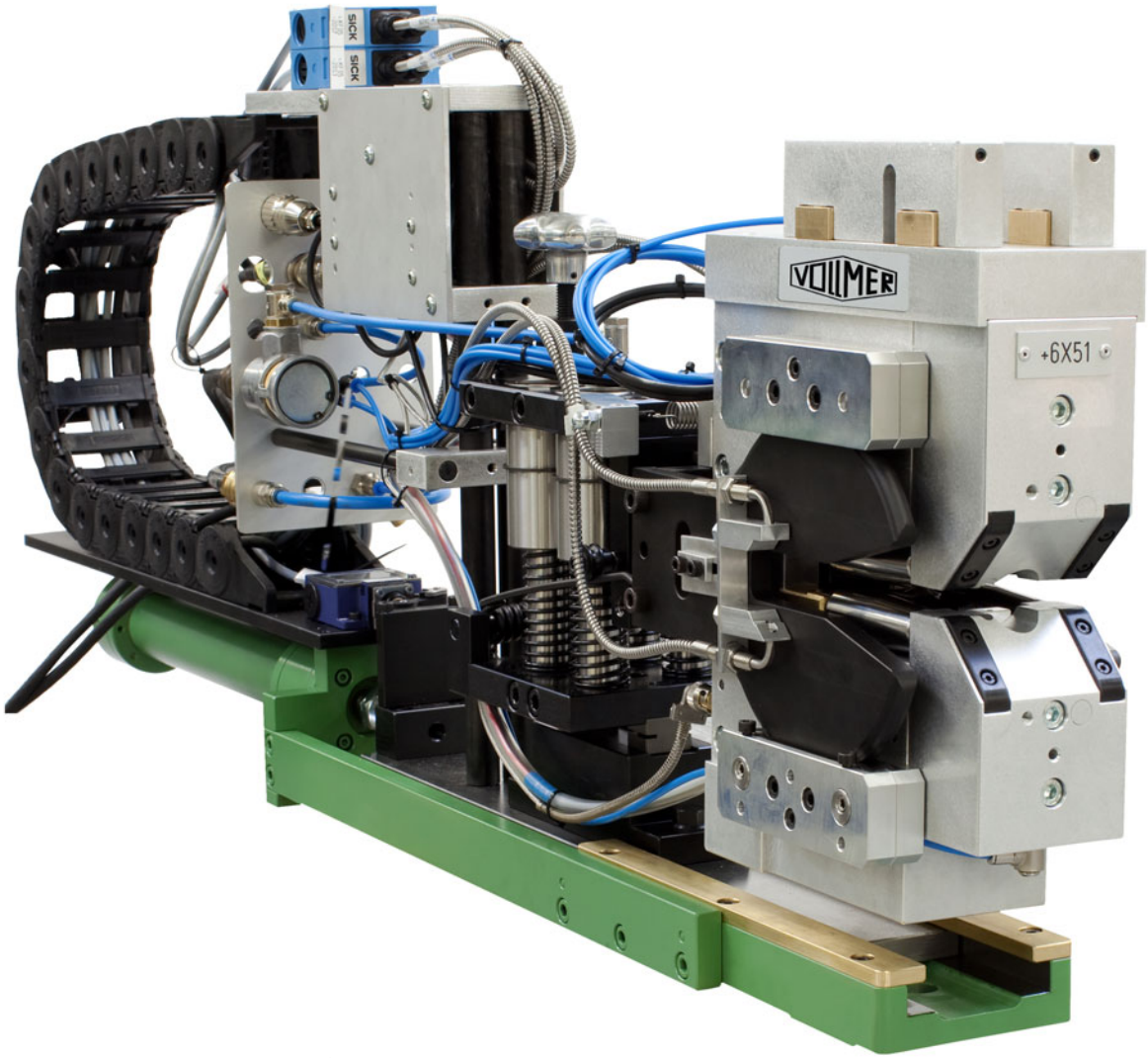
Strip Thickness Gauge
for Cold Strip with Crossbow

VBM 565



Operating Instructions

(Übersetzung der Originalanleitung)

VBM 565-1_e_rev_01 Seiten: 40	erstellt am: 12AUG2011 Name: Rietdorf	geprüft am: 15AUG2011 Name: Bergmann	freigegeben am:15AUG 2011 Name: König	Bemerkungen: nur DG+VTS, HWSt, für P 21239-Z4B

Table of Content

Subject to change without prior notice

Some photos in this manual may show gauges slightly different to your gauge. However, the parts and functions described in the text apply to your gauge.

Intended use of this machine

This gauge must be used exclusively for the measurement of cold strip.

The application specifications for your gauge are described in the specification note which is part of the documentation.

The Gauge 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-No.. on the identity plate of the gauge.

Qualified Users

This product must be used and installed only by qualified users. A qualified user, in the sense of this manual, is a person, who has performed an apprenticeship as skilled worker, comparable to what can usually be expected in Germany and who is authorized by the employer to operate this product. In addition, to be a qualified user, a person needs be familiar with the safety standards on which the manufacturer has based the design and the construction of the product (and the machine into which the product is integrated).

Warranty Note

In order to maintain the warranty, the gauge must be orderly stored, installed, used, cleaned and serviced. Please regard the document “Important Notes about Maintaining the Warranty” which is part of the documentation.

WE CARE ABOUT YOUR HEALTH.

PLEASE FOLLOW THE SAFETY PRECAUTIONS.

ESPECIALLY IF YOU HAVE MANY YEARS OF PROFESSIONAL EXPERIENCE, YOU WILL BE A GOOD EXAMPLE FOR YOUNGER COLLEAGUES

Safety Precautions, please read carefully!

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 this 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).

Danger, Crushing Hazard! 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.

Warning, Crushing Hazard to hands and fingers ! Do not put hands or fingers into the vertical guiding or onto the slidebase. The pneumatic vertical guiding and pneumatically operated guide rolls might cause injuries on hands and fingers. In case of a pressure drop, the vertical guiding with the gauge head might leap up or down. Under certain conditions, the guide rolls might close the gap unexpectedly. Therefore the pneumatic system must be depressurized before anybody starts to work on the gauge.

The aluminium gauge head might get hot. Therefore check the temperature before trying to handle the gauge head.

The gauge head is heavy (approx. 30 kgs). Therefore get a secure footing and if possible work with two persons when you have to handle the gauge head without lifting device.

If the gauge head is operated automatically or semiautomatically, the documentation contains a description of the control program for this application. Nobody is allowed to work on the gauge unless he knows the control program sequences. For your own safety, please make sure to get familiar with the control program sequences before you start to work on the gauge !

Operation mode selector switch 'Service I/0'

The electronic cabinet for this gauge contains a selector switch labelled 'Service I/0'.

'Service 0' is the position for the normal operation mode in which the gauge is traversed back and forward automatically. If e.g. when the strip tension breaks down or when the strip moves laterally, the gauge head is traversed off the strip into its rear limit position at double speed

Danger: Crushing Hazard!

Nobody is allowed in the danger zone as long as the system in the 'Service 0' mode.

When switching to 'Service 1', hang up the warning sign 'Somebody is working on the gauge...' at the touchpanel or close to it.

'Service I' is the mode for service operation. The gauge head can only be traversed in inching service by manual controls. The automatic traverse controlling is switched off, so that the gauge will not move automatically.

Caution: crushing hazard for hands and fingers!

Do not put hands or fingers into the vertical guide or the slidebase.

Design and function

The VBM 565 is designed to measure the thickness of high quality strip in cold rolling mills. The gauge measures the passing material continuously in its measurement mouth which has a depth of 50mm.

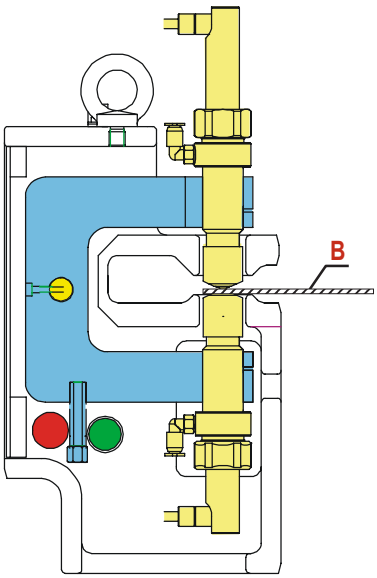
The strip passes the C-shaped thickness measurement frame with two thickness feelers which are measuring the passing strip simultaneously from the top and from the bottom. Due to strip thickness changes, the transducer tips are pushed apart or come closer. The transducer tips are crowned and polished diamonds, which do not leave any marks on the strip.

Each transducer has a digital position encoder inside its rear end. The inner measurement stroke of the of the transducers 805 and 812 is 5 resp. 12 mm, however, the available measurement stroke is a little smaller.

All changes within the two transducers or the single transducer are passed to the VTS, or to a PC with the optional Vollmer data evaluation software VGraph or VRecoS, where they are added (for sum measurement). The measurement result is indicated as deviation from zero, i.e. the difference to the preset nominal size. The nominal size is set via the VTS or optionally by means of an external source. The indication is zero as long as the measured strip meets the nominal size.

The measurement data can be used as signal for controlling and for quality monitoring documentation according to ISO 9000. It is available on several different interfaces.

