h.e.l

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, adiabatic calorimeter**
- **Phi-TEC II: Bench-top, low phi-factor, adiabatic calorimeter**
- **Simular: Process development reaction calorimeter**

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

TSu

Phi-TEC I

Phi-TEC II

Simular

Test cell system compatability

	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	✓	✓	✕
Titanium, 1/4 inch feed tube	✓	✓	✕
Titanium, 1/4 inch feed tube, with thermowell	✓	✓	✓*
Stirred test cells			
Type 4A test cell, stainless steel, 1/8 inch feed tube and 1/16 inch additions tube, with thermocouple	✕	✓	✓*
Type 4C test cell, stainless steel, 1/8 inch feed tube and 1/16 inch additions tube	✕	✓	✕
Type 1A test cell, stainless steel, feed 1/8” brazed thermocouple	✕	✕	✓
Type 1A test cell, hastelloy, feed 1/8”, Inconel thermowell	✕	✕	✓
Type 1B test cell, stainless steel, feed 1/8”, brazed thermocouple	✕	✕	✓
Type 1D test cell, stainless steel, feed 1/8”, screw top	✕	✕	✓
Type 1E test cell, stainless steel, feed 1/8”, vent 1/16”, swaglok fitting	✕	✕	✓
Type 5A test cell, stainless steel, feed 1/8”	✕	✕	✓
Type 5D test cell, stainless steel, feed 1/8”, screw top	✕	✕	✓
Type 3B test cell, borosilicate glass, viton screw cap	✕	✕	✓

* Adaptor required.

Choosing the right test cell

Material

H.E.L test cells are available in four different materials; hastelloy, stainless steel, titanium 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. Titanium has better corrosion resistance, higher melting point and lower density resulting in a lower phi factor, for more information please contact your sales representative.

Fig 1. 1/8″ and 1/4″ feed tube size

Feed tube size

Two different feed tube sizes are available depending on your testing needs; 1/8″ (3.175mm) for liquid samples and 1/4″ (6.35mm) 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.

Fig 2. 1/4″ test cell insert

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.

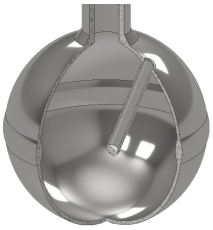

Fig 3. Cross-section of spherical test cell, showing thermowell

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 and overhead stirring that can provide agitation for your experiment, see Fig. 4. Stirred test cells are not compatible with our TSu systems.

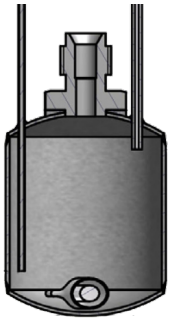

Fig 4. Cross-section of stirred test cell

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.

High Phi-factor test cells

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" (3.175mm) or 1/4" (6.35mm)
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	HEL028028
2	Hastelloy, 1/4 inch feed tube	HEL028029
3	Hastelloy, 1/8 inch feed tube, with thermowell*	HEL032206
4	Hastelloy, 1/4 inch feed tube, with thermowell*	HEL032207
5	Hastelloy anti-reflux inserts (pack of 5)	HEL032211
	1/8 inch Phi-TEC II adaptor (pack of 1)	HEL017802
	1/4 inch Phi-TEC II adaptor (pack of 1)	HEL022582

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" (3.175mm) or 1/4" (6.35mm)
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	HEL032208
7	Stainless steel, 1/4 inch feed tube	HEL028027
8	Stainless steel, 1/8 inch feed tube, with thermowell*	HEL028032
9	Stainless steel, 1/4 inch feed tube, with thermowell*	HEL032204
10	Stainless steel anti-reflux inserts (pack of 5)	HEL028131
	1/8 inch Phi-TEC II adaptor (pack of 1)	HEL017802
	1/4 inch Phi-TEC II adaptor (pack of 1)	HEL022582

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. **Single use only**

Pack Size: 5 test cells, plus corresponding nuts and ferrules
Feed Tube size: 1/8" (3.175mm) or 1/4" (6.35mm)
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 anti-reflux inserts (pack of 5)	HEL032211
10	Stainless steel anti-reflux inserts (pack of 5)	HEL028131

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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 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" (3.175mm) and 1/16" (1.59mm) addtions feed
Thermocouple: Available with or without
Compatible with: Phi-TEC I, and Phi-TEC II*

		H.E.L ID
13	Type 4A stainless steel, 1/8 inch feed tube and 1/16 inch additions tube, with stirrer and thermocouple* (pack of 1)	HEL032457
13	Type 4A stainless steel, 1/8 inch feed tube and 1/16 inch additions tube, with stirrer and thermocouple* (pack of 5)	HEL032201
14	Type 4C stainless steel, 1/8 inch feed tube and 1/16 inch additions tube, with stirrer (pack of 1)	HEL032456
14	Type 4C stainless steel, 1/8 inch feed tube and 1/16 inch additions tube, with stirrer (pack of 5)	HEL032203
	1/8 inch Phi-TEC II adaptor (pack of 1)	HEL017802

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Low Phi-factor test cells

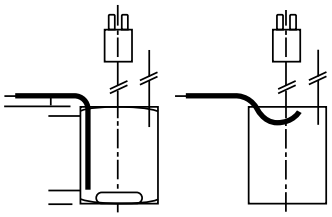


Fig 5. Long feed line (left) and swan neck feed line (right)

Suitable for liquid samples

Uniquely designed for testing liquid samples with fewer leak or vapor condensation points. Fitted with feed and vent lines and encapsulated magnetic stirring, allows for controlled reagent addition and agitation during experiment.

