Double Track Thickness Gauge for Strip and Profile
(with lateral guide rollers)

VBK 2596/11E
(and 2596 / 1 E)

Operating- & Service Instructions
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*Subject to change without prior notice.*

*Some photographs in this manual show the VBK 2596 12 gauge type. However, such photos were only used when the relevant items as explained in the corresponding text were exactly the same as installed in your gauge.*
Safety Precautions, please read carefully!

Keep off the gauge while the strip is running or while it is under tension.

This gauge is meant to be used exclusively as a fix mounted component of a strip processing machine. The strip processing machine must not be started until a written statement was made that the entire machine (into which the gauge is installed) is in accordance with the regulations of the EG-Maschinenrichtlinie 89/392/EWG. The manufacturer hereby points out, that this may include the installation of an appropriate protection device. If necessary, a protection device has to be made in such a way that the operator can pull the gauge on the strip and push it off the strip during the rolling process without facing any hazard by the running or by the possibly breaking strip.

The gauge has an easy running slidebase. Fasten the slidebase to the gauge before carrying the gauge. Otherwise your fingers might get crushed in the slidebase or the gauge or the slidebase might fall down while they are carried.

As the gauge has pneumatically operated guide rollers, it is not allowed to work between the rollers unless the compressed air supply for the rollers (at the rear side of the gauge) is disconnected; DANGER OF FINGER INJURIES

This manual has to be handed to the machine operator, and one copy must be permanently available to operator and service personnel.

Nobody is allowed to work on or with the gauge, before he has read and understood this manual. Feel free to call the Vollmer company in case of any questions (phone +49 2334 507 0).

Warning, Crushing Hazard! In some applications this gauge has a hydraulic traverse unit. It has to be switched to the mode 'Service I', before anybody enters the danger zone. When operating in the standard mode ('Service 0') the gauge might rush back or forward unexpected and uncontrollable.

Intended use of this machine

This gauge must be used exclusively for the measurement of cold strip or profile as specified in the order. It must be firmly installed in its intended position and electrically, electronically, hydraulically and pneumatically connected as intended by the Vollmer company. Any alteration might cause severe damage.

Spares

Please order spares referring to the part number and drawing number of the enclosed documentation drawings. To speed up our work, please do also state the Project number which is written as P-Nr. on the identity plate of the gauge.
Design and Function

The VBK 2596/11 measures simultaneously on two tracks the thickness of narrow strip and profile. This gauge is designed for the installation into rolling mills or inspection lines. The VBK 2596 measures the passing material continuously in its measurement mouth which has a depth of 20 mm. In order to ease the reading, the following sections of this manual will not always refer to strip and profile, but sometimes only to strip.

The strip first passes through a set of lateral guide rollers and then through a set of vertical guide rollers. Then it runs through the first thickness measurement frame with two thickness feeler pins which measure the running strip simultaneously from the top and from the bottom.

Due to strip thickness changes, the feeler tips are pushed apart or come closer. The distance between the feeler tips is measured by a transducer which is integrated into the thickness measurement frame between the upper and the lower measurement arm. The tips are crowned and polished diamonds, which do not leave any marks on the strip.

The second measurement frame is the same like the first one, but it may be set to another track in order to measure the strip thickness at another distance from the strip edge.

Each of the two transducers (measuring the distance between the measurement tips) is connected to a PC interface which then processes and evaluates the measurement data. The software is described in a separate manual.
The set of lateral guide rollers is an optional addition. It consists of two adjustable rollers with perpendicular axles. The rollers guide the gauge head so that it follows lateral strip movements. With this option, the gauge head needs to be mounted on an easy motion slide-base.

The VBK 2596 is also available as type 12 (i.e., a thickness and width gauge instead of type 11 (i.e., two thickness measurement tracks). In combination with another width gauge, it is also available as type 1 (i.e., one thickness measurement track).
Measurement head adjustment

Installation

When the gauge is installed into an inspection line, installation height and levelling of the gauge are derived from the inspection table. If the gauge was removed from its position, take care to reinstall the slidebase angular to the passline.