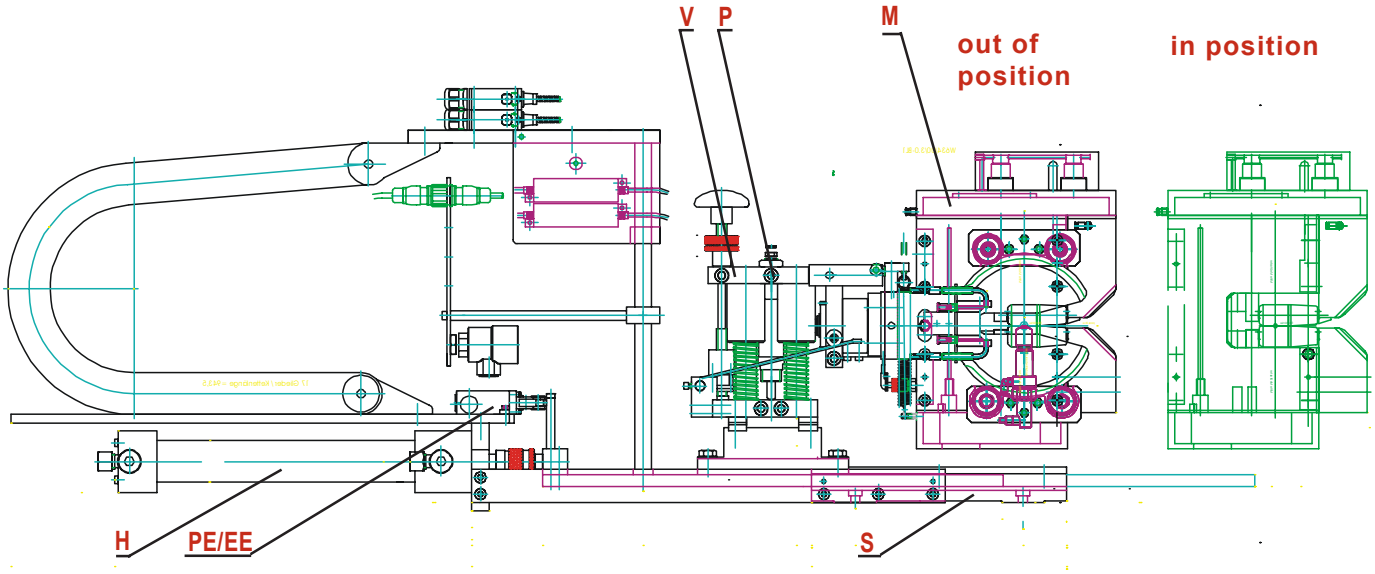
The C-shaped measurement frame in the VBM 565 gauge has an extremely low temperature extension. This leads to an optimum reproducibility of the measurement results. The gauge head is held in the passline by a spring suspended and pneumatically operated vertical guiding. Spring suspended or pneumatically operated guide rolls hold it always parallel to the strip surface. The measurement frame is installed in a measurement module. This module can easily be removed from the gauge head and quickly be replaced by a spare module, thus avoiding downtime on the system.



Longitudinal sectional view of the measurement module: The two thickness measurement transducers (yellow), installed in the measurement frame (blue) are measuring the passing strip (B).

Its special cardanic suspension (ka-device) allows to measure any strip, even with a considerable crossbow, exactly at the selected distance from the strip edge.

The gauge is positioned (i.e. traversed across the strip) by a hydraulic traversing unit (HWSt), controlled by two adjustable light barriers (one on each side of



Lateral view VBM 565 with pV-B: The Gauge head M is suspended by vertical guiding PV. The vertical guiding is traversed in the slidebase S by the hydraulic cylinder H between the rear limit position (out of Position) and the measurement position (in position) on the strip B. During traversing, the pneumatic cylinder P lifts the gauge head up to the passline.

the gauge head). One measures the crossing of the strip edge and stops the traversing at that point. The second light barrier is set back for a little, so that it usually remains open. It serves as a limiter for the measurement depth. If it is actuated when the strip is laterally misplaced, the gauge is automatically pulled back to its rear limit position at double speed.

While the gauge is traversed forwards or backwards, the upper guide rolls are lifted up and the Diamond Lifting Device (DAV) does automatically pull back the transducer rams. This prevents the rolls and the transducer rams from hitting the strip edge during the forward traversing. While the gauge moves back, it prevents the diamonds from clicking together when they cross the strip edge.

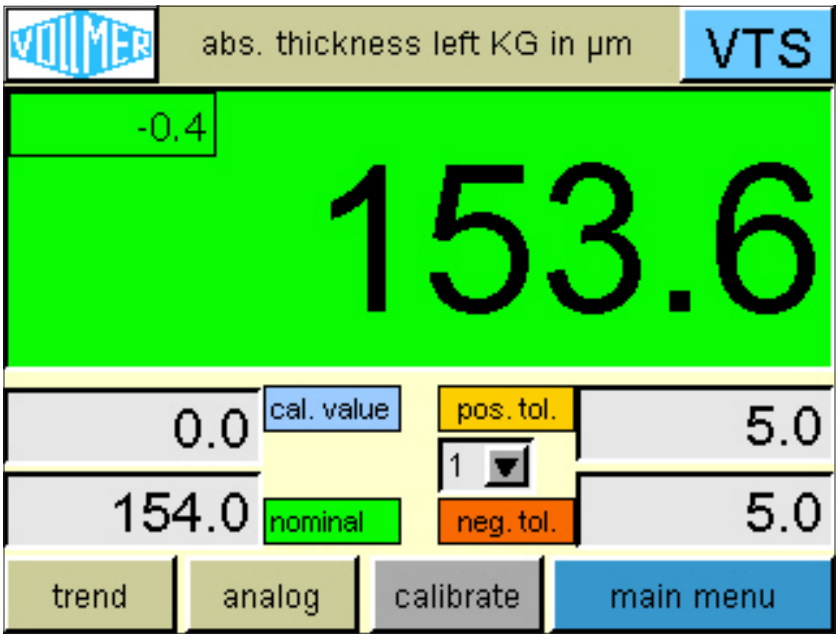
When the gauge is in measurement position, the DAV is automatically switched off, so that the transducer rams are released and contact the strip with the selected measurement pressure. Simultaneously, the pneumatics of the upper guide rolls are pressurized, so that the rolls are pushed down. The rolls hold on to the strip, so that the gauge head inclines to the crossbow and the transducers are measuring perpendicular to the strip surface.

The electronic limit switch EE puts out a signal and to the customer's machine control and to the Vollmer electronics when the gauge is in the rear limit position. This starts the automatic zero setting. The pneumatic limit switch PE automatically switches the DAV off when the gauge is in the rear limit position.

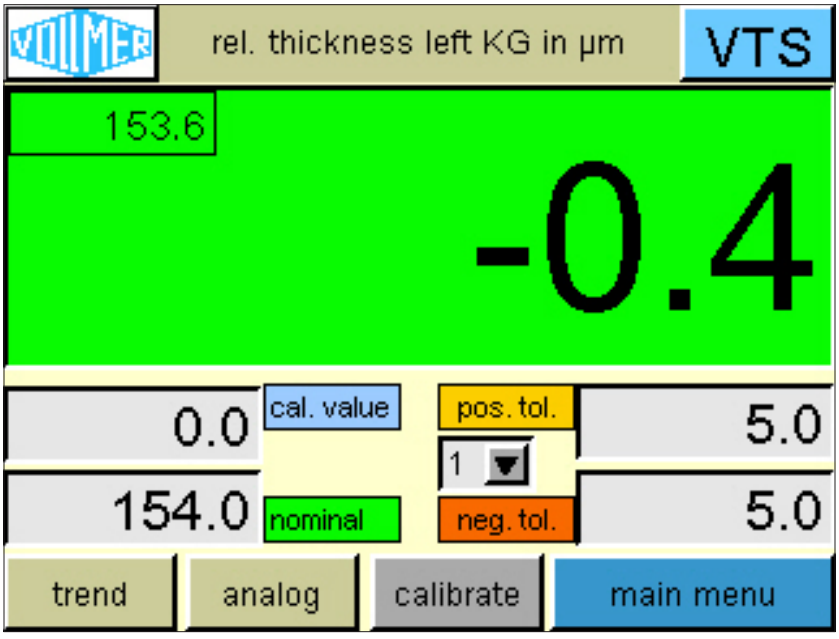
The pushbuttons "Gauge Forward" and "Gauge Backwards" are installed in the operator desk or are displayed on the screen of the optional PC.

System

This gauge is installed with a VTS module. The VTS indicates the measured strip thickness (as absolute thickness or as deviation from nominal size) and if the thickness is in or out of tolerance.



Example for a typical VTS indication: The green background indicates, that the measured thickness is in tolerance. Depending on the application, the Thickness is indicated as absolute thickness (see above) or as difference to the nominal size (relative thickness, see below). The function "reset to zero" is not used during normal operation, since the gauge is automatically set to zero when it is in the rear limit position. "Set to zero" is used when the transducers are reinstalled into the gauge after service.



In addition, the VTS does indicate the nominal size as well as negative and positive tolerances.

Depending on the application, these data are entered via the VTS (**V**ollmer **T**ouch **S**creen) or/and read from an external source via the Profibus or Ethernet.

A separate instruction for the VTS part of the documentation. The separate manual is only mentioned here because this manual refers to on some pages.

Types

VBM 565 E/Su-Dig/VTS/pn/ka/pV-B/T/K/A0/DAV/HWSt300

Meaning of the abbreviations:

VBM 565 E:
Electronic strip thickness gauge for high quality strip on cold rolling mills, measurement depth up to 50 mm from the strip edge.

Su-DIG:
Measurement by 2 transducers in sum (Su); accurate measurement values even in case of strip vibration, digital type transducers (Dig).

VTS:
Vollmer-**T**ouch-**S**creen for the input of nominal size and tolerances, thickness data indication, provides interfaces to external computers of the customer

pn:
The upper guide rolls are pneumatically pushed down onto the strip when the gauge is in On Strip position (measuring position).

ka:
With this cardanic suspension the gauge measures precisely and in the selected distance to the strip edge, even when the strip lies passes in a hollow shape (crossbow)

pV-B:
Pneumatically operated vertical guiding (pV), passline adjustment by pressure variation in the pneumatic cylinder; guiding is installed behind (not beside) the gauge head (B).

T:
Heating elements in the gauge head for keeping a constant temperature, against long-term drift because of heat coming from the strip into the gauge.

K:
Air cooling of the transducer's measurement tips, against short-term drift if the measurement tips are heated by the strip.

A0:
Electronic adjustment system, operating when the gauge is in its rear limit position. The gauge is set to zero. Beside the automatic zero setting in the rear limit position, this procedure can be started during a measurement (option). Then the gauge is traversed back, automatically set to zero, and is then automatically traversed back onto the strip.

DAV:
The diamond measurement tips of the two transducers are pneumatically pulled apart when the gauge is traversed, in order not to damage them at the strip edge. For measurement of wavy or vibrating strip, the measurement pressure can be pneumatically increased to prevent the measurement tips from losing contact to the surface.

