KRONE
THE POWER OF GREEN

BiG X – Long-chop silage with intensive conditioning

www.krone.de

Dear reader,

A new technique of harvesting maize is currently being discussed – a harvesting technique which produces significantly longer chop lengths than we are used to here in Germany and elsewhere in Europe. The method originated in America, and as with anything that comes from America, it has generated a great deal of hype in Germany. You have no doubt received several enquiries from your customers and you may even feel pressurised into making new investments in this field. So a word of reassurance: Every forage harvester manufacturer in the marketplace has their own specific technology for producing the long-chop maize silage currently being promoted by the Americans. Just ask your manufacturer – they will doubtless be able to offer you a suitable solution. In this brochure we would like to show you the various methods available from KRONE for producing long-chop maize silage.

However, we believe it is somewhat short-sighted to blindly pursue this hype from America. In our view the process poses a number of risks to the silage, of which you should make your customers fully aware. Otherwise you run the risk of possibly damaging the silage and, as a contractor, subsequently being held responsible. The 11/2015 edition of the German magazine Lohnunternehmen (Contractors) featured an article that was written by a group made up of DLG approved manufacturers and DLG members to work on 'Recommendations for the use of silage additives' and who explored the topic very thoroughly. In the article, they come to the following conclusion:

"A wholesale transfer of American conditions to German farms is inadvisable. The effects on silage management as well as those on forage still have to be investigated, if only on the grounds that recommendations for producing maize silage differ considerably between the USA and Germany." (LU 11/2015) You can read a translation of the full article on page 14 of this brochure.

Yet, we can sum up the situation for you and your customers as follows:
All manufacturers of forage harvesters are technically capable of implementing long maize chops, albeit using different solutions.
Tell your customers about the risks of this harvesting technique and ideally seek confirmation that you will not be held responsible for any potential damage to the silage.

While we appreciate the difficult times that dairy farmers are currently facing, we wish you all the very best for the 2016 season.

Thank you and best wishes from Emsland

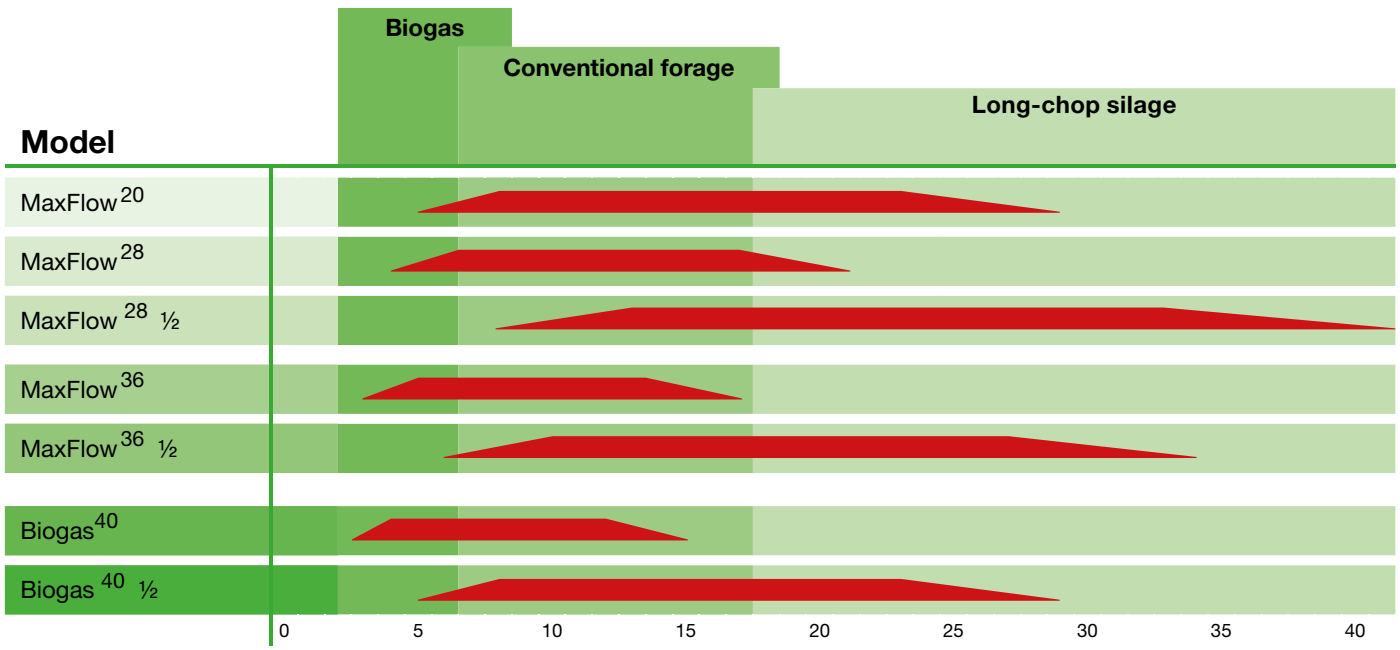
Heinrich Wingels
Head of Marketing

Henrik Feldmann
Head of Product Marketing

KRONE chopping drums

The right concept for every job

KRONE offers a wide range of technical options for producing long-chop silage with your BiG X. Allowing machine owners to operate the drum either with all or half the blades fitted, our solutions give you the flexibility to produce any chopping length your customers may ask for. Converting the drum from short to long chopping lengths (long-chop silage) is quick and easy – thanks to a unique design which delivers the fastest blade attachment and removal in the industry. Looking for an even more convenient solution? Then look at our new VariLOC pulley gearbox which controls the pulley speed and switches the drum from short cuts to long cuts (long-chop silage) within a few minutes.



