1. Scratches and chatter marks on glass

Scratches may appear individually and spread over glass but they can also be so close together that they form a white mark or ring. These chatter marks are scratches that are not normally visible to the naked eye. Under a microscope you can however see fracture lines running along the scratch like scales. Scratches are always caused by mechanical action on the surface of the glass. This means that hardly any drinking glasses in daily usage are free of scratches. When a dishwasher is used, scratches and chatter marks above all appear when

glasses bump against each other as they are loaded into the machine or knock against other hard objects
glasses touch each other in the basket. This often produces ring-shaped rub marks if glasses additionally rotate during dishwashing.
All marks on glasses resembling scratches are made worse during machine dishwashing. Although they cannot initially be seen by the naked eye, they become clearly visible with an increasing number of washing programmes. This is due to the following:
Water and aqueous washing solutions penetrate scratches and fine cracks. This forces out little particles of glass that are already loose. This process is above all exacerbated by the drop in temperature from the hot dishwashing cycle and cold intermediate rinsing.

2. Pinprick and fluff-like changes to glass

In contrast to scratches and chatter marks that appear individually, changes to glass resembling scrapes, pinpricks and fluff are an accumulation of little scuff marks, countless tiny dots and damage on the surface of glass that look like the lint seen on fabric. Such irregularities typically occur together. A trained eye will often already spot them on unwashed glasses. They become clearly visible after just a few washing programmes, generally after just the first one. It is possible to tell here whether this must involve damage to the surface of the glass that came about during the production process or while en route to the consumer.

Such damage is quickly made worse under the conditions of machine dishwashing.

3. Irreversible cloudiness and iridescent deposits on glass

Frequent machine dishwashing will not usually damage glass if it is dishwasher-safe. Exceptions here are glasses decorated with coloured patterns and/or with gold, as well as glasses that are old and especially good quality. They are not generally suitable for dishwashing. The surface of these glasses may be damaged by dishwashing in a machine. Irreversible cloudiness and deposits with a rainbow effect are then seen on the glass. Nothing can be done about such changes to the glass surface. If they occur, a machine cleaning product and a damp cloth can be used to check whether this involves corrosion or limescale. If the cloudiness cannot be removed, the cause is chemical sensitivity of the glasses due to their production process. If limescale is involved, cloudiness can be removed by hand with a damp cloth or by washing in the machine with a machine cleaning product.

4. Hidden flaws on glass

By this we understand all effects such as cloudiness and iridescence which sometimes do not appear until after frequent dishwashing. The production process plays a key role here. One example of such flaws are cooling cracks. This is due to stresses that occur in glass if it does not undergo a defined slow cooling process after being given its final shape. These defects are "frozen" in the glass and only become visible with daily usage. They are seen when for example a sliver of glass suddenly breaks off from the rim of a glass that initially looks on the outside perfectly intact while in use, when a glass bowl smoothly breaks in half or the sturdy base of a drinking glass snaps off.

5. Symmetrical cloudiness on glass

During production glasses that are hand-blown have a cap, which is scored with a diamond and then snapped off.
The sharp edge that occurs during this process has to be rounded off. This can be accomplished by grinding or melting it down in a hot gas flame. Here the sharp edge is ground to round it off and then smoothed with polishing agent. How the glass will subsequently behave with dishwashing in a machine depends on this process and the work method applied. When the rim has been melted to round it off, symmetrical cloudiness may occur below the edge. No rings form after round grinding. This can almost never be detected in glasses that have not been used. Symmetrical cloudiness is however typical damage to glass that can occur with dishwashing in a machine. Symmetrical cloudiness is also seen following the attachment of a handle with insufficient thermal treatment.

6. Iridescence on glass

In most cases this involves a pearly rainbow effect of colours. However, sometimes only brown, green or blue discolouration occurs. Glasses nevertheless remain perfectly transparent, although they often look darker. These changes are brought about by very fine deposits, which slowly form during machine dishwashing. This involves layers that are rich in silicates. To date it has not been possible to clarify with any certainty whether this is caused by silicate from the glass material itself, the detergent or both together.

