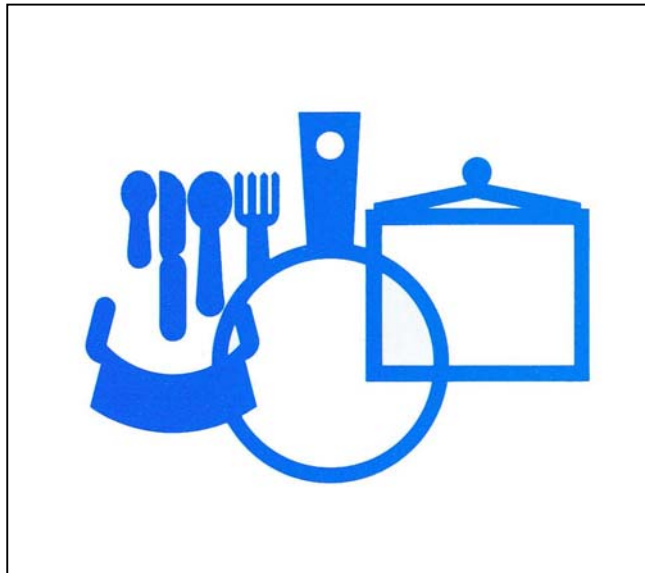


# Commercial dishwashing & wash ware made of metal

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## Foreword

The market for metal wash ware and for its cleaning and maintenance in the commercial sector is characterized by huge variety in terms of materials and quality.

Statements regarding warewasher-safety may, because of the growing proliferation of commercial warewashers, be of critical importance to the purchasing decision of the user. They are an important parameter to use and should be queried with the manufacturer.

Cleaning in commercial warewashers can be assumed to place less of a load on wash ware than automated warewashing in domestic warewashers.

For this reason, information from the manufacturer on suitability for domestic use can as a rule also be applied to the warewashing process in the commercial sector.

<p><b>What materials are used?</b></p>	<p><b>1. Non-cutting cutlery</b> <b>1.1 Cutlery made of stainless steel</b></p> <p>Stainless steel is the name used to designate steels which are alloyed with 12% or more chromium and may also contain nickel, molybdenum and other metals. Products made from such steels are usually labelled with a trademark.</p>  <p>The proportions of the individual constituents can affect the degree of corrosion resistance, which can in turn also lead to changes in other properties such as suitability for thermal hardening or magnetic properties.</p> <p>Among the stainless steels, a distinction is made between chromium steel, chromium-nickel steel and chromium-nickel-molybdenum steel.</p>
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	<p>The various grades are identified under EN by their material numbers, e.g. 1.4301.</p> <p>Further information can be found in the VGG technical information sheet <a href="#"><u>Commercial dishwashing &amp; the resistance of materials in dishwashers.</u></a></p> <p>A distinction should be made between cutlery made of non-magnetisable chromium-nickel steel containing approx. 18% chromium and approx. 9% nickel and cutlery made of magnetisable chromium steel containing approx. 13%-17% chromium.</p> <ul style="list-style-type: none"><li>• Cutlery made of chromium-nickel steel is unreservedly warewasher-safe.</li><li>• Cutlery made of stainless chromium steel with a chromium content of approx. 13%, on the other hand, can <b>not as a general rule</b> be assumed to be warewasher-safe.</li><li>• For warewashers with automated cutlery removal, for which only stainless magnetisable steels are suitable, it is recommended that 17% chromium steels be used.</li></ul> <p><b>1.2 Silver-plated cutlery</b></p> <p>Within the definition of this information sheet, these are warewasher-proof.</p> <p>However, care should be taken with such cutlery to ensure that, on account of its differing properties, e.g. surface hardness, it is not washed in direct contact with chromium steel cutlery and chromium-nickel steel cutlery.</p> <p><b>2. Cutting cutlery - knife blades, hollow-handled knives, monobloc knives</b></p> <p>At present, chromium steels with elevated carbon content, suitable to thermal hardening, are the preferred materials used for knife blades and monobloc knives. They can be distinguished from chromium-nickel- steels by their magnetic properties.</p> <p>In contrast to the hollow-handled knife, in which the handle and the knife blade are made of different materials (e.g. chromium steel with elevated carbon content for the knife blades, chromium-nickel steel for</p>
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	<p>the handle), the monobloc knife - handle and knife.</p> <p>blade - is forged from one piece. This type of knives is predominantly only being used for cutlery of low grade quality. As a rule, they are processed from stainless chromium steels which vary in carbon content (up to 0.40%). Therefore, a monobloc knife <b>cannot generally</b> assumed to be warewasher-proof.</p> <p>If the handle is not thermally hardened, it can <b>not</b> assumed to be warewasher-safe. Chromium and chromium-molybdenum steels, suitable to thermal hardening with a chromium content of more than 15% are particularly suitable for cleaning in commercial warewashers (see item 1.1).</p> <p>When purchasing monobloc knives, it is recommended ensuring that both the handle and the knife blade are thermally hardened.</p> <p><b>3. Stainless steel kitchenware and tableware</b></p> <p>Due to its smooth non-porous surface and excellent performance characteristics in terms of abrasion-resistance, scratch-resistance, corrosion-resistance and impact-resistance, stainless steel is also used for pans, platters, containers and the like. In the main, chromium-nickel steel is used here. Simple equipment can also be manufactured from chromium steel.</p> <p>With regard to resistance, the same statements apply here as to cutlery.</p> <p>Since stainless steel has low thermal conduction properties, in general a so called sandwich layer is applied to the pan base. This layer, which usually consists of aluminium alloys, is not resistant to caustic detergents and should therefore be fully encapsulated by stainless steel.</p> <p><b>4. Wash ware made of combinations of materials</b></p> <p>With regard to wash ware made in material combinations e.g. in wood, ceramic, non-ferrous metal and plastic combinations, a general statement concerning warewasher-resistance cannot be given. The resistance is principally determined by the materials that are used.</p>
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	<p>For example, where copper is used, discolourations are frequently produced by the alkaline detergents used.</p> <p><b>5. Wash ware made of aluminium and non-ferrous metals (e.g. copper, brass, zinc)</b></p> <p>Equipment made of aluminium and non-ferrous metals should no longer be used due to their low chemical resistance and on hygiene grounds.</p>
<p><b>What influence does processing quality have on usability?</b></p>	<p>Apart from the choice of materials in use, processing is the key factor determining the warewasher-resistance of cutlery. It can basically be stated that the better the surface processing of cutlery is executed, the more warewasher-safe the cutlery will be. This is true not only to the main areas of front and backside but to a substantial degree also to minor areas such as e.g. the areas between the prongs of a fork.</p> <p>Here, only flawless processing will ensure that corrosion is prevented from occurring during commercial warewashing. The surface processing requirements are all the higher, the lower the grade of the material per se.</p> <p>This means, for example, that cutlery made from 17% chromium steels, as recommended for automated cutlery removal, should have better surface processing than cutlery made from chromium-nickel steels. In the case of knife blades and possibly also monobloc knives, the requirement for optimum possible surface processing is supplemented by the added requirements that the heat treatment of this material has been performed optimally and also that the pre-treatment stages in surface processing have been carried out such that no prior damage to the material has occurred.</p> <p>Appropriate tests are available for monitoring these properties, and these tests are regularly applied by prestigious manufacturers of high-quality cutlery. This provides a guarantee that, where such high-quality cutlery is used, no problems will occur if they are cleaned in commercial warewashers.</p> <p>As far as cutlery being positioned in the lower price segment is concerned, it cannot as a rule be assumed that this cutlery will be corrosion-resistant in every case.</p>

