

MILLSTAR™:

All advantages on its side.



The best milling procedure has a name: MILLSTAR™.

Efficient brewing starts with appropriate milling. The last three decades of practical experience have proven the efficiency of GEA Brewery Systems' steeping conditioned milling concept. Our MILLSTAR™ combines the advantages and benefits of conventional wet and dry milling. This method ensures almost perfect husk conservation and optimal grinding of the endosperm, which provides numerous advantages for your brewing process and your final product beer.

Performance creates efficiency.

MILLSTAR™ stands for convincing performance in the brewhouse. In terms of capacity, it can compete with any other milling system and method. In addition, it requires comparably low capital expenditure and has an excellent cost-benefit ratio. The conversion from conventional dry milling to the MILLSTAR™ technology alone yields a capacity increase in the lauter tun of up to 20 %. Therefore the investment pays off within a very short period of time. In combination with the lauter tun we achieve a real win-win situation: in terms of Total Cost of Ownership (TCO), MILLSTAR™ plus lauter tun is by far the most efficient solution for your brewhouse.

No compromises on beer quality.

With its special milling method and gentle grain treatment the MILLSTAR™ contributes to a higher wort quality. Instead of finely grinding the grain, it is crushed in a way to ensure optimal extraction and subsequent wash-out in the lauter tun. This does not only enable higher lauter tun loads. Due to the smaller surface and the fast processing the crushed grain is less susceptible to oxidation, which would affect beer quality. One more advantage for the flavor stability of your beer.

FACTS & FIGURES



Successful operation all over the world

More than 380 MILLSTAR™ units with capacities from 3 up to 40 tons per hour are being operated all over the world. Our experience with the entire range of mill capacities means additional safety for our customers.



Compact design, easy upgrade.

The MILLSTAR™ has a really convenient design. Steeping conditioning, crushing and mashing-in take place in one unit. Due to this compact design, the space requirements are much lower than for comparable dry milling systems. Special explosion protection measures are almost completely unnecessary. Due to its favourable ATEX classification, the MILLSTAR™ can also be installed directly in the brewhouse.

Our unique safety system always ensures the safety of the personnel performing maintenance work on the MILLSTAR™. All important units of the mill are easily accessible and allow for convenient maintenance. Therefore the MILLSTAR™ can be easily integrated into existing brewhouses.

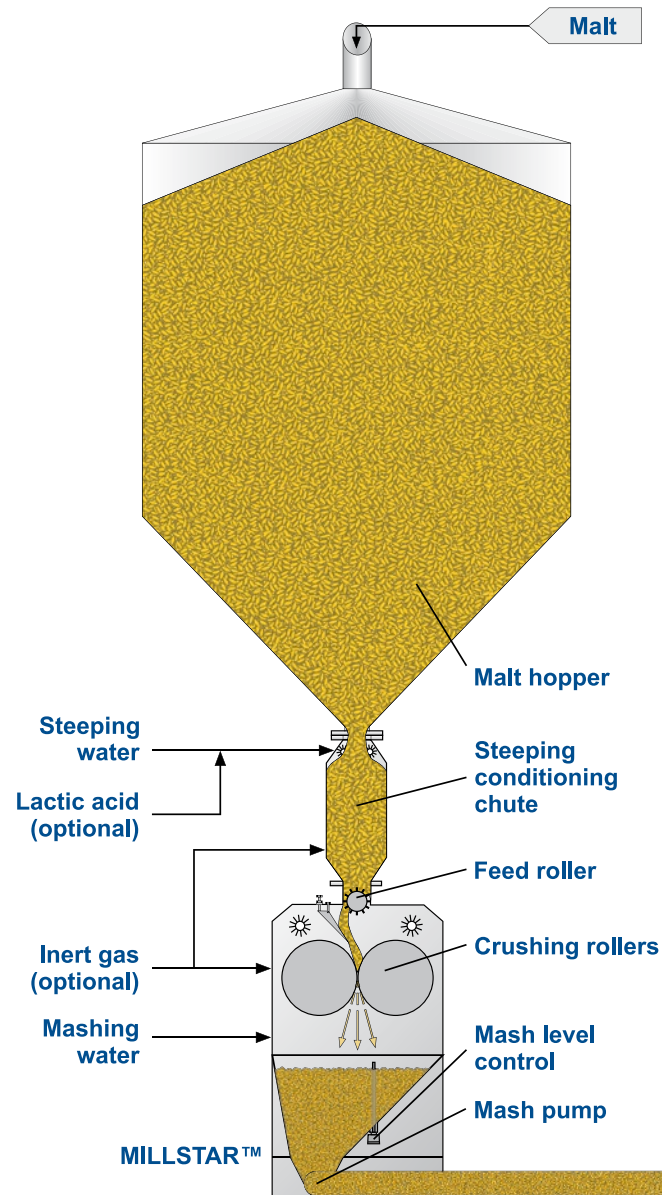
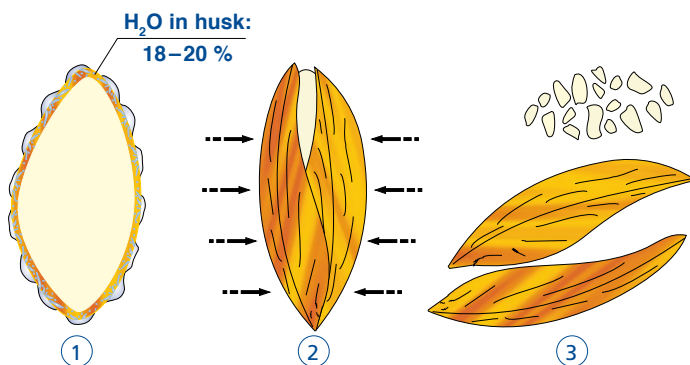
What makes the MILLSTAR™ so special:

- Hygienic design for simple and efficient cleaning
- Positive displacement pump for mashing-in: malt to water ratios of up to 1:2 (without rinsing) can be reliably handled
- Level control in mash hopper for low oxygen uptake
- Optimized spray geometry to avoid mash flotation
- Quality automation system: feed roller speed control based on grist throughput rates, providing adjusted steeping time for 'harder' malt batches
- Temperature and flow of steeping water individually adjustable
- Precise and easy adjustment of the crushing roller gap
- Large-dimensioned rollers for optimal crushing and husk conservation
- Mash acidification possible directly in the mill
- On request, also available with equipment for inert gas flushing

The MILLSTAR™ concept: optimizing the complete process.

This is how the MILLSTAR™ works: The initially dry and cleaned malt constantly passes through the conditioning chute for a short period of time. During this period the water content of the husk is increased approx. to 18–20 %. As a result the husk obtains the elasticity necessary to slip off the grain in one piece.

The endosperm itself stays dry throughout this process. Best conditions for optimal crushing and high yield. The endosperm is extracted from the husk and perfectly ground by a pair of crushing rollers. During this process the patented quality system automatically adjusts the capacity depending on the malt quality and thus consequently compensates quality fluctuations. The decisive factor for roller capacity and conditioning time regulation here is the friability of the supplied malt. Malt batches with increased hardness are crushed more slowly, which enables them to absorb more water in the conditioning chute. Always optimal grist – independent of the grain quality.



FACTS & FIGURES

Advantages of steeping conditioning

In the conditioning chute the grist is evenly humidified ①. At this stage water absorption reaches a level of approx. 18–20 % in the husk. Thus, the husk becomes flexible enough in order not to get crushed during the subsequent milling process. The endosperm itself stays dry and brittle. The roller design allows for maximum contact time of the grain in the crushing area and prevents husk damage

due to shearing forces ②. The roller pressure provides optimal crushing of the brittle endosperm. The MILLSTAR™ leaves the husk ③ intact, which provides best conditions for a good lauter tun performance, as the husk fraction has a decisive influence on the filter cake volume and consequently on the lauter tun performance as well.

Mash acidification

As a special feature the MILLSTAR™ can be equipped with a system for continuous lactic acid dosing. Dosed into the steeping water, the lactic acid provides an earliest possible lipoxygenase inhibition. Thus at the stage of water absorption negative enzymatic oxidation of the grain is inhibited. The grain is optimally prepared for milling.