This type 1B stainless steel low-phi factor test cell (HEL034842/3) is ideal for quench testing. The long feed line design (alternative to the swan neck design in other test cells) allows liquid to be expelled when venting test cells through the standard feed line (see figure 5).

Test cell volume: 110ml

Feed and vent line size: feed line 1/8″ (standard) or 1/16″, vent line 1/16″

Thermocouple: Brazed directly into body of stainless steel test cells, thermowell for hastelloy

Stirrer: Magnetic stirrer

		H.E.L ID
1	Type 1A test cell, stainless steel, feed 1/8″ brazed thermocouple	HEL034840
	Type 1A test cell, hastelloy, feed 1/8″, thermowell thermocouple	HEL034844
	Type 1A test cell, stainless steel, feed 1/16″, brazed thermocouple	HEL034841
2	Type 1B test cell, stainless steel, feed 1/8″, brazed thermocouple	HEL034842
	Type 1B test cell, stainless steel, feed 1/16″, brazed thermocouple	HEL034843
3	Thermocouple (for Type 1A hastelloy)	HEL001908

Suitable for solid powders and viscous materials

These stainless steel test cells are ideal for testing solids, powders, viscous liquids or 2-phase samples. Test cells come with either a screw top or swaglok fitting for easy addition of samples. Screw top seals available in graphite (standard option), viton, perlast and PTFE. All test cells fitted as standard with thermocouple and magnetic agitation.

Test cell volume: 110ml

Feed and vent line size: feed line 1/8″ or vent line 1/6″

Thermocouple: Brazed directly into test cells

Stirrer: Magnetic stirrer

		H.E.L ID
4	Type 1D test cell, stainless steel, feed 1/8″, screw top	HEL034846
	Type 1D test cell, stainless steel, feed 1/16″, screw top	HEL001227
5	Type 1E test cell, stainless steel, feed 1/8″, swaglok fitting	HEL034845
	Alternative cap for type 1D without vent line	HEL022434
	Alternative 1D cap seal – viton	HEL014278
6	Alternative 1D cap seal – perlast	HEL013821
	Alternative 1D cap seal – PTFE	HEL011774
7	1/8” cap for swaglok fitting (required to seal test cell)	HEL001535

Extremely viscous samples

These test cells come fitted with overhead driven agitation designed specifically for testing viscous liquids. Test cells all come fitted with brazed thermocouple and feed line and optional vent lines.

Screw cap options available for easy addition of samples, allowing for solids, viscous and 2-phase samples with overhead driven agitation. Screw top seals available in graphite (standard option), Viton, Perlast and PTFE.

Test cell volume: 110ml

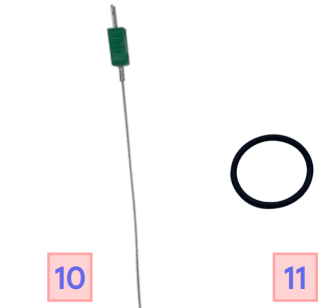
Feed and vent line size: feed line 1/8" or 1/16", vent line 1/16" (option without vent line)

Thermocouple: Brazed

Stirrer: Direct overhead stirring

		H.E.L ID
8	Type 5A test cell, stainless steel, feed 1/8"	HEL034847
	Type 5A test cell, stainless steel, feed 1/16"	HEL034848
9	Type 5D test cell, stainless steel, feed 1/8", screw top	HEL034849
	Type 5D test cell, stainless steel, feed 1/16", screw top	HEL034850
10	Alternative 5D cap without vent line	HEL017715
	Alternative 5D cap seal – viton	HEL014278
11	Alternative 5D cap seal – perlast	HEL013821
	Alternative 5D seal – PTFE	HEL011774
	Alternative o-ring seals - perlast	HEL002162
	Alternative o-ring seals – PTFE	HEL003764

Note: These test cells are only compatible with Phi-TEC II with overhead stirring motor



Metal sensitive samples

If your sample has compatibility issues with metal, made out of borosilicate glass and with viton caps, this test cell is designed specifically for this. Systems come as standard with thermowell and glass-coated magnetic stirrer to ensure chemical compatibility.

Test cell volume: 90ml

Material: Borosilicate glass, viton caps

Feed line: 1/8" (stainless steel)

Thermowell: Always included

		H.E.L ID
12	Type 3B test cell, borosilicate glass, viton screw cap	HEL015359
	Thermocouple	HEL001908
	Alternative seal - perlast	HEL002148

Accessories

Note: included as standard with all relevant test cells

		H.E.L ID		For overhead agitation	H.E.L ID
13	1/16" nut and ferrule set	HEL001531		2 off glacier bearings	HEL004889
14	1/8" nuts and ferrule	HEL001532		Brass bush	HEL004887
	1/16" cap	HEL005499		Brass cap	HEL004888
				Collar	HEL002269
				PTFE washer	HEL014226
				2 x Viton o-rings	HEL003763

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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