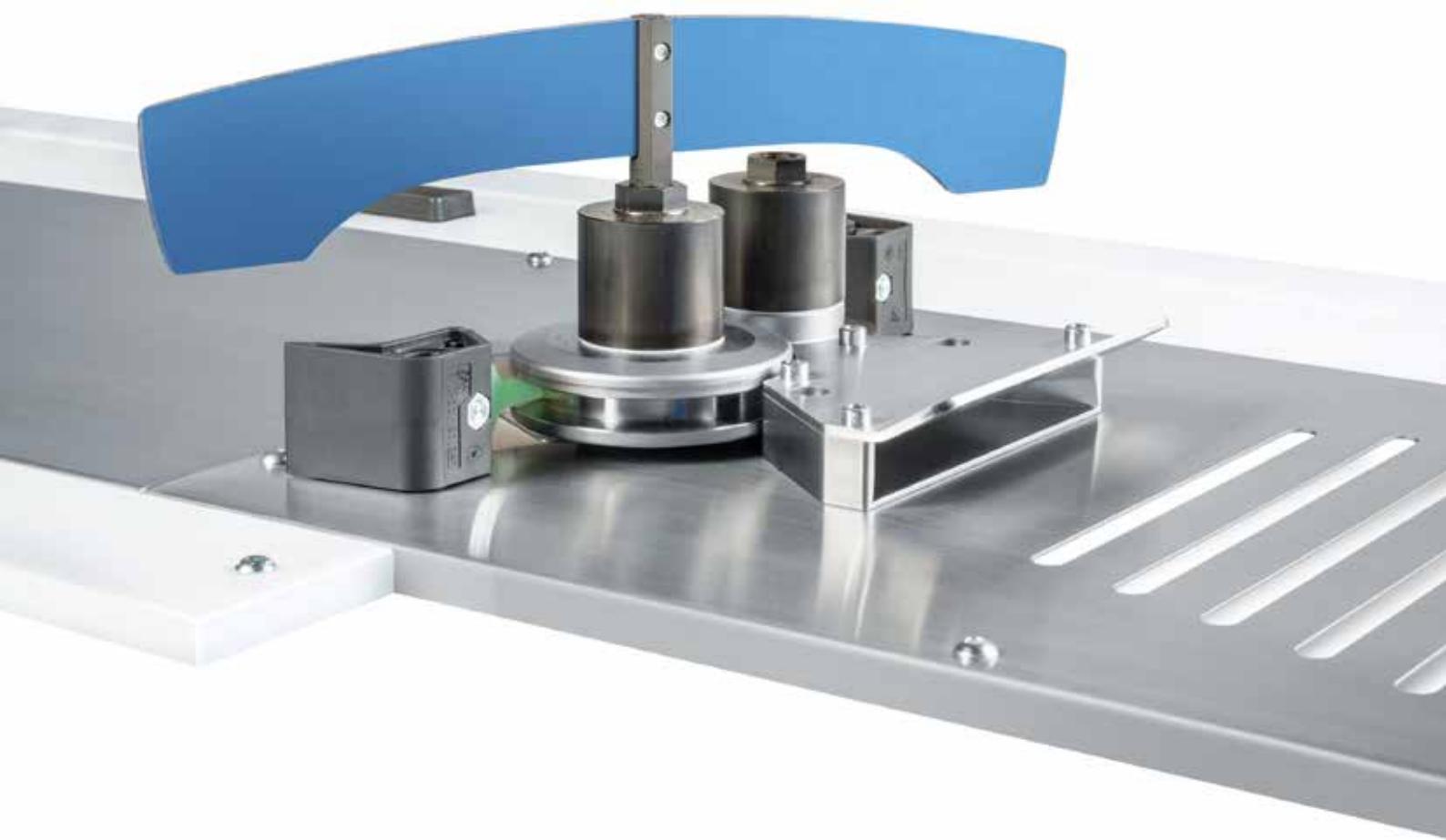


# DRAW FRAMES

GETTING FIBERS INTO SHAPE



**TRÜTZSCHLER**  
SPINNING



# DRAW FRAMES

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Experience interactive added values with our Trützschler Spinning App



**1. Download the app**

You can use the Trützschler Spinning App with Android devices as well as iPhone and iPad. Download the app free-of-charge from the Google Play Store ( $\geq$  Android Version 4.1) or the Apple App Store ( $\geq$  iOS Version 8).

**2. Use the Smartview function**

Open the Trützschler Spinning App and activate Smartview in the drop-down side menu.



**3. Scanning and viewing additional information**

Scan the entire page that contains the scan icon with the Smartview function. Touch the screen to play the video. Get started.

[www.truetzscher.com/apps](http://www.truetzscher.com/apps)

# FARSIGHTED AND RESPON

We want you to be successful with the help of our technologies and services. However, our actions are not limited to economic aspects.

As family enterprise, we have experienced, accompanied and shaped the business and its specifics for decades. Thus we know that success is more than just numbers.



## **Business partner, with emphasis on partner**

Those who choose Trützschler will receive added values that cannot be taken for granted in view of the increasingly fierce competition. But in our opinion they are imperative.

## **Reliable and close**

For four generations we have demonstrated that our word carries the same weight as a contract elsewhere. Though business numbers are taken seriously by us, we will not bow to them. Instead, we rely on real customer proximity in the textile markets of this world through our international production and service network.

## **Always innovative**

Our actions, which are based on long-term success, ensure that you have a partner that is always available. But also the security to continuously profit from technical innovations that can only be provided by Trützschler in this quality.

In short: Trützschler attaches importance to commercial success, but even more to long-term partnerships.

# SISIBLE ACTION



it's true

## **Customer benefits, with emphasis on benefits**

What constitutes a good production installation? Definitely a low TCO (Total Cost of Ownership). The only response of some machine manufacturers is to lower investment costs. We use a different approach.

## **Compact and secure**

The small footprint of our machine technology and its high safety level are good for nature and user. One results in lower building and operating costs, and the other protects the operator during his work.

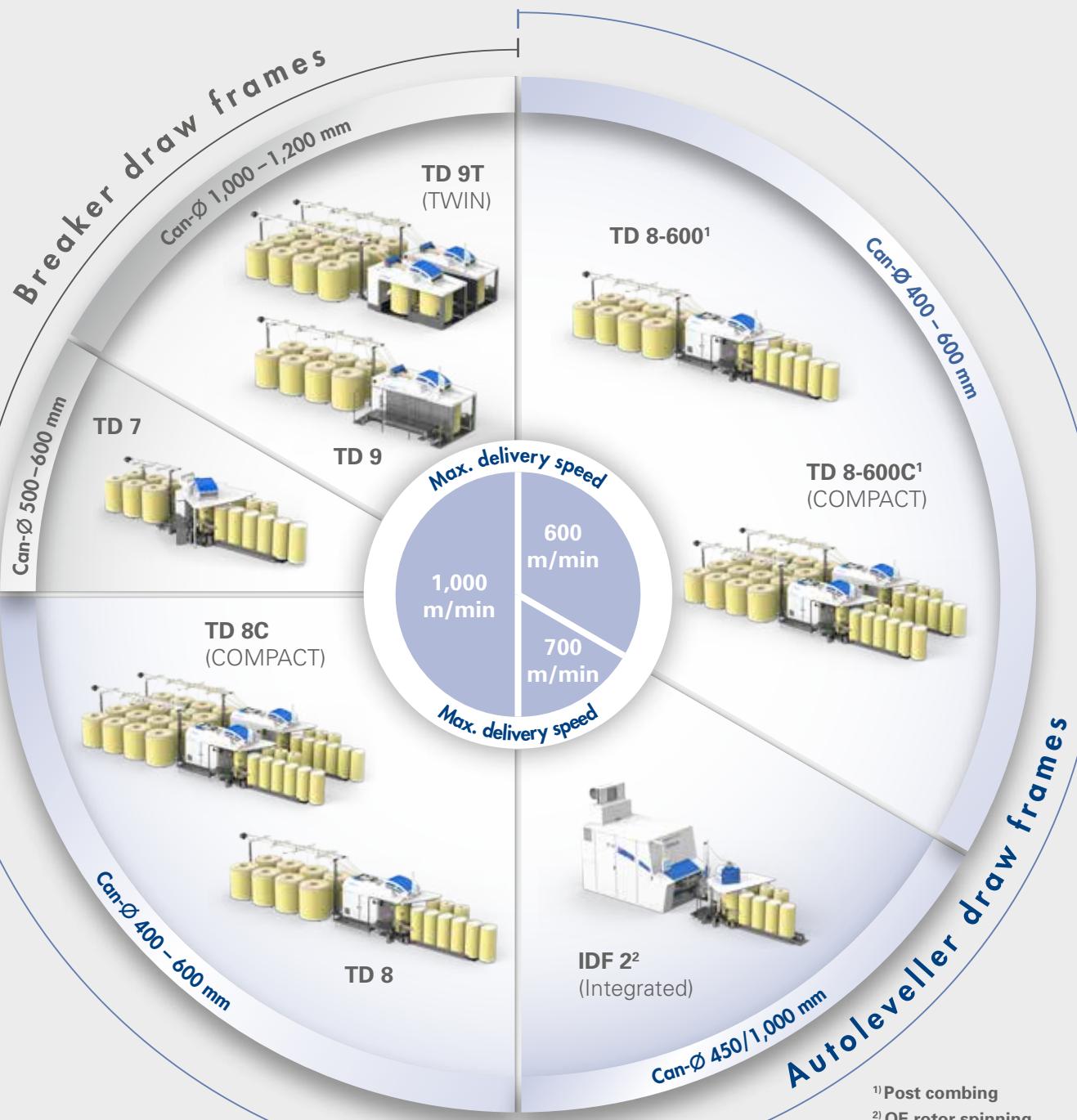
## **Long-term efficiency**

Our installations convince in terms of a well-known long service life and low energy consumption. At the same time they make the best possible use of valuable raw materials. Our intelligent technologies retrieve additional good fibers even from alleged production waste. The beauty of this particular type of environment protection and resource conservation lies in the fact that it benefits nature and your production equally.

Anyone who expects sustained added value from an installation throughout the entire production process is demanding - and a Trützschler customer.

# THE RIGHT DRAW FRAME FOR YOU

The Trützschler draw frame types are as diverse as their applications. The one thing all Trützschler draw frames have in common is a drafting system concept with optimized



# OR EVERY APPLICATION

drives and pneumatically loaded top rolls, which are of great technological importance. Colour touch screens allow for simple and secure operation and maintenance by the user.

## **The new breaker Draw Frame TD 9T**

The Trützschler Draw Frame TD 9T is a twin draw frame with focus on reduced space requirement and efficient production. If required, it is also available as single TD 9 version. Thus, each even and uneven number of drafting heads is implemented.

The Trützschler breaker Draw Frame TD 9T stands for efficiency and reliability. For the first time a new can format is introduced to short staple spinning. Cans with 1,200 mm diameter reduce the number of can transports and significantly improve the efficiency of the downstream machines. This holds true for the Superlap as well as the autoleveller draw frame.

## **The reliable breaker Draw Frame TD 7**

If the operational organisation does not permit the use of large cans, the reliable Trützschler breaker Draw Frame TD 7 is employed. Featuring a large can magazine, it is ideal for a space saving solution for cans with 500 or 600 mm diameter.

## **The successful autoleveller Draw Frame TD 8**

The best autoleveller draw frame of all times convinces with consistently good sliver quality and excellent running behaviour. This draw frame is characterised by simple, intuitive operation and sophisticated optimization tools.

## **The special autoleveller Draw Frame TD 8-600 for combing**

This version of the TD 8 was developed for use post combing. Optimization of the control algorithms to the typical application range of 450 – 550 m/min improves sliver quality. Selecting drives for a delivery speed of maximum 600 m/min reduces power consumption.

## **The Integrated Draw Frame IDF 2 for rotor spinning**

For rotor spinning, especially when processing cotton and any type of waste and secondary raw materials, there is no better solution than direct coupling of the Integrated Draw Frame IDF 2 with the card. Yarn quality and economic efficiency outperform any conventional process.

# DISCOVERING TECHNOLOGY

It is the task of the Trützschler draw frames to optimize the sliver after carding and before spinning. There is a matching machine type for every application: The autoleveller Draw Frame TD 8 is ideal for high productions up to 1,000 m/min. The TD 8-600 (600 m/min) was designed for combing mills. Due to their low energy consumption, breaker Draw Frame TD 7 without levelling and the newly developed TWIN Draw Frame TD 9T operate particularly economical. The advantages of the Integrated Draw Frame IDF 2 are low space requirement and a high level of efficiency.





Self-adjusting lap monitoring integrated in the top roll supports

**Page 10**



The new breaker Draw Frame TD 9T has been developed for the new JUMBO CANS 1,200 mm.

**Page 12**



Integrated Draw Frame IDF 2 for rotor spinning

**Page 26**



New, space-saving installation concept COMPACT.

**Page 24**



The Quality Sensor DISC MONITOR reliably determines the quality data.

**Page 41**



Newly developed can changers with different can feed variants ensure a controlled can transport.

**Page 36**

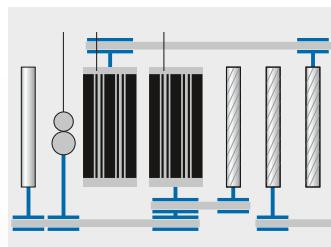


Hydro polished tubes for gentle sliver coiling



Due to its individual drive, the SERVO CREEL contributes to dynamic levelling.

**Page 38**



The digital, direct servo drives of the drafting cylinders allow higher precision at reduced energy consumption. They eliminate the use of gears.

**Page 22**



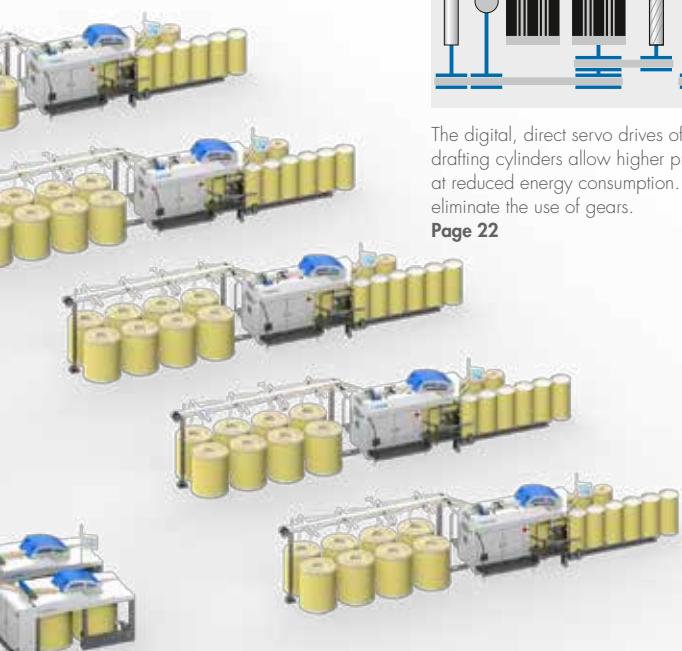
The DISC LEVELLER impresses with maintenance-free bearings, precision sensing and groove rolls, as well as simple, user-friendly adaptation to the respective application.

**Page 22**



The single-handed opening and closing of the drafting system are a sign of an effective practical approach. The top rolls remain safely in the top roll supports.