HWSt300:
Hydraulic traverse unit consisting of a control unit and a slidebase with roll guiding. The stroke of the hydraulic cylinder is 300 mm

Operation / Measurement

Depending on the application the gauge operates manually, half automatically or automatically controlled. The internal sequences are PLC-controlled.

During manual operation it is most important, to traverse the gauge off the strip before the strip end runs through it. The strip end would severely damage the gauge.

Gauge forward / backward

If in the standard mode (Service 0), the forward command is put out, the gauge is traversed to the measurement position and stops there. When ready to measure, the electronic puts out an enabling signal.

While the gauge is traversed forwards or backwards, the upper guide rolls are lifted up and the Diamond Lifting Device (DAV) does automatically pull back the transducer rams. This prevents the rolls and the transducer rams from hitting the strip edge during the forward traversing. While the gauge moves back, it prevents the diamonds from clicking together when they cross the strip edge.

When the gauge is in measurement position, the DAV is automatically switched off, so that the transducer rams are released and contact the strip with the selected measurement pressure. Simultaneously, the pneumatics of the upper guide rolls are pressurized, so that the rolls are pushed down. The rolls hold on to the strip, so that the gauge head inclines following the crossbow and the transducers are measuring perpendicular to the strip surface.

“Gauge backwards“ traverses the gauge to its rear position immediately, independent of the actual position.

In the "Service I" mode the gauge head can be hydraulically moved back and forward by inching operation. In this mode the compressed air supply is switched off, i.e. the pneumatic guide rolls cannot be closed and the DAV is not operational.

Various electronic interlocks are optionally available to avoid damage. For example a strip tension breakdown may be the trigger for moving back the gauge. Or the gauge moves only on strip and remains there, if a certain rolling speed is exceeded.

Measurement mouth limiter

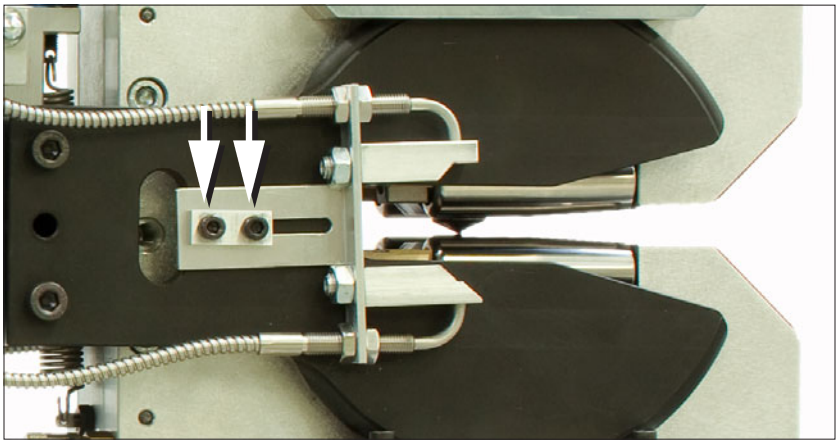
The light barrier on the left side of the gauge is a limiter for the measurement depth. If it is actuated when the strip is laterally misplaced, the gauge is automatically pulled back to its rear limit position at double speed. The position of that light barrier was set at the factory and usually there is no need to readjust it.

Note on Safety: Crushing Hazard !

The gauge must be switched to the "Service I" mode, before somebody goes close to the gauge or starts to work on it. In the "Service I" mode, the gauge will not automatically be moved back when this light barrier is actuated.

To set the measurement position

The two light barriers are adjustable. The one on the right side of the gauge housing (shown below) controls the measurement position, so that the thickness is measured at the intended distance to the strip edge. Once the light beam is interrupted at the crossing of the strip edge, the traversing is stopped.



Light barrier to determine the measurement position: Loosen the two screws (see arrows) and shift the light barrier to the intended position.

Zero check

The gauge sets itself automatically to zero as long as it is in the rear limit position. To check the constancy of the zero, switch the gauge to the "Service I" mode, and then traverse it off the rear limit position for a few centimetres so that the rear limit switch is no longer actuated. The transducer rams remain released since the DAV is not active in this mode and the upper guide rolls will stay up.

Then put a thin piece of material in between the transducer rams and pull it out again. The indication must return to zero (+/- 1µm). If not, check the gauge.

CAUTION !
FOLLOW THE SAFETY INSTRUCTIONS:

FIRST SWITCH THE SERVICE MODE ON!

NOBODY IS ALLOWED CLOSE TO THE GAUGE BEFORE THE OPERATOR CHECKED THAT THE GAUGE DOES ONLY MOVE SLOWLY WHEN THE ON STRIP BUTTON IS PRESSED.

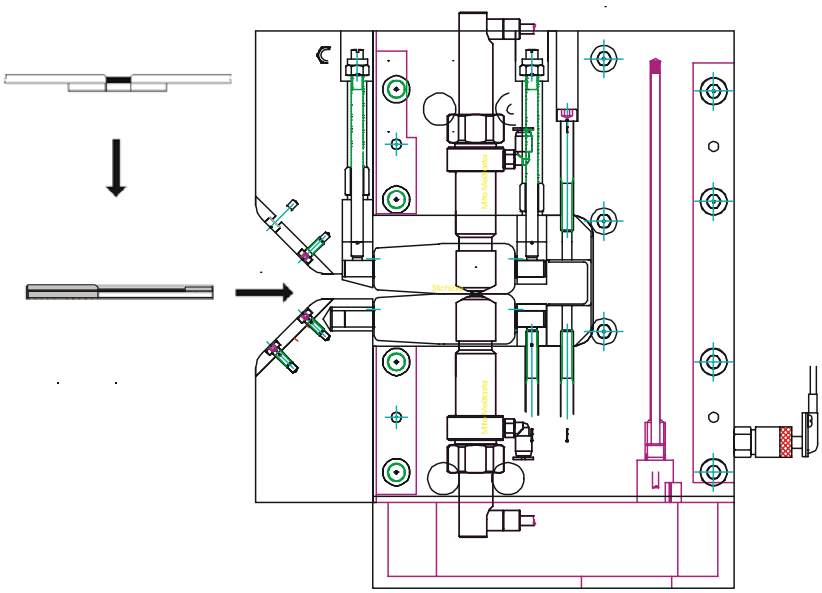
Indication check

If the previous test shows a constant zero, the gauge calibration can be checked with a slip gauge or an adjustment plate with integrated slip gauge (optional addition). This test should be made regularly, especially when rolling with tight tolerances

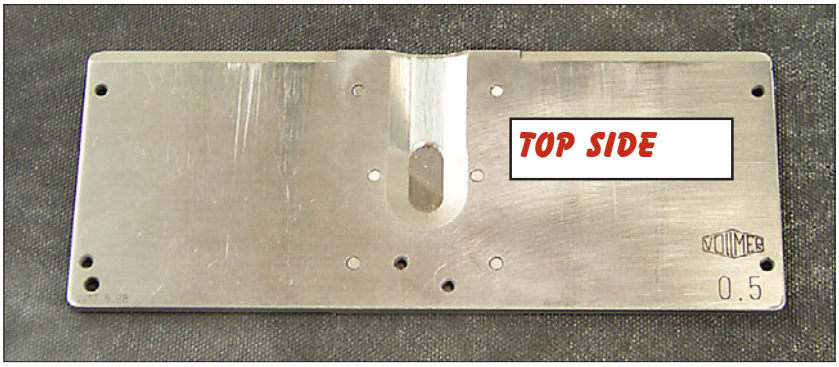
The test step by step:

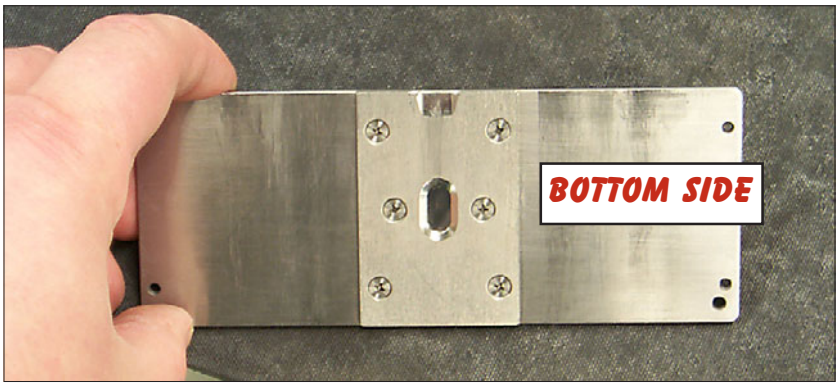
- traverse gauge to rear limit stop
- switch the gauge to mode "Service I"
- check if there is no strip in the mill
- set the thickness of the slip gauge as nominal size
- press "gauge forward", the **gauge must move only slow in inching service.** Traverse the gauge forward far enough to release the rear limit switch, thus avoiding the automatic zero setting.

- insert the slip gauge plate between the guide rolls as shown below



- check indication, it should be very close to zero (+/- 1µm), if not try to move the plate for a little. If necessary, check the entire gauge adjustment
- remove the adjustment plate





Adjustment plate with integrated slip gauge (option): The top side (upper photo) is flush except for the hollow part with the slip gauge. The underside has a screwed on plate in the middle which is holding the slip gauge (lower photo).

Nominal size and tolerance limits

After the zero check, set nominal thickness and tolerances at the VTS or, depending on the application, by an external source via Profibus or Ethernet.

Measurement start and end

Measurement start:

- set nominal thickness and tolerances

- press "gauge forward", the gauge is traversed to the "on strip" position (the upper guide rolls are lifted up and the DAV pulls back the transducer rams, the thickness indication is over 9000µm minus nominal size).

  Once the gauge is in measurement position, the pneumatics of the upper guide rolls are pressurized, so that the rolls are pushed down and hold on to the strip. The DAV is switched off, so that the transducer rams are released and contact the strip with the selected measurement pressure.

  The VTS display indicates how much the strip thickness differs from the nominal size and whether the thickness is in tolerance or not

Measurement end:

- press "gauge backward", the DAV pulls back the transducer rams, the upper guide rolls spring up and the gauge is traversed to the rear limit position.

