi-factor, adiabatic calorimeter**
- **Similar: Process development reaction calorimeter**

See our **Process Safety and Scale-Up** portfolio for further details.



Test Cell System Compatibility

	TSu	Phi-TEC I	Phi-TEC II*
Spherical test cells			
Hastelloy, 1/8 inch feed tube	✓	✓	✓
Hastelloy, 1/8 inch feed tube, with thermowell	✓	✓	✓
Hastelloy, 1/4 inch feed tube	✓	✓	✓
Hastelloy, 1/4 inch feed tube, with thermowell	✓	✓	✓
Stainless steel, 1/8 inch feed tube	✓	✓	✓
Stainless steel, 1/8 inch feed tube, with thermowell	✓	✓	✓
Stainless steel, 1/4 inch feed tube	✓	✓	✓
Stainless steel, 1/4 inch feed tube, with thermowell	✓	✓	✓
Glass, 1/8 inch feed tube, with thermowell	✓	✓	✗
Glass, 1/4 inch feed tube, with thermowell	✓	✓	✗
Stirred test cells			
Stainless steel, 1/8 inch feed tube and 1/16 inch additions tube	✗	✓	✓
Stainless steel, 1/8 inch feed tube and 1/16 inch additions tube, with thermocouple	✗	✓	✓

* Adaptor required.

Choosing the right test cell

Material

H.E.L test cells are available in three different materials; Hastelloy, Stainless Steel, and Glass. It is important that you choose the right test cell material for the sample you are testing. This can be to reduce unwanted reactions that can ruin your results or for mimicking plant equipment for scale-up. Hastelloy and Stainless Steel are pressure rated to over 150 bara, at temperatures of up to 500 °C. Glass test cells allow for testing highly reactive samples, that react with metals but are not suitable for working at high pressure.

Feed tube size

Two different feed tube sizes are available depending on your testing needs; 1/8" (3.16 mm) for liquid samples and 1/4" (6.35 mm) for powders or high viscosity materials, see fig 1. We recommend the use of the smaller, 1/8" feed tube, as it reduces heat losses caused by the reflux effect. Test cell inserts, see fig 2, can be used to reduce this effect when using test cells with 1/4" feed tube.

Thermowell

We recommend taking direct temperature measurements from the sample, and our systems allow for the thermocouple to be in direct contact with the sample, via the feed tube. However, if this is not possible, or you do not want direct contact with your sample, we offer cells with thermowells that will prevent chemical damage to the thermocouples. See Fig. 3 for a cross-section diagram showing how the thermowell sits within a spherical test cell.

Agitation

If you are testing mixtures that separate or you plan to add a second reagent during your experiment, then you are likely to need additional stirring. We offer specialized cells that include a magnetic stirring bar that can provide agitation for your experiment, see Fig. 4. Stirred test cells are not compatible with our TSu systems.

Low Phi-factor testing

Are you investigating vent sizing or worst-case scenarios? Our Phi-TEC II system uses Low Phi-factor test cells to allow you to simulate thermal runaway risks under manufacturing plant conditions with greater accuracy at the laboratory scale. Please speak to your local H.E.L representative to learn about our wide range of Low Phi-factor test cells.



Fig 1. 1/8" and 1/4" feed tube size



Fig 2. 1/4" test cell insert



Fig 3. Cross-section of spherical test cell, showing thermowell

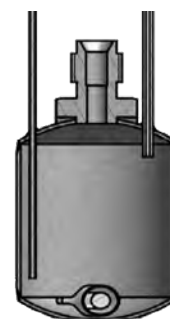


Fig 4. Cross-section of stirred test cell



Hastelloy Test Cells

Designed to withstand high temperatures, high stresses, and highly oxidizing atmospheres, hastelloy test cells have outstanding corrosion resistance.

Pressure rated to over 150 bara, with a temperature tolerance of at least -40 °C to 500 °C as limited by the system.

Typical working volumes of 0.5 ml to 5 ml, or 0.5 g to 5 g.

Single use only

Pack Size: 5 test cells, plus corresponding nuts and ferrules

Feed Tube size: 1/8" (3.175 mm) or 1/4" (6.35 mm)

Thermowell: Available with or without

Compatible with: TSu, Phi-TEC I, and Phi-TEC II (with adaptor)

Accessories: Hastelloy cell inserts

	H.E.L ID
1 Hastelloy, 1/8 inch feed tube	HELO28028
2 Hastelloy, 1/4 inch feed tube	HELO28029
3 Hastelloy, 1/8 inch feed tube, with thermowell	HELO32206
4 Hastelloy, 1/4 inch feed tube, with thermowell	HELO32207
5 Hastelloy cell inserts (Pack of 5)	HELO32211
1/8 inch Phi-TEC II adaptor (Pack of 1)	HELO17802
1/4 inch Phi-TEC II adaptor (Pack of 1)	HELO22582



Stainless Steel Test Cells

Stainless steel offers a more affordable alternative to hastelloy, with good corrosion resistance and are able to withstand high temperatures and pressures.

Pressure rated to over 150 bara, with a temperature tolerance of at least -40 °C to 500 °C as limited by the system.

Typical working volumes of 0.5 ml to 5 ml, or 0.5 g to 5 g.