**Page 10**



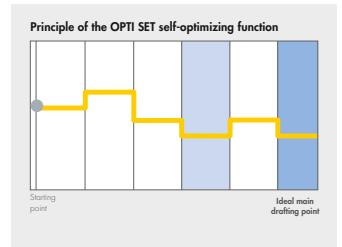
AUTO DRAFT controls the fully automatic optimization of the break draft of the autoleveler draw frame.

**Page 20**



The display of the autoleveler draw frame is swivel-mounted and located in the direct working area of the operator

**Page 40**



The standard self optimization function OPTI SET automatically determines the optimum value for the main drafting point.

**Page 21**

# Drafting system technology

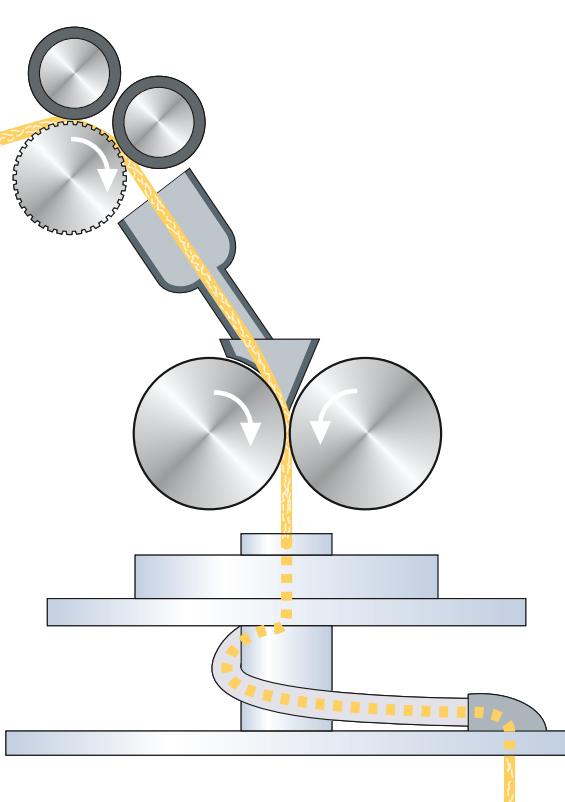
With sliver evenness in mind

Gentle sliver guidance



The video shows how easy it is to perform precision setting of the individual top roll load.

Scan page with Smarview.



All Trützschler draw frame types TD 7, TD 8 and TD 9 are equipped with the same reliable drafting system. In the main draft area of the 4-over-3 drafting system, the adjustable pressure bar provides controlled guidance of even short fibers. At the delivery side of the drafting system, the 4th top roll ensures an ever more careful sliver deflection.

These controllers allow easy and reproducible settings of the top roll loads. A special sensor monitors the pressure.



## Pneumatic top roll load

The load of each of the four top rolls allows infinitely variable setting. Thus, an adjustment to the fiber mass in the drafting system, the draft force and the roll coatings can easily be performed. This is only

possible with the Trützschler system of pneumatic top roll load. Another advantage of the system compared to conventional spring load is the automatic relief during standstill of the draw frame. This is a reliable prevention of pressure marks on the top rolls.

## Six-fold increase of service life

Since the cleaning bars can be used in six positions, they offer a six-fold longer service life compared to conventional solutions. The bearings of the top rolls are lubricated for life. In connection with a low heat development, they provide optimal running properties and an extended service life of the coatings, thus effectively preventing lap formation.

## Precision setting of suction capacity

Effective suction ensures excellent dedusting of the sliver. When readjusting the drafting system, the suction hoods are automatically adjusted as well, thus maintaining optimum geometry to the rolls. Special strippers for the bottom rolls are integrated.



The drafting zone width can be simply and quickly adjusted since top rolls, top roll supports and drafting cylinders form a unit that is automatically adjusted as well.

## TWIN Draw Frame TD 9T

"Think twice" for twice the benefit



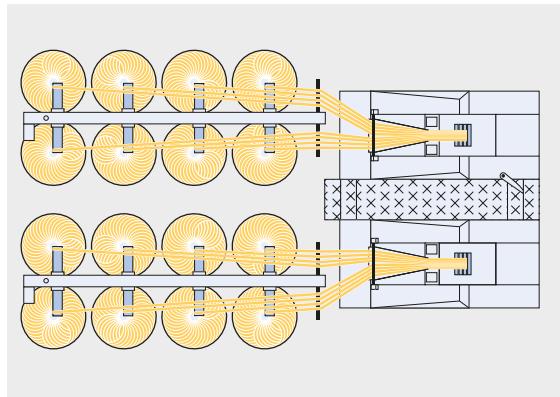
The Trützschler TWIN Draw Frame TD 9T in the typical Trützschler design is the space-saving solution and brilliantly easy to operate.

Trützschler has developed a new concept for breaker draw frames. Thus, traditional classifications into single head and double head machines are outdated. The Trützschler Draw Frame TD 9T is a twin draw frame that is also available as single version if required. Thus, each even and uneven number of drafting heads can be implemented.

**The TWIN-concept is based on independent draw frame modules with common elements**

Only elements without a negative influence on efficiency, such as control cabinet, control, screen, operator platform and filter, are shared.

Due to its intelligent concept, the TWIN version is compact and requires little space.



**No efficiency coupling by means of separate drive technology**

Conventional double head draw frames have a very poor efficiency. A standstill on one side stops the production on the other side as well. This is not the case with the Trützschler TWIN-concept. Here the fault-free side continues with regular production.

On a conventional draw frame with a single efficiency of 85 %, only 72 % are actually realised. The single efficiency factors must be multiplied:

**On the Trützschler TWIN Draw Frame TD 9T, the single efficiency – as in this example 85 % – is fully maintained.**

Depending on the size of the installation, one to two drafting heads can thus be eliminated. The strict separation of the drives permits a very flexible use. Thus it is possible to process two different materials or two different sliver counts side by side on one machine without any problem.

**The breaker draw frame with the elements of a modern autoleveller draw frame**

The Trützschler breaker Draw Frames TD 9 and TD 9T share a variety of technologically important elements with the reliable Trützschler autoleveller Draw Frame TD 8:

- 4-over-3 drafting system with pressure bar
- Pneumatic load, separately controllable for each top roll
- Pneumatic threading aid
- Self-adjusting lap monitoring
- All creel versions
- Coiler plate with hydro polished tube

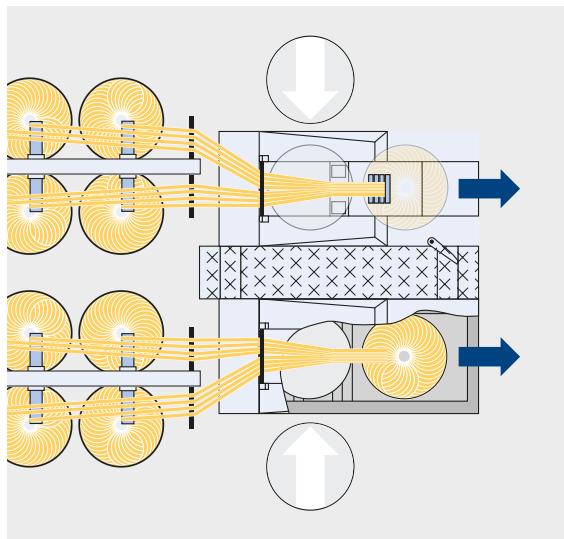
# New can changer

Precise and easy can change in the smallest space

## New can changer for the new draw frame

To ensure that the full potential of the space-saving TWIN-design is maintained, a new can changer was developed. The space it requires is little more than for two cans. The cans are moved by functionally reliable pneumatics.

The new linear changer with safe, three-sided can guide during the change process



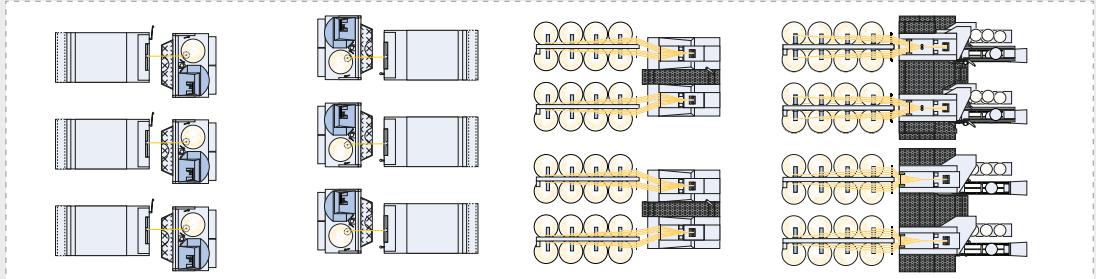
## Developed for the new Trützschler can format

Naturally, both TD 9 versions are also available for the new 1,200 mm JUMBO CANS. These cans with 43 % more content compared to cans with 1,000 mm diameter show their advantages in the creels of the downstream leveller draw frames or Superlaps. As standard, the can changer is installed under floor, but a version for above floor is also available.

## Space-saving integration into modern lines

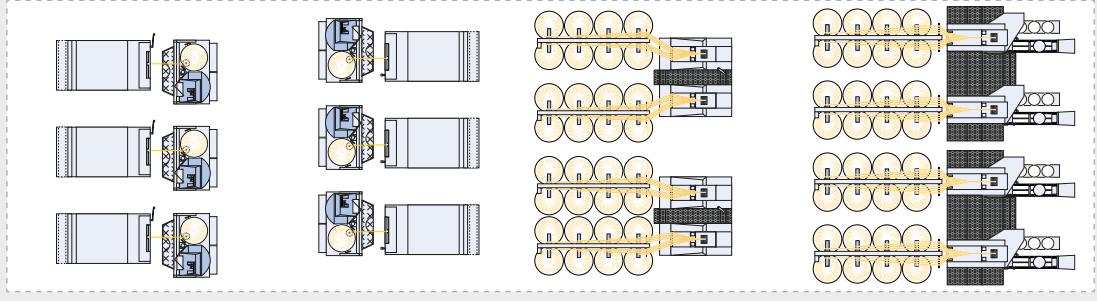
The strong increase in card production during the last few years has changed the ratio of number of cards to number of draw frames. The installation width of the TD 9 and TD 9T is adapted to the reduced number of cards.

### Can diameter 1,000 mm to autoleveller draw frame



Even with 1,200 mm diameter cans, the new breaker draw frames use up no more installation width than the card group.

### Can diameter 1,200 mm to autoleveller draw frame

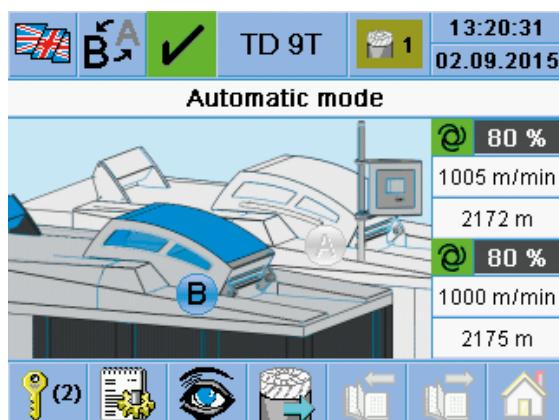




Trützschler breaker  
Draw Frame TD 9  
(single version)

### Sophisticated operating and control concept

Due to the size of the draw frames, can changers and creels, the operators have to cover long distances. This is at the expense of time and effectiveness. With the breaker Draw Frame TD 9T, both sides are operated from the middle of a shared platform. The operating elements of the drafting heads are therefore mirrored. From the platform, the creel as well as the can changer can be reached with just a few steps. The operator does not need to walk around the machines. Compared to competition, the distances are reduced by approx. 50 % for the operator. Both drafting system units have a joint display with



Operation becomes more transparent by using one touch screen for both sides.

coloured touch screen. The assignment of the machine sides is clear and unmistakable, thus simplifying operation. The machine status or the behaviour in the event of fault is shown by means of simple symbols and graphics.

As is customary with Trützschler, all service aids such as logbook functions, lot data or sensor overviews are integrated. The left and right machine side can be operated independent of each other. This also applies to maintenance work and settings. However, optionally a synchronous setting of both sides can also be selected. For safety reasons, the emergency stop applies to both sides simultaneously.

### Complete equipment for safe operation at high efficiency

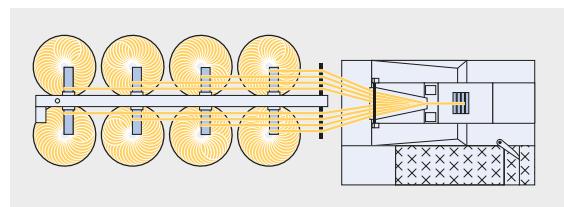
Frequently, breaker draw frames are only equipped with the basics. Trützschler can provide everything that increases operational safety, simplifies operation, promotes quality and increases economic efficiency.

In addition to the elements already described, this includes:

- Infinitely variable delivery speed
- High-performance drafting system
- Individual sliver monitoring in the creel
- High-volume filter or connection to a central suction system
- Very good accessibility to the control sections
- Safety panels for the protection of the operators
- Under floor can changer for easy can handling
- Colier plate with hydro polished tube

### The single Draw Frame TD 9

If an uneven number of drafting heads is required, a single draw frame can be added to the TWIN draw frames. This reduces investment and operating costs compared to a conventionally required additional double head draw frame.



The space requirement of the Trützschler breaker Draw Frame TD 9 is reduced to the minimum.

# Breaker Draw Frame TD 7

Combination of economic efficiency and quality

Breaker draw frames in the first passage are often underestimated in terms of technology. However, these draw frames also contribute to a consistent and reproducible yarn quality. For this reason, Trützschler has decided not to make any compromises concerning technology and quality. Thus, the TD 7 is also equipped with the high-end drafting system of the autoleveller Draw Frame TD 8 with all its advantages:

- 4-over-3 drafting system geometry
- Pneumatically loaded top rolls, separately controllable
- Speed-controlled drives
- Pressure bar in main draft area
- Pneumatic web threading

## The two-in-one space concept

The drafting system is positioned directly on the can changer. Thus, the installation width required for the breaker Draw Frame TD 7 is not more than the can changer itself.

## Reduced energy consumption

The concept for energy optimization starts in the most effective key areas:

- The perfect continuous suction works at a low, energy-saving negative suction pressure.
- Energy-intensive mechanical gears have been completely eliminated on the TD 7.
- The coiler plate is equipped with an individual drive and the main drive is infinitely variable.



### **Less maintenance – more productive time**

Each hour spent on maintenance is an hour lost for production. Due to individual drives and elimination of complex gears, maintenance and cleaning have been reduced to a minimum. Cleaning work is facilitated by the opening of only a few large-space panels without the use of tools:

### **Convenient and simple operation**

As is common with Trützschler, the Trützschler breaker Draw Frame TD 7 is equipped with its own microcomputer control. Operation takes place on the colour touch screen. This is also the place where, for instance, the drive speeds are set. The tension draft to the draw frame can be optimized in a very sensitive manner due to the individual SERVO CREEL drive. This also applies to the optimization of the sliver coiling geometry in the can, since the can plate features a separate drive as well.



The TD 7 is equipped with individual sliver monitoring in the feed area of the draw frame.

As with the TD 8, operation takes place from the side. The drafting system opens up to the back from the position of the operator. The operator has optimal access to an unobstructed and ergonomic working area.



## Autoleveller Draw Frame TD 8

A draw frame that optimizes itself



As quality filter of the spinning mill, the draw frame has an important function: preventing errors in the sliver which inevitably lead to yarn defects. Because quality can no longer be improved after the draw frame.