	<p>The aforementioned remarks apply analogously to pots, pans and platters. In particular, joints between container and handle are often weak points in the processing and are thus more sharply exposed to corrosion attack.</p>
<p><b>Does stainless steel rust if used properly?</b></p>	<p>The material is corrosion-resistant and permanently retains its shiny metallic appearance. Since no protective layers have been applied, abrasion, scratches, shocks or impacts do not detrimentally alter its performance characteristics.</p> <p>The usual cleaning, rinsing and water softening processes, hot water or the final drying cycle do no damage to higher-grade stainless steels.</p> <p>If spots of rust do occur, then these will be predominantly extraneous rust.</p> <p>This may originate from rust particles carried along in potable water or from washing together with non-rustproof washware or from rusting dish racks being present.</p> <p>Using or washing with metal pan scourers and such like can also lead to the rusting of stainless steel items.</p> <p>Where small rust spots have already appeared on stainless steel, such spots should be removed immediately. It usually suffices simply to rub them off, but sometimes a non-scouring detergent is required.</p> <p>Evenly spread corrosion, where the stainless steel is ablated evenly from the surface, does in general not occur. Nowadays, professionally processed stainless steels are used which are of a quality that makes them wholly suitable for automated dishwashing (see VGG technical information sheet <a href="#">Commercial dishwashing &amp; resistance of materials in dishwashers</a>).</p> <p>Pitting corrosion is a particular form of corrosion.</p> <p><b>Pitting corrosion</b> is the result of an excessively high chloride load. Pitting corrosion involves the formation of a rust-coloured spot, at the centre of which a small crater develops. If this is not removed and, above all, if the cause of the pitting corrosion is not eliminated, a hole can develop in a relatively short space of time. Pitting corrosion can be triggered by:</p>