Highest quality by just in time milling.

The MILLSTAR™ crushes the malt at the moment it is needed – directly before mashing-in. The necessary amount is processed in one step, so that storage periods and treatment involving the danger of grist oxidation by atmospheric oxygen are minimized. After being crushed in the MILLSTAR™, the grist is immediately mixed with water, which also excludes oxygen impact to a large extent.

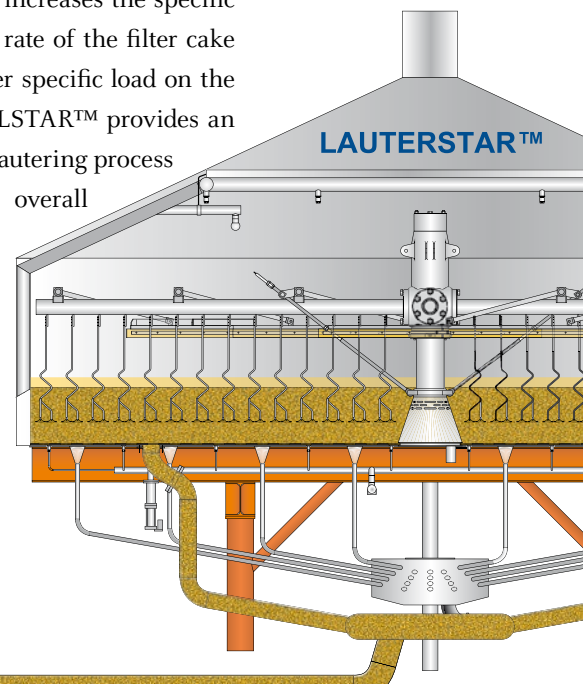
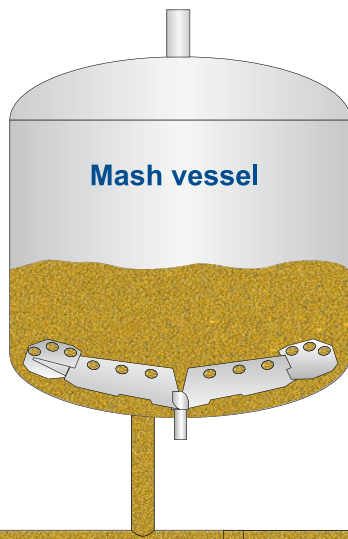
A further advantage: The MILLSTAR™ allows mashing-in at high concentrations. The mash hopper level control ensures that the thick matter pump delivers mash only and no air-mash-mixture. Downstream vessels – the mash tun as well as the lauter tun – are exclusively bottom filled. This guarantees minimum oxygen contact in every step and the highest possible quality.

Win-win situation:

MILLSTAR™ and lauter tun.

In combination with the lauter tun the MILLSTAR™ displays its full potential. As milling ensures an almost perfect conservation of the barley malt husk, the lauter tun capacity increases as well. The husk fraction has a decisive influence on the filter cake volume. The filter cake should be as light as possible to ensure optimal wort run-off and extract yield.

Unlike dry milling the steeping conditioning creates ideal conditions to achieve this objective. Before milling, the water content of the malt grain is raised to an extent which ensures an almost full husk conservation. This increases the specific volume and the throughput rate of the filter cake and therefore allows a higher specific load on the lauter tun bottom. The MILLSTAR™ provides an excellent preparation of the lautering process resulting in an increased overall brewhouse yield.