- at the rear limit position, the DAV is switched off and the gauge is set to zero.

Important note for manually controlled gauges

The gauge must always be traversed off the strip before the strip tension is switched off! The strip end must never pass through the gauge, as it will cause serious damage.

Continuous checking

In between the service intervals, check the gauge regularly for:

Temperature: The heater control is in the electronic cabinet. The heater is automatically controlled so that the gauge head temperature does not change when the gauge is traversed off the strip into the rear limit position. This avoids long term drift of the gauge zero point. The control box indicates the actual temperature in the gauge head. The heater control parameters are set correctly, if the indication remains constant after the gauge was traversed into the rear limit position.

If the temperature goes down in the rear limit position, raise the nominal temperature in small steps. Allow one or two hours for adaptation before trying the next step. The optimum gauge head temperature is close to the temperature of the passing strip, do not set an unnecessary high temperature.

If the temperature goes up in the rear limit position, nominal temperature is set too high. Set it to a lower value.

How to set the nominal temperature:
- push and hold down button K1 > Indication changes from actual to nominal temperature
- turn potentiometer W1 to set new nominal temperature
- release button K1, new nominal temperature is active
- the LED K1 is on when the heater is on, i.e. as long as the actual temperature has not reached the nominal temperature.

The internal heater control parameters were set at the factory. Usually there is no need to change them. Therefore do not touch the potentiometers at the top of the control box. The button K2 is not in use in this application and should not be touched either.

Safety Precautions

Nobody must work on the gauge unless it has been switched into the 'Service I' mode. This mode makes sure, that the gauge will not be automatically traversed and the pneumatic guide rolls will not close unexpectedly (Danger of hand injuries).

Caution: Crushing hazard ! Never traverse the gauge as long as somebody is in the danger zone ! The hydraulic cylinder which is traversing the gauge has great power. If the gauge is in the normal operation mode (Service 0), the hydraulic cylinder may push the gauge uncontrollably fast and powerful and back or forth to the limit position. This motion can only be stopped by the "Emergency Stop" button.

Accuracy check with slip gauge: Set the gauge to the nominal size of the slip gauge, and insert the adjustment plate with integrated slip gauge. The indication should be zero. For tight tolerances, check daily (otherwise weekly).

Guide rolls: Check for easy motion (up/down and rotation).

Passline: Check the correct height of the gauge to the strip

Transducer lifting device: When the gauge is traversing, the thickness indication must be over 9000µm minus nominal size. This is a secure indication, that both of the transducers rams are fully pulled in. If not, check the easy motion of the transducer rams, then the compressed air pipes and the working pressure of the DAV.

To check the DAV function

Check the DAV for proper function after the module was inserted. Connect the pneumatics and - before traversing the gauge on strip for the first time - check, if the DAV fully pulls in both transducer rams.

Lift the upper guide rolls and put a thin plate onto the lower guide rolls. The underside of this plate forms the passline. The ram of the lower transducer must be about 2mm (0,08") below the plate when the DAV is active. If the ram protrudes too much, e.g. because the transducer was installed too high or because DAV is not connected, the transducer will get damaged at the first attempt when the gauge is traversed on strip

Pneumatics

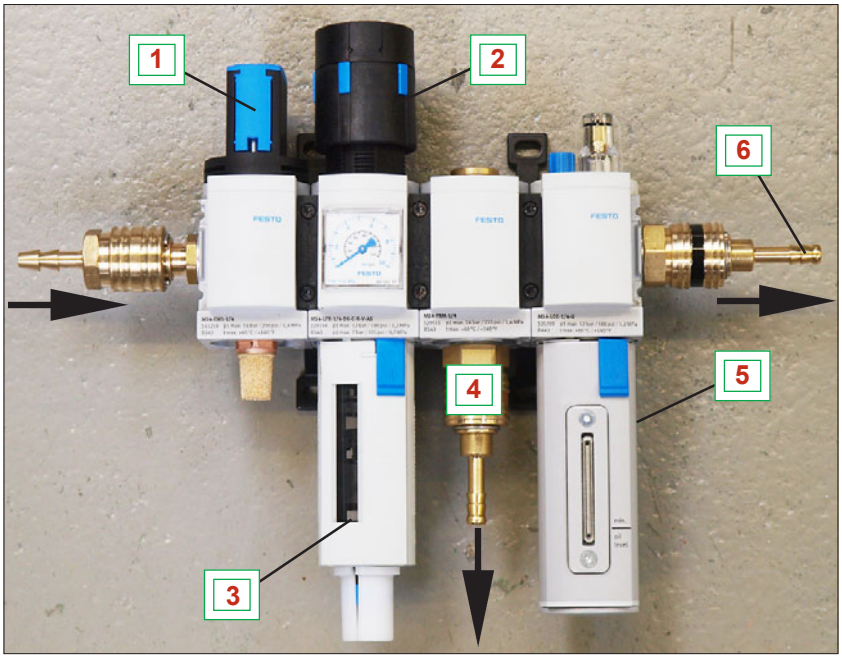
Note

If the gauge has a pneumatic box at the top of the gauge, all of the pneumatic valves are in that cabinet.

If the gauge has a separate pneumatic cabinet instead of the box on the gauge, then the valves for the pneumatic measurement pressure enhancement are installed at the rear of the gauge.

The compressed air from the local compressed air supply is fed into the system via a pneumatic reducing and filter station (service unit).

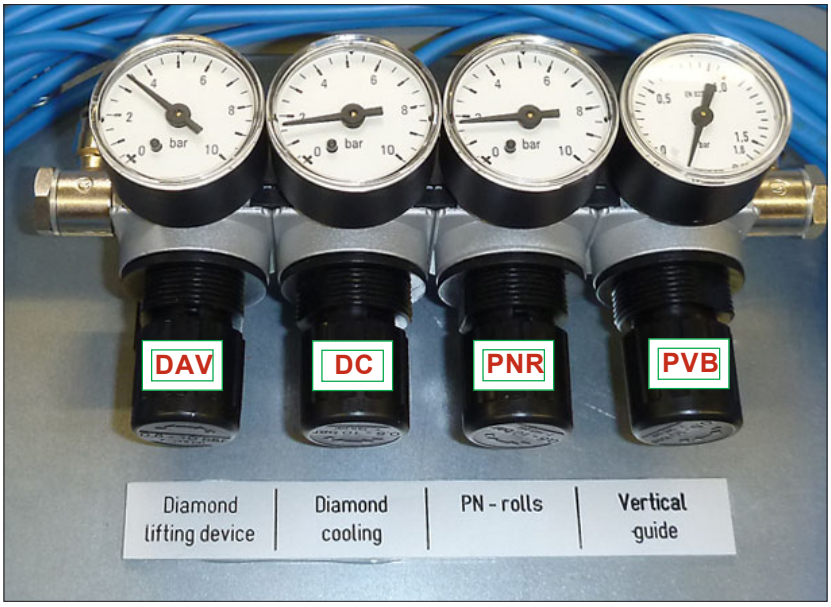
Compressed air quality requirements:
- supply pressure at least 5 bar
- compressed air quality according to DIN ISO 8572-1:
  hard substances grade 4 = max. 40µm, particle density <10 mg/m3
  water content grade 5 = 9,4 g/m3 at 10 C°
  oil content grade 4 = oil content < 5 mg/m3



Pneumatic service unit: 1= Lock and bleed valve (to depressurize the gauge), 2 = working pressure adjustment valve, 3 = separator with automatic condensate discharge, 4 = output of dry compressed air, not oiled, 5 = oiler (not required on all gauges) , 6 = output of oiled compressed air

- automatic discharge of the condensate
- use only oil according to ISO 3448, viscosity 32cSt at 40°C (e.g. MOBIL DTE24 or similar).

Max. consumption of compressed air: < 7m³/h



Left: Pneumatic valves in the electronic cabinet of the VBM 565. Right: Connector plate at the rear of the gauge with valve to set the pneumatically enhanced measurement pressure.

Compressed air supply: Permanent pressure for the entire gauge is set to 5 bar at the service unit (see previous page).

Diamond lifting device (DAV): The DAV requires a supply pressure of 3.5 bar.

Measurement pressure enhancement MD: The pneumatic measurement pressure enhancement is in common for both transducers at the valve at the rear of the gauge. A typical setting is 0.2 bar. Adjust this pressure to the individual requirements. If the measurement data records show sudden peaks, increase the pressure, if the strip is marked, reduce the pressure. In order to extend the life of the measurement diamonds, it is recommended to set the pneumatic measurement pressure enhancement as low as possible.

.

Diamond cooling (DC): Working pressure is 0.5 to 2 bar. Select appropriate pressure to avoid short-term drift (see "Trouble Shooting")

Pneumatic guide rolls (PNR): Working pressure is 3 to 5 bar - depending on the strip material.

Pneumatic vertical guiding (PVB): Depending on the suspension spring pressure the vertical guiding requires a pressure between 0.5 and 1 bar to lift the gauge so that it floats in the passline. Adjust the spring pressure in such a way that the pneumatic cylinder does not require a working pressure of more than 2 bar to lift the gauge head up to the passline. If the pneumatic pressure is too high, the suspension would not flexible

enough for the gauge head to follow strip movements easily. Select appropriate pressure to avoid strip marking by the rolls. The working pressure for the PVB needs to be set the lower the thinner the strip is. The lower guide rolls must always run, driven by the strip.

Pneumatic damping of the DAV

The diamond lifting device (DAV) pulls the ram into the transducer housing against the force of the measurement spring. When the vacuum is switched off, the spring presses the ram out of the housing and if the pneumatic measurement force enhancement is switched on, the ram is pushed out harder.

If the measurement diamonds of the two rams click together too hard, this might result in cracked measurement tips. In order to avoid damage, this motion is damped by a nozzle (diameter 0,3mm) in the DAV connector.