Many years of experience leads to the supposition that iridescence only occurs with low-alkaline detergent with a fairly high silicate content.
If a high or low-alkaline product without silicate is used, such iridescence is not observed. Lead crystal, potash lime and soda-lime glasses which have been washed 1000 times with low-alkaline, silicate-free detergent show no signs of corrosion at all even after such frequent dishwashing.

7. Stainless steel rusts (fascia and housing)

The stainless steel chromium steel 4016 must not be cleaned with:

- Non-oxidising acids
- Solutions and their salts
- Chloride-containing media
- Seawater

or come into contact with them.

One possible cause of rust occurring on chromium steel 4016 is commercially available **sponge cloths**.

These sponge cloths are dyed, and stainless steel may start to rust from the **residual salts** they contain.

8. Stainless steel discoloured (fascia and housing)

Localised discolouration may be caused by:

- Mustard
- Onions
- Sauerkraut
- Rhubarb

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9. Pitting corrosion on stainless steel

The most common type of corrosion is pitting corrosion, also known simply as pitting, which acts to destroy the material. It above all affects knife blades. With high-alloy steels pitting only occurs as a result of faults in processing the material.
It generally starts with little holes like pinpricks that are not yet visible to the naked eye. They may subsequently enlarge to become destroyed areas that are some cm^2 in size. The locations affected by pitting have been eaten away, are dark grey to black and show a granular structure.
This corrosion is always caused by a fault in or destruction of the protective layer or the "passivated" stainless steel surface. The main reasons for this are acid-containing food remnants of vegetables, fruit, fruit juices and dairy products that remain on the steel surface. But is not only acids that can attack stainless steel. There is above all a risk from table salt. It is virtually always contained in drinking water and food remnants. It is therefore important that, after filling the salt reservoir of the water softening system, no regenerating salt is left at the bottom of the reservoir or in other areas of the dishwasher for any length of time. In comparison, alkaline products such as detergents and their alkaline solutions do not cause pitting on stainless steel surfaces.

10. Extraneous or surface rust on stainless steel

This involves rust particles from external sources which have been deposited on the surface of non-rusting steels. This particularly occurs when the handles of pots and pans are attached with screws made from material that is not rustproof.
This is especially problematic at points where screws are inserted in pots and pans and are no longer visible on the finished part. Parts are suspended for enamelling by these lugs, which are therefore not covered with the protective layer of enamel, so allowing them to subsequently rust in use.
Rust can be deposited on enamelled pots and pans made from sheet steel whose enamel layer is flaking off at certain points and is then carried over. A frequent source of extraneous rust is also baskets whose plastic coating has become damaged to expose the metal wire underneath. In rare cases rust can also be introduced via tap water. Another possible source is when parts with rusting steel are also put in the dishwasher, for example the blades of old knives.

11. Pitting corrosion on stainless steel

Complaints about rust are frequently received in conjunction with pitting, particularly in the case of knife blades. Such complaints only mention dots of rust or little rings (av. approx. 1 mm). These cases involve little black dots like pinpricks in the middle of these rings of rust. Although not apparent to the naked eye, they are visible with a magnifying glass. This is pitting corrosion at the initial stage.

12. Crevice or contact corrosion on stainless steel

By this we understand corrosion that occurs in "crevices", for example in crevices and cracks in a material, and in particular at crevices where two different materials come into contact with each other.
The classic example of this with machine dishwashing of tableware is the crevice on a knife where the stainless steel blade meets the handle. The materials which come into contact with each other here are, on the one hand, low-alloy knife-grade steel and on the other, knife handles made from German silver, a copper-nickel-zinc alloy 90 or 100 silver-plated or handles made from a high-alloy 18/10 chromium nickel steel. These dissimilar materials have different electrochemical properties, so allowing a galvanic cell to be set up. With this electrochemical reaction the less noble metal is attacked at the point of contact. Chloride ions again have a highly detrimental effect here. Contact corrosion is frequently the result of damage to the passivation layer, i.e. the oxide film. The first signs of all crevice corrosion are dark discolouration and rust marks at the point of contact.

