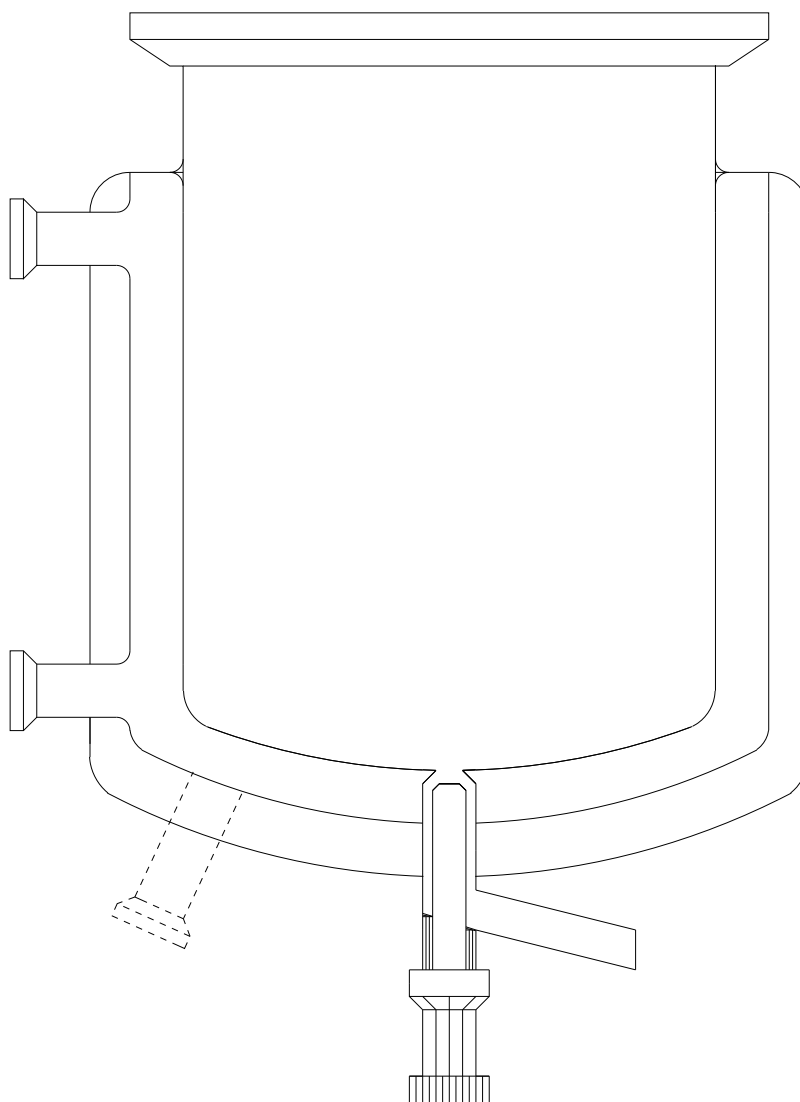


KGW-ISOTHERM Triple-Walled Vacuum-Insulated Reaction Vessel

June 29, 2006

INSTALLATION AND OCCUPATIONAL SAFETY AND HEALTH: GUIDELINES FOR TRIPLE-WALLED GLASS REACTION VESSELS



KGW-ISOTHERM

Gablonzer Straße 6

76185 Karlsruhe

Germany

Tel: 0049 / 721 95897-0

Fax: 0049 / 721 95897-77

Internet: www.kgw-isotherm.com

e-mail: info@kgw-isotherm.de

KGW-ISOTHERM Triple-Walled Vacuum-Insulated Reaction Vessel

June 29, 2006



**Warning! Make sure to read the operating manual
before unpacking or installing the product!**

Table of Contents

1	Safety Information	3
1.1	General Safety Information for Vessel Owners	3
1.2	General Safety Information for Vessel Operators	3
1.3	Warning Labels	3
1.4	Personnel Qualifications	4
1.5	Hazards of Ignoring the Safety Warnings	4
1.6	Alterations and Spare Parts	4
1.7	Correct and Incorrect Ways to Operate the Vessel	4
1.8	Safety Warnings for Operations in Hazardous Areas	4
2	Liability for Defects as to Quality	4
3	Transportation	5
4	General Information	5
4.1	Manufacturer's Declaration	5
4.2	Design	6
4.3	Specifications / Limits of Use	6
5	Assembling Triple-Walled Vessels	7
6	Putting Into Operation	7
7	Maintenance / Servicing / Repairs	7
8	Diagram of a Triple-Walled Reactor	8

KGW-ISOTHERM Triple-Walled Vacuum-Insulated Reaction Vessel

June 29, 2006

1 Safety Information

1.1 General Safety Information for Vessel Owners

This operating manual contains basic information on setting up, operating and servicing your vessel. The vessel owner and designated personnel should (a) read this manual before performing any such activities, (b) follow its instructions while performing the activities, and (c) make sure the manual is available wherever the triple-walled vessel is being used.