Single use only

Pack Size: 5 test cells, plus corresponding nuts and ferrules

Feed Tube size: 1/8" (3.175 mm) or 1/4" (6.35 mm)

Thermowell: Available with or without

Compatible with: TSu, Phi-TEC I, and Phi-TEC II (with adaptor)

Accessories: Stainless Steel cell inserts

	H.E.L ID
6 Stainless steel, 1/8 inch feed tube	HELO32208
7 Stainless steel, 1/4 inch feed tube	HELO28027
8 Stainless steel, 1/8 inch feed tube, with thermowell	HELO28032
9 Stainless steel, 1/4 inch feed tube, with thermowell	HELO32204
10 Stainless steel cell inserts (Pack of 5)	HELO28131
1/8 inch Phi-TEC II adaptor (Pack of 1)	HELO17802
1/4 inch Phi-TEC II adaptor (Pack of 1)	HELO22582



Glass Test Cells

For specialized testing, when using highly corrosive samples that react with metals. These cells also come with thermowells as standard for no direct contact with the sample. The feed tube is made of Kovar alloy, allowing a perfect hermetic seal with the glass. We do not recommend using glass test cells for experiments above atmospheric pressure.

Typical working volumes of 0.5 ml to 5 ml, or 0.5 g to 5 g.

Single use only

Pack Size: 5 test cells, plus corresponding nuts and ferrules

Feed Tube size: 1/8" (3.175 mm) or 1/4" (6.35 mm)

Thermowell: Always included

Compatible with: TSu and Phi-TEC I

Accessories: Hastelloy and Stainless Steel cell inserts

		H.E.L ID
11	Glass, 1/8 inch feed tube, with thermowell	HEL032209
12	Glass, 1/4 inch feed tube, with thermowell	HEL032210
5	Hastelloy cell inserts (Pack of 5)	HEL032211
10	Stainless steel cell inserts (Pack of 5)	HEL028131



Stirred Test Cells

Unique design by H.E.L., these stainless steel test cells allow for stirring and reagent additions. PTFE encapsulated magnetic stirrer, contained within a cylindrical design to allow for controlled agitation during the experiment.

Pressure rated to over 120 bara, with a temperature tolerance of at least -40 °C to 500 °C as limited by the system.

Typical working volumes of 3.5 ml to 11 ml, larger volumes required to allow for stirrer.

Single use only

Pack Size: Sold in singles or 5 test cell packs, plus corresponding nuts and ferrules

Feed Tube size: 1/8" (3.175 mm) and 1/16" (1.59 mm) additions feed

Thermocouple: Available with or without

Compatible with: Phi-TEC I, and Phi-TEC II

		H.E.L ID
13	Stainless steel, 1/8 inch feed tube and 1/16 inch additions tube, with stirrer (Pack of 1)	HEL032456
13	Stainless steel, 1/8 inch feed tube and 1/16 inch additions tube, with stirrer (Pack of 5)	HEL032203
14	Stainless steel, 1/8 inch feed tube and 1/16 inch additions tube, with stirrer, and thermocouple (Pack of 1)	HEL032457
14	Stainless steel, 1/8 inch feed tube and 1/16 inch additions tube, with stirrer, and thermocouple (Pack of 5)	HEL032201



Service and Support

Protect your investment, with uninterrupted performance and priority support

Your H.E.L equipment is covered by a standard 12-month warranty. Beyond the first year of ownership, we offer three Service Agreement options to suit your needs and budget.

The benefits of a Service Agreement include:

- Minimized downtime and unexpected loss of productivity
- Maximized equipment lifetime and return on investment
- Priority onsite and remote support over non-contract customers
- Instrument calibration to optimize and maintain performance and accuracy
- More control over your Service and Maintenance cost
- Discounts on selected additional services or parts



Three Service Agreement Options:



Preventative

Designed to give your system an annual service visit, and to ensure correct operation and calibration of sensors whilst checking for any wear and tear to the system.



Advanced

Building on the Preventative Agreement, this level of cover is for users who require the additional security of emergency cover on top of an annual preventative maintenance.






Premium

For critical operations when downtime is NOT an option. This comprehensive service package includes all aspects of service and maintenance for full cost management.



Service and Support

	Preventative Agreement 	Advanced Agreement 	Premium Agreement 
Full Preventative Maintenance (PM)*	1 per year	1 per year	1 per year
Priority support over non-contract customers	✓	✓	✓
Emergency breakdown (Repair) visits	✗ 10% discount (travel & labor)	✓ 1 per year	✓ Unlimited
Parts on repairs	10% discount	15% discount	✓
Discount on other spares and consumables	5%	10%	20%
Discount on additional PM visits	10%	15%	20%
Control Software version updates	10% discount	15% discount	✓
Remote software support	4 hours	6 hours	Unlimited
Remote access assistance	4 hours	6 hours	Unlimited
Discount on training	10%	15%	20%

* Includes travel and labor costs, instrument calibration, performance verification and PM kit, as required

Customer Service Enquiries & Technical Support Requests

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About H.E.L Group

H.E.L Group's mission is to work together with chemistry, safety and biotechnology experts to engineer and unleash the full potential of the scientific community. To this end, H.E.L develops and manufactures innovative scientific instruments and software designed to optimize the efficiency, safety and productivity of key processes in chemistry and biology applications.

The H.E.L team includes highly skilled process and software engineers, based at their extensive research and manufacturing facilities in the UK, as well as sales and support offices around the world.

H.E.L has a long history of solving complex challenges for customers. For more than 30 years the company has worked with businesses and laboratories globally, providing proprietary automated solutions for the pharma, biotechnology, chemical, battery and petrochemical sectors. H.E.L is accredited with ISO 9001 : 2015 and ISO 14001 : 2015.

- With a strong focus on the customer, our **service and support** enables our customers to keep working efficiently
- Our **wide range of customizable products** put the customer at the heart of what we do, with solutions designed around their needs



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