The decisive factor is the sliver quality after the last draw frame passage. Precisely this is the key strength of the Trützschler autoleveller Draw Frame TD 8. It is available in two versions:

1. For the high-production area up to 1,000 m/min, the TD 8 is the perfect solution.
2. For combing mills with a delivery speed up to 600 m/min, the TD 8-600 is ideal.

Both are specialists in their respective application and are appropriately equipped.

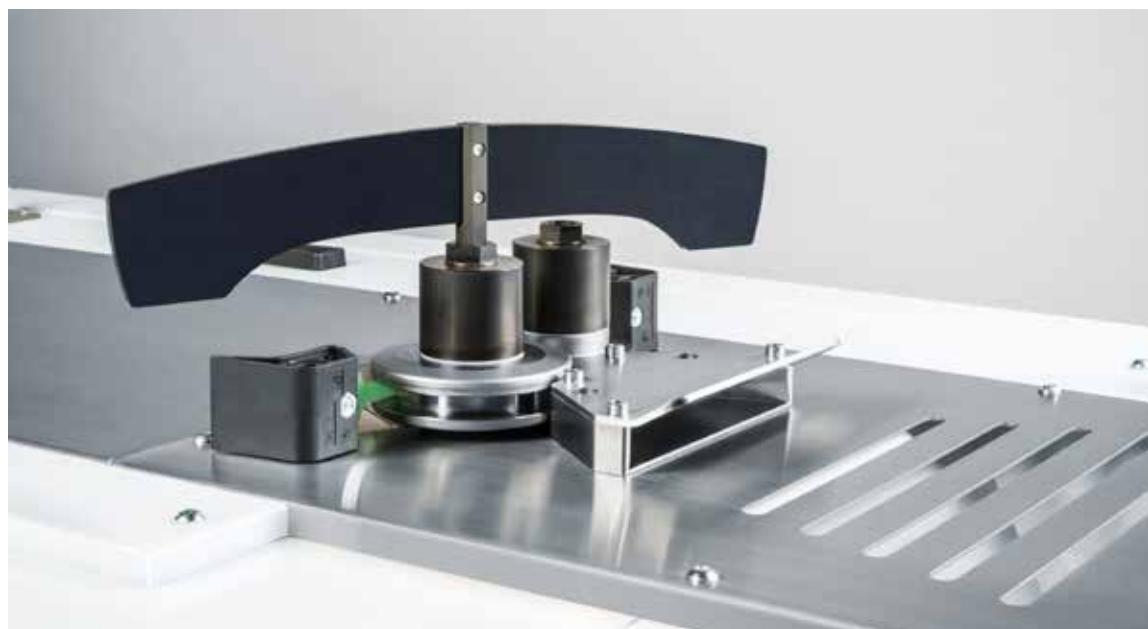
#### **Less errors mean more productivity**

The groove and sensing roll unit DISC LEVELLER integrated into the Trützschler autoleveller Draw Frame TD 8 sets a new quality standard: a draw frame sliver CV<sub>1m</sub> of 0.4 % or less and a yarn count variation clearly below 1% are the realistic goal set by modern spinning mills.

The total draft is specified in the spinning plan. The break draft is material-related and quality-relevant. An incorrect setting can result, for instance, in an unnecessarily large number of imperfections and reduced yarn strength, as well as lower efficiency at the spinning machine.

The optionally available self-optimizing function AUTO DRAFT ensures that the break draft on the Trützschler autoleveller Draw Frame TD 8 is always perfectly set. The ideal main drafting point is automatically determined by the standard self-optimizing function OPTI SET.

DISC LEVELLER grooved roll and sensing roll unit



# AUTO DRAFT

## Self-adjusting perfection

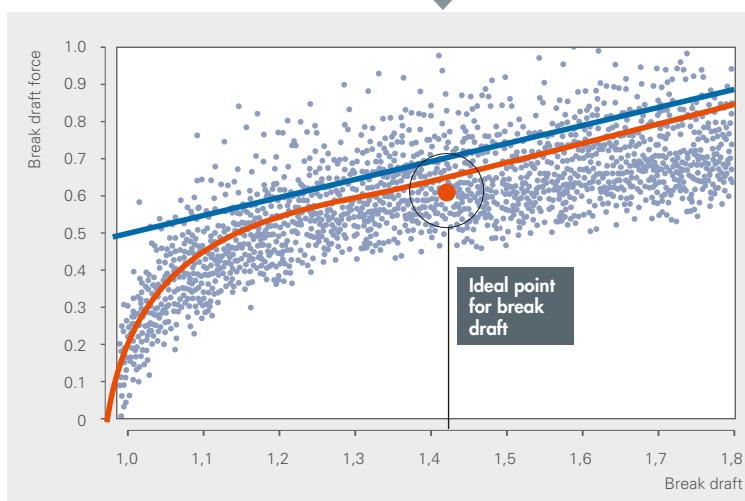
Start of the automatic break draft determination



### Self adjustment at the touch of a button

At the touch of a button, the draft force is measured along the entire draft zone. Within 60 seconds, AUTO DRAFT has collected all the necessary information and determined the ideal degree of the break draft. As soon as the operator acknowledges this value on the screen, the optimization is finished.

The ideal point is calculated from a large number of single measurements



### The principle of self-adjustment

AUTO DRAFT optimizes the break draft for the autoleveller draw frame fully automatically. In less than one minute the system, which can be optionally integrated into the Draw Frame TD 8, makes an automatic recommendation for the ideal material-specific break draft.

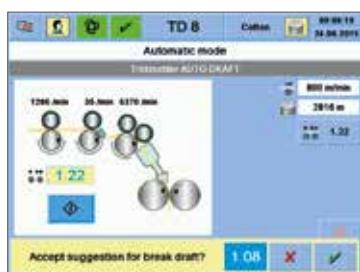
Duration of optimization:

60 sec

Material supply:

600 m sliver length

Result of the automatic break draft determination



The break draft of the autoleveller draw frame is optimized fully automatically. Within one minute the optional AUTO DRAFT module automatically recommends the ideal, material-specific distribution of the entire draft between break draft and main draft. The degree of the break draft has a major influence on evenness and strength of yarn, number of imperfections and running properties of the spinning machine.

### Suitable for all materials

AUTO DRAFT is basically suitable for all materials since it takes all major factors into account:

- Fed fiber mass
- Fiber characteristics (e.g. crimping)
- Fiber-fiber friction
- Fiber-metal friction
- Machine settings
- Ambient atmosphere, etc.

The optimization potential of AUTO DRAFT is particularly high when drawing man-made fibers.

### Trouble free lot change

When a spinning mill produces only one material it is sufficient to equip only one individual draw frame as "pilot machine" with AUTO DRAFT. This draw frame is used to determine the optimum break draft and to subsequently transfer it to the other machines. In highly flexible installations with different materials that are subject to frequent change it is practical to equip all draw frames with AUTO DRAFT.

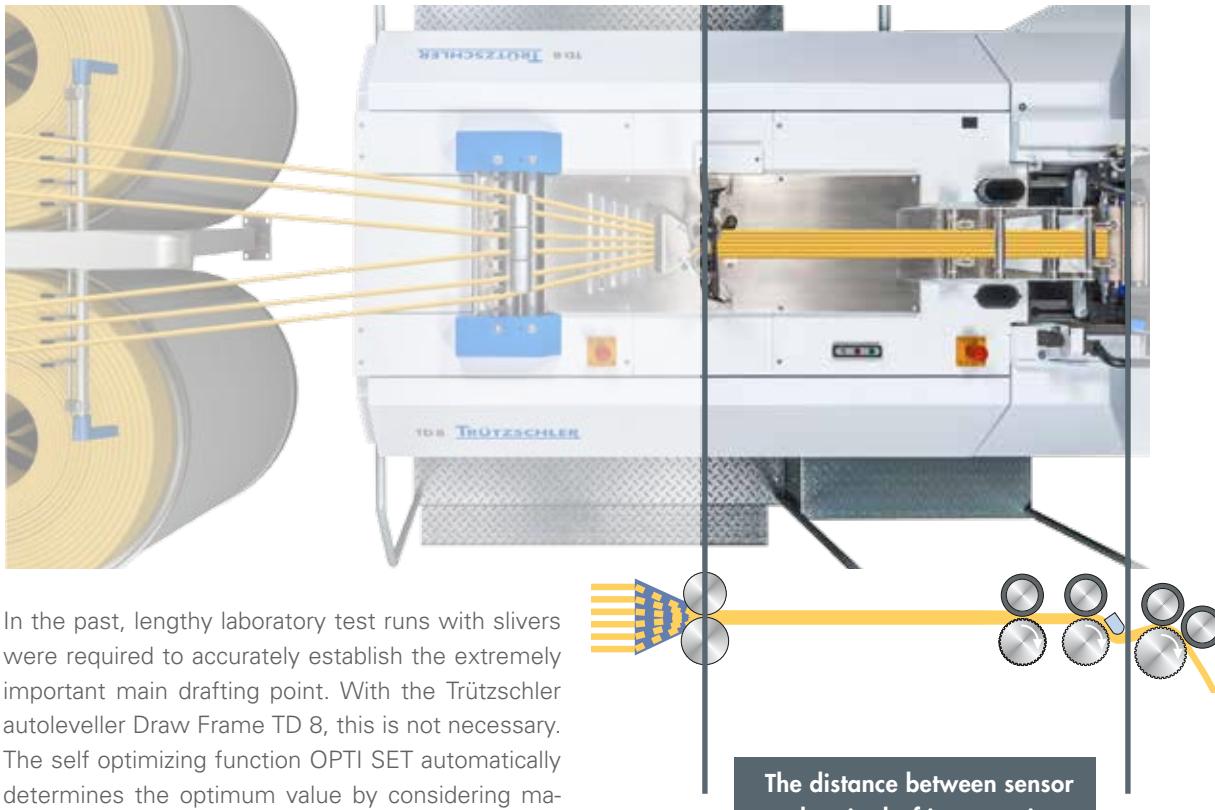


The video shows an animation of the AUTO DRAFT function.

Scan page with Smartview.

# OPTI SET

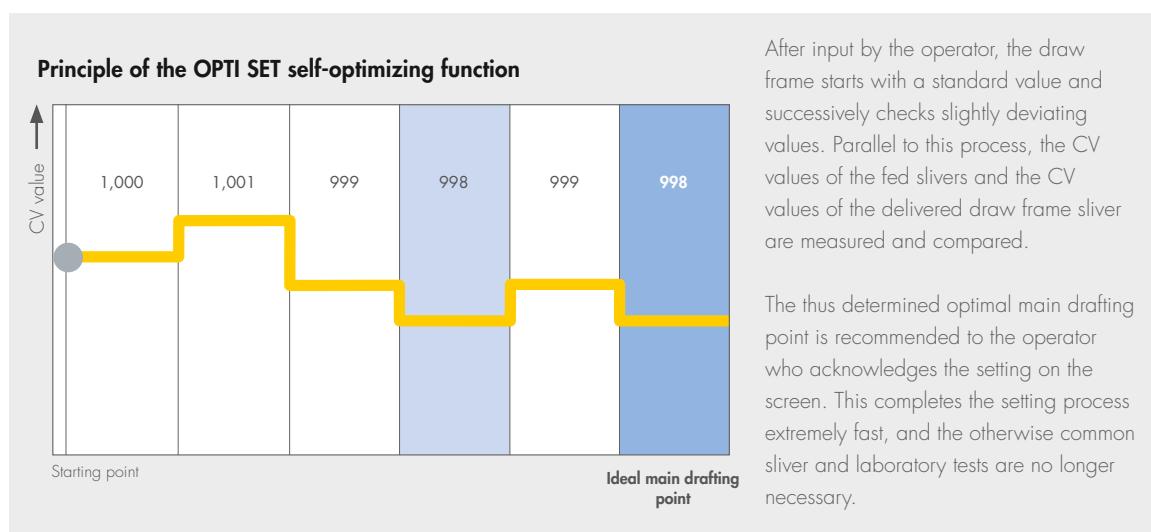
The main drafting point determines the quality



In the past, lengthy laboratory test runs with slivers were required to accurately establish the extremely important main drafting point. With the Trützschler autoleveller Draw Frame TD 8, this is not necessary. The self optimizing function OPTI SET automatically determines the optimum value by considering machine settings, material characteristics and ambient atmosphere.

A sensor scans the fed slivers and initiates a corresponding time-delayed levelling action as soon as the material has reached the main draft zone. This time delay between measurement and levelling action de-

termines the main drafting point. Its exact position depends, among other things, on machine settings, material and ambient atmosphere.



# SERVO DRAFT

Extremely short correction lengths for optimized sliver quality

Deviations from the target sliver weight have a serious impact on product quality, and thus on the economic efficiency within the process chain. The Trützschler autolevelling system SERVO DRAFT provides highly dynamic compensation of deviations from the target weight. This degree of short-term levelling cannot be realised with conventional concepts. SERVO DRAFT allows reliable optimization of sliver quality at this high level since it links mechanical and electrical components with "expert knowledge" in an intelligent way.

The high contact pressure ensures that deviations in material thickness are put on the same level as actual mass deviations. The signals of the DISC LEVELLER are translated by SERVO DRAFT after a delay into draft changes: the result is a perfectly levelled sliver and consistent sliver count stability. During lot changes with changed sliver masses, the groove and sensing rolls can be quickly and easily exchanged.

DISC LEVELLER grooved roll and sensing roll unit



## DISC LEVELLER sets a benchmark in quality

With the groove and sensing roll unit DISC LEVELLER it is possible to reach a draw frame CV<sub>1m</sub> of 0.4% or less and a yarn count variation clearly below 1.0 CV%. Thus, the quality objectives of modern spinning mills are achieved in a reproducible way. The sensor is based on friction-free, fiber-friendly measurement.

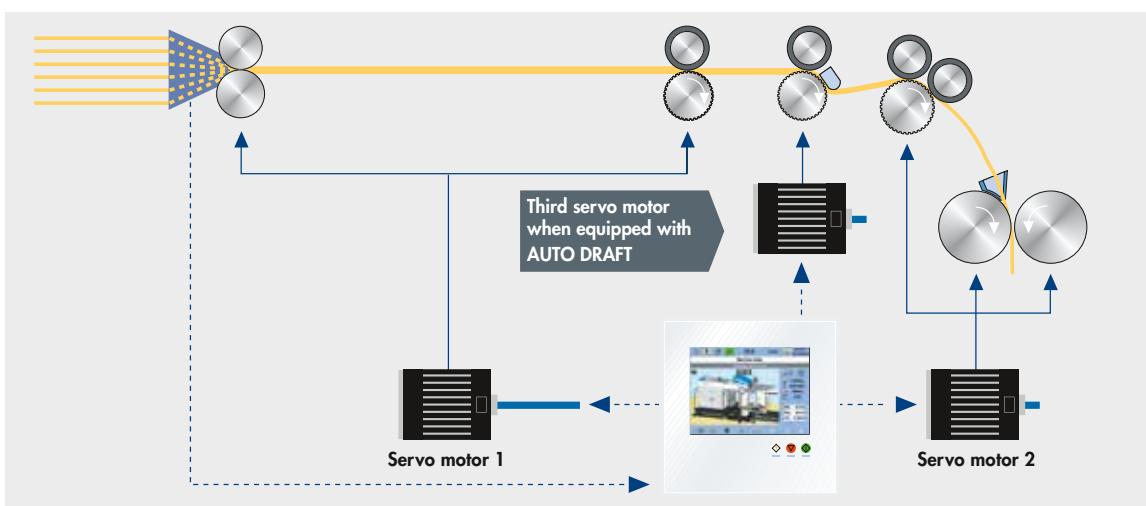
## Values and knowledge for increased evenness

The levelling of Draw Frame TD 8 combines precise measured values with "expert knowledge": empirical values integrated into the software. This results in a significantly increased sliver evenness. For applications below 600 m/min in combing, the TD 8-600 offers fine-tuning of the levelling software with adapted motors.