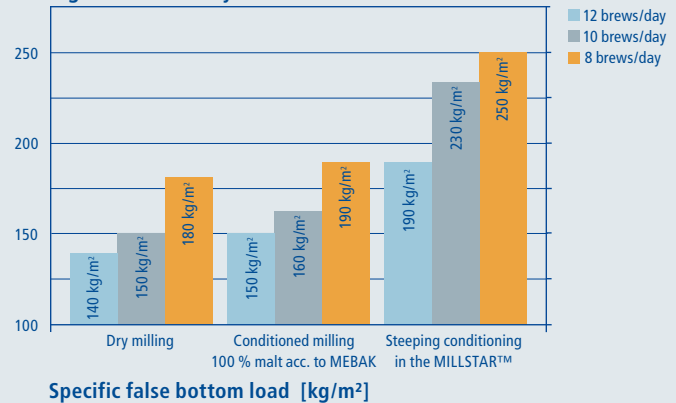


Mashing-in at high concentrations

A thick matter pump, in our case a positive displacement spiral pump, is indispensable for mashing-in highly concentrated mashes with a malt/water ratio of 1:2 (without rinse waters). Due to its design this kind of pump guarantees a very gentle mash transfer at low speed. The low shear forces provide minimum beta-glucan release and extremely low fines abrasion – both

guaranteeing optimal lautering and good beer filterability. The method of working with high mash concentrations does also offer energetic advantages. By using hot water directly in the brewhouse the hot water balance can be improved further.

Higher brewhouse yield



Designed for more quality and efficiency.

The MILLSTAR™ does not only satisfy highest technological requirements. Its compact and sophisticated design facilitates everything – from installation to cleaning and maintenance. And compared to other milling systems the steeping conditioning method is much safer.

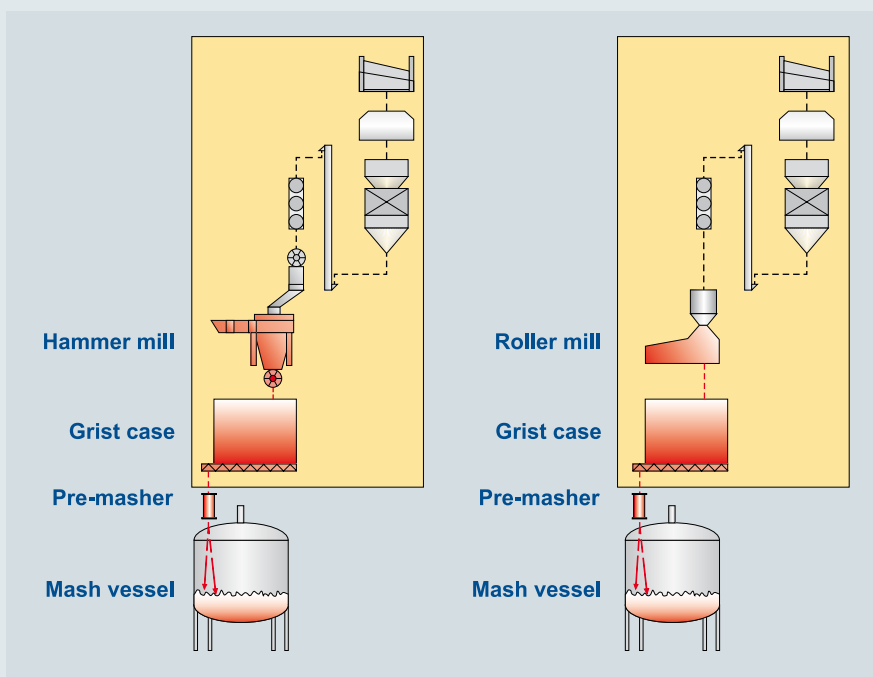
Explosion protection included.

With a MILLSTAR™ the delicate issue of explosion protection is not a problem anymore: wet grist and a subsequent addition of mashing water reliably avoid dust generation. Therefore the danger of a dust explosion in the roller area is completely eliminated. Protection measures are only needed for the upstream areas, like transportation equipment and malt handling. Whereas dry milling can sometimes require considerable civil works, the MILLSTAR™ makes a structural separation of mill and brewhouse superfluous.

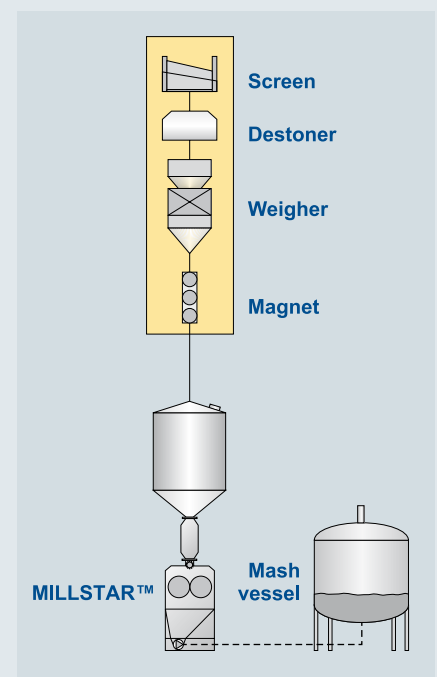
Clear control structures provide transparency.

The power consumption of the crushing rollers indicates the hardness of the grains and feed roller supply and water quantities are regulated accordingly. Consistent milling results are ensured, irrespective of variations in raw material quality. Furthermore, the temperatures and volume flows of steeping water and mashing water can be parameterized independently. Thus, the MILLSTAR™ provides great flexibility for recipe development and constant milling conditions at the same time, regardless of the temperature of the grains. The mash hopper level control reliably prevents oxygen uptake during transport to the mash vessel.

DRY MILLING SYSTEMS



MILLSTAR™ SYSTEM



■ Areas with high oxygen load ■ Zone classification acc. to ATEX necessary

Less kilowatts – hour after hour.

Resources cost money. In this respect the MILLSTAR™ also proves itself to be particularly efficient. Compared to the fine milling in a hammer mill, the MILLSTAR™ equipment is a much more economical solution.

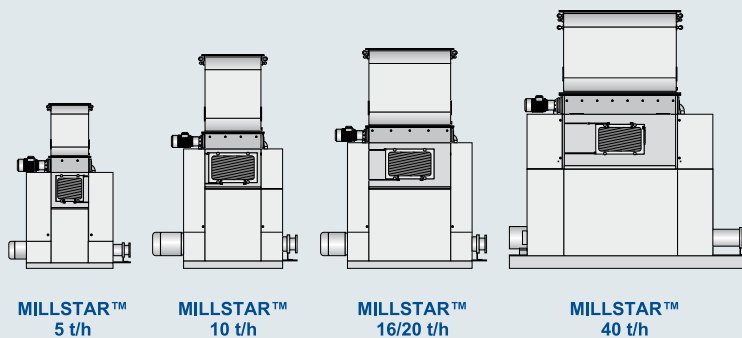
	MILLSTAR™	Hammer mill
Installed capacity	77.2 kW	90.0 kW
Milling time	25.1 min	60.0 min
Energy consumption	32.3 kWh/brew	90 kWh/brew
Spec. energy consumption	3.86 kWh/t	10.8 kWh/t

Basis: 420 hl cold cast wort, 8,350 kg of malt

MILLSTAR™ always up to date with our service package.

To ensure that your MILLSTAR™ always delivers maximum performance, we do not only provide original spare parts, but also a range of technical and technological service packages.

- Attention: One-time inspection of the mill, evaluation of milling and brewhouse process.
- Care: Periodic annual inspection, scope as described above but with additional inspection plan, hotline service and emergency service.
- Roller service: Participation in the GEA Brewery Systems roller replacement system; we always have a pair of rollers available on call.
- Grooving service: We regroove your rollers at our contracting companies with the original geometry.



FACTS & FIGURES

	Width [mm]	Height [mm]	Depth [mm]	Empty weight	Capacity
MILLSTAR™ 5 t	1,400	2,660	830	1.9 t	5 t/h
MILLSTAR™ 10 t	1,600	3,450	1,110	4.3 t	10 t/h
MILLSTAR™ 16 t	2,000	3,550	1,110	5.7 t	16 t/h
MILLSTAR™ 20 t	2,000	3,550	1,110	5.7 t	20 t/h
MILLSTAR™ 40 t	3,000	4,170	1,430	11.4 t	40 t/h



MILLSTAR™ – A successful system.

With all its technical advantages the MILLSTAR™ is the ideal system for a milling process that requires high flexibility. Thanks to its unique technical features, you can take essential measures already during mashing-in to ensure the high quality of your beers.



Process Engineering

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