They should also follow the following rules:

- All applicable national regulations on accident prevention, electrical equipment, static electricity, transportation equipment, environmental protection and explosion prevention
- The vessel owner's in-house process specifications, operating instructions and safety regulations

If you have any questions, please contact KGW-ISOTHERM in Karlsruhe, Germany.

1.2 General Safety Information for Vessel Operators

- Do not perform any activity that could make the triple-walled vessel and/or the system less safe.
- As a general rule, you should only work on the triple-walled vessel once it has gone out of operation and reached ambient temperature.
- Before disassembling the vessel, make sure it does not contain any substances that are hazardous to the environment and/or human health.
- Once you are finished with your work, you must immediately re-attach all the protective and safety devices.
- Before performing any maintenance or repairs, you must ensure that the apparatus cannot be turned on again.

1.3 Types of Safety Warnings

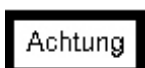
This operating manual contains safety warnings that, if not followed, could pose a serious health hazard. These warnings are labeled as follows:



General hazard symbol



Electrical voltage warning



Safety warnings that, if not followed, could pose a risk to the vessel and its functionality

Installation and Operating Manual

KGW-ISOTHERM Triple-Walled Vacuum-Insulated Reaction Vessel

June 29, 2006

1.4 Personnel Qualifications

The employees who assemble, connect, test-run, operate, service and eliminate faults on the vessel must be appropriately qualified or adequately trained.

The vessel owner must:

- Make clear arrangements regarding personnel responsibilities and supervision
- Ensure the personnel fully understand the contents of the operating manual(s)

1.5 Hazards of Ignoring the Safety Warnings

If you ignore the safety warnings, you could put yourself, other personnel, the environment and the vessel (as well as the apparatus/system) at risk, and free KGW-ISOTHERM of any and all liability for defects as to quality.

The hazards of ignoring safety warnings include:

- Injuries due to electrical, mechanical or chemical influences
- Problems with important functions
- Environmental pollution from hazardous material leaks

1.6 Alterations and Spare Parts

The vessel owner may only alter or modify the triple-walled vessel in consultation and agreement with the manufacturer. For your safety, you should only use original spare parts and accessories authorized by the manufacturer. Using other parts may render the manufacturer's liability for any consequences null and void.

1.7 Correct and Incorrect Ways to Operate the Vessel

The vessel must be operated as indicated in this manual (4.3 7) to ensure adequate safety. If you operate the vessel in any other way or with media which may attack the vessel materials, we may disclaim any and all liability for the consequences. Also: The vessel may only be operated if it is in flawless condition.

1.8 Safety Warnings for Operations in Hazardous Areas

If you operate glass apparatuses in hazardous areas in a way that may lead to explosive discharges of static electricity, you must take appropriate precautions. The extent of these precautions depends on the probability that an explosive atmosphere will be created. This probability (in terms of time and location) is broken down into zones that depend on the areas in which the device is to operate. The zones correspond to the Equipment Categories laid out in Directive 94/9/EC.

For more details on how electrostatic ignition hazards are caused, evaluated and avoided, please consult Guideline BGR 132 on static electricity issued by BG Chemie.

KGW-ISOTHERM Triple-Walled Vacuum-Insulated Reaction Vessel

June 29, 2006

2 Liability for Defects as to Quality

Our liability for defects as to quality is as laid out in our General Terms and Conditions of Sale and Delivery as they may change from time to time. Please notify us immediately if damages occur during the contractually agreed upon period. This is the only way you can safeguard your rights to a remedy in case of defects as to quality.

We are only liable if the permitted operating conditions were complied with and the material's resistance to the media was considered. As set forth in our valid Terms and Conditions of Sale and Delivery, we disclaim all liability for damages sustained by the failure to observe these requirements.

3 Transportation



Any transportation must comply with generally accepted technical conventions, accident prevention regulations, regulations on handling and using transportation and lifting equipment (including the manufacturer's instructions), and in-house safety rules.

Achtung

Every triple-walled vessel is delivered packaged in boxes / cases. The vessel must be protected against shock, impact or any other mechanical stress when you unpack the parts and transport them on your own premises.

Achtung

Keep people outside of the hazard area.

4 General Information

4.1 Manufacturer's Declaration

The triple-walled vessel was manufactured by

KGW-ISOTHERM GmbH
Gablونzerstrasse 6,
D-76185 Karlsruhe, Germany
Phone (0049 / 0721) 95897-0
Fax (0049 / 0721) 95897-77
E-mail: info@kgw-isotherm.de

Please contact the manufacturer if you have any questions about assembling, connecting, operating, servicing, repairing, or eliminating faults on the vessel.

KGW-ISOTHERM Triple-Walled Vacuum-Insulated Reaction Vessel

June 29, 2006

4.2 Design

Triple-walled vessels contain three walls that have been fused together. The space between the inner and the middle wall is filled with the tempering medium. The space between the middle and outer wall is evacuated of air and acts as an insulating jacket.

You will generally have to install a pressure relief device rated at 0.5 bar before you can fill the vessel with a liquid tempering medium.

As a general rule, the vessel is outfitted with a bottom outlet J-valve designed to automatically adjust to changes in the extension of the PTFE valve spindle.

The vessels can also ship with a transparent PU coating on request.

4.3 Specifications / Limits of Use

The standard rules for calculating pressure resistance do not apply to vessels with three fused walls: Their design and construction are too complicated. That is why these vessels are individually pressure-tested.

The vessels can be used in the following operating conditions:

	Product space	Thermal jacket	Insulating jacket
Pressure range	- 1 / + 0.5 bar	+ 0.5 bar	- 1
Temperature range	- 80 / + 140°C	- 80 / + 140°C	
Temperature differential in the glass wall	max 30°C	max 30°C	

The bottom outlet J-valve is spring-loaded to maintain the same level of closing force at different temperatures.

5 Assembling Triple-Walled Vessels

Make sure to wear protective goggles or a face mask as well as protective gloves whenever you handle or work with vacuum-insulated reaction vessels.

Only properly trained personnel should install glass components in KGW supporting frames or in mounting equipment provided by the customer. The glass components must be installed without stress.

All external connections on the triple-walled vessel must be connected without stress.

Glass vessels with several fused walls are held in place using standard stainless steel connectors with a supporting ring or on aluminum plates (Easy Frame) in a supporting frame that holds the vessel's entire weight.

To ensure adequate safety, the vessel must also be installed in an enclosure / protective wall made of transparent plastic to protect the operator if the vessel is destroyed.

The product space and the thermal jacket must be equipped with a pressure relief device to prevent the maximum permissible operating pressure from being exceeded.

You may have to remove the bottom outlet J-valve to clean the vessel. When you reinstall the valve, you should make sure it is opened. Otherwise, you could damage the valve seat or the valve spindle.

KGW-ISOTHERM Triple-Walled Vacuum-Insulated Reaction Vessel

June 29, 2006

6 Putting Into Operation

Before the vessel is put into operation, the owner needs to look for cracks, scratches and other signs of damage on the surface of the glass and in the glass itself.

You should also examine the glass surface for signs of chemical wear, if applicable.

Vessels with signs of surface damage, wear and tear, et cetera, should not be used: They could implode when placed under thermal or mechanical stress.

When putting the vessel into operation, you should avoid any start-up processes that could lead to surges in pressure. The tempering medium circuit must be depressurized and fully evacuated of air before being put into operation.

When starting up or shutting down the vessel, you must make sure to increase / decrease the circulation flow slowly. Quickly increasing or decreasing the circulation flow can produce sudden surges in pressure that could destroy the vessel.

Also, heating and cooling speeds must not exceed 1 K / minute in the thermal jacket.

Due to the triple-walled vessel's special design, you must make sure when filling the empty vessel that the difference between the medium temperature and the thermal jacket temperature is not greater than 30 K.

When you are adding a medium to a vessel you have previously filled, and the difference between the medium temperature and the product temperature is greater than 50 K, you must make sure not to feed the medium directly onto the wall, which would expose the glass to critical thermal stress.

7 Maintenance / Servicing / Repairs

If the product tends to leave deposits, make sure that there are no solid particles near the valve spindle and/or valve seat when you close the valve. Deposits will produce leaks and could damage the valve.

Damaged vessels should not be put into operation.

Please contact the manufacturer if your vessel requires repairs.

KGW-ISOTHERM Triple-Walled Vacuum-Insulated Reaction Vessel

June 29, 2006

8 Diagram of a Triple-Walled Reactor