In rolling mills the gauge should be installed as described in the following sketch:

![Diagram]

If possible, the gauge should be positioned between the roll gap (mill = W) and the deflector roll U. Base and the bracket K are so high that they lie under the strip by the "passline height" H (see data drawing in the documentation). Here the stroke of the vertical guiding is able to follow the expected range of strip movement.

Additional conditions are:
- base parallel to roll axes in the mill
- slidebase rectangular to the strip
- gauge must be able to traverse towards the roll middle

Levelling and Passline adjustment

If the strip does not run horizontally, the gauge head can be turned: Loosen clamp screw X at the rear of the gauge. Lift the gauge at its front end, adjust it to the passline angle and clamp it again by screw X.

The gauge is suspended by pressure springs in the vertical guide. Off strip, the suspension pushes the gauge head against the upper limit stop of the vertical guide. "On strip" the gauge is pneumatically pushed down into the passline by the pneumatic cylinder P.

Adjust the height of the gauge pneumatically to a position where the lower guide rollers touch the strip edge with the upper third or less of their slope.
when the gauge is pulled on strip. The strip should pull the gauge down for no more than a few millimetres. For standard material, the gauge is floating, i.e. it is not resting on the bottom limit stop of the vertical guide. Under normal conditions, the working pressure of the pneumatic cylinder should not exceed 3 bar, in order to ensure that the gauge is able to follow the strip movements easy enough. Pressure is correct, when the gauge head can be lifted off the passline by one hand.

The lower limit stop of the vertical guide is determined by the position of the sliding part SP which forms the bottom limit stop for the vertical guiding. SP rests on a grub screw which is accessible from the bottom side. From above, SP is positioned by screw Z.

The passline is adjusted to the lowest passline, beginning at the top side: Loosen lock nut Y and push the gauge head pneumatically down to the limit stop. Now turn screw Z to adjust the gauge to the lowest passline. In this position secure the screw Z with its lock nut Y sliding part SP by tightening the lock nut Y. Then insert and tighten the grub screw from below to secure the sliding piece SP in its position.

When measuring very thin strip, it is recommended to lower the bottom limit stop so far that the lower guide rollers put only very little load to the strip. However, the height must not be reduced too far, because the lower guide rollers need to be permanently driven by the passing strip.
**Thickness measurement frames settings**

Two springs push the measurement frame with the (firmly installed) lower thickness feeler pin against the bottom strip side. The limit stop for this is formed by bolt B, which is locked by nut N. The setting is correct, if the tip of the lower pin stands about 1.5 mm higher than the top of the bottom guide rollers with the two pins touching each other (if there is no material in the gauge).

The knurled nut K can be turned to shift the C-frame backwards and forward. This allows to measure strip thickness at any distance up to approx. 15 mm from the edge.
Guide rollers

The upper guide rollers are linked by the body plate of their vertical guiding. For the measurement of some kind of profiles, they need to have a groove in their surface. The groove must match the size of the profile which is to be measured, so that the profile is always pushed flat onto the lower guide rollers. These rollers stabilize the gauge on the profile and they hold the material exactly rectangular to the measurement feelers. Appropriately shaped rollers are available as optional extra.

During measurement, the upper guide rollers are pneumatically pushed down. The pneumatic cylinder has a choke valve at its inlet. The choke was set at the factory to ensure a smooth closing of the guide rollers at a working pressure of 3 bar. Depending on the pressure of the compressed air, the choke
should be set in such a way that the limit stops for the pneumatics are not hit too hard. It is sufficient when they reach their limit stop without stopping at other positions before.

**Lateral guide rollers**

The gap between the lateral guide rollers needs to be set to such a size, that the rollers to not deform the strip and that the strip is easily passing through the gap. It is recommended to close the gap so far that the rollers are just touching the strip edges and then turn the knurled knob back for half a turn.