	<ul style="list-style-type: none"><li>• unsuitable steel alloys</li><li>• incorrect processing of the steel, defective surface quality</li><li>• unsuitable water containing high chloride levels together with dissolved cooking salt from food residues</li><li>• prolonged action of acid and/or salt-containing food residues, before being washed</li><li>• underdosing of detergent</li><li>• Malfunction of the water-softening equipment (regeneration salt carried off).</li></ul>
<p><b>What types of residues are there on wash ware and how can they be prevented?</b></p>	<p>It should categorically be stated that it is of crucial importance that no residues should remain on wash ware surfaces.</p> <p>If deposits do occur, then these will, in particular, be</p> <ul style="list-style-type: none"><li>• <b>food residues that were not removed (defective cleaning).</b></li></ul> <p>Even assuming that the technical warewashing conditions (e.g. machine, agents, dosing, and handling) are fully complied with, poor warewashing results can still arise if food residues are allowed to dry on over a prolonged period, especially where heated trolleys are used, and inadequate pre-soaking is carried out.</p> <p>Unfavourable wash conditions can result in food residues which have already been removed being finely distributed and re-deposited on wash ware, including on items on which the food residues were not originally to be found.</p> <p>This occurs particularly where the detergent solution is too heavily loaded with food residues or the detergent dosage is too low.</p> <ul style="list-style-type: none"><li>• <b>lime deposits and other residues.</b></li></ul> <p>Water hardness levels that are too high, detergent dosages that are too low, water treatment equipment failures, combined waste-water hardness levels that are too high, or possibly a combination of several of the aforementioned factors can result in lime deposits.</p>

	<p>Such deposits can be removed again by applying acidic products such as descaling agents.</p> <p>Detergent solution and food residues may remain on wash ware if the fresh water rinse is inadequate or wash ware is routinely too tightly arranged in the racks.</p> <p>Too high a mineral content in the water can also result in residues (spot formation). These can be prevented e.g. with the aid of a demineralisation unit (see VGG technical information sheet <a href="#">Commercial dishwashing &amp; water</a>).</p> <p>The prevention or removal of all the residues on stainless steel cutlery and wash ware listed here is vitally important, as full corrosion-proofing is provided only if, by virtue of unrestricted oxygen access, a wafer-thin, invisibly protecting passive layer can repeatedly re-form on the clean surface.</p>
<b>How are discolourations produced?</b>	<p>Blue, violet or rainbow-like discolorations of the surface of stainless steel are completely harmless but are perceived as being unattractive. They may be produced simply by water and contact with food. For example, discolorations of this kind can occur when cooking celeriac in stainless steel pans.</p> <p>Practical experience reveals that discolorations can be countered by an adequately high detergent dosage.</p>
<b>How can such discolorations be removed?</b>	<p>The majority of discolorations can be removed again with a suitable descaling solution (HCl-free), especially if this is done immediately after they appear. Some, however, can be removed again only by specialists (steel manufacturers, suppliers of agents).</p> <p>This is particularly true where they are allowed to "age" over a prolonged period, since they also become "fixed" as a result.</p> <p>Special cutlery soaking agents can also be used for removing such discolorations.</p>
<b>What has to be borne in mind when cleaning cutlery?</b>	<p>The basic rule for trouble-free use of a commercial warewasher is to follow the instructions of the machine's manufacturer.</p>



	<p>It is equally important to take precise note of dosage specifications and information on procedures from agent manufacturers. Detergents in powder form must not be sprinkled over cutlery as this can produce persistent dark stains. Particular attention should be paid to ensuring that the water treatment equipment is functioning properly. The formation of problem-causing deposits can in this way be prevented (see VGG technical information sheets <a href="#">Commercial dishwashing &amp; agents</a> and <a href="#">Commercial dishwashing &amp; water</a>).</p> <p>The user must also take care to ensure that cutlery is not inserted in special cutlery racks too closely together immediately after it has been used.</p> <p>Soaking cutlery in a heatable pre-soaking tank to which a special soaking agent has been added (the relevant instructions for use from the agent manufacturers should be observed) so that the food residues cannot dry on has been shown to be effective.</p> <p>Pre-soaking cutlery and dishes with inappropriate high-foaming manual washing-up liquids should always be avoided.</p> <p>In addition, there are special machines for cleaning cutlery which also permit the use of other methods.</p>
<b>What has to be borne in mind when purchasing stainless steel kitchenware and tableware?</b>	<p>Care should be taken to ensure that the wash ware is designated “warewasher-safe” by the manufacturer. The items should be as smooth as possible and have an easy-to-clean surface finish.</p>
<b>Technical advice provided by the member companies of the VGG</b>	<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 personnel, and regular maintenance of the warewasher, dosing equipment and water treatment system by the manufacturer will produce the washing 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 &amp; wash ware made of metal</i>" should be addressed to</p> <p><b>Arbeitsgemeinschaft Gewerbliches Geschirrspülen, Feithstraße 86, D-58095 Hagen, Germany Phone: +49 (0)2331/ 377 544 – 0, Fax: +49 (0)2331/ 377 544 – 4, E-mail: <a href="mailto:info@vgg-online.de">info@vgg-online.de</a>.</b></p>
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