The specialist drums for animal feed

The 20-blade drum: MaxFlow

This drum cuts the kind of long lengths that are called for in some countries.

LOC range: 5-29 mm from 20 blades

The 28-blade drum: MaxFlow

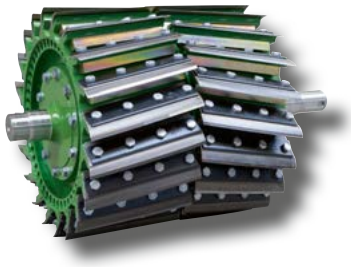
This is our universal drum. Used with just half the number of blades, it is perfect for producing long-chop silage.

LOC range: 4-21 mm from 28 blades
8-42 mm from 14 blades

The 36-blade drum: MaxFlow

Handling massive throughputs and providing a wide range of cutting lengths, this 36-blade drum will earn its keep in no time. Remove half the blades and the unit is perfect for long-chop applications.

LOC range: 3-17 mm from 36 blades
6-34 mm from 18 blades



The 40-blade drum: Biogas

This 'biogas drum' delivers an extremely high cutting frequency. With all blades in place it is the specialist drum for the kind of short LOCs that biogas plants want. And you can easily convert it to long-chop lengths by removing half the blades.

LOC range: 2.5-15 mm from 40 blades
5-29 mm from 20 blades

Quick fit blades:
Each blade is attached with only three bolts. For extra stability, each blade is bolted to the underside of its holder.

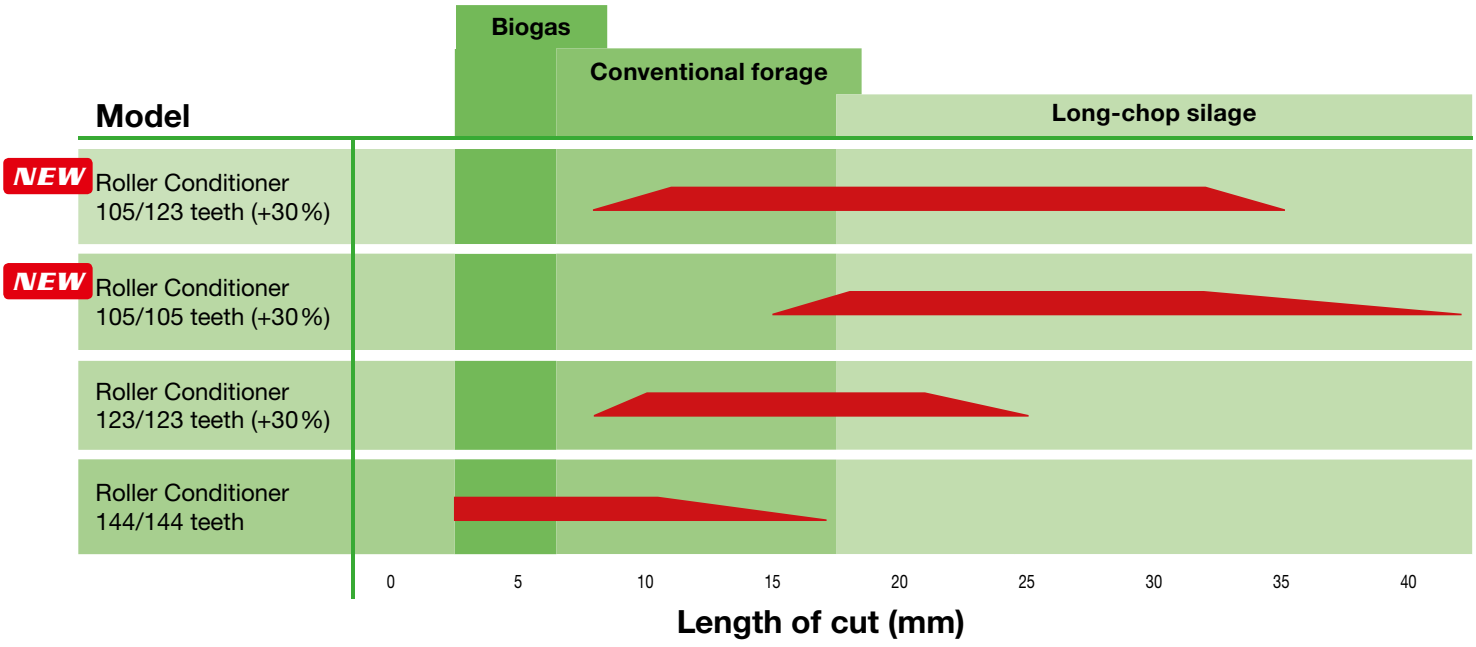
Cutting edge:
A precise LOC is down to the gap between each blade and the counterblade. Aligning the blades relative to the counterblade is straightforward thanks to the eccentric bolts.

More carrying space:
The special design of the blade holders provides plenty of carrying space and makes for high throughputs and quieter running, especially in long chop lengths.