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 at the same distance from the edge as the transducers have measured.
⇨ Check the strip thickness at correct edge distance

❍ Transducers dirty ?
In a very dirty environment, the rams of the transducers 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, any transducer ram should slide easy in its bushing or bearing for a quite long period of time.
⇨ Increase cleaning frequency

❍ Transducers clamped too hard?
If the clamp screws in the C-frame are tightened too hard, they possibly distort the transducer housing which increases the friction in the ram guiding.
⇨ Loosen the clamp screw and re-tighten with moderate force

❍ Oil in the DAV-tube?
The oil increases the friction of the ram guide bushing or ball bearing. In that case the transducers cannot continuously keep contact to a vibrating strip. The measurement then indicates “too thick”. Oil in the tube does choke the diamond lifting when the tube is partly filled.
⇨ Remove the module from the gauge, remove transducers, pull off the tubes and blow the clean with compressed air, clean the transducers and improve the quality of the compressed air .

❍ Gauge zero not constant?
If the screws, which connect the measurement tip with the guide ram, are not tight, the measurement ram might move against the guide ram. If, for example, DAV was activated or material was placed between the transducers and then removed, the zero point changes. The indication is incorrect even if the symmetry is correct.
⇨ Fasten the grub screws in the guide ram (see transducer manual)

❍ Long-term drift of the zero point?
An integrated heater heats the gauge so that the temperature does not change whether the gauge is measuring or not. The temperature control should be adjusted so that the gauge always keeps the same temperature when it is moved off the strip or when the measurement starts after a long stop. The temperature should not drift for more than 2°C degrees.

❍ Short-term drift of zero point?
Can be noticed, if the rolling has been finished and the gauge in its rear position is directly moved set to nominal size zero without pushing A0

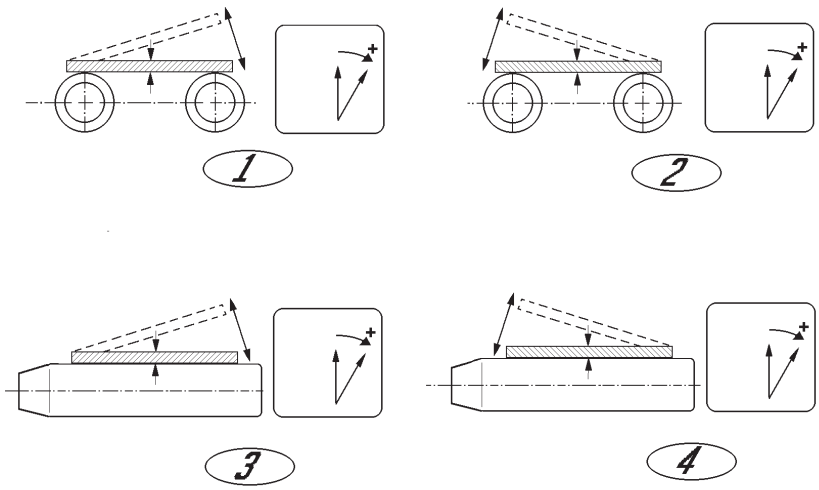
and with the gauge in the "service I" mode. If then the indication drifts away to + or -,the cooling of the diamonds does not work correctly. Check, if the compressed air supply is correctly connected. Readjust the cooling at the 'pneumatic diamond cooling' valve in the pneumatic cabinet.

⇨ Connect the air supply correctly or adjust air pressure
(if the display drifts away to minus - increase cooling,
if the display drifts away to plus - reduce it).

❍ Indication wrong?
If the fine thread of the upper transducer is defective or worn, the nominal size setting is disturbed.

⇨ Readjust the transducer positions and clamp moderately tighter

❍ Indication too large?
Put an adjustment plate onto the lower guide rolls and set the gauge to zero. Tip the plate it to both sides as well as forward and backward. The indication should deflect only towards +. If not,



Note

Set the gauge to the mode "Service I", before performing this test. This makes sure that the gauge will not traverse unexpectedly and the upper guide rolls are depressurized. In addition, it is necessary to traverse the gauge off the rear limit position, so that the automatic zero setting is switched off.

⇨ check the complete gauge (measurement tips for wear, C-frame for 90° position and C-frame distortion). For your convenience, 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 (see picture under 'Measurement / Indication Check'.

❍ Indication too large?
After strip breaking or when the strip end passed through the gauge, the C-frame might possibly got bent. The indication is too high. Check as before and

⇨ check the alignment of transducer clamping bores with a 20 mm inspection pin.

If the gauge marks the strip ?

❍ Diamond with small cracks ?
If hit too hard, the diamonds in the transducer measurement tips might get tiny ring-shaped cracks, which are hardly visible. Sometimes such cracks mark the strip
⇨ Replace the measurement tip

❍ Diamond broken out?
In case of strip breaking a diamonds might break out of a transducer measurement tip.
⇨ Replace the measurement tip

❍ Roll blocked ?
⇨ Replace the roll. If the roll surface is not damaged, replace only the bearings.

❍ Working pressure guide rolls set too high ?
Might cause slight marking on extremely soft strip material.
⇨ reduce working pressure

❍ Working pressure of vertical guiding set too high ?
Might cause slight marking on extremely soft strip material.
⇨ reduce working pressure as far as possible, but the lower rolls must always be driven by the strip

Maintenance

The thickness gauge does not need much maintenance. Only the measurement tips with the diamonds and the guide rolls are subject to wear. The gauge requires regular cleaning to avoid firm dirt deposits which might block movable parts.

For servicing, replace the measurement module by the spare module. Then the rolling can be continued after a short check while the service department has sufficient time to check and to clean the other module.

Safety Precautions

Nobody must work on the gauge unless it has been switched into the 'Service I' mode. This mode makes sure, that the gauge will not be automatically traversed and the pneumatic guide rolls will not close unexpectedly.

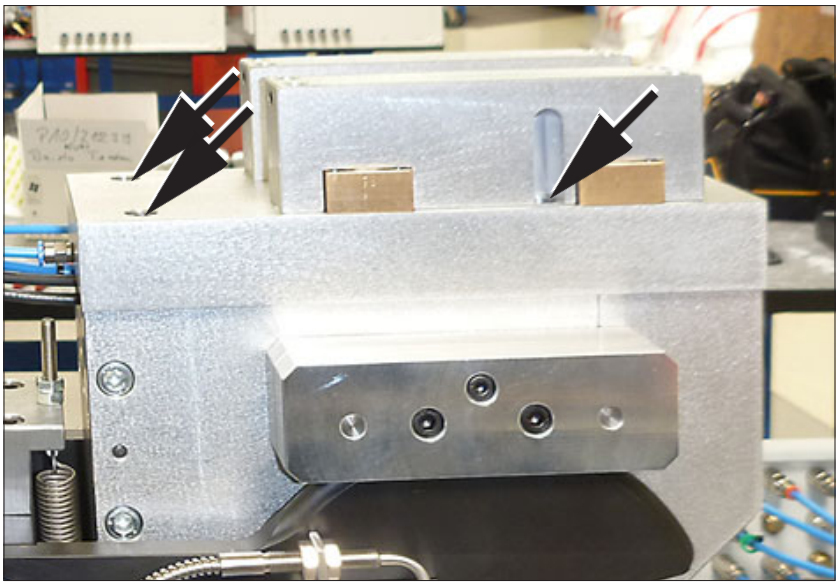
Caution: Crushing hazard ! Never traverse the gauge as long as somebody is in the danger zone !

Module replacement

For most of the service activities it is sufficient to remove only the module.

Important Note !

First disconnect the power supply for the measurement electronics, then remove or install a transducer. Otherwise the electronics might get damaged and the counter might put out erratic pulses when the transducer connectors are life plugged or unplugged.



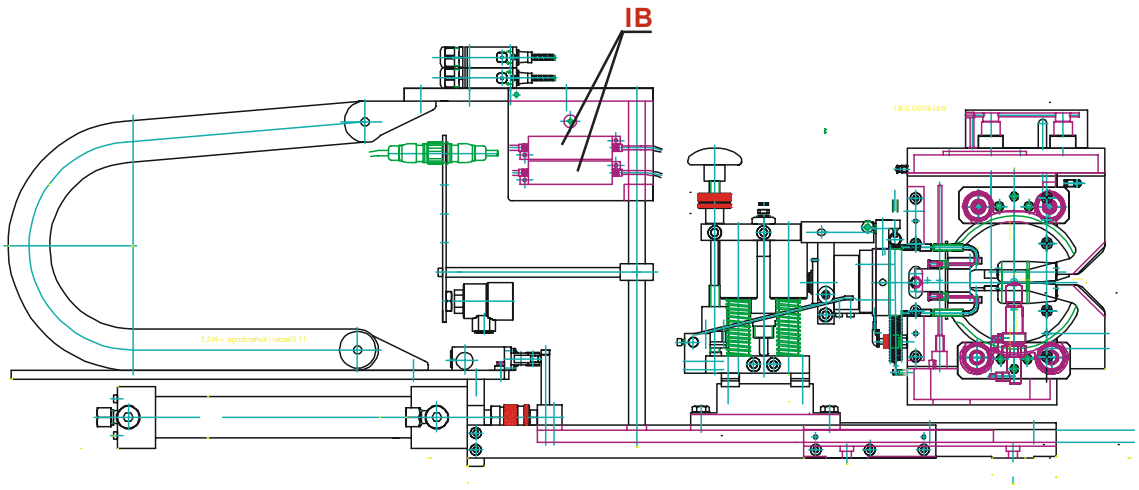
The photo shows three of four fastening bolts (see arrows) of the gauge cover. The fourth bolt is in the groove on the opposite side.

Undo the four bolts from the top of the gauge cover by a hexagonal socket wrench with ball head. Then remove the cover.

The cables from the transducers to the counter boxes IB are long enough o allow to put the measurement module on top of the gauge head. To remove the module (for replacement or servicing), the cables and the counter boxes need to be removed with it.

Note

The support surfaces for the measurement module need to be clean. Always, clean those surfaces in the gauge housing before inserting the module.



That means to undo the cables and the counter boxes and then to disconnect the plugs at the connector plate. Hold the module by the jack ring, lift it off the gauge housing and disconnect the pneumatic tubes at the module.

Check the underside of the module and the module bed in the housing for dirt deposits and clean thoroughly if necessary. The module needs to rest well set in the housing without any play or wobbling.