## Levelling also during can change

Short-term levelling with SERVO DRAFT works reliably even at changing draw frame speeds, which typically occur before and after can change. The draw frame control permanently processes the incoming signals and directly controls the servo motors. Thus, every metre of draw frame sliver is of optimal quality. This, in contrast, cannot be achieved by draw frames with unregulated main motors.

TD 8 with AUTO DRAFT option, with three servo motors



The video shows an animation of the DISC LEVELLER function.

Scan page with Smartview.

# Digital Trützschler servo motors

Increased precision, reduced use of energy and maintenance

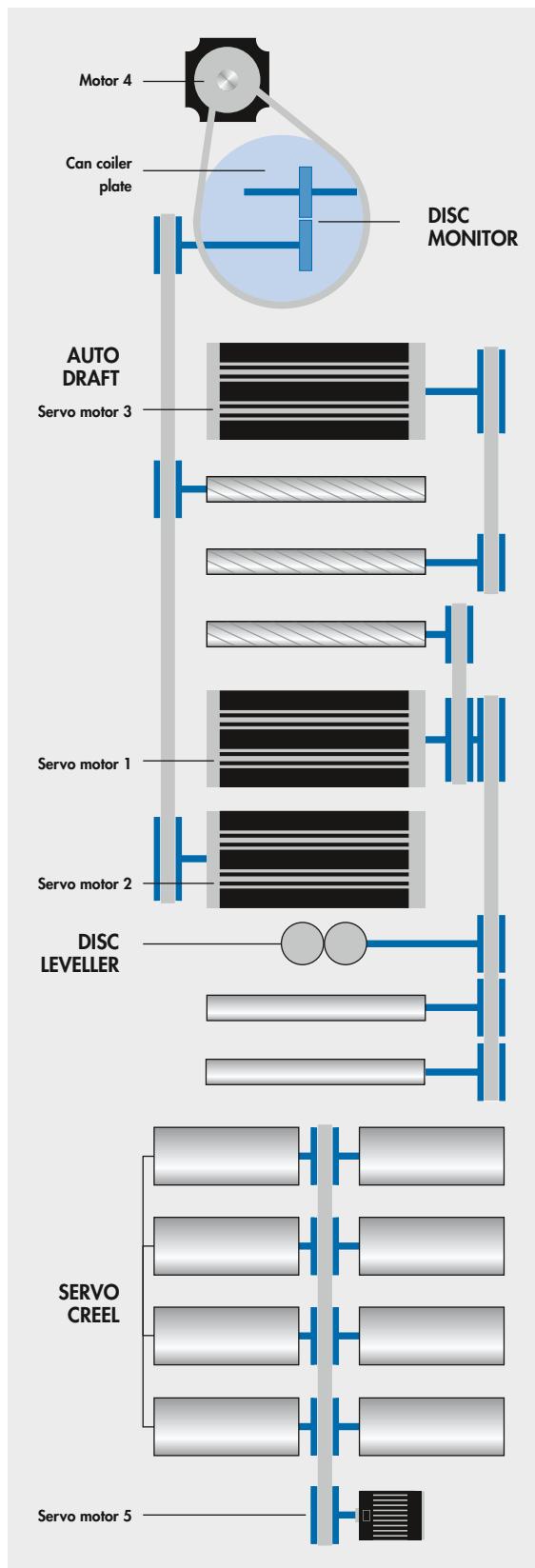
The direct, infinitely variable drive by means of servo motors and the elimination of differential gears or change wheels have a positive impact on the current consumption of the draw frame. Depending on application, the power consumption is between 0.020 and 0.030 kWh per kg of produced draw frame sliver.

## Speed and sliver count easy to set

In contrast to other draw frames, parameter changes such as draft can easily be performed on the TD 8 on the touch screen, without replacement of change wheels. Another advantage in terms of user comfort and quality are the storable and always retrievable settings for every material processed.

## Lowering maintenance – increasing productivity

The concept of our draw frames is largely maintenance free. This, among other things, is ensured by maintenance-free motors, permanently lubricated bearings and easy access of components without tools. The drafting system is easily accessible by simply opening a flap on the operator side. The top rolls can be removed from the load supports at the touch of a button. Threading is reliably performed with the help of pneumatics. The high-capacity filter box without troublesome mechanism must seldom be emptied. Smooth, shape-optimized components prevent fiber build-up and contaminations. Maintenance times are drastically reduced.



The drafting cylinders are directly powered by digital servo drives. The diagram shows autoleveller Draw Frame TD 8 with AUTO DRAFT option

# Autoleveller Draw Frame "COMPACT" TD 8C

Compact dimensions, bundled performance

The autoleveller Draw Frame "COMPACT" TD 8C is the Trützschler solution for minimal space requirement.

The identifier C = COMPACT characterises the installation solution for this machine.



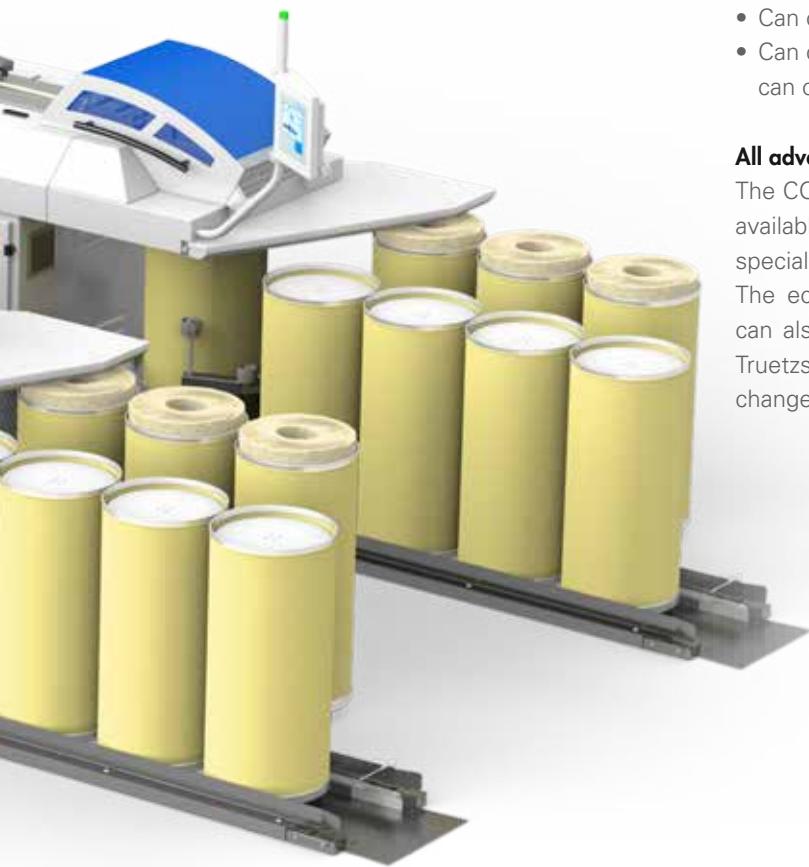
The COMPACT installation means shorter distances for the operator. The installation width of the installation shown here with creel in two rows for cans with 1,200 mm diameter corresponds to the one of the breaker Draw Frames TD 9T with a delivery to JUMBO CANS.

### Single head or double head draw frames

Concerning autoleveller draw frames, there is no uniform response to this decision. For the most part, autoleveller draw frames require independent units and have only a few components that can be shared. The only thing in favour of double head draw frames is reduced space requirement.

### Reduced space requirement and short distances for the operator

The draw frames are directly next to each other, without any space in between. The left operator platform of one draw frame is the right operator platform of the other draw frame. There is sufficient operator space between the can rows in the creel.



### Why decide between single head and double head draw frames?

To form compact units, the COMPACT concept also allows the combination of more than two draw frames. If, for instance, five draw frames are required according to spinning plan, six heads must be installed when using double head draw frames.

With Trützschler COMPACT draw frames it is possible to combine three or more draw frame heads, e.g. five.

### The most flexible installation concept

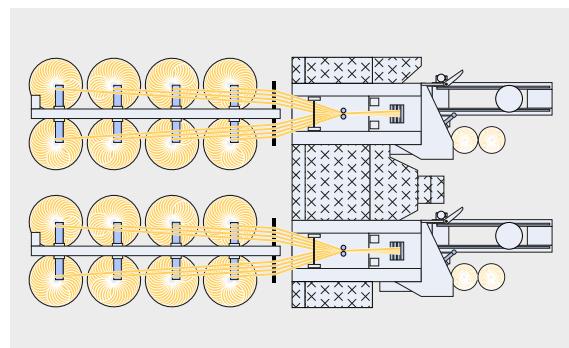
In general, Trützschler draw frames offer all variants necessary for the respective application-oriented requirements:

- Creel in one or two rows
- Creel for 6-fold or 8-fold doubling
- Creel for 600, 1,000 mm cans and JUMBO CANS 1,200 mm
- Creel adjustable in height to the selected can height
- SERVO CREEL or feed creel
- Can changer with active or passive can supply
- Can changer for cans with rolls or transfer to a can carriage

### All advantages also available in combing

The COMPACT installation concept is of course also available for the draw frame version TD 8-600C, the special draw frame after the comber.

The economic advantage of the larger can format can also be used for this draw frame. The Toyota-TruetzschlerComber TCO 12 can be equipped with can changers for 1,000 mm and 1,200 mm can diameters.



Space-saving installation of autoleveller Draw Frame TD 8C

## Integrated Draw Frame IDF 2

More economic efficiency in rotor spinning

Multidimensional advantages from fewer process steps: Reducing investments, lowering workload, eliminating errors, saving space. Particularly in the spinning mill with its many machines, reduced installation space quickly multiplies into large economic advantages.

The Integrated Draw Frame IDF 2 achieves this by direct linking to the Trützscher Card TC 15 in the rotor spinning mill.

Only the Trützscher card/draw frame linking combine all the advantages of the Card TC 15 with reliable and successful draw frame technology. Thus, in addition to economic advantages, quality is also measurably improved.

The 1 zone drafting system of the IDF 2 provides an excellent sliver evenness and a significantly better yarn evenness. The better quality is evident in the uniform fabric appearance.

### Also shorter spinning process

There is no shorter spinning process than feeding the card sliver directly on the OE rotor spinning machine. This requirement is also perfectly met by the Integrated Draw Frame IDF 2.





# Integrated Draw Frame IDF 2

Improved quality and optimized economic efficiency

The integrated draw frame IDF 2 with automatic can changer



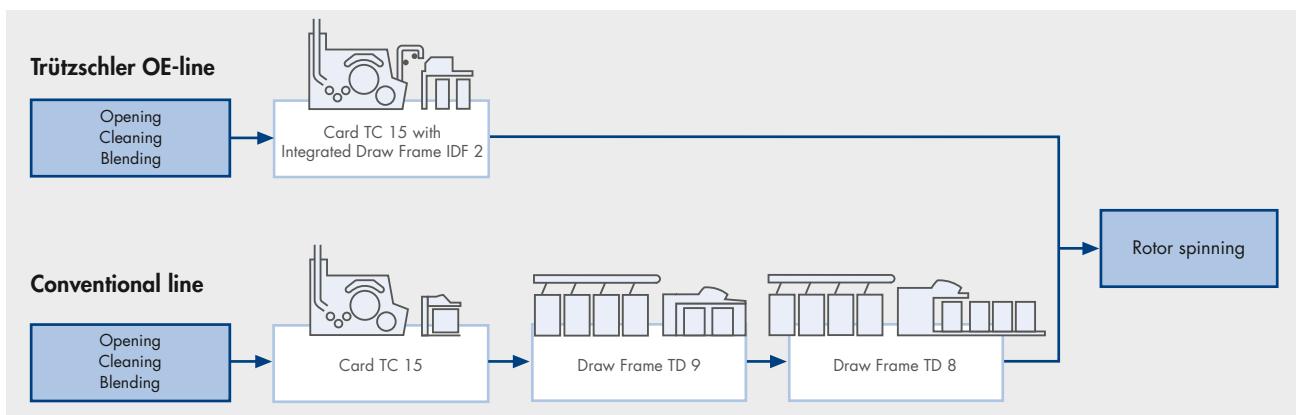
Economic advantages in production:

- Significantly lower space requirement
- Less cans required
- Simplified can transport
- Lower current consumption
- Reduced personnel and operating costs

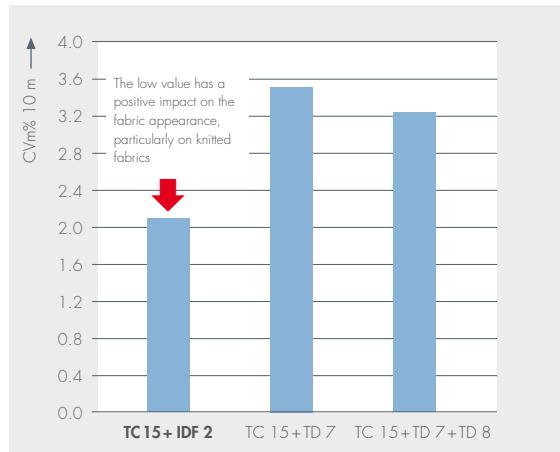
These advantages are made possible by the intelligent design of the IDF 2 system: Since the draw frame unit is positioned above the can changer, the IDF 2 requires no more space than a regular can changer.

Compared to other draw frame slivers, the increased sliver adhesion and adapted fiber orientation results in a better running behaviour during further processing.

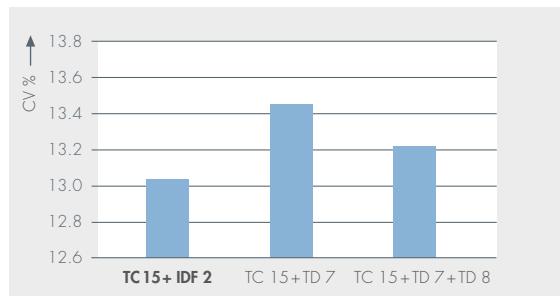
The IDF 2 allows processing of all fibers common in rotor spinning. This solution features improved yarn quality and increased economic efficiency.



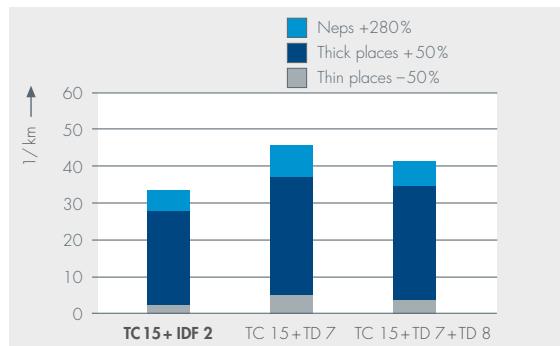
### Comparisons of direct spinning IDF 2 with one and two draw frame passages for OE yarn NE 20 cotton



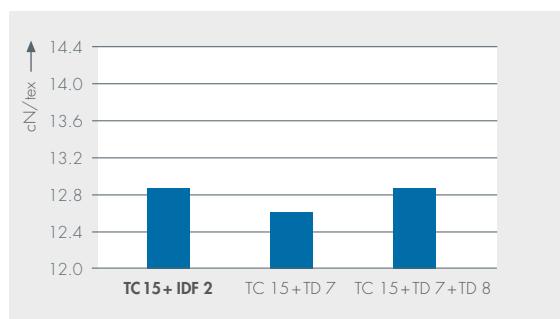
Yarn count variations



Yarn evenness



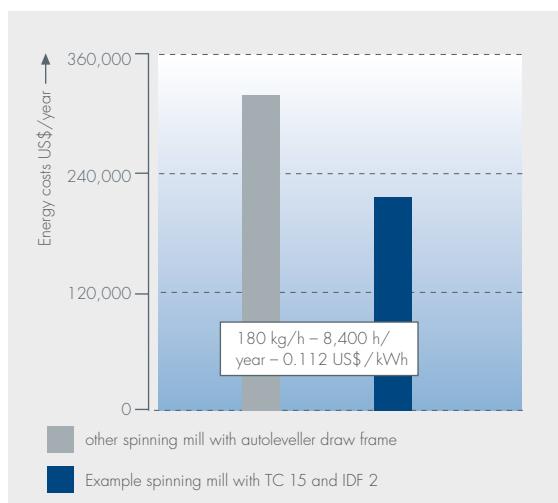
Yarn imperfections



Yarn strength

84,000 US\$.

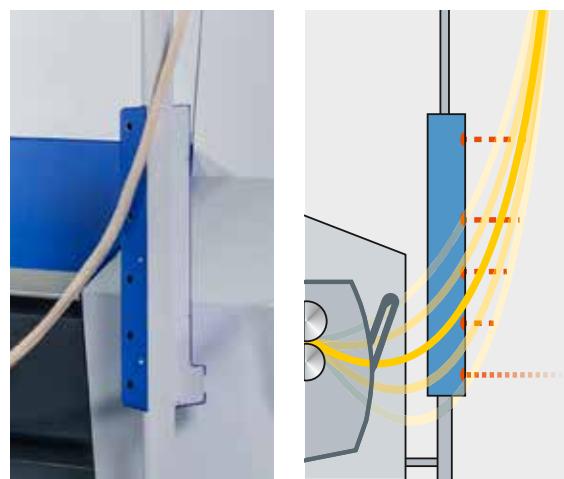
and more savings in energy costs (per card 180 kg/h, 8,400 production hours/year. Calculated card, filter and building costs)



Energy costs

### Automatic sliver separation during can changing

The can changer for the IDF 2 is largely identical to the one of Draw Frame TD 8 and is designed for the standard can diameters. The can height ranges between 900 and 1,500 mm. The sliver is automatically separated during can change.



Fully automatic synchronisation of the delivery speed with the card by regulating the sliver sagging between the machines by means of light barriers.

# Combination IDF 2 and TC 15

Working together for more economic efficiency

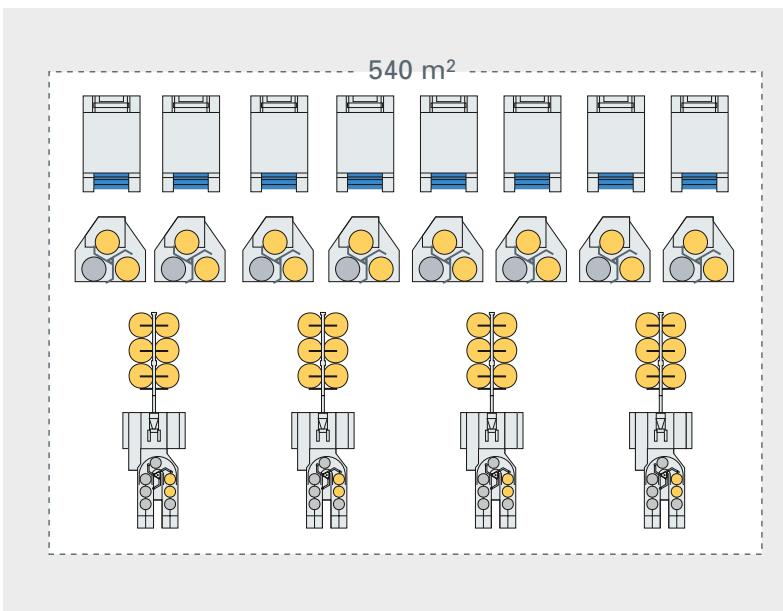
The Integrated Draw Frame IDF 2 is directly connected to the card. Due to this concept the draw frames are eliminated; as a result, the space otherwise required for the draw frames with reserve can storage is not needed.

#### Advantages of direct card and draw frame combination:

- Less tied up capital due to significantly smaller material buffer
- Shorter throughput times
- Reduced operating work
- Reduced building area

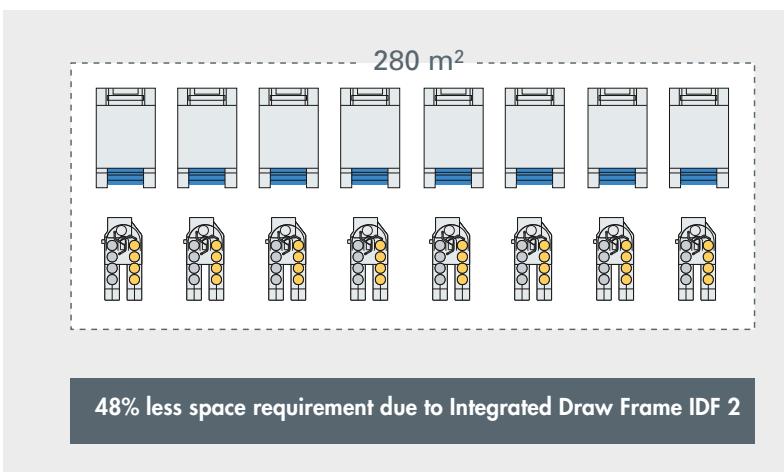


Sensor to determine sliver count (top) and quality sensor (bottom)



#### Levelling quality without compromises

Before being fed into the drafting system, the card sliver is scanned directly by the tried and tested Trützschler sliver sensor; then it is levelled via the drafting system. The close physical proximity of measuring point and drafting system allows reliable levelling of the draft. To ensure that every metre in the can has the desired quality, the sliver is permanently checked by a second sensor positioned immediately behind the drafting system.



The installation space required at same output is dramatically reduced.

TC		
Automatic mode		
Lot data		
Card collector tension	5 %	
Starting speed	15 m/min	
Slow speed	50 m/min	
Can changing speed	50 m/min	
Can filling	3000 m	
Rotary can plate drive	60 %	

Simple and clear operation via the card display

# Complete autoleveller draw frame

Advantage: space-saving design

Trützschler combined the compactness of a simple drafting system with the performance of a fully-fledged autoleveller draw frame to ensure a high level of quality.

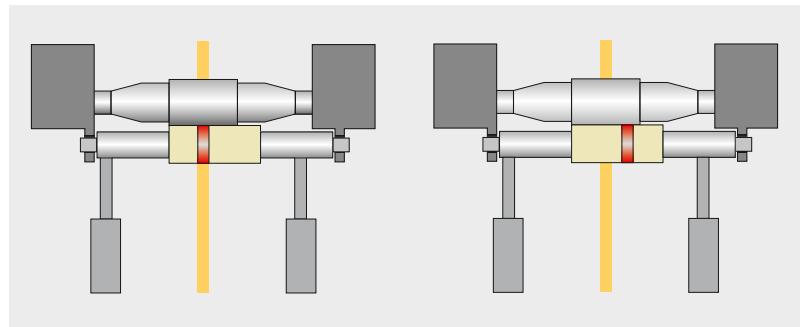
The advantages:

- Maintenance-free, digitally controlled servo drives
- Low mass inertia for high levelling dynamics
- Draft up to 3-fold
- Delivery speeds up to 700 m/min
- Controlled material storage for trouble-free can changing
- Trützschler quality sensors in the feed and delivery area
- Permanent monitoring of sliver quality

The drafting system is integrated in the production flow / sliver run and consists of reliable Trützschler components. This includes also technical highlights, like for instance the pneumatic load of the top rolls.

## Top roll coatings with twice the service life

Savings are also achieved with the top roll coatings in the new IDF 2. On the one hand, the top rolls are now in an asymmetric position in the drafting system, while at the same time the loading cylinders are symmetrical arranged in the proven way. This facilitates easy turning of the top rolls by 180° after the coatings wear off, thus doubling their service life. The drafting system was also modified to a 1-zone drafting system to improve sliver quality. In addition, the optimization effort and thus the service costs are lowered by extremely simple settings.



Top rolls (beige) can be turned by 180° after wear of the top roll coatings (wear shown in red).



Top rolls in open drafting system



Drafting system and motors allow quick and easy access

## Increased dynamics in levelling

Due to a more powerful, maintenance-free levelling motor and reduced masses in the drafting system, the Integrated Draw Frame IDF 2 features increased dynamics and a faster response.

## Very good accessibility

The casing of the IDF 2 can be opened quickly and without tools. For operation and maintenance purposes, it is simply flipped open in front and back. This ensures that service work can be performed in a quick and uncomplicated manner.

# JUMBO CANS 1,200 mm

The new economic efficiency – exclusively at Trützschler

The larger the cans, the greater the efficiency of the downstream machine. Greatest economic advantage: 43% longer runtime in the creel results in reduced downtimes on autoleveller draw frame or Superlap. In practice, efficiencies can be increased by 1.5-2%.



**43%**  
more draw frame  
sliver in the  
new Trützschler  
JUMBO CANS



The filling quantity in the cans is determined by a number of factors. Larger can dimensions have a positive influence on:

- Efficiency
  - unwinding in the creel of the downstream machine
  - filling of the cans
- Number of
  - can transports
  - cans required
- Lower personnel costs
- Quality improvement

#### 43% more draw frame sliver per can

Compared to a can with 1,000 mm diameter, a JUMBO CAN with the new 1,200 mm diameter format holds 43 % more draw frame sliver. The logical consequence is a reduction of downtimes of up to 43 % for the can change. The result is an improved overall draw frame efficiency.

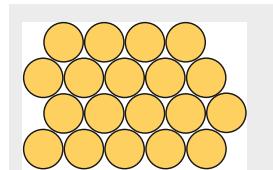
#### Can transports reduced by 30 %

The full cans must be transported from the breaker draw frame to the autoleveller draw frame. In a spinning mill with an annual production of 10,000 t this means more than 190,000 transports per year or approx. 24 per hour. With the new can format, only 17 can transports per hour are required. Even at a weight of 76 kg card sliver (23 kg more than in 1,000 mm cans), the 1,200 mm JUMBO CANS can easily be moved across the flat hall floor by means of smooth-running ball castors.

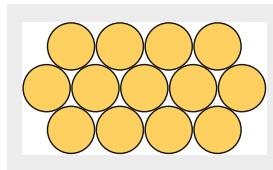
#### Less cans at same material buffer

To ensure trouble-free operation, material buffers between the production steps are practical. Thanks to the new can concept, less cans are needed for the same amount of material in the buffer.

#### Cans and space required for 1,000 kg material buffer



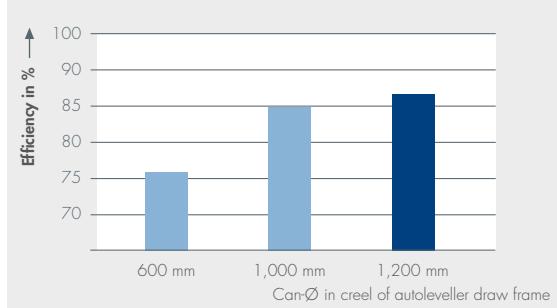
19 cans with Ø 1,000 mm,  
space required: approx. 20 m<sup>2</sup>



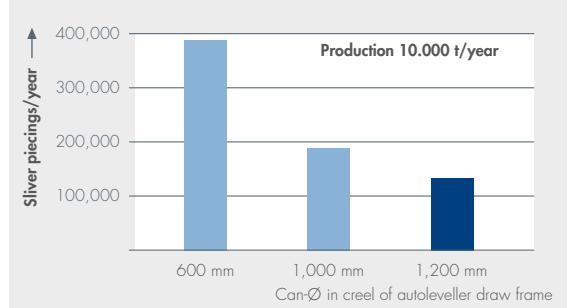
13 cans with Ø 1,200 mm,  
space required: approx. 20 m<sup>2</sup>



The JUMBO CANS 1,200 mm  
are easy to move



The efficiency of the draw frame increases with larger can formats



less sliver piecings reduce yarn imperfections

### **Less personnel required**

Less can transports and less can changes in the creel reduce personnel requirements or increase personnel efficiency: One person can operate more draw frames.

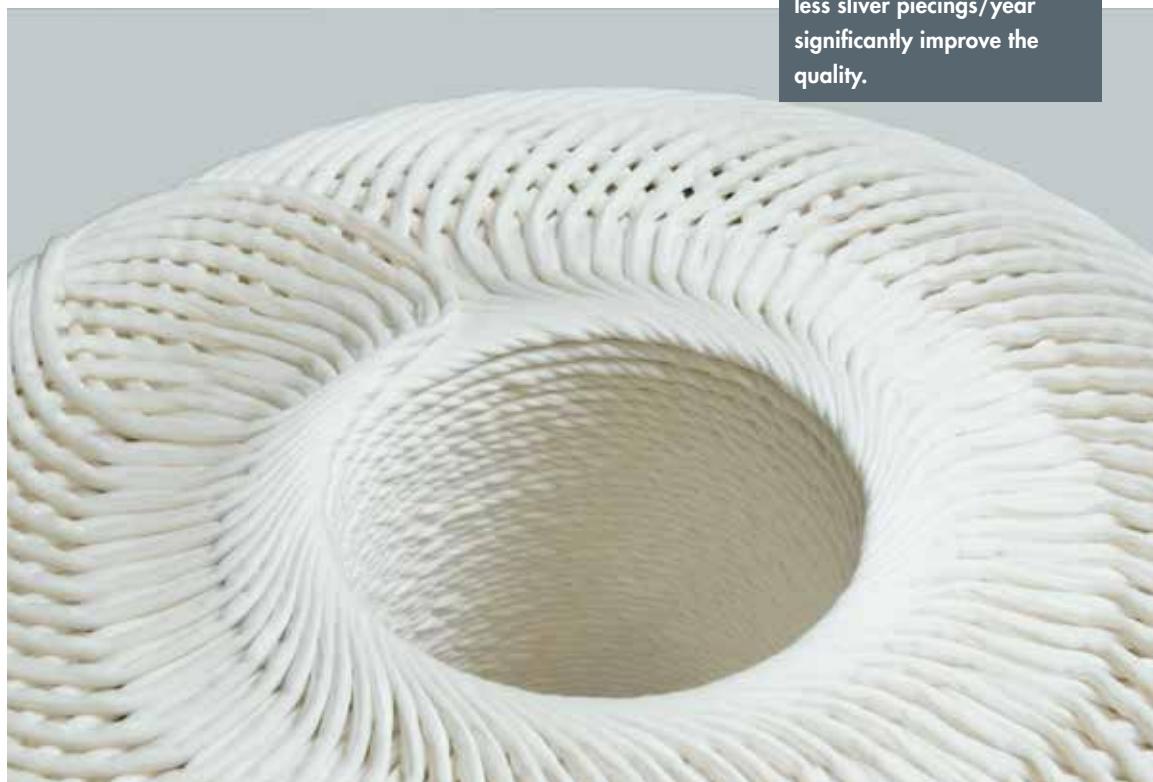
### **Reduced sliver piecings improve the quality**

Of course, 30 % less can changes in the creel also mean 30 % less sliver piecings and thus 30 % less potential error locations. In our spinning mill example

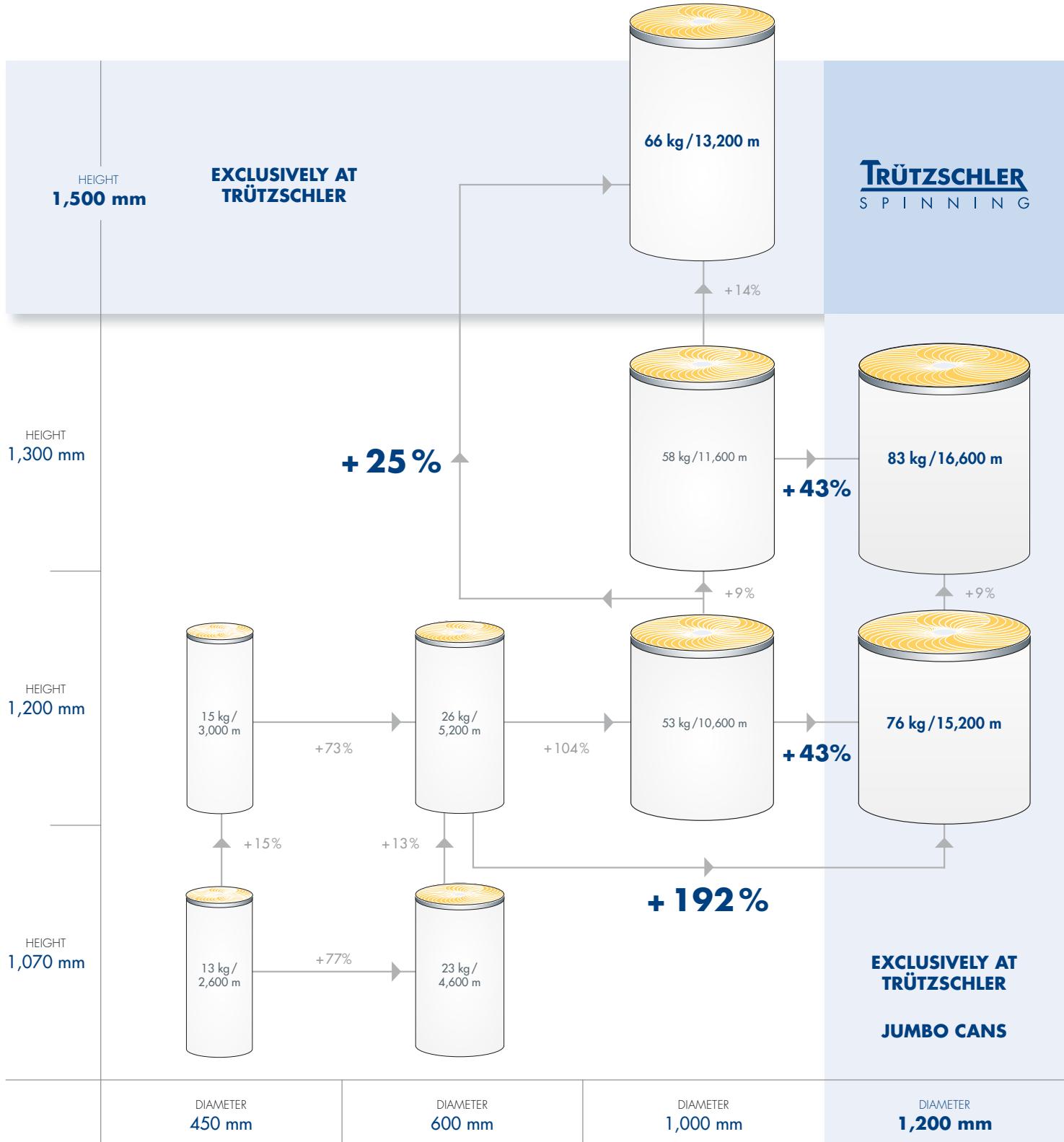
with a production of 10,000 t per year, 58,000 fewer sliver piecings are required at the autoleveller draw frame.

If JUMBO CANS 1,200 mm are not feasible for operational reasons, 1,000 mm cans with an increased height of 1,500 mm provide an alternative. They hold approx. 25 % more draw frame sliver. This solution is also exclusively offered by Trützschler.

58,000  
less sliver piecings/year  
significantly improve the  
quality.



Up to 1,200 mm diameter, up to 1,500 mm height – these new can dimensions are only available from Trützschler. The result is a significantly higher capacity and even higher economic efficiency.



# Automatic can changer

## Flexibility and high efficiency

### New, universal and highly flexible

The can changer for cans ranging from 400 to 600 mm diameter has been newly designed and adjusted to the breaker Draw Frame TD 7, the autoleveller Draw Frame TD 8 and the Integrated Draw Frame IDF 2 and the Trützschler cards. These can changers function on the principle of rotation.

The can changers can be adapted to the respective requirements with greatest precision:

- Cans with or without balls castors
- Cans with 400, 450, 500 or 600 mm diameter
- Can heights 900 to 1,500 mm
- Under floor or above floor
- Passive or active empty can feeding
- Delivery of full cans to a delivery ramp, directly onto the floor or onto a can carriage.

### Above floor or under floor?

If the structural conditions permit, the advantages of the under floor version should be used. The empty cans must not be lifted as high, and the full cans can be delivered directly onto the floor. The entire can handling is simplified.

If the hall floor does not allow this version, Trützschler also offers an above floor version.

### CAN TRACK or SERVO TRACK?

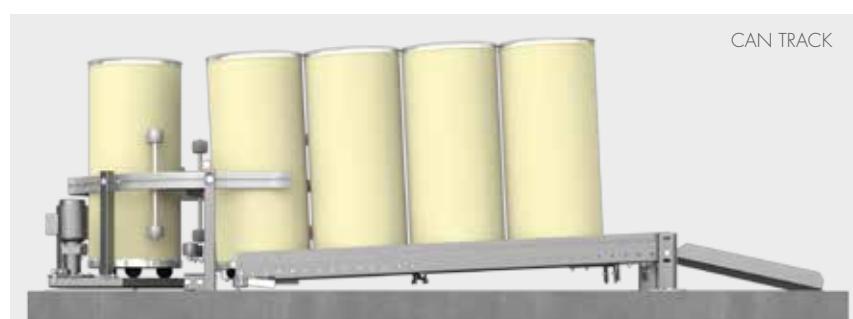
Trützschler offers two versions of empty can feeding. With CAN TRACK, the cans slide by gravitational force on an inclined roller track into the change position. This version is possible above and under floor. When using the SERVO TRACK version, the transport of the empty cans is handled by driven belts. This comfort gain is only practical under floor to provide the operator with ground-level feeding of empty cans.

### Delivery onto the floor or can carriage?

When using the under floor version, the cans are delivered directly onto the floor. In case of an above floor version, the cans are delivered onto an inclined outlet track. An interface for transfer onto a can carriage is also possible.

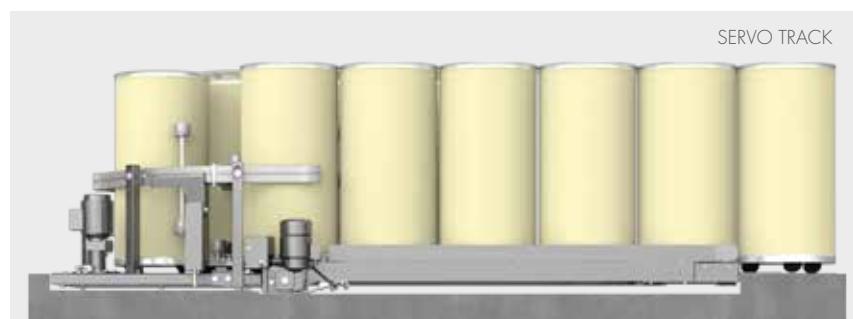
### Maintenance-free sliver separation the intelligent way

With autoleveller draw frames, sliver separation is performed automatically during can change by applying a brilliantly simple solution: The drafting system motors produce a short thin sliver section that simply breaks during can changing. In contrast to conventional draw frames with high-maintenance mechanical sliver separation, the typical advantages of the Trützschler technology are evident here as well.



CAN TRACK

Can changer floor group, above floor



SERVO TRACK

The under floor can changer with delivery at floor level is easier to operate



Automatic can changer for breaker Draw Frames TD 7 and TD 8 as well as IDF 2 (here an above floor version)



#### **Perfect coiling geometry ensures quality for downstream production**

The sliver coiling geometry of the Trützschler auto-leveler draw frames is such that the slivers can be removed without trouble in further processing. Since the can plates have a separate drive, they allow infinitely variable adjustment. These parts of coiling are also controlled via the touch screen.

The simple setting by means of the individual can changer drive allows perfect setting of the coiling geometry.

# SERVO CREEL

The new perfection of the creel



To ensure an optimal quality base already during sliver feeding into the draw frame area, the separately driven sliver feed SERVO CREEL was developed – a typical Trützschler innovation.

#### **Separate drive: Advantages for increased quality**

For the first time, a creel is equipped with a separated drive. Due to the lack of a mechanical connection between creel and draw frame, the tension draft to the draw frame and thus the running behaviour can be continuously optimized in a very sensitive manner on the touch screen. In addition, a higher levelling dynamics is achieved since the levelling motor is no longer strained by permanent acceleration and braking of the creel. The result is a clearly improved levelling quality. Besides the quality advantages, the SERVO CREEL is superior to conventional creels also from an economic perspective.



One idea makes the difference: separate drive with convincing advantages.

#### **The classic alternative**

Of course, it is also possible to use a feed creel. The supports are height adjustable and can be fitted to the corresponding can height on both versions.



The drafting system of the breaker Draw Frame TD 7 is mounted onto the can changer, requiring only little space. To maintain the good accessibility to the drafting system, the creel is slightly angled.

#### **Application-oriented creel versions**

- Feed creel or SERVO CREEL
- 6-fold or 8-fold doubling
- Can set-up in one or two rows
- Can heights 900 to 1,500 mm
- Sliver monitoring:
  - Light barriers
  - Individual sliver monitoring

The creel versions are configured and provided according to application.



The video shows how to set the tension draft between creel and draw frame.

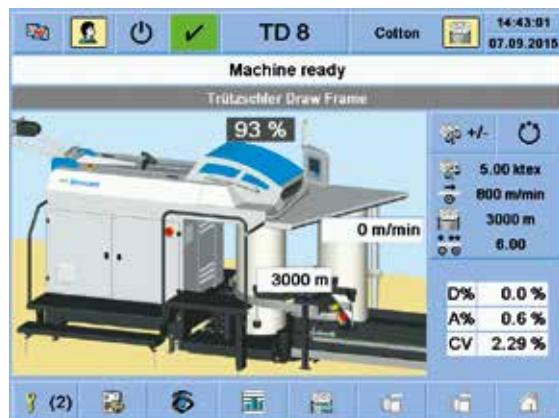
Scan page with Smartview.

# Operation

Intuitive menu navigation via touch screen

Operation of the draw frames is conveniently performed largely via language-independent symbols or graphics. Individual operating functions can be displayed depending on the situation. Only the displays and menus that are necessary or practical in the particular situation appear.

In the event of a machine malfunction, the display not only shows the point of failure, but also an accordingly marked detailed picture or diagram of the fault.



All important parameters are clearly displayed with numbers and symbols on the main screen.



The video shows the simple operation on the touch screen.

Scan page with Smartview.

The operator receives all important information via the screen.



# Integrated quality monitoring

## Standard for Trützschler

### DISC MONITOR: Assurance for consistent sliver count

The robust and reliable quality sensor does not miss anything: it measures each centimetre of the continuous sliver produced. The permanent quality monitoring results in a significant reduction of the otherwise common laboratory tests.

In the event of irregular or faulty sliver, the DISC MONITOR sends a warning or shuts down the draw frame. When and how it responds to specific causes can be individually configured.

### Spectrogram monitoring as standard

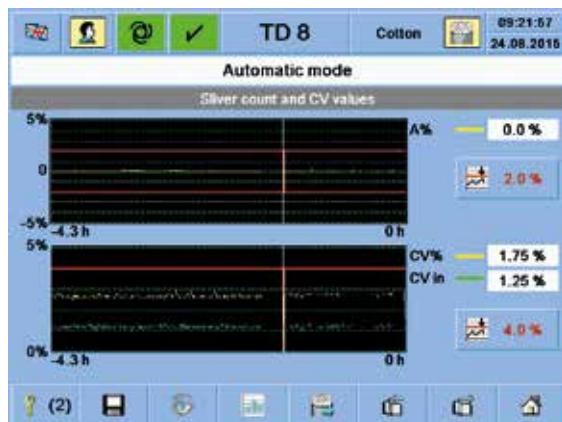
If there are deviations from a defined quality limit in the Spectrogram, quality monitoring reliably shuts down the autoleveller draw frame. Following this, the troubleshooting process is shortened by the respective display information: Once an error appears in the spectrogram, the possible failure source is marked on the gearing diagram. Thus, quality management is actively supported.

### The sensor DISC MONITOR permanently monitors the sliver quality



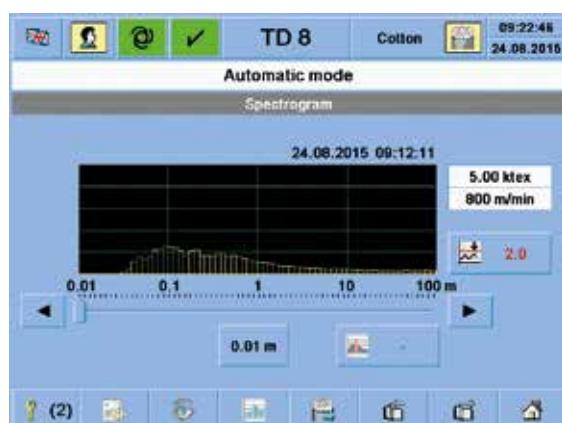
#### Error display

In the event of a fault, the operator is informed about the type and location of the fault.



#### Sliver evenness

The visualisation of the quality data also takes place on the screen.



#### Spectrogram

The sensor DISC MONITOR also supplies the data for the Spectrogram. At the touch of a button an error is analysed and the possible causes indicated.

**Automatic mode**

Logbook

Date	Event	Status
24.08. 09:25:44	Automatic mode	OK
24.08. 09:25:41	Service mode	OK
24.08. 09:25:39	Service mode	OK
24.08. 09:25:37	Machine stopped	OK
24.08. 09:25:30	Change of shift	OK
24.08. 09:20:01	Automatic mode	OK
24.08. 09:17:07	Silver break	OK
24.08. 09:16:59	Automatic mode	OK
24.08. 09:13:27	Can change by operator	OK
24.08. 09:13:09	Machine stopped	OK
24.08. 09:08:50	Automatic mode	OK
24.08. 09:08:48	Machine stopped	OK
24.08. 09:08:45	Automatic mode	OK

#### Log book

The logbook function is only one example of the supporting maintenance and service functions.

# T-DATA

## Recognising great potential in small details

### All important data in view at all times

The Trützschler Online Data Monitoring System T-DATA gathers all current production and quality data. Due to its modern web architecture, these data are also available while on the road. No matter where you are, Smartphones or tablets allow access to all important data and error statistics of the machines connected, individually and also as overview.

### Optimization of production

Trends in production can be detected at an early stage and malfunctions and faults dealt with faster. This allows a measurable reduction of downtimes and optimization of machine settings for higher production rates. T-DATA makes sure that every metre of sliver in the can has been checked.

### Individual data view

Each customer decides which data is of interest and how it is to be displayed. The Web interface with intuitive operation can easily be adapted to individual requirements. The options range from basic settings to highly sophisticated functions.

Data can be selected from clearly arranged graphics or tables over a freely definable period, and compared with each other.

### The right sensors at the right places

Trützschler sensors measure where they are needed. Thus, all important quality and production data that are required for the optimal control of production are determined. The DISC MONITOR, for example, permanently monitors the current draw frame production and issues a warning as soon as irregularities occur in the draw frame sliver.

### Integration into existing systems

T-DATA can easily be integrated into an existing ERP or control system. In addition to current data, it is also possible to transmit and compare past production data and fault messages via an external interface. This allows easy use of synergy effects.

For more information, see  
the brochure "T-DATA".



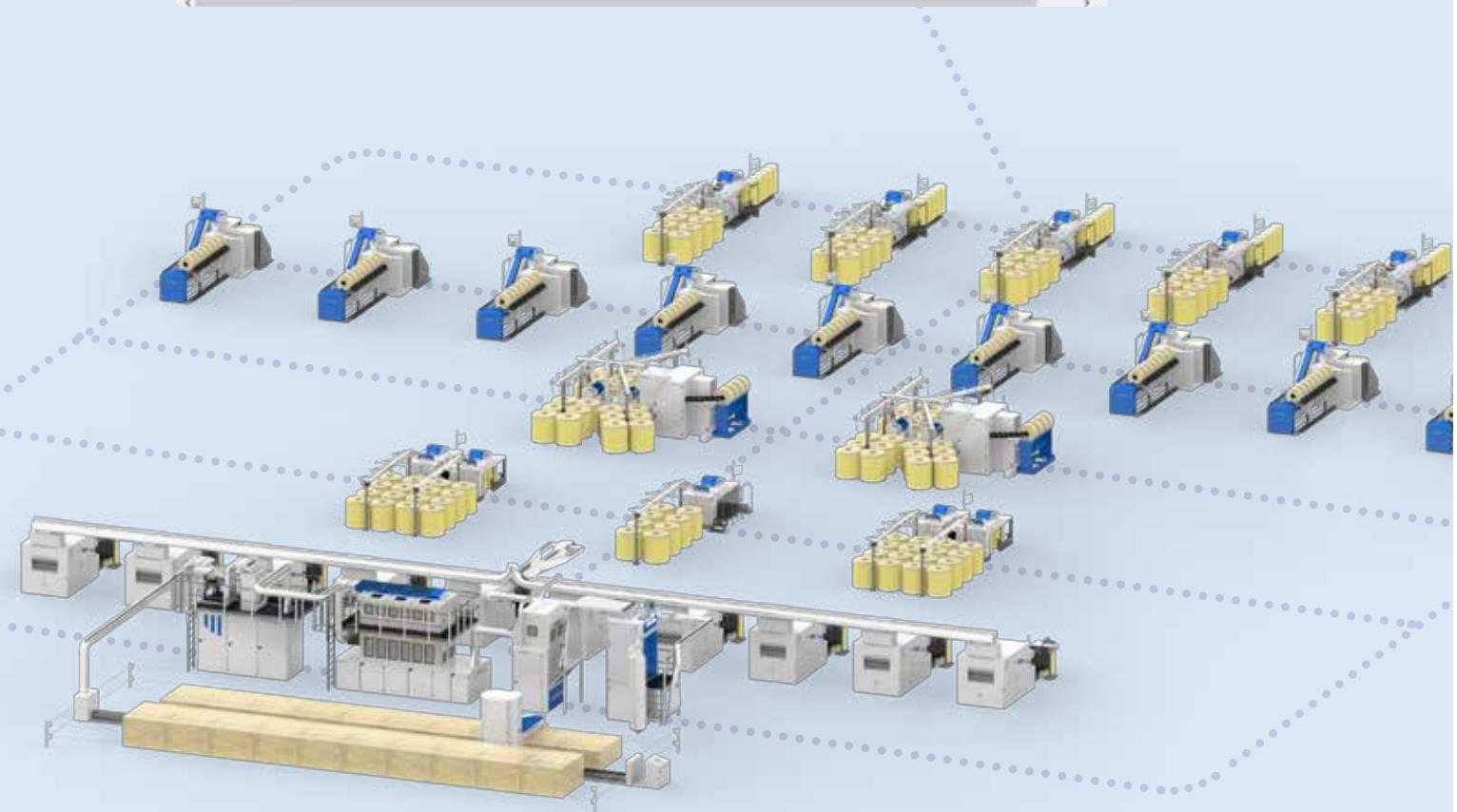
Watch the film T-DATA  
with the Trützschler  
Spinning App.

Scan page with Smartview.

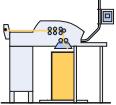
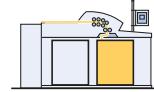
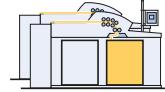
Data of the individual machines, for instance, can be read on a tablet PC.



Comparing two draw frames reveals a sliver fault on one draw frame (in orange).



# Technical data

	Breaker draw frames			
	TD 7	TD 9	TD 9T	
				
Maximum delivery speed	m/min	1,000	1,000	1,000
Can diameter	mm	600	1,000 + 1,200	1,000 + 1,200
Can height	mm	1,000 - 1,500	1,200 - 1,500	1,200 - 1,500
Cans without ball castors		•	-	-
Cans with ball castors		•	•	•
Material: Fibers up to 60 mm		•	•	•
Material feed	ktex	15 - 50	15 - 50	15 - 50
Draft	fold	4 - 10	4 - 10	4 - 10
Air volume of suction	m³/h	600	600	1,200
Negative pressure of suction:	-Pa	400	400	480
Installed draw frame power	kW	5.0	5.25	10.5
Installed can changer power	kW	0.5	0.25	0.5
Installed filter power	kW	0.9	0.9	0.9
Installed power SERVO CREEL	kW	0.6	0.6	1.2
Installed power SERVO TRACK	kW	0.3	-	-
Continuous power consumption		depending on application, approx. 0.020 – 0.030 kWh/kg		
Compressed air requirement	Nl/h	240	280	560
Noise level	dB(A)	84	84	84



Integrated Draw Frame IDF 2



DISC LEVELER

Autoleveller draw frames				
TD 8	TD 8-600	TD 8C	TD 8-600C	IDF 2
1,000	600	1,000	600	700
400 – 600	400 – 600	400 – 600	400 – 600	400 – 600
900 – 1,500	900 – 1,500	900 – 1,500	900 – 1,500	900 – 1,500
•	•	•	•	•
•	•	•	•	•
•	•	•	•	•
15 - 50	15 - 50	15 - 50	15 - 50	6 - 10
4 - 11	4 - 11	4 - 11	4 - 11	1 - 3
800	800	800	800	350
450	450	450	450	450
9.8	6.9	9.8	6.9	4.6
0.5	0.5	0.5	0.5	0.5
0.9	0.9	0.9	0.9	–
0.6	0.6	0.6	0.6	–
0.3	0.3	0.3	0.3	0.3
depending on application, approx. 0.020 – 0.030 kWh				2.5 kW
240	240	240	240	2,800
84	79	84	79	79



4-over-3 drafting system technology



Individual sliver monitoring in the feed area of the draw frame

# Equipment and options

## Equipment and options

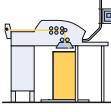
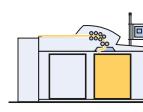
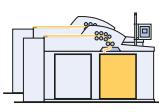
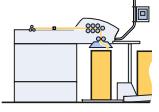
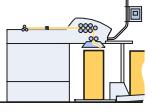
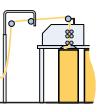
Single head version
TWIN version
Good accessibility to all maintenance and cleaning points
Safety panels
Modern, energy-saving drives
Infinitely variable setting of the delivery speed
Individual drive for infinitely variable setting of sliver count and draft
Individual can plate drive for optimized sliver coiling
4-over-3 drafting system with pressure bar
Individual sliver drafting system 2-over-2
Pneumatic load of top roll, individually adjustable
Quick relief during standstill
Coiler plate with hydro polished tube prevents deposits
Integrated suction in drafting system
Microcomputer control
Data transmission interface to T-DATA
Colour touch screen for operation, maintenance and service
Short-term leveller SERVO DRAFT
Input sensor DISC LEVELLER
Input sensor measuring funnel
Automatic sliver count monitoring DISC MONITOR
Optimization package TD-OS
– Separately driven servo drive for middle drafting system cylinder
– Software package AUTO DRAFT for self optimization of draft
OPTI SET for perfect levelling quality
Integrated quality monitoring (sliver count, sliver evenness, integrated spectrogram analysis)
Maintenance management
Feed creel, double-row for up to 8-fold doubling
Separately driven SERVO CREEL TD-SC single row for up to 8-fold doubling
Separately driven SERVO CREEL TD-SC two rows for up to 8-fold doubling
Automatic rotary can changer under floor
Automatic rotary can changer above floor
Automatic linear changer under floor
Automatic linear changer above floor
Can magazine CAN TRACK for empty cans
Driven can magazine SERVO TRACK for empty cans (only under floor)
Interface full can transfer onto can transport carriage (transport carriage provided by customer)
Continuous suction with monitoring of negative pressure (above and underfloor)
Integrated filter TD-FB with fan, large filter surface and high-volume collecting container

1) Automatic synchronisation with the card

● = Series   ○ = Option

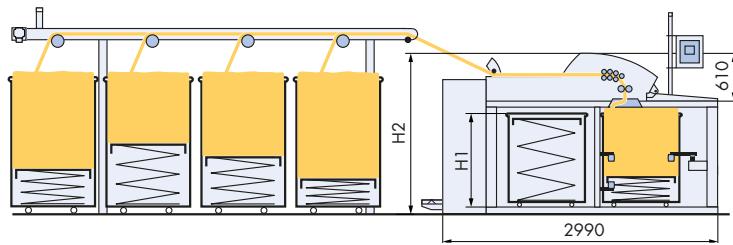
2) via the card or card control

3) with different sensor

Breaker draw frames			Autoleveler draw frames		
TD 7	TD 9	TD 9T	TD 8/TD 8C	TD 8-600/ TD 8-600C	IDF 2
					
●	●	—	●	●	●
—	—	●	—	—	—
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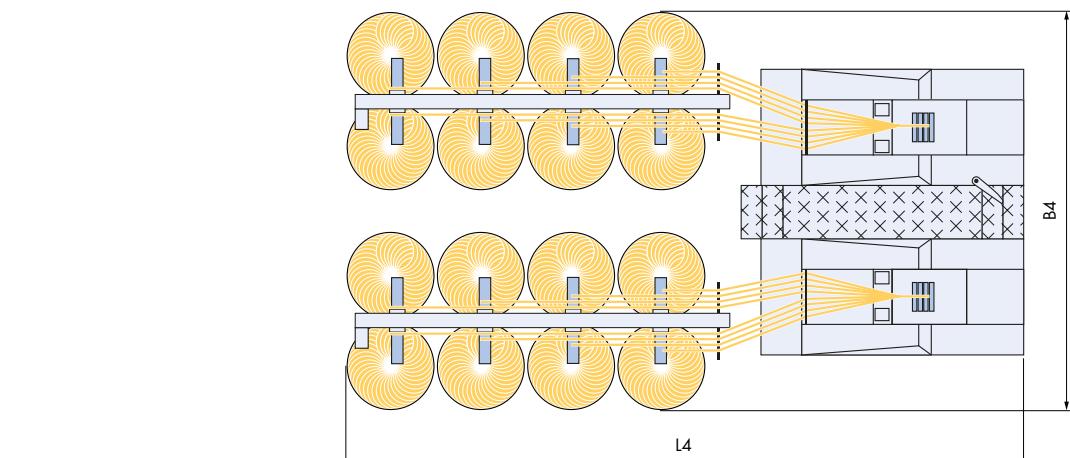
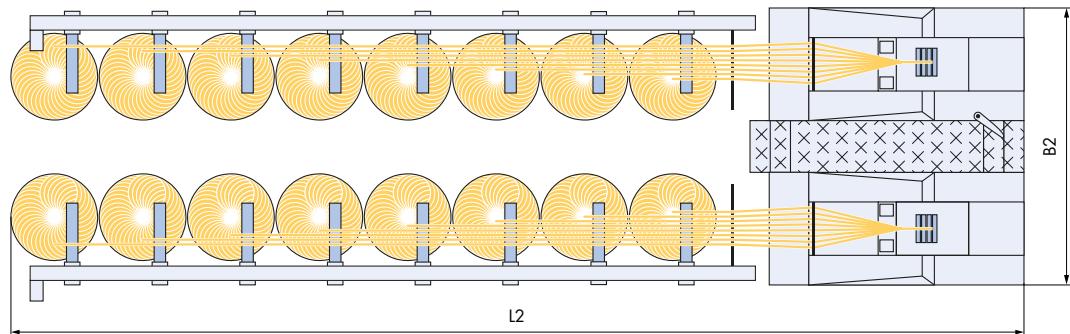
## TWIN Draw Frame TD 9T

Dimensions	TD 9T					
	Can delivery 1,000 or 1,200 mm Ø					
Can height H1 mm	1,075	1,100	1,200	1,225	1,300	1,500
Total height H2 <sup>1)</sup> mm	1,790	1,815	1,915	1,940	2,015	2,215



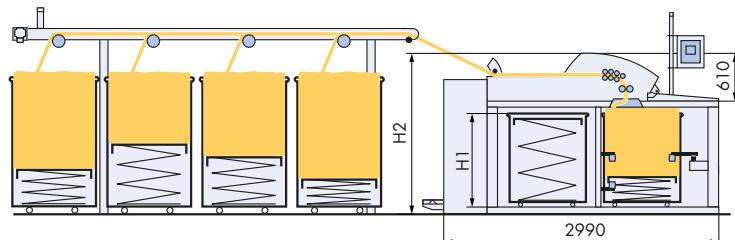
1) Above floor versions minus 80 mm

Creel dimensions		Can-Ø 1,000 mm	Can-Ø 1,200 mm
Creel, 1 rows	Total length L2 mm	12,055	13,653
	Total width B2 mm	3,300	3,700
Creel, 2 rows	Total length L4 mm	7,805	8,703
	Total width B4 mm	4,600	5,400



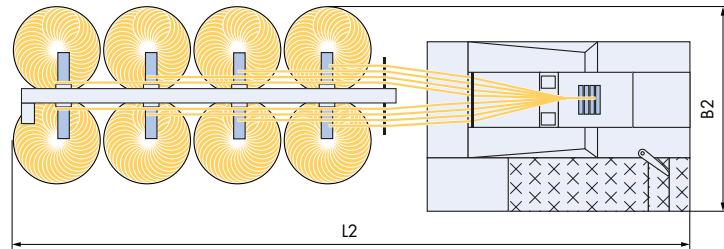
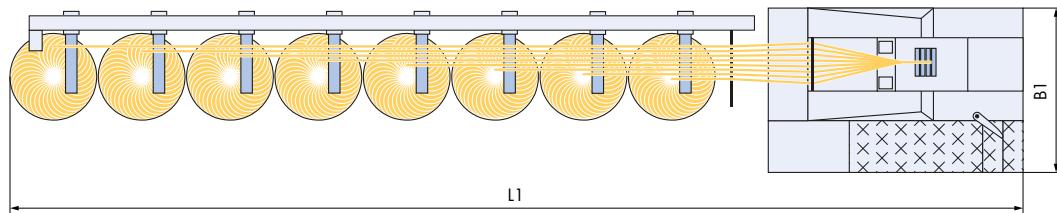
## Breaker Draw Frame TD 9

Dimensions	TD 9					
	Can delivery 1,000 or 1,200 mm Ø					
Total can height H1 mm	1,075	1,100	1,200	1,225	1,300	1,500
Total height H2 <sup>1)</sup> mm	1,790	1,815	1,915	1,940	2,015	2,215



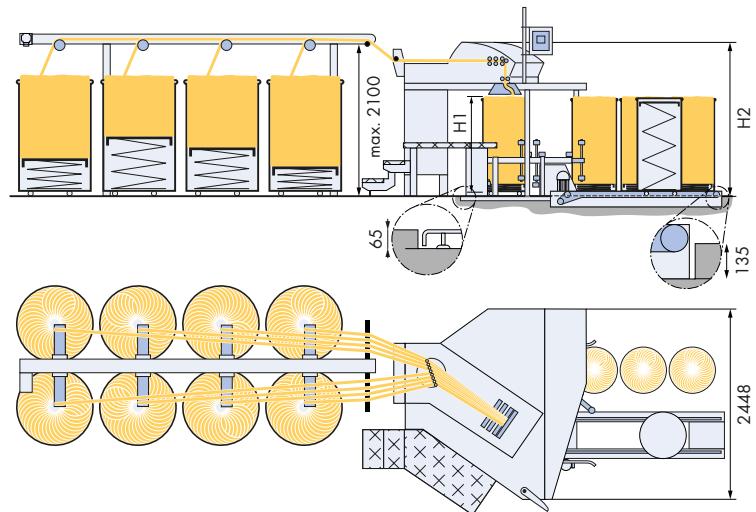
1) Above floor versions minus 80 mm

Creel dimensions		Can-Ø 1,000 mm	Can-Ø 1,200 mm
Creel, 1 rows	Total length L1 mm	12,055	13,655
	Total width B1 mm	1,950	2,150
Creel, 2 rows	Total length L2 mm	7,805	8,705
	Total width B2 mm	2,300	2,400



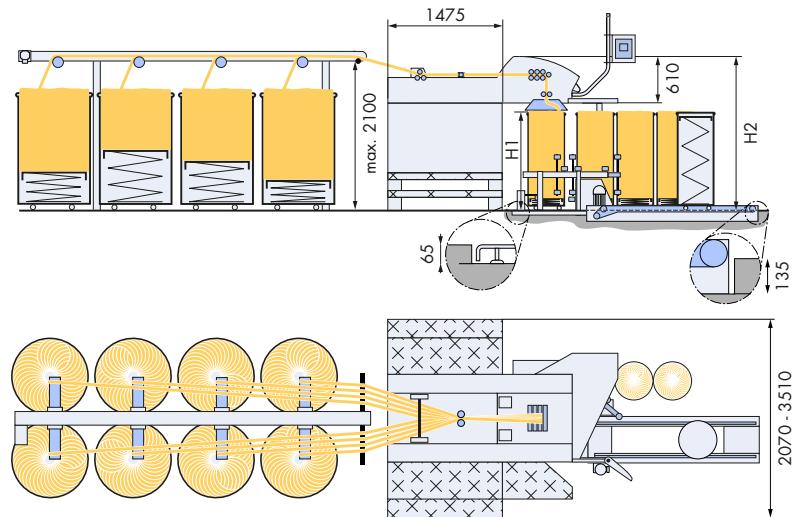
## Breaker Draw Frame TD 7

Dimensions	TD 7							
Can height H1	mm	1,050	1,100	1,200	1,300	1,400	1,500	1,525
Total height H2 <sup>1)</sup>	mm	1,855	1,905	2,005	2,105	2,205	2,305	2,330



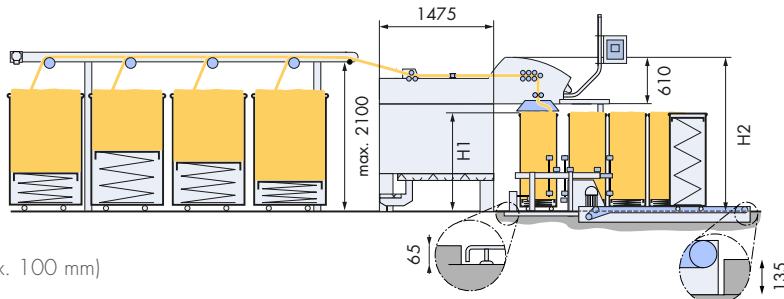
## Autoleveller Draw Frames TD 8 and TD 8-600

Dimensions	TD 8 + TD 8-600							
Can height H1	mm	900	1,000	1,070	1,100	1,200	1,300	1,400
Total height H2	mm	1,675	1,775	1,845	1,875	1,975	2,075	2,175

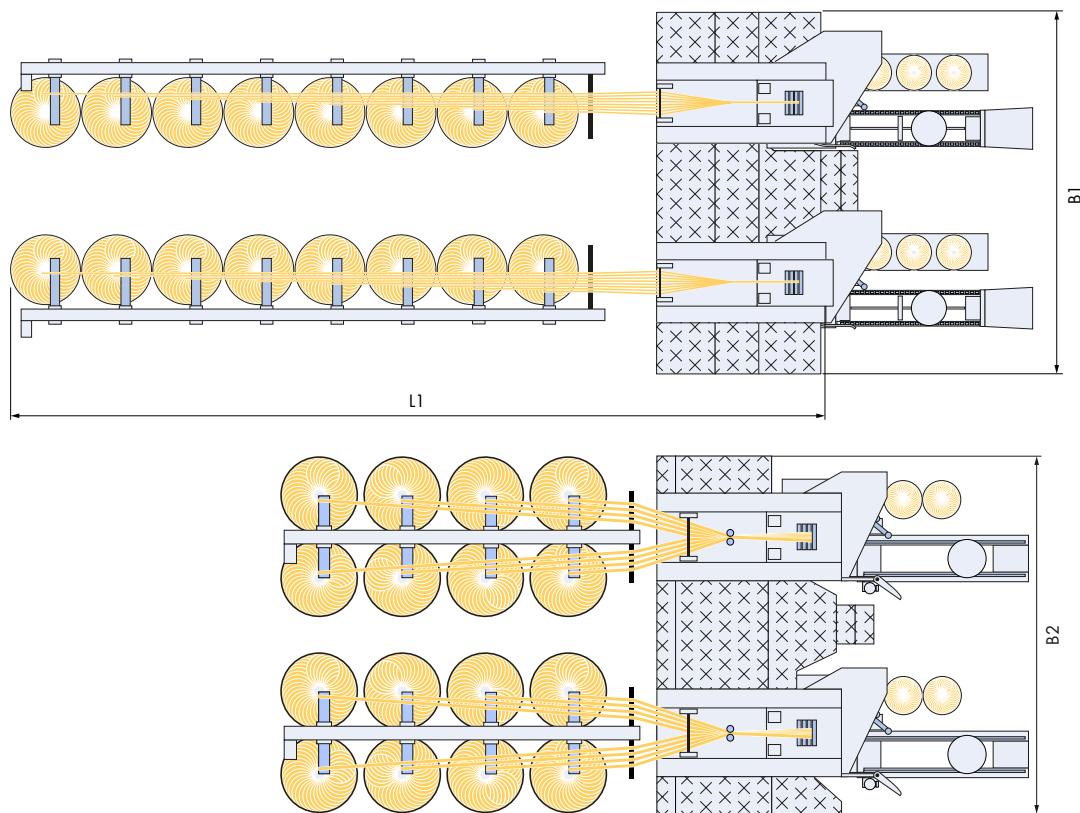


## Autoleveller Draw Frames TD 8C and TD 8-600C

Dimensions		TD 8C + TD 8-600C							
Can height H1	mm	900	1,000	1,070	1,100	1,200	1,300	1,400	1,500
Total height H2 <sup>1)</sup>	mm	1,675	1,775	1,845	1,875	1,975	2,075	2,175	2,275



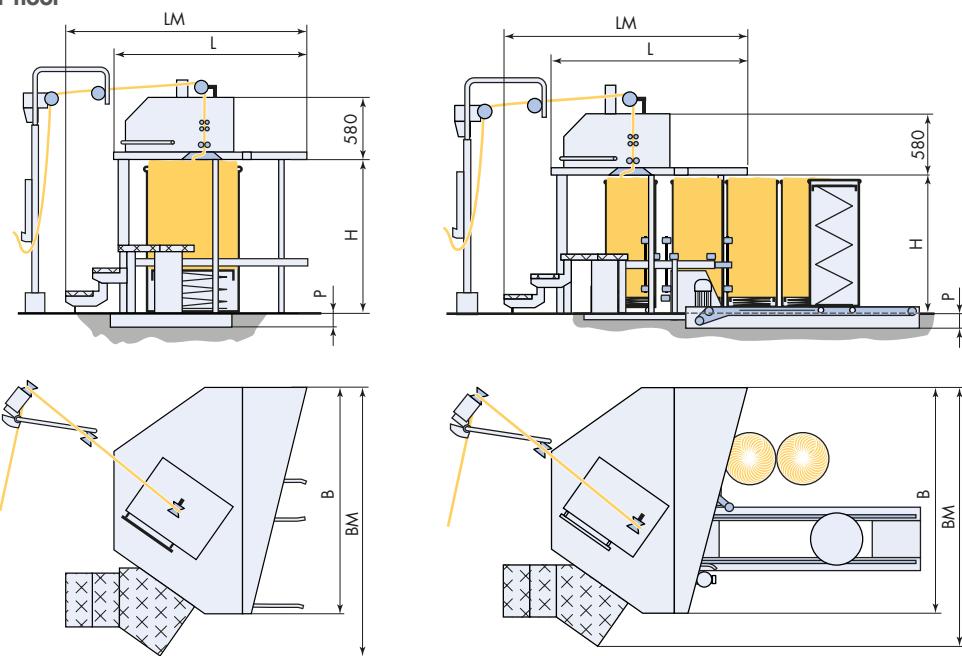
Creel dimensions		Can-Ø 1,000 mm	Can-Ø 1,200 mm
Creel, 1 rows	Total length L1 mm	11,390	12,890
	Total width B1 mm	3,020	3,420
Creel, 2 rows	Total length L2 mm	7,190	7,890
	Total width B2 mm	4,600	5,400



## Integrated Draw Frame IDF 2

Dimensions		Can-Ø 400-600 mm	Can-Ø 1,000 mm
Height of bottom plate P	mm	65	95
Width without platform B	mm	2,110	2,750
Total width BM	mm	2,427	2,897
Length without platform L	mm	1,850	2,250
Total length LM	mm	2,140 – 2,390	2,475 – 2,737
Height H	mm	935 – 1,510	950 – 1,575

### Under floor

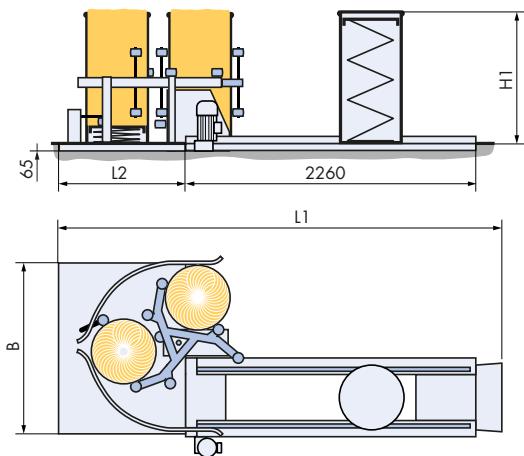


## Can changer versions TD 7, TD 8, IDF 2

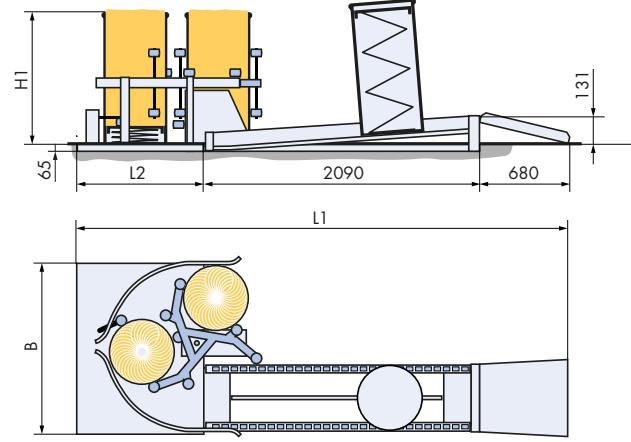
### Dimensions

		Can changer versions			
Inner can diameter	mm	400	450	500	600
Total can height H1	mm	900 – 1,500			
L1	mm	3,690	3,750	3,770	3,840
L2	mm	930	965	1,000	1,070
B	mm	1,250	1,300	1,400	1,600

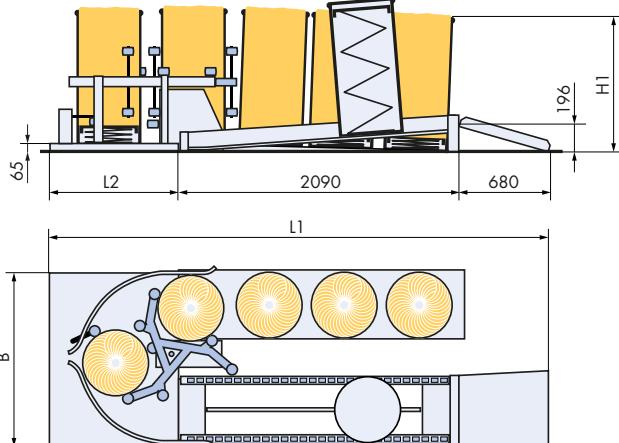
Under floor SERVO TRACK



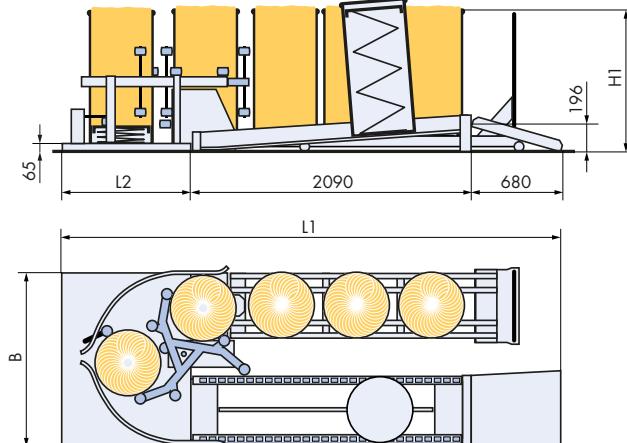
Under floor CAN TRACK



Above floor CAN TRACK delivery track



Above floor CAN TRACK can carriage





GERMAN Technology



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# GETTING FIBERS INTO SHAPE – SINCE 1888



Fiber preparation installations: Bale openers · Mixers · Cleaners/Openers  
Foreign Part Separators · Dust separators · Tuft blenders  
Waste cleaners | Cards | Draw frames | Combing machines

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Bale openers/Mixers | Card feeders | Cards/Crosslappers | Wet laying lines | Needling machines  
Hydroentangling, needling, thermo- and chemical bonding lines  
Finishing, drying, winding, slitting machinery

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Filament lines: Carpet yarns (BCF) · Industrial yarns

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Metallic wires: Cards · Cards long staple · Cards nonwovens · Open-end spinning  
Flat tops | Fillets  
Carding segments | Service machines | Service 24/7