KRONE roller conditioners

Tailor-made systems that boost your bottom line

- Large 250 mm diameter rollers
- Perfect conditioning from a large friction surface area
- 30% speed difference for maximum fracturing
- A different number of teeth for each LOC range KRONE roller conditioners



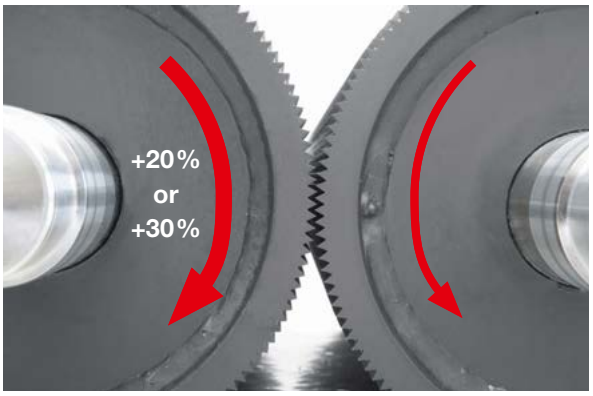
Optimal digestibility

Livestock farmers want forage that is very easy to digest. This means every single kernel needs to be cracked and husks, leaves and stalks must be fractured, even when you're chopping long lengths. KRONE roller conditioners deliver just that. Larger diameter rolls and larger friction faces deliver top quality conditioning and perfect results.

Standard toothed rollers:
Our standard conditioners are available with 105, 123 or 144 teeth. These teeth feature a special triangular design which ensures perfect crop treatment.

Hard chrome plated toothed rollers:
Developed for heavy-duty applications, the chrome plated roller conditioner has an extremely long service life. Providing a sawtooth friction face, these rollers deliver maximum conditioning. The rollers are available with 105, 123 or 144 teeth.

The KRONE roller conditioner cracks every kernel:
Our 250 mm diameter rollers have a larger friction face than the smaller diameter toothed rollers. They can be operated with a larger roll gap for greater efficiency and fuel economy and they are more efficient at conditioning longer chops. The standard speed difference between the two rollers is 20% but this can be increased to 30% if a greater intensity is desired. We also recommend the 30% speed difference for long-chop applications, so as to achieve thorough conditioning and fracturing of long chops.

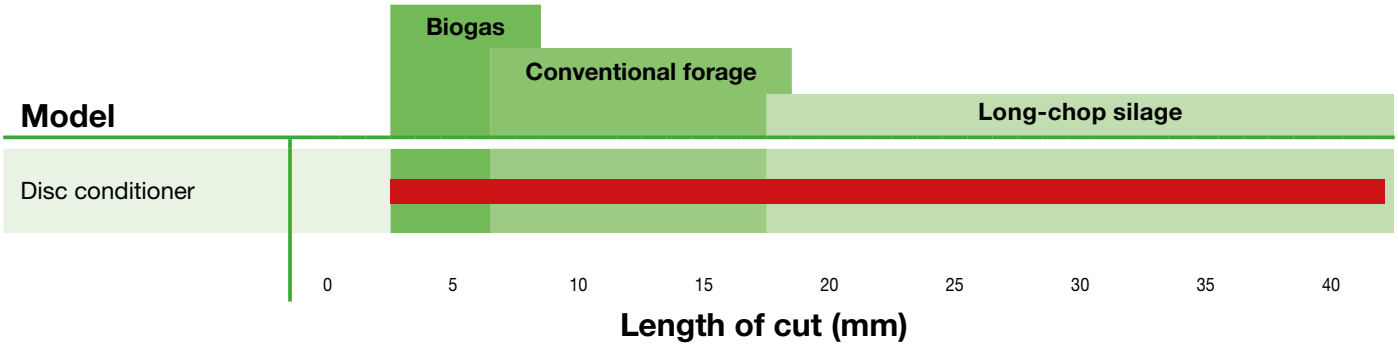


Variable roll gap:
The operator can control the roll gap from the cab, adjusting it steplessly to the current conditions. The current setting is shown on the display screen.

KRONE disc conditioner

The system for maximum conditioning

- Powerful disc conditioner with a friction surface area 2.5 times larger than that of the roller conditioner
- Perfect conditioning and fracturing
- Large 265 mm disc diameter
- Disc gap adjusts conveniently from the cab

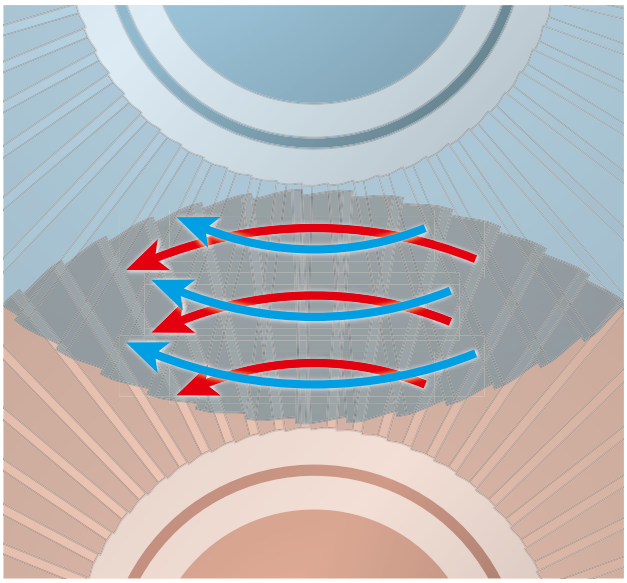


The KRONE disc conditioner simply delivers

With V-shaped gaps between the individual discs to increase the friction surface area, the KRONE disc conditioner delivers maximum conditioning while requiring low power input, producing perfectly conditioned forage.

The KRONE disc conditioner:
The disc conditioner assembly is made up of two shafts with interlocking discs that provide V-shaped gaps to crack the kernels. This design has 2.5 times the friction face of a roller conditioner and delivers outstanding conditioning and fracturing, even in high throughputs and long LOCs.

KRONE disc conditioner cracks every kernel:
With the discs on the outer shaft measuring 265 mm in diameter and those on the inner shaft measuring 135 mm, and both rotating towards each other at identical speeds, the assembly generates two different circumferential speeds, which in turn causes frictional effects that grind the material between the discs.
The result? Every single kernel is cracked effectively and long stalks are fractured lengthways. The clear benefit of this is that the conditioning effect is intensive without destroying the structure. Just what farmers have asked for.



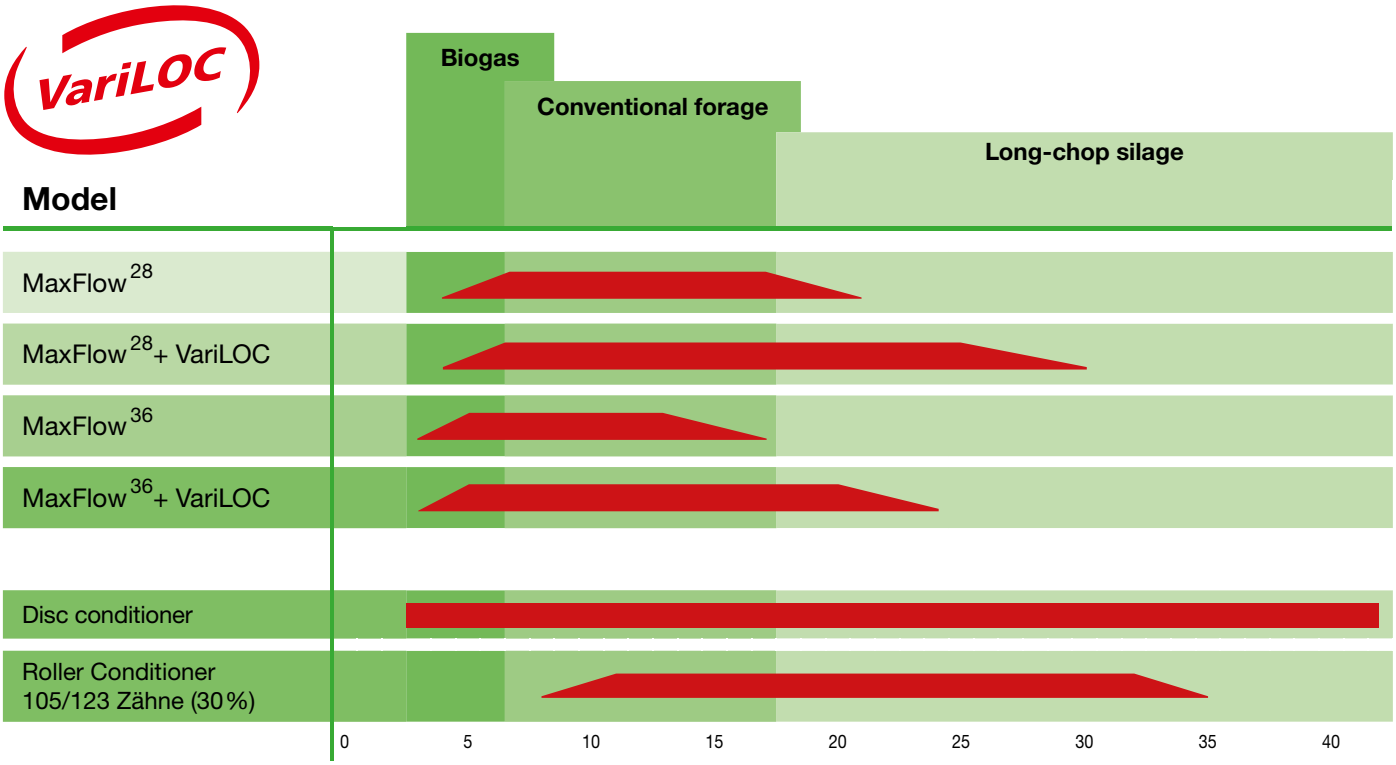
Variable disc gap:
The operator can control the disc gap from the cab, adjusting it steplessly to the current conditions. The current setting is shown on the display screen.

KRONE VariLOC

NEW

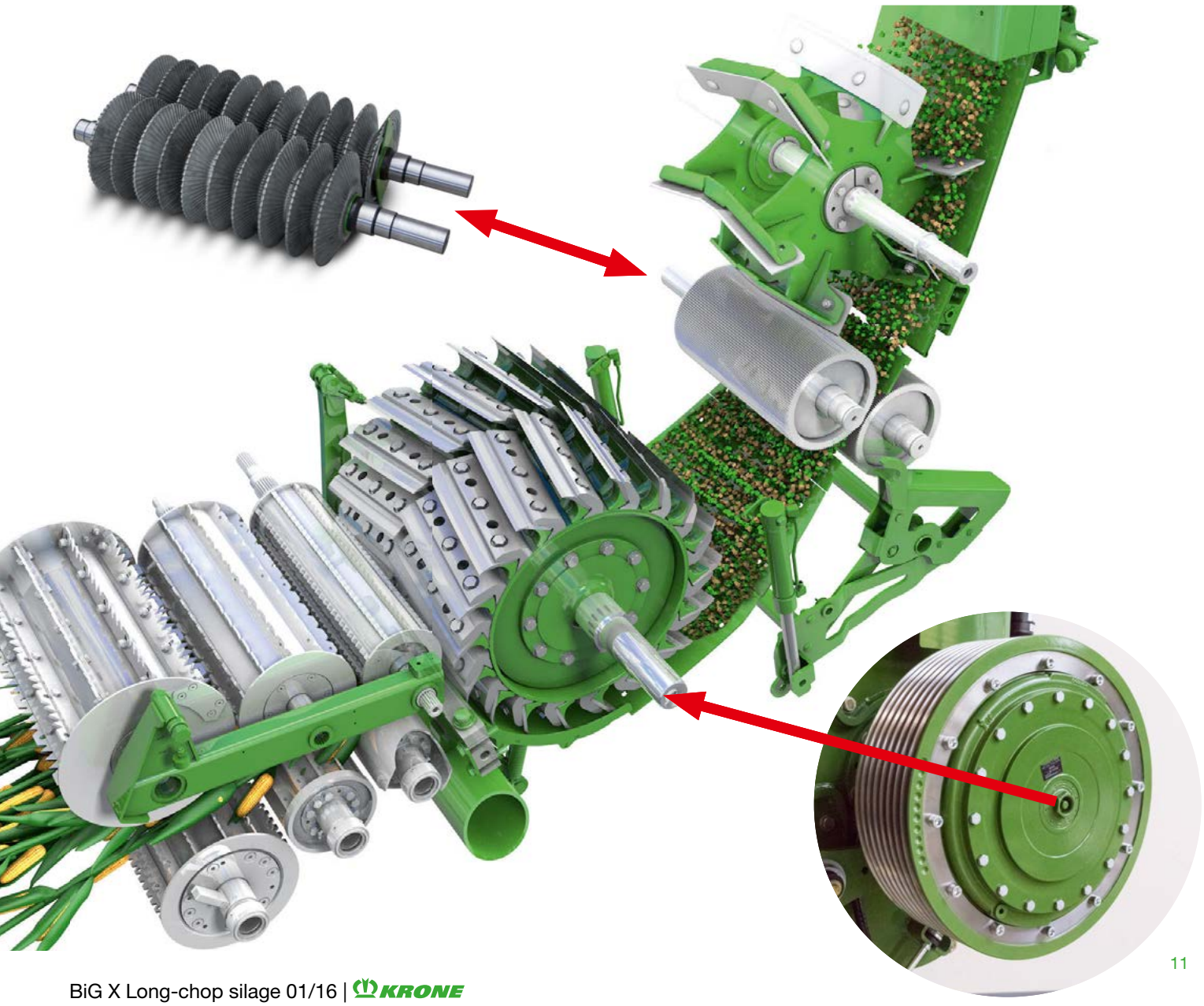
The pulley gearbox – a KRONE exclusive

- A unique world innovation
- Turns your forage harvester into an all-rounder
- Switches flexibly from short cuts to long cuts
- Changeover takes less than 5 minutes
- No downtime, no machine conversion, no up-front planning



Biogas in the morning – long-chop silage in the afternoon

Forming an integral part of the pulley, VariLOC is a gearbox that shifts the speed of the chopping drum. By changing the drum speed from 1250rpm to 800rpm with a simple spanner, you can increase the LOC range by up to 53%. This way you can instantly change over from short to long cuts and vice versa within a few minutes, allowing you to respond to customer requirements at short notice without any prior modifications to the machine or up-front planning. Combined with the new 105/123 tooth roller conditioner (with 30% speed difference) or the disc conditioner, this gearbox turns your BiG X into an all-rounder and gives you maximum flexibility.



Krone now offers a gearbox for the chopping drum on its BiG X 600 to 1100 series models – the VariLOC.

Krone VariLOC chopping drum gearbox:

Free rein...

Freedom of choice – what's not to like? But what does this have to do with the Krone BiG X forage harvester? Plenty. The north German specialist manufacturer of forage harvesters has developed a mechanical gearbox that gives operators the freedom and flexibility to change the speed of the forager's chopping drum at any time within minutes. The gearbox is an option that complements the drum's stepless LOC control…

Gottfried Eikel

Back in the day, buyers of a new forage harvester didn't have to think about how many blades they wanted on their chopping drum. That was because maize chopping lengths were set in steps by using different numbers of blades. Later on, the steps disappeared and the chopping length could be adjusted steplessly between 5mm and 15mm. And when operators wanted a longer chop in grass they removed every second blade from the drum. But these days biogas plants sometimes specify chop lengths of less than 5mm. And in the dairy sector there are two trends. Dairy farmers will ask for an 8mm chop if the ration contains enough crude fibre from grass silage, for example. Or they will ask for a 20-30mm chop to increase the percentage of crude fibre in the maize silage if it contains more than 75% maize. This type of long-chop silage is known as "shredlage".

If contractors want to meet both needs and provide long chops for livestock farmers and very short cuts for biogas plants, they have to convert their machine several times a season. This means they have to allow extra time and money for removing and replacing the blades or swapping the entire chopping drum. And even large contractors who run a big forager fleet and who can fit their machines with different drums, may find themselves in a situation where a specific chop length is required but the particular forager is in the wrong place and needs to be moved quite a distance.

"This is the problem contractors have asked us to solve," Krone explained when asked why they developed a gearbox that changes the drum speed. Unveiled at Agritechnica, this new gearbox was developed with the aim of integrating it in the forager's existing driveline. Another aim was to change the drum speed hassle-free and within less than in under five minutes.

The idea was born four years ago and was implemented for the 2014 season. At the end of this year's maize season we got the chance to take a look at a VariLOC gearbox which was installed in a BiG X 700 equipped with a 12-row EasyCollect header and a disc cracker. The machine was owned by German contractor Otto Hamester.

From the outside, the gearbox is so inconspicuous that even a forager expert finds it difficult to tell whether the drum has the VariLOC gearbox or not. The box is a two-speed planetary gearbox which is integrated inside the pulley on the shaft that drives the drum. When the drum is revolving at its regu-

Nominal LOC ranges provided by VariLOC on the Krone BiG X 500 to BiG X 1100 foragers

MaxFlow chopping drum	Drum speed		LOC range	
	1,250 rpm	800 rpm	without VariLOC	with VariLOC
28 blades	4.0 mm to 21.0 mm	6.2 mm to 30.0 mm	17 mm	26 mm (+53%)
36 blades	3.0 mm to 17.0 mm	4.7 mm to 24.0 mm	14 mm	21 mm (+50%)

lar 1,250rpm, the housing of the gearbox (i.e. the pulley) is directly connected to the shaft. Shifting reduces the shaft speed to 800rpm. Krone wouldn't reveal – yet – exactly how the new development works. But they did say the technology was not as simple as you might think. Take the bearing lubrication, for example, which takes place with those high centrifugal forces going on inside the rotating planetary drive.

Like the drum speed, the cutting frequency is also reduced by 36%. This means the number of cuts drops from 22,500 to 14,400 cuts per minute on a BiG X 700 with a 36-blade drum. This approach translates into two theoretical LOC ranges – the conventional 3-17mm plus the 4.7-26.6mm range. This said, the maximum length is actually 24mm. So the gearbox increases the overall range of available cutting lengths by 50%, from 3mm to 24mm (and by 53% with a 4-30mm range on models with the 28-blade drum).

Changing the range takes as little as three minutes, although as usual it's a bit tight for space around the front wheel, the intake system and the chassis. But the procedure is straightforward: remove the pulley housing, take a regular 36mm open spanner and turn the shaft as required. Make sure the gear locks home. It was still a bit on the notchy side in our test.

A key feature of long chop lengths is that all the kernels need to be cut in half at the very least. Better still, they should be quartered or totally destroyed, something that regular corn crackers fail to achieve. So Krone recommends opting for the disc cracker (profi 4/2013). Depending on the spec, this comes at a €3,000 to €6,000 premium over a roller cracker.

The VariLOC speed is changed with a regular 36mm spanner.

In our brief test, we analysed the structure of the chopped material by setting the LOC to 4mm, 14mm and 24mm. We found that the fractions contained no kernels that were left undamaged. So the disc cracker did a good job. And the small, medium and long chops fractions are clearly visible in the photos.

Other points worth mentioning:

- VariLOC is available for the MaxFlow drums with 28 and 36 blades.
- At present, VariLOC is available for the high-capacity BiG X models only (BiG X 600 to BiG X 1100), but it will also be available for the smaller models (BiG X 480 to BiG X 630) at a later date.
- Once the operator has changed the speed in order to chop longer lengths, he still has to calculate the longer length himself before he can enter it to the terminal. Yet this is only a temporary solution. In future the software will do it all for him.

Summary: The new Krone VariLOC chopping drum gearbox increases the range of chop lengths that are available from MaxFlow chopping drums, providing a 50% larger LOC range on the 36-blade drum and a 53% larger range on the 28-blade drum. Changing the speed in the planetary gearbox can be done in the field and just takes a few minutes – with no special tools needed. At a price tag of €9,800 excl. VAT, it doesn't come cheap. But it compares favourably with the alternative of spending €18,000 on a 20-blade drum – never mind the cost of the time-consuming conversion and extra road travel.

The quality of chop obtained in our test on a BiG X 700 with a 36-blade MaxFlow chopping drum, a VariLOC gearbox and a disc cracker can be seen here. The nominal LOC was set to 4mm (left), 14mm (middle) and 24mm (right). The kernels were effectively crushed in all samples. Photos: Eikel, manufacturer (1)

Translation by trans-agrar

Compression is the bottom line

We have recently seen considerable media coverage of a new chop regime from the USA – shredlage silage. The Americans developed this technique in order to improve the feed value of maize silage – and now this trend has arrived in Germany. The Working Group that develops 'Recommendations for the use of silage additives' is examining the extent to which the findings from the USA are transferrable to German farms.

Maize silage has long been the subject of intense discussion, regardless of chop length. Many livestock farmers question the effective fibre levels of rations containing large quantities of maize silage. But the fact remains that short-chop silage is easier to compress than longer chop. This means that converting to longer chop would involve more rolling work on the clamp.

Reheating: an underestimated problem

Reheating and mould development are still the main problems affecting many types of maize silage. Farmers often tend to underestimate their effects on silage quality and feed value. Poor compression and inadequate feed removal from the clamp are among the principle causes. Many consultants are aware that many farms fail to achieve the required level of compression (Table 1). Poor compression is often attributed to a combination of insufficient rolling, too thick silage clamp layers and borderline DM content.

The poorer the compression, the greater the risk of air getting into the silage through the clamp face when material is removed. Yeasts and fungi then proliferate, causing the silage to heat up. This particularly affects the top third of the clamp. The impact on the silage and the subsequent feed can be catastrophic. A 15 – 25 % reduction in compression means that the air can penetrate the silage to a depth of approx. 50 cm from the clamp face. If the silage system is switched to shredlage without making any adjustments, the air penetration depth can quickly rise to 75 cm or even 1 m. After all, it's a well-known fact that the longer the chop, the more rolling is required.

Table 1: Target values for compression of maize silage (according to Honig)

DM (%)	Storage density (kg DM/m³)*
28	230
29	238
30	246
31	254
32	262
33	270
34	278
35	286
36	302
37	320
38	338

*(equivalent to 820 kg/m³ storage density)

(Table 2). The same applies to increasing concentrations of dry matter.

Table 2: Effect of chop length on storage density (relative in %) as a function of the DM content of the silage
(Zimmer and Honig, 1979)

Theoretische Häcksellänge	27 % TM	36 % TM
4 mm	100	100
7 mm	95	92
14 mm	89	86

Basically, the longer the chop and the higher the dry matter content, the more difficult it is to achieve target values for compression. These correlations also apply to shredlage. So if the maize is to be ensiled in the form of shredlage, more care and effort must be taken to ensure adequate compression during storage than was previously the case.

Why shredlage?

Shredlage is designed to improve fibre and starch digestibility without changing the crude fibre content. A further aim is to reduce the risk of selective feeding. In Germany, the maize silage is chopped to longer lengths/more coarsely and the kernels are cracked more thoroughly. It produces a chop length of 2 – 3 cm, depending on the DM content. In addition the fibrous plant parts are shredded into strands and the maize kernels are ground to increase the surface area for microbial activity in the rumen. Generally the same trial results from the USA are repeatedly quoted as confirmation that this procedure works. Conventionally chopped maize silage with a

Long chop maize – Customers will soon be demanding it

We are always happy to report on issues which generate feedback from our readership. In the 09-2015 edition of the magazine, we included an interview with contractor Henning Sudenn and two of his customers, who have had very positive experiences with long-chop maize silage for a number of years now. This article sparked some lively discussions from our readers: Some said we've been doing that for a long time and it works very well. Others maintained that they had seen it all before and had no intention of following yet another fad, especially as they would have to modify their forage harvesters at additional cost. The Working Group 'Recommendations for the use of silage additives' warned us that the results of previous American studies of shredlage are not 100% transferable to Germany. They also pointed out that long-cut silage would require meticulous compression management. The debate is currently being fuelled by a number of forage harvester manufacturers seeking to promote the suitability of their equipment for long-cut silage or shredlage. Their customers are aware of the new approach and at some point in the 2016 season they are going to turn to you and ask if you can set to work with your 'long-chop' harvesters. Where do you stand in the shredlage debate? Do you already have practical experience of this technique? What are your customers demanding? Contact me at the editorial office and tell me what you think: +49 5132 859146 or luetzen@beckmann-verlag.de.

Yours sincerely
Björn Anders Lützen,
LOHNUNTERNEHMEN editorial office

Table 3: Silage quality (Univ. Madison, 2012)

	Shredlage Chop length 30 mm Corn cracker 2.5 mm	Maize silage Chop length 19 mm Corn cracker 3 mm
DM (%)	**35.0**	**34.7**
pH level	**3.59**	**3.61**
Lactic acid (% in DM)	**6.0**	**5.1**
Ascetic acid (% in DM)	**1.0**	**1.0**
Compression (kg DM/m³)	**280**	**275**

theoretical chop length of 19 mm is compared with shredlage with a 30 mm chop length. As expected, both silages had similar ensiling parameters (Table 3). Storage density was similar despite the slightly longer length of the shredlage chop. That too was as expected. Shredded stalks and cobs are easier to compress than whole-chop. The individual plant fibres become entangled with one another and remain more tightly interlocked, reducing the chances of the silage expanding again after clamping. So in theory it is possible to achieve the required level of compression with shredlage as well. The results of the US studies were particularly positive with regard to feed intake and efficiency. The cows produced more milk, which was ultimately attributed to improved starch digestion. So much for the results from the USA.

Are these results transferable to Germany?

The question we now need to ask is to what extent are the results from the USA transferable to the maize varieties and conditions here in Germany. The fact is, producing longer chops places greater demands on clamping. The special shredding technique used in the shredlage process changes nothing in this respect. Compression data from the USA indicate wide variations in results ranging from better to similar or worse (www. dairybusiness.com). To evaluate this data it is essential to know what was being compared. For instance in the USA they tend to chop at different lengths to those used in Germany; the recommended theoretical chop length (TLC) is 0.5 to 0.75 inch. That equates to 1.25 to 2.00 cm (1 inch = 2.54 cm). A chop length of 1.9 cm was used in the much-quoted trials. If the DM content is greater than 38 % DM, the chop length should be reduced to less than 0.5 inch. If long-chop material is additionally shredded, it's fair to assume that compaction characteristics will improve. In Germany the situation is completely different, where a substantially lower theoretical chop length of 4–8 mm is recommended (all kernels damaged). If we also consider that reheating and mould formation as a result of poor compaction is a nationwide problem in maize silage, then farmers must be strongly discouraged from spontaneously switching to shredlage to avoid impairing silage quality. Coarser chop does not alleviate the problem, in fact it could make it worse on affected farms.

A wholesale transfer of American results to German farms is therefore inadvisable. The effects on silage management as well as those on feed still have to be investigated, if only on the grounds that recommendations for producing maize silage differ considerably between the USA and Germany. Furthermore, many farms in Germany manage very well with conventionally produced maize silage. As long as ten years ago, nationwide trials were conducted to investigate the effects of longer chop lengths (2.0–2.5 cm). The impact of long chop on silage quality and feeding was the subject of comprehensive studies undertaken by the State Research Centres for Agriculture in Bavaria, North Rhine Westphalia and Schleswig Holstein. The findings were unequivocal. No appreciable differences were found between short and long chop silage, particularly due to the fact that grass silage was traditionally included in the feed.

So if you are planning to switch to shredlage, we recommend clarifying the following points in advance:

– How has the maize silage been compressed up until now?
– Were the target values achieved?
– Did problems with reheating/mould development occur in the maize silage? If so, what were the reasons for this?
– Is shredlage a sensible choice in view of the current feed regime?

All aspects of the ensiling process must be very carefully managed, especially in the first year of shredlage. Ideally you should harvest one week earlier than originally planned. This also makes compression easier. It is also advisable to use suitable silage additives (action category 2) to ensure aerobic stability.

Further trials were launched this year at the State Research Centre for Agriculture in Bavaria and North Rhine Westphalia to enable the shredlage process to be fully assessed under German conditions, putting silage management and feed issues under the spot light. Preliminary findings are expected in spring 2016.

Working Group 'Recommendations for the use of silage additives'

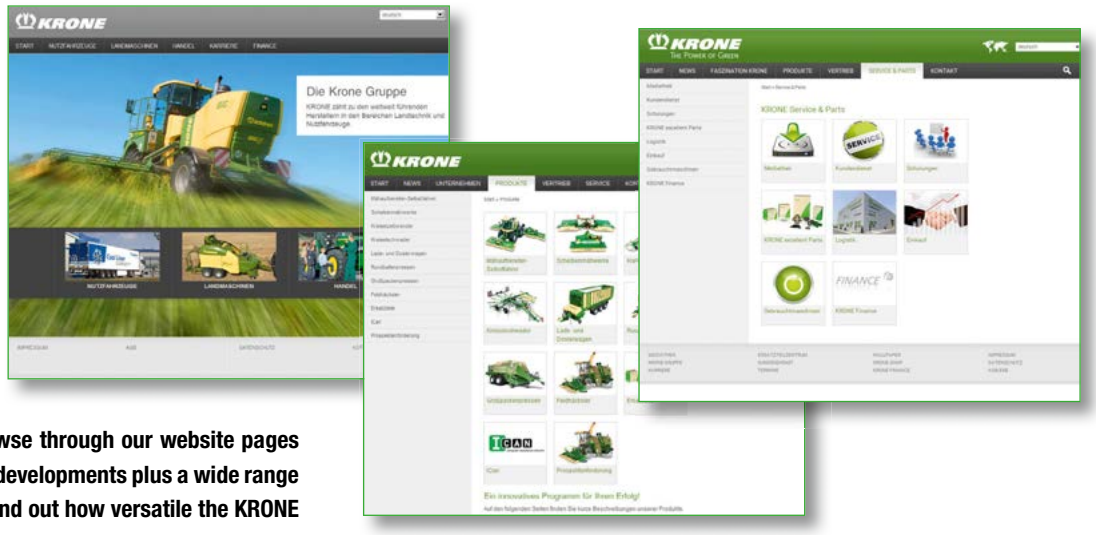
Translation by trans-agrar

Working Group 'Recommendations for the use of silage additives'

In autumn 2014 industry representatives (DLG-approved manufacturers) and members of the DLG Commission on Silage Additives met near Frankfurt to discuss a range of issues concerning silage management and the use of silage additives. There was one thing that they all agreed on. There is still scope for improving silage quality on many farms. The participants formed a Working Group in order to provide more assistance to livestock farmers. The aim of the working group is twofold – to develop simple and effective tools to help consultants and farmers in their work and to respond promptly to new trends in silage production by providing clear, well-informed feedback.

Long-chop silage requires accurate compaction management in the clamp. (Photo: Klaus Hünting)

Internet



Discover the world at KRONE and browse through our website pages to find facts and figures and also new developments plus a wide range of services. Explore our website and find out how versatile the KRONE world is.

News
Click here to find up-to-the minute information about KRONE – from new product presentations to show reviews. Here you are at the pulse of KRONE life.

Products
Find extensive information on our full product range. This section holds everything you need – from video clips to manuals.

Sales organisation
Here you find a distributor in Japan as well as your local KRONE dealer who will be pleased to support you. This is where you find your KRONE partner who will be pleased to assist you.

Jobs
Would you like to join our company? KRONE is often looking for diligent and motivated staff to work at our farm machinery factory as well as at our commercial trailer production plant. So, this section is always worth a visit.

Media center
The KRONE 'database' holds thousands of documents, pictures, test reports and much more. Here you find very detailed information on KRONE products that are of special interest to you.

Events
Are you in for a KRONE live experience? Check out for KRONE events and look at a machine on show or watch it during a demonstration. After all, there is little that is more effective than a hands-on experience.

Service
Here you find all the service information you require – from a point of contact at the factory to finance schemes for your KRONE machine as well as training schemes for staff and users.

Download Center
Are you looking for a KRONE calendar for your desktop or a smart picture for your presentation? Here, at the KRONE download center, you will find plenty of useful material for a wide range of projects.

Used Machinery
KRONE often has a wide range of demonstration or exhibit machinery on offer. This is a good site to find your KRONE machine. Then contact your local KRONE dealer to arrange the details of a potential purchase.

Parts
24/7... This service gives you the opportunity to find your KRONE part at any time and without waiting. The KRONE Agroparts Portal has an article number and exact description for every part. You can order the part instantly at your local KRONE dealer by sending an e-mail to Agroparts.

KRONE shop
Are you looking for a gift or are you a collector of farm models? Then you should definitely shop around at our KRONE shop. We take your orders at any time of the day.

Your KRONE dealer

Maschinenfabrik Bernard KRONE GmbH

Heinrich-Krone-Straße 10
D-48480 Spelle

Telefon: +49 (0) 5977.935-0
Telefax: +49 (0) 5977.935-339

info.ldm@krone.de
www.krone.de

EN · BiG X Langschnitt-03.16