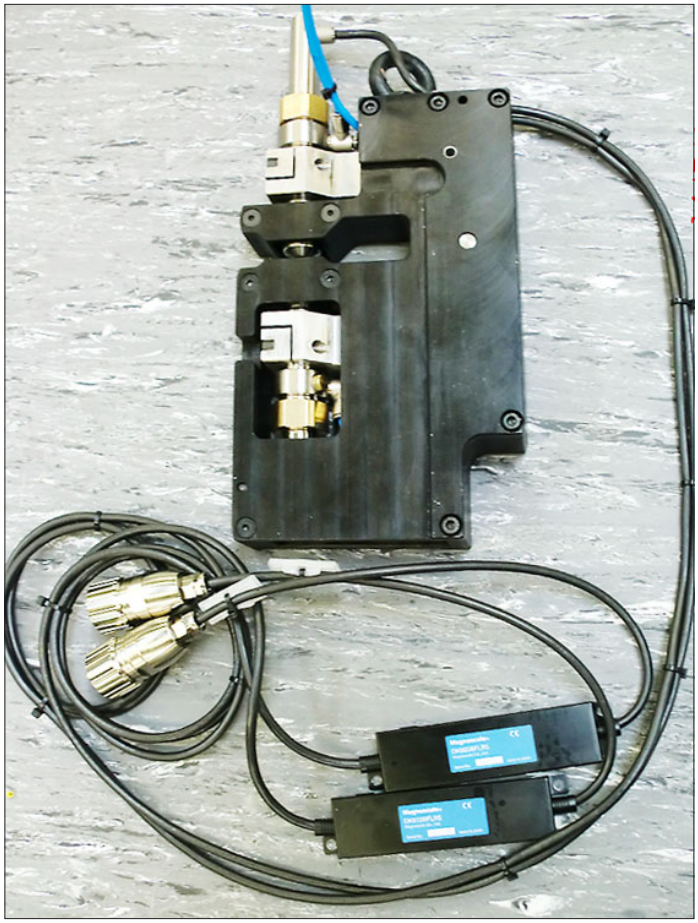
Then connect the pneumatic tubes to the spare module and insert it into the gauge housing. Afterwards fasten the transducer cables and the counter boxes and connect the transducer plugs at the connector plate.

AVOID DAMAGE:

CHECK THE POSITION OF THE LOWER TRANSDUCER BEFORE STARTING THE FIRST MEASUREMENT !

Check the DAV for proper function after the module was inserted (see under "To check the DAV function").

Finally traverse the gauge to the rear limit position and switch it to the "Service 0" mode.



VBM 565 spare module with transducers: Each transducer with cable and counter box forms a unit which can only be replaced as a whole.

Now the gauge is ready for measurement.

Servicing in general

At least the following points must be checked regularly, even if measurement results are correct.

Guide rolls

❍ Clearance?
The rolls have to move freely. They should have only little axial clearance. Blocking rolls mark the strip.
⇨ Replace defective rolls

❍ Deposits on the surface?
Some strip materials tend to leave deposits on the rolls. They cannot run smooth and might mark the strip.
⇨ Replace rolls (rework if possible)

❍ Roll support defective?
The upper guide rolls can be shifted up/down in a sliding guide. On strip, the pneumatic guide rolls are pressed down. Check regularly, if the upper guide rolls move up to their mechanical limit stop when the compressed air is switched off (in the rear limit position).

Check the lower guide rolls for parallel alignment by means of a flat plate. The plate indicates if the rolls are parallel or not. Damage of the roll support happens very rarely, sometimes after heavy strip breaking.
⇨ Replace and or adjust (see under "Repairs").

C-frame

❍ Easy movable?
The C-frame might get stuck because of large dirt deposits in the gauge mechanics. The front of the C-frame must rest against its bottom limit stop. In that position, the adjustment pin must slide easily into the adjustment hole on the right hand side of the module. Without adjustment pin, try to lift the front of the C-frame. It should have 1-2 mm clearance. If not,
⇨ Clean the gauge, adjust

Gauge cleaning

For cleaning based on e regular schedule, remove the module from the gauge head. Wipe all parts clean with lint-free cloths but do not use aggressive solvents. This is to avoid dirt deposits which might block movable parts. Do not use aggressive degreasing agents, since those will harden such deposits which are not completely removed and then might disturb the mechanics of the gauge. In addition, such agents and solvents may damage the transducers or other electronic parts. When cleaning the gauge housing, the main target is to remove dirt deposits and deposits of emulsion from the module bed. The tracks and the grooved rolls of the ka-device need to be free of deposits as well.

To open the module / To remove the transducers

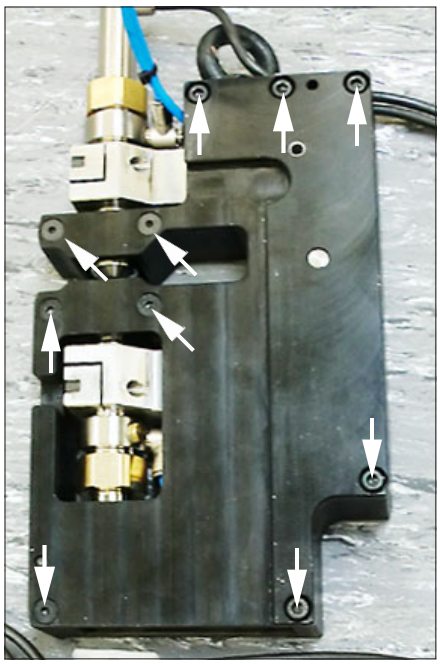
The transducers need only to be removed if they have to be serviced themselves, or if the module has to be taken apart. Put the module in the supplied wooden holding, loosen the clamp screw holding each transducer and pull the transducers off the measurement frame.

Important Note

Do not remove the left side panel of the module. If this cannot be avoided, always remove only one side panel at a time. Before loosening the screws of the second panel, reassemble the housing, so that the remaining parts guide the reassembled parts into their position. If both side panels are loose at the same time, the alignment bores in the module housing and the measurement frame become useless.

To remove the right hand side panel as shown here, undo the 10 hexagonal socket bolts (see arrows) and then carefully remove the side panel.

The loosen the two clamp screws at the front end of the arms of the C-frame and pull out the transducers.



To check the transducer alignment

If there was any wrong measurement result, e.g. after a strip break, the alignment of the transducer clamps should be checked with a 20mm inspection bolt (available from Vollmer). It must slide easily through the two clamps. If not, have the C-frame aligned at Vollmer, or replace it.

Note

For realignment or replacement of the C-frame, send the entire module to the Vollmer company. Do not make own repair attempts before.

Transducer check

This is just a basic check of the transducer function. Please read the separate transducer service manual for service and repair.

- Ram easy movable ?
  The transducer rams must be easy to be pushed in and spring back immediately.

- 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 transducers and check the measurement tips:

❍ Diamonds worn?
The diamonds 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

To install the transducers

This gauge has a measurement module which is lifted out of the gauge head for servicing, such as cleaning or replacing the transducer measurement tips. This means, the transducers are installed without having the guide rollers forming the passline level which is needed to position the lower transducer. An adjustment plate is used instead. This plate is inserted into the measurement mouth of the module.

The digital transducers (type Dig) have an extended stroke, the lower transducer 4.5mm (appr. 0.18") and the upper transducer 9.5mm (appr 0.37"). This allows to measure strip up to 7mm (appr. 0.27") thickness without the standard installation comprising a mechanical adjustment of the upper transducer. Therefore this design has no stepper motor and no gear and drive shaft. A VTS unit or a computer with the optional software VGraph or VRecoS is used instead of the standard VMF amplifier.

In order to indicate the measurement data of the single transducers separately, select the option "Gauge Overview" or " switch the VRecoS to the "Service" mode. VGraph offers this function under "Mill2Graph" (for details see the corresponding manual: VTS, VRecoS or VGraph). However, the selection of the single transducer data display is not required when following the instructions in this manual.

Important issues regarding digital transducer installation

To points are especially important for the installation of Dx transducers:

1. First disconnect the power supply for the measurement electronics, then remove or install a transducer. Otherwise the electronics might get damaged and the counter might put out erratic pulses when the transducer connectors are life plugged or unplugged.

2. The lower transducer needs to have 2mm reserve stroke below the passline. Reason: The ram of the lower transducer must be able to dive below the passline, so that it is not damaged when the gauge is traversed on strip.

3. When the ram of the lower transducer is pushed down well below the passline, the upper transducer ram must follow without losing contact between the two measurement diamonds. Reason: If the upper ram cannot follow the lower one, but lifts off from the lower ram, the gauge would indicate wrong strip thickness data.