13. Stress corrosion and hardening crack corrosion on stainless steel

Intergranular corrosion and corrosion due to deformation can be solely attributed to faults in the production process of the steel. In most cases these faults affect the crystal lattice structure of the material. In a resistant steel alloy with an austenitic lattice this gives rise to areas with a martensitic or ferritic structure with a lower resistance to corrosion. Here stress crack corrosion is solely caused by table salt.

This is at the same time also the classic example of interaction with machine dishwashing. Stress and hardening cracks above all affect knife blades at the serrations and, from the back of the knife, towards the cutting edge. An alkaline detergent medium generally acts to reduce levels of corrosion here.

14. "Tarnish" discolouration on stainless steel

This affects pots and pans made from stainless steel. Steel surfaces can become discoloured with iridescent shades of brown and blue or pearly tints when cooking certain foods (cauliflower, celery, kohlrabi, button mushrooms, potatoes, pasta, poached fish or savoy cabbage). Such discolouration is caused by fine coatings firmly adhering to the steel due to a reaction between hydroxide ions (OH ions) and minerals such as magnesium, silicic acid and phosphorous compounds. They are in physiological terms entirely harmless.

15. Iridescent coatings on stainless steel

Stainless steel pans shimmer with rainbow colours. Light striking the surface is diffracted by a fine layer on the steel, for example left by food remnants. This phenomenon can sometimes also be seen in the interior of a dishwasher or on the inside of the door. It has the same cause as the iridescence found on stainless steel pans. Remedy: Wash stainless steel pans showing this rainbow effect using a machine cleaning product. Another cause is the quality of the material of the dishwasher tub or of the stainless steel pan. Under certain conditions contamination of stainless steel alloy, e.g. titanium, can result in discolouration. Here too washing with a machine cleaning product may help.

16. Tarnishing of silver

It is a well-known fact that silver will tarnish when not in use. It is just a question of time here until dark-coloured, brown, blue or blue/black spots appear on the surface or it becomes discoloured overall in a process commonly known as "tarnishing".
This is due to the special sensitivity of silver to sulphurous gases as found in the air. Just traces of hydrogen sulphide in the air, in concentrations we cannot even smell, are sufficient to tarnish silver. A reaction between hydrogen sulphide and silver already takes place at room temperature, producing silver sulphide, which then causes the dark discolouration described above.
Similarly, this occurs with contact between silver and food remnants with sulphur-containing substances such as egg yolk, mayonnaise, mustard, onions, pulses, fish, especially fish brine, and marinades. For this reason it is best for example not to use a silver spoon when eating a boiled egg.
800 silver can tarnish in shades from gold to light brown due to its high copper content: 200 parts to 1000. This means

that it is less suitable for machine dishwashing. If however it was subsequently galvanically silver-plated, the metal will of course behave like 90 or 100 silver plating.
Tarnishing cannot be avoided due to the highly sensitive reaction between silver and sulphur-containing compounds described above. Even care products for silver which contain substances said to have a protective effect are only able to delay tarnishing for a little while, if at all. As such protective layers are always just very thin, this protection is therefore effective only for a very short time.

17. Silver in the dishwasher

The conditions under which silver is washed in home dishwashers are generally less favourable than when washing dishes by hand. Tarnishing of silver is encouraged here by the following influences:
Food remnants: Sulphur-containing food remnants as mentioned above may sometimes have plenty of time to act on a silver surface prior to machine dishwashing as, unlike with washing-up by hand, dishwashing does not generally take place immediately after a meal, only once the machine is full of soiled dishes, etc.
Cleaning temperatures: During dishwashing the contaminated fleet also comes into contact with the silver for much longer, and moreover at higher temperatures of 50 to 65 °C, than when washing up by hand. The reactivity of the silver is reinforced by the higher washing temperatures. The higher temperatures occurring with machine dishwashing thus encourage the chemical processes resulting in tarnishing.
Cleaning time: The intensive cleaning process in a dishwasher strips the silver surface of all grease, so making it more sensitive to external influences.
Oxidising agents in detergent: Oxidising agents based on active chlorine or oxygen bleaching are also involved in this process. According to observations made to date, tarnishing when using detergents containing active oxygen is greater than with systems containing active chlorine.
Alkalinity (pH value) of detergent fleet: Physicochemical testing has shown that higher alkalinity reduces the risk of silver becoming tarnished by certain food remnants in the washing fleet, e.g. mustard.
When washing up by hand, the action of drying lastly has a certain polishing effect, which is of course omitted with machine dishwashing. Under no circumstances should detergents come into direct contact with items made from silver. If not rinsed off immediately, the detergent remains on the surface for a while, producing blue to black marks, which are very difficult to remove, with this generally only being possible by mechanical means.

18. Cleaning tarnished silver

It does not really matter whether silver has become tarnished while kept in a drawer, during normal use or with machine dishwashing, i.e. whether involving coatings of silver oxide, silver sulphide or silver chloride or metallic silver. Such discolouration has to be removed by hand using a care product for silver with a gentle abrasive action. This generally also ensures that the desired patina of decorated silver parts remains intact.
Products are available to care for silver, i.e. also to remove tarnishing, in the form of liquids or pastes as well as care cloths, soaps and cotton wool. Under no circumstances should scouring powder or similar cleaning agents with highly abrasive additives be used here.

19. Residues

Residues (often gritty in nature) occurring in glasses, cups or other hollow containers: Food remnants inside have not been washed out as they are located in spray shadows. Please make sure the dishwasher is loaded correctly. Tall, slender glasses should not be stood in the corners of baskets. The water must be able to reach all parts unhindered, and the spray arms must move freely. Or: Food remnants have been deposited on surfaces where they were not previously present. Check whether filters are soiled and clean if necessary. Or: The detergent dosage was insufficient. Follow the dosage chart on the product packaging.

20. Matt coatings on plates

This may involve starch (*see picture*) deposited by potatoes, pasta and thickened sauces. Residues from denatured protein (*see picture*) are however also possible here. Coatings of this type can best be removed using a 65 °C programme and a detergent dosage of 30 ml.

with iodine solution
Starch deposits dyed

Spoon with and
without residues of protein

21. Tea stains

Black tea that has been made with hard water and is then left to stand forms a film of tea that may be left in the cup.

Such tea stains (*see picture*) will only be removed if there is a well-balanced interaction between the individual components in the detergent. This applies to all Somat detergents. Stubborn tea stains can best be removed with a 65 °C programme and a detergent dosage of 30 ml as the bleaching system can then function to optimum effect.

22. Residues of spinach

When dishes are washed with residues of spinach still on them, these residues often appear again on other items after dishwashing (*see picture*). This comes about because the rinsing water pumped round the dishwasher then distributes the washed-off spinach residues throughout the machine. Spinach has a tendency to firmly adhere to smooth surfaces. In such cases the only solution is to prerinse dishes by hand.

23. Residues of grease

Grease residues build up in the filter and the dishwasher only when frequently washing very greasy dishes and at programmes below 50 ºC, possibly also without using a prerinse programme. Remedy: Use a 65 °C programme or a special programme for pots and pans with 30 ml detergent or clean the dishwasher with a machine cleaning product. Then run a 65 °C dishwashing programme at least once a week. In extreme cases such grease residues may block the control system for the water level, which will then necessitate costly repair of the dishwasher.

24. Dull surfaces

Streaks, water stains and limescale are particularly common on glasses and cutlery when the dosing dispenser has run out of rinse aid in or the rinse aid dosage is set too low. It then has to be topped up with rinse aid or the rinse aid dosage set higher.

Glasses with marks and streaks/residues of salt = poor rinsing result

25. Residues of salt

White coatings on washed items taste salty. This is salt from the regeneration chamber. Either: The lid of the salt reservoir has not been closed properly so brine can escape into the interior of the machine. In this case close the lid tightly. Or: The lid has a fine crack that allows brine to escape into the interior of the machine. The lid then has to be replaced by a new one.

26. Limescale

The water is not softened sufficiently and/or too little detergent has been used. Check the level of salt and top up regularly with Somat special salt. Always dose the detergent according to the dosing instructions. Or: Set the water softener to a higher hardness range.
Immediate remedy: With the machine empty, run a washing programme with a machine cleaning product. This will remove limescale deposits.