**Feeler pin alignment**

Depending on the type of profile, the diamond edges of the feeler pins need to be set across or parallel to the passing strip (see example sketch below). Loosen clamping screw C and pull the feeler pin for a few millimetres off.
its resting position. Then turn it for 90° and allow the alignment pin to engage into the other hole in the round head of the feeler pin (see holes A and B in photo above). Do the same with the lower feeler pin.

The feeler pins are clamped with their head lying against the measurement arm. Regard the 3mm spacer S which is only used under the head of the upper feeler pin.
Measurement

Zero check

Gauge zero should be checked regularly. The feelers pins do not touch each other when there is no strip in the gauge. That means, this gauge needs to be set to zero by means of a slip gauge:

Set the gauge to nominal size 3000 µm, insert a 3000µm slip gauge and check the indication. It must be close to zero. Eliminate minor deviations by the calibrating function of the software indicator. If the zero is not constant or if there is a considerable deviation, check the gauge for correct function (see under Trouble Shooting).

Measurement start and end

Operate the pneumatic foot valve to lift the upper guide rollers and the upper measurement arms and to lower the two measurement frames. Then release the pneumatic break (hand valve) and pull the gauge on strip. Do not activate the pneumatic break during measurement because the gauge needs to float freely in its slidebase, guided by the lateral guide rollers.

Important note

Do not activate the break during measurement!

The pneumatic break BR is used to secure the gauge in its rear limit position.
Now open the lateral guide rollers far enough and then feed the strip end through the gauge and into the next strip guiding device before operating the foot valve again to shut the guide rollers and to lower the upper measurement arms. Set the lateral guide rollers so that they just touch the strip edges and then turn back the knob for about half a turn.

Check if the two thickness measurement feeler pins measure the strip at the intended track positions, adjust tracks if necessary. Now the PC monitor indicates the measurement data.

**Important note**

*Push the gauge off strip before the strip is finished. The strip end must never run through the gauge! It would probably cause severe damage.*

To end the measurement, operate the foot valve to lift the upper guide rollers and the upper measurement arms and to lower the two measurement frames. The push the gauge back to its limit stop and activate the pneumatic break (hand valve). Operate the foot valve again to release the guide rollers and the measurement arms.

**Important note**

*Always activate the break when the gauge is off strip. Otherwise, even a very slight push might move it forward where it might get damaged.*
Continuous check

In between the service intervals, it is recommended to check the gauge regularly:

**Accuracy check with slip gauge**: Set the gauge to the nominal size of the slip gauge, and insert slip gauge between the transducer tips. The indication should be zero. In case of tight tolerances check daily, otherwise weekly.

**Feeler pin position to the strip**: For most gauges, the Vollmer company offers a special adjustment plate with an integrated slip gauge, which is individually selected to match the thickness of that strip which is usually rolled on your mill (optional extra).

**Guide rollers**: Check for easy rotation.

**Passline**: Check the correct height of the gauge to the strip
Strip breaking

The gauge is mounted onto the slidebase with two shear blocks. This is to prevent the gauge and its suspension from destruction in case of strip breaking. The shear blocks B are made from cast iron and easy to replace. In case of overload they shear off, so that the gauge and its suspension can move with the broken strip.

Please check the gauge zero after each strip breaking. If it has not changed, measurement can continue immediately.

If the gauge zero has shifted for a minor amount, set the indicator to zero and check again. Possibly check the gauge with a slip gauge which is integrated into an adjustment plate (addition, available from Vollmer). If the result is all right, measurement can go on.

If the measurement does not indicate the exact thickness of the sample, check the whole gauge. Give special attention to the diamond measurement edges, to the easy movement of the upper measurement arm and of the entire thickness measurement frame, and to the alignment of the feeler pin holes in the measurement arms.
**Maintenance**

The thickness gauge does not need much maintenance. Only the measurement tips with the diamonds and the guide rollers are subject to wear. From time to time the gauge should be cleaned in order to avoid dirt deposits which might block movable parts.

The following points must be checked regularly, even if measurement results are correct.

**Guide rollers**

- **Clearance?**
  The rollers have to move freely. They should have only little axial clearance. Blocking rolls mark the strip.
  
  ▷ Replace defective rollers

- **Deposits on the surface?**
  Some strip materials leave deposits on the rollers. They cannot run smooth on the strip and might mark the strip.

  ▷ replace rollers (rework if possible)

- **Roller support defective?**
  Check regularly, if the upper guide rollers run smooth in their vertical guides, and if they move easily down to their mechanical limit stop when the compressed air is switched off.

  ▷ clean the ball guides if the rollers get stuck

**Measurement frame**

- **Thickness measurement frame movable?**
  The measurement frame (which is pneumatically lowered while the gauge is traversed) might get stuck because of large dirt deposits in the gauge mechanics, or if after long time of operation the C-frame bearing is worn. This might cause measurement errors.

  ▷ Clean the gauge, call for Vollmer for repair if ball guides are worn or defective

- **Upper thickness measurement arm movable?**
  The measurement arm (which is pneumatically lifted while the gauge is traversed) might get stuck because of extensive dirt deposits in the gauge mechanics, or if after long time of operation the C-frame bearing is worn. This might cause measurement errors. The upper measurement arm must be easy to be pushed up and come down immediately.

  ▷ Clean the gauge, call for Vollmer for repair if defective

- **Measurement frame distorted?**
  Take an inspection pin to check the alignment of the feeler pin clamp bores in the measurement arms. The pin must slide easily through both bores. If not, do not try to align the arms by yourself.

  ▷ call for Vollmer for repair
**Feeler pins**

- Measurement tips worn or damaged?
  If the measurement result of the slip gauge plate is not 0, but the other checks are all right, remove the feeler pins and check their diamond measurement tips:

- Diamonds worn?
  The diamond edges should be crowned to achieve accurate measurement results. Worn diamonds with flat spots may cause measurement errors.
  - Replace and possibly get the old diamonds reworked

- Broken diamonds?
  Cause incorrect measurement results and mark the strip
  - Replace

- Measurement tips with broken-out diamonds? (after strip breaking or when the strip end has passed through the gauge)
  - Replace
Trouble shooting

If the gauge measures wrong

- Wrong point remeasured?
  Cross profile strip thickness varies in many cases. If the gauge is checked, strip thickness must be measured in the same distance from the edge as the transducers have measured.
  ➡️ check the strip thickness at correct edge distance

- Measurement arms dirty?
  In a very dirty environment, the measurement arms sometimes get too sticky, so that they do not shut completely. If the gauge is then set to zero, the indication of a following measurement is too low. After cleaning the upper measurement arm and each measurement frame should slide easy in its guide for a quite long period of time.
  ➡️ increase cleaning frequency

- Gauge zero not constant?
  If a clamp screw for a measurement feeler pin is not tightened, the pin might move against its holding. If the 3mm slip gauge was placed between the pins and then pulled off and re-inserted, the zero point changes.
  ➡️ Fasten the clamp screws, check the diamonds for damage

- Indication too high?
  Put a test plate onto the lower guide rollers and tip it to both sides as well as forward and backward. The indication should deflect only towards +. If not,
  ➡️ check the complete gauge (measurement tips for wear, C-frame for 90° position and C-frame distortion)

- Indication too high?
  If the strip breaks or a strip end passes through the gauge, the C-frame is possibly bent. The indication is too high. Check as before and
  ➡️ check the alignment of measurement feeler pin clamping bores with an inspection pin

If the gauge marks the strip?

- Diamond with small cracks?
  If hit very hard, the diamonds in the transducer measurement tips might get tiny cracks, which are hardly visible. Sometimes such cracks mark the strip
  ➡️ replace the measurement tip

- Diamond broken out?
  In case of strip breaking the diamonds might break out of the measurement tips.
  ➡️ replace the measurement tip

- Roller blocked?
  ➡️ Replace roller. If the roller surface is not damaged, replace only the bearings.