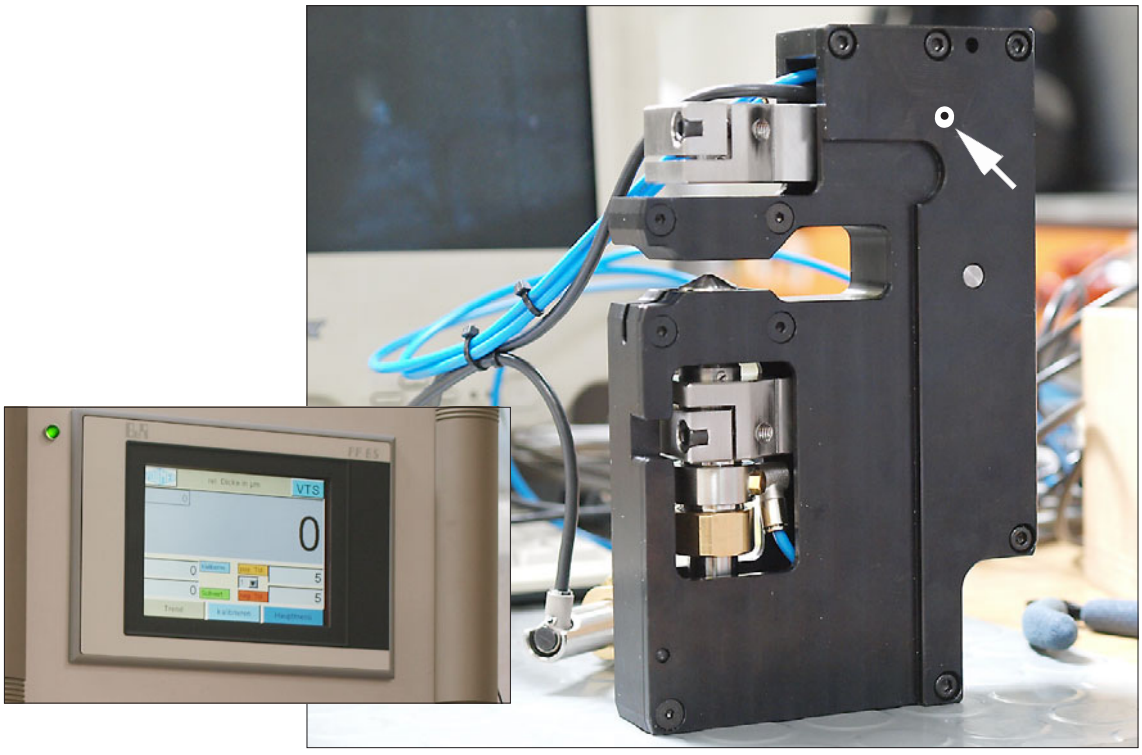
First connect the transducers: First switch off the power supply for the measurement electronics, then connect the two transducers. They both need to stay connected until they are correctly positioned in the C-frame. Reason: The counter will loose its zero when it is disconnected. However, after the two transducers were correctly positioned, the power can be switched off and then the module can be disconnected from the VTS or from the PC.

To check the stroke of the transducers : Put the transducers into a position where their rams are released. Then set the indicator in such a way that it shows the sum data of the two transducers. Set the indication to zero.

Now push the ram of the transducers in - only one at a time - and check the indication (mod. 805 approx. 4,5mm ; mod 810/812 approx. 9,5mm)

To install the lower transducer (4,5mm stroke): Insert the lower transducer carefully into the bottom clamp hole of the C-frame, with the cable entrance and the DAV connector pointing backwards.

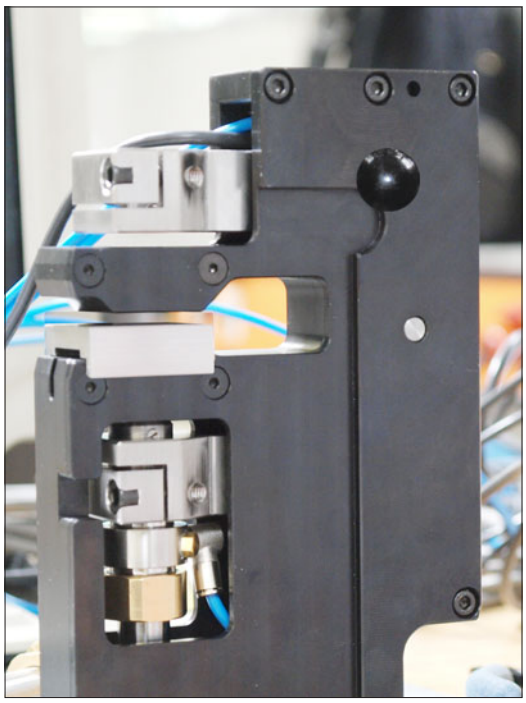
Reassemble the module side panel: Put on the removed side panel, check if the bearing bolt of the C-frame fits into the hole in the side panel.



VBM 565 module: The lower transducer is loose inserted into the C-frame, the upper transducer lies aside. VTS indication is zero. The arrow marks the bore for the adjustment pin.

Insert the adjustment pin (that came with the gauge) into the adjustment hole in order to lock the measurement frame. Then insert the alignment block with the step pointing downwards into the mouth of the module.

Left: Adjustment pin to lock the C-frame in the 90°-position.



Right: VBM 565 module with adjustment pin and alignment block, the steps are on the underside.

To install the lower transducer (4,5mm stroke): Insert the transducer carefully into the bottom clamp hole of the C-frame. The alignment block simulates the passline (strip underside). Clamp the transducer with moderate force when the indication is approx. 2500µm.

Set the indication to zero.

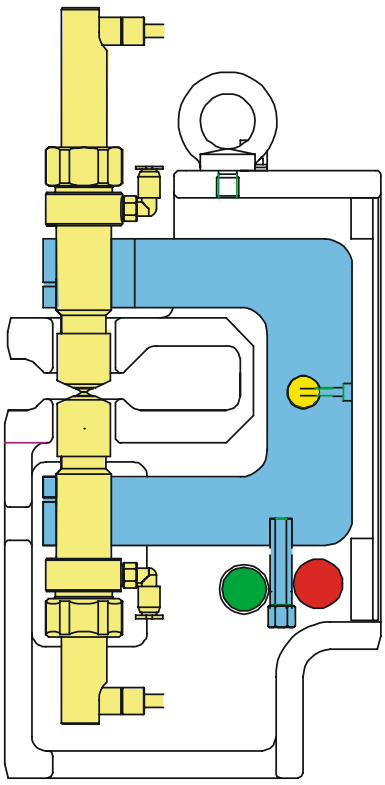
Then **remove the alignment block** (indication will change to minus 2500µm) and insert the **upper transducer (approx. 9.5mm stroke)** into its clamp hole in the C-frame

Now **push the upper transducer down in position.** Clamp it with moderate force when the indication is approx. +2000µm.

Set the indication to zero and **check the gauge zero**. Insert a thin piece of material between the transducer tips and pull it out again. The indication must return to zero (+/- 1µm).

Repairs

To replace the C-frame bearings



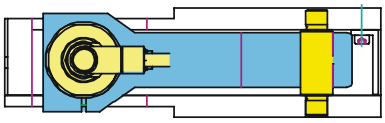
Open the module as described before. Now the C-frame (blue) is freely accessible. The remove the transducers (yellow).

The C-frame is resting on a rod (yellow). This rod might get bent under extreme overload, and then it needs to be replaced. To do so, remove the bolt from the rear side and then carefully pull the rod off the C-frame. Insert the new rod and fasten it with the screw. Clean C-frame, bearing and all module parts thoroughly with a non-corrosive solvent and dry with compressed air.

After reinstalling of the C-frame, insert the removed side panel and tighten the 10 fastening bolts. Put the module upright. The C-frame must not have any considerable lateral play. If so, put appropriate spacer washers between the bearing bolt and the side panels. However, the easy motion of the C-frame is first priority.

Afterwards the transducers need to be positioned (see under "To install the transducers").

90°-position of the C-frame



The rotation of the C-frame is limited by two eccentric bolts red and green in the sketch on the right). The rear bolt (red) holds the C-frame in a position, where the transducers stand perpendicular to the strip surface. This is the so-called 90°-position. For servicing, the 90°-position is induced by the inspection pin mentioned before.

The green bolt forms a limit stop for the upward rotation of the front end of the C-frame. This limit stop is firm. It allows the front end of C-frame to go up for 1-2mm from the 90°-position. The eccentric bolt for the 90°-position was set at the factory. The set screw of this eccentric bolt (see arrow) should not be altered.

To replace the guide rolls

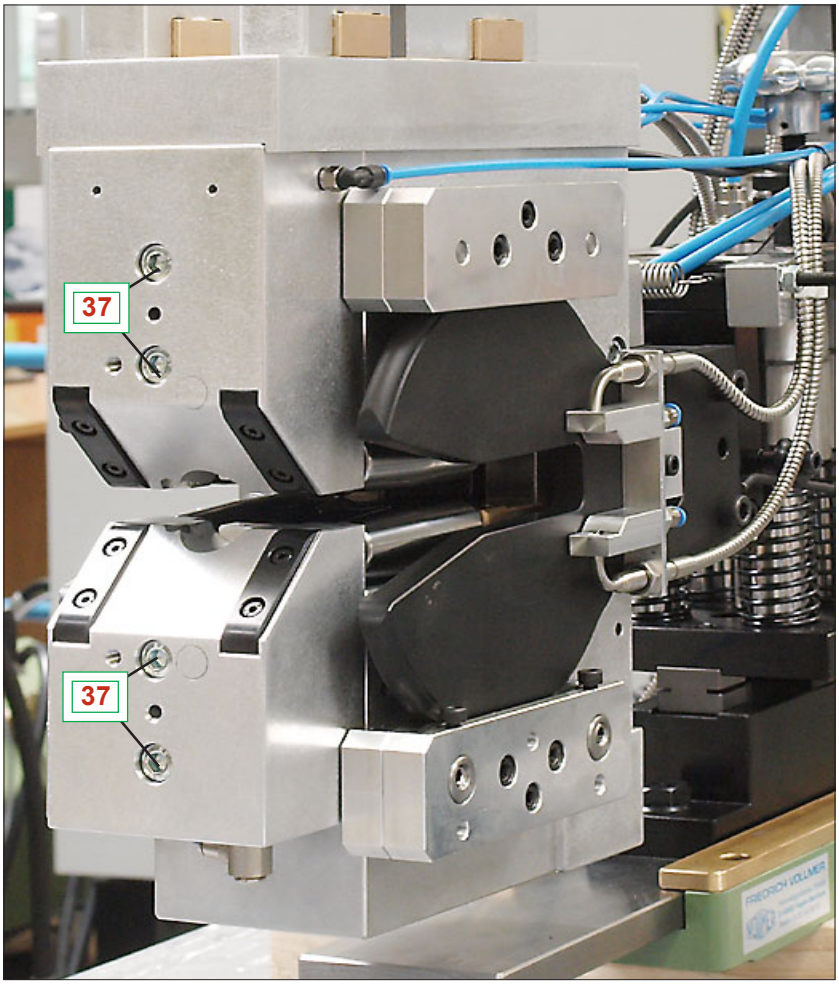
Remove the two screws 37 each and then take off the roll support.

Now the guide rolls can be pulled of the rear brass bearings.

When reinstalling the new rolls, insert them with the bigger end towards the rear. Use the adjustment plate which was supplied with the gauge to check if the rolls are parallel. The plate must contact them over its entire width, so that in cannot be tilted. If there is any wobbling, remove the rear bearing blocks and adjust their position by putting a spacer washer underneath or by grinding off a little from their bottom side.

