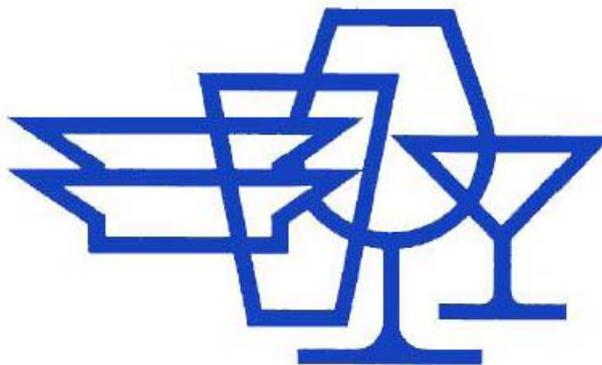




Commercial dishwashing & wash ware made of glass

(Technical information sheet No. 10)

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<p>What is glass?</p>	<p>Glass is fused from quartz sand, lime, soda, potash and other added substances.</p> <p>The purpose of the additions is to facilitate the melting of the glass (1,100 °C to 1,500°C), to add or remove colour, as well as to achieve certain properties (e.g. grindability, high light refraction = crystal effect).</p>
<p>What is tempered glass?</p>	<p>Tempered glass is produced by means of a special production technique. As in steel production, the finished product is reheated almost to melting point and then abruptly cooled. Through this tempering process, drinking glasses and pieces of crockery (plates, bowls, cups, etc.) become substantially more resistant to damage and breakage and to sudden changes in temperature than similar glass products.</p> <p>Visually, there is no discernible difference.</p>
<p>What is glass used for?</p>	<p>From drinking glasses and plate glass to car windscreens and special optical and chemical glasses, there are countless fields where glass is used in numerous shapes and colours.</p> <p>Items made out of glass ceramic, for example, are used for tableware and cookware because of their high thermal shock resistance.</p> <p>For commercial warewashing, however, only <i>drinking and dining vessels</i> are of interest.</p>
<p>What properties do drinking and dining vessels made of glass have?</p>	<p>Because of its smooth surface, glass is particularly easy to clean hygienically.</p> <p>The physical and chemical properties of glass are determined principally by its composition, processing, shaping, finishing and coating. Despite its stability, glass can be attacked/alterd both physically and chemically.</p> <p>Glass is subject to an increased risk of breakage, and is susceptible to stresses during temperature changes and to mechanical damage.</p> <p>From the aforementioned it is evident that glass is a very delicate wash ware material (cf. <i>Tempered glass</i>, above, but: while tempered glass is more resistant, it is no less prone to corrosion; see <i>Glass damage</i>).</p>



<p>How is glass cleaned in the warewasher?</p>	<p>Provided they are suitable, glass vessels can be cleaned by machine without any problems. However, due to the delicate nature of glass vessels, it is recommended that a special glasswasher be used. There, the glasses are cleaned by the recirculated detergent solution. They are then given a fresh water rinse with a rinse aid solution. At the same time, the detergent solution in the tank is regenerated by the inflowing rinse aid solution.</p>
<p>How are glasses cleaned hygienically?</p>	<p>DIN standard 10511 "Commercial dishwashing with glasswashing machines - hygiene requirements, type testing" defines the technical and hygiene requirements for glasswashers and for warewashing results.</p> <p>The methodology for the type testing of glasswashers is also described. The requirements include:</p> <ul style="list-style-type: none"> • Glasses must be visibly clean. • Glasses must be dry on the outside within two minutes after the glass rack has been taken out of the machine, though remaining drops of water at the contact points and residual moisture in the inside of glasses are tolerated. • The total bacterial count in the detergent solution must not exceed 200 CFU/ml as an acceptable limit and 500 CFU/ml as a hazardous limit. (CFU = colony-forming units/indicator of the number of bacteria). • When the glass surface is examined microbiologically, the count must not exceed 5 CFU per 10 cm². <p>Further criteria set out in this standard include: The temperature in the detergent tank of a glasswasher must be at least 55°C, the temperature of the detergent solution should not substantially exceed 60°C and the temperature of the rinse aid solution should be between 63°C and 67°C.</p> <p>Contact times of 90seconds are deemed to provide a sound basis for achieving fully hygienic warewashing results.</p> <p>Every glasswasher which has passed the type test may carry the label "DIN 10 511-H" in a prominent position.</p>



<p>What is meant by the collective term 'glass damage'?</p>	<p>Glass damage after automated warewashing may include the following changes to the surface of the glass:</p> <ul style="list-style-type: none">• <i>tension cracks or chipped edges</i>• <i>scratch-like changes</i>• <i>extensive scoured areas</i>• <i>cloudiness of the glass</i>• <i>films.</i> <p>The suitability of glasses for automated warewashing depends on, amongst other things, the type of glass, but is determined chiefly by the manufacturing process, finishing, shape, etc. The particular warewashing conditions in a glasswasher ensure that the requirements in terms of the utility value of a suitable glass are met.</p>
<p>What connection is there between agent dosage and glass cloudiness?</p>	<p>In time a grey layer may form on glasses. This adverse effect may have two causes: Either it may be a reversible cloudiness caused by lime deposits or it may be an irreversible corrosion of the glass.</p> <p>Reversible lime deposits occur if no appropriate water treatment is used for running the warewasher with raw water of correspondingly high degrees of hardness. In this way, the lime-depositing agents contained in the water reach the glasses and are deposited on the glass surface during the drying phase.</p> <p>Since detergents also have hardness-binding properties, this clouding by lime can be prevented or at least delayed by an adequate dosage of detergent.</p> <p>Lime cloudiness can be removed completely by means of a little acid at a low concentration.</p> <p>However, the lime cloudiness also shows at the same time that the water contains too many hardness minerals such as calcium and magnesium ions. It should be softened or demineralised accordingly. (see VGG technical information sheet Commercial dishwashing & water).</p>

<p>What is glass corrosion?</p>	<p>Glass corrosion is a visibly recognisable clouding of the glass that can no longer be removed. This phenomenon is a form of irreparable damage to the surface of glass which can occur after frequent washing in a warewasher.</p> <p>The cloudiness of the glass is produced by the extraction of glass components or by uneven erosion from the glass surface.</p> <p>What is left behind is a layer of varying refractive index which the human eye perceives as cloudiness. Glass corrosion does not occur spontaneously during a single wash process but gradually over a large number of wash cycles. The cloudiness is not always evenly distributed over the entire glass but tends to occur in areas which have been thermally posttreated in the manufacturing process (e.g. on the rims).</p> <p>Glass corrosion can occur both in very high-quality and in ordinary glass, but certain types of glass such as ordinary soda-lime glass are more prone to glass corrosion, while other types like crystal glass, lead crystal or borosilicate glass are less susceptible.</p>
<p>What are the causes of glass corrosion?</p>	<p>Water alone can cause glass corrosion under automated warewashing conditions. Clouding of glass and damage to decoration can be delayed by using special glass detergents.</p> <p>Sample images of corrosion:</p>  <p>Image 1: Localized clouding at the rim (source: Proceedings of the 77th Glass Technology Conference in Leipzig in 2003, pp. 55-58)</p>

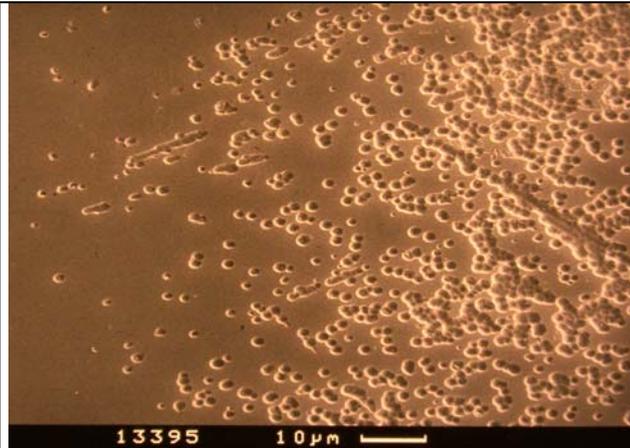


Image 2: The area of glass corrosion comprising numerous small pits can be seen on the right of the image, while the clouding of the glass decreases toward the left-hand side and there are fewer pits present.



Image 3: Line corrosion
(source: Proceedings of the 77th Glass Technology Conference in Leipzig in 2003, pp. 55-58)

The specifications of the agent manufacturer regarding the dosing of detergent and rinse aid should always be observed. At the same time, it is important to be aware that underdosing generally has a more adverse effect on the resistance of glasses and decorations than overdosing, but overdosing does not improve wash results and it is also uneconomical and increases the waste water pollution loading.



	<p>automated warewashing can be provided only by the glass or decoration manufacturers themselves.</p> <p>Specialist advice should therefore be obtained when selecting and purchasing glasses.</p>
<p>How is spotlessly washed glass achieved?</p>	<p>In the case of water with a low total mineral content, good drying results are obtained with a correctly set rinse aid dosage. However, it should be noted that the glass does not dry inside but outside the glasswasher.</p> <p>Problems caused by water having an excessive total mineral content can be solved only by rinsing with partially or fully demineralised water (see VGG technical information sheet Commercial dishwashing & water).</p>
<p>How long should the glasses remain in the glasswasher?</p>	<p>The washing process should not exceed 150 seconds in total. The warewasher should be opened immediately after the wash cycle so that the exhaust air can escape. If the glasses remain in the machine after the programme run, then both the exhaust air and the steam rising from the water in the tank will precipitate as condensation on the glasses, which presents an additional loading on the glass surface. This also adversely affects the intrinsic drying behaviour of the glasses. Glasses should not be left in the warewasher over night.</p>
<p>What effect do sudden temperature variations have on the life of glasses?</p>	<p>As previously mentioned, glasses are highly temperature-sensitive (see page 1, <i>Tempered glass</i>). Sudden temperature variations can lead to a reduction in the life of glasses. In particular, glass should cool down to room temperature before it comes into contact with cold liquids.</p>
<p>What should be observed when using glasses?</p>	<p>Glasses should always be of a design suitable for washing in warewashers, i.e. free of protruding edges, and with no depressions in the base, for example. Decorations on glasses should be warewasher-safe in the way they are designed and applied. The rack clearance height of the machine should also be taken into consideration, especially when purchasing glasses at a later date, as well as of the fact that the bottom of the glass is frequently more difficult to clean and to rinse in tall glasses.</p> <p>It is recommended that attention be paid to statements made by glass manufacturers with regard to warewasher suitability.</p>



<p>What is important to note with regard to glass outside the warewasher?</p>	<p>Washed glasses should be neither dried by hand nor “polished” subsequently, so as not to jeopardise the (hygienic) cleaning success achieved (see DIN 10511) by re-introducing germs.</p> <p>This also increases glass breakage and consequently the risk of injury.</p> <p>Placing drinking glasses inside one another in a cupboard should be avoided as this can lead to glasses breaking, particularly around the rim.</p> <p>This may also cause very fine, invisible scratches which widen (grow) during automated warewashing until they become visible as clear scratches.</p> <p>In order to prevent unpleasant odours developing in glass, the glass should:</p> <ul style="list-style-type: none"> • not be stored in rooms in which cooking takes place; • not be placed hanging in the open above the counter; • not be stored in wooden cupboards; • not be stored with the opening facing downward, so as to enable circulation of the air in the inside of the glass; • not be stored on damp cloths. <p>Bowls and dishes may however be stacked.</p>
<p>Technical advice provided by the member companies of the VGG</p>	<p>This technical information sheet, which has been drawn up by experienced practitioners, is intended to draw the attention of the reader to the fact that commercial automated warewashing cannot be carried out successfully if it is approached superficially and without the appropriate involvement of all those participating in the warewashing process.</p> <p>Only an understanding of the technical processes and of the interdependencies that these entail, teamwork on the part of all those involved, in particular the operator of the warewasher and his/her staff, and regular maintenance of the warewasher, dosing equipment and water treatment system by the manufacturer will produce the warewashing results expected by the user.</p>



	<p>Consistent cooperation between warewasher, agent and dosing equipment manufacturers as well as manufacturers of water treatment equipment and wash ware will ensure constant and optimum adaptation to practical requirements, to the benefit of the customers they share and of the environment.</p> <p>Enquiries regarding this technical information sheet "<i>Commercial dishwashing & glass</i>" should be addressed to</p> <p>Arbeitsgemeinschaft Gewerbliches Geschirrspülen, Feithstraße 86, 58095 Hagen, Germany Phone: +49 (0)2331/ 377 544 – 0, Fax: +49 (0)2331/ 377 544 – 4, E-mail: info@vgg-online.de.</p>
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