The upper rolls need to stand parallel as well (view light gap when they contact the lower rolls).

The roll motion is mechanically synchronized. The roll alignment was set at the factory by means of spacer washers on the piston extensions. Damage of the roll support occurs only very rarely.

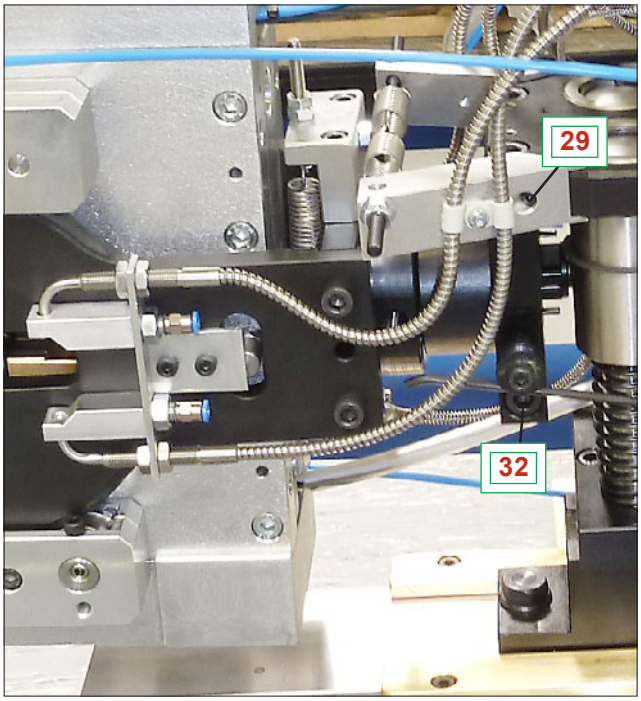


To remove the gauge head

First disconnect all connectors at the connector plate and pull the connectors off the plate.

Then remove the screws 29 from both sides of the gauge and pull the holding arms off the vertical guiding..

Finally loosen the clamp screw 32 and pull the entire gauge with the rotary bearing off the clamp.

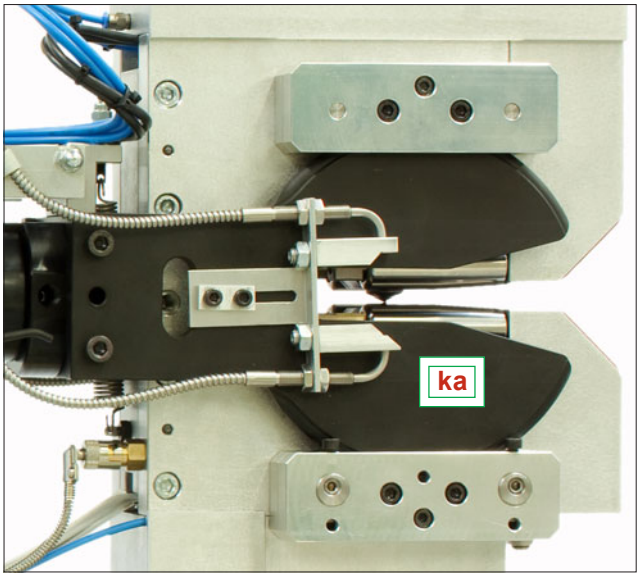


To remove the ka-device

Remove the lid (as previously described) and remove the ka-device, before the gauge housing can be disassembled.

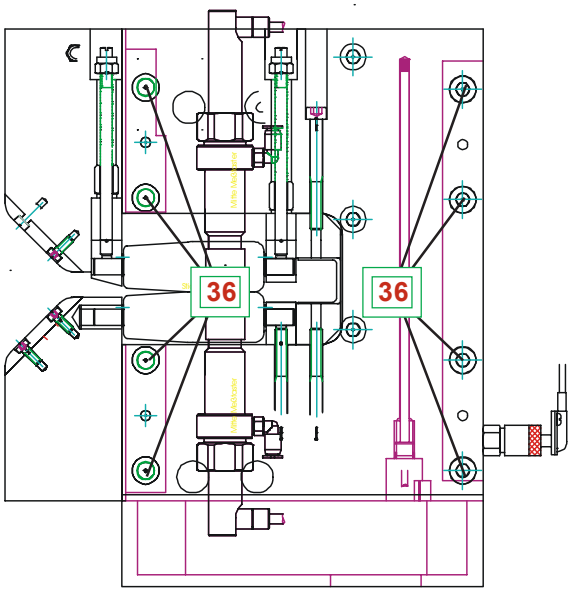
First loosen the two lock screws 6, then turn the eccentric bolts 5 in order to loosen the clamping of the ka-device. Now undo the three bolts 26 and remove the lower ka-bearing with the notched rolls.

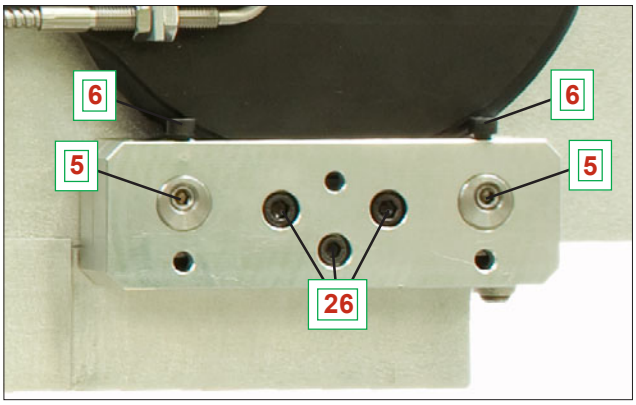
Do the same on the opposite side. Now the gauge housing is freely accessible.



To disassemble the gauge housing

Always remove only the right hand side of the housing (as shown in the sketch below). Undo the eight screws 36 and lift the side panel off the housing.



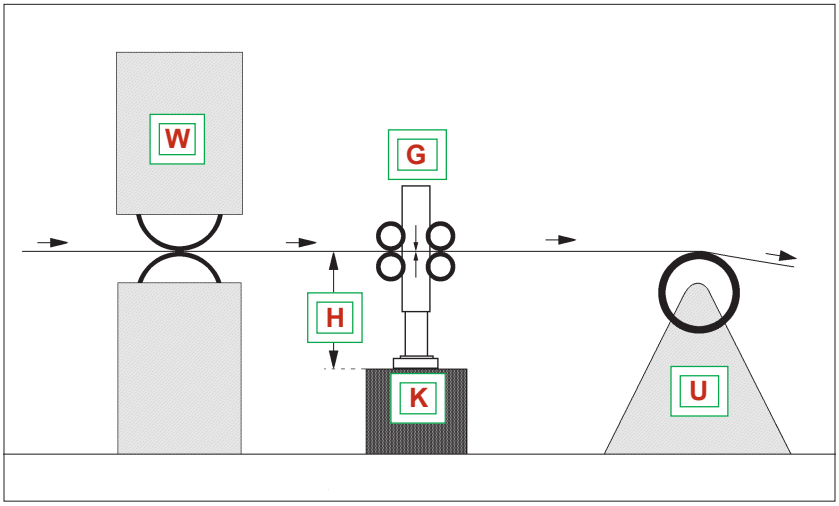


Suspension, Installation, Gauge Head Alignment

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:



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

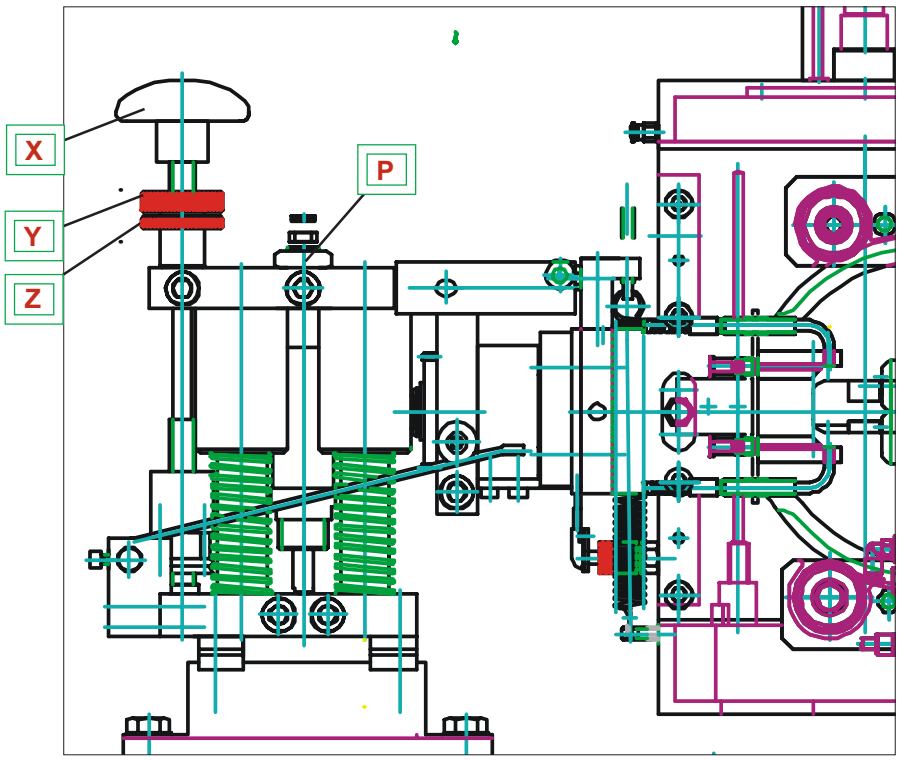
Suspension and Passline adjustment

The gauge is suspended by pressure springs in the vertical guiding which push it up. The spring load was set at the factory. In addition, the pneumatic cylinder in the vertical guiding compensates for the rest of the gauge weight, depending on the set pneumatic pressure. Adjust the pressure in such a way, that the bottom guide rolls are just turned by the strip when the gauge is moved onto the strip. The strip should pull the gauge down only for a little.

The upper limit stop of the vertical guide should be set to a position where the lower guide rolls touch the strip edge with the lower third of their slope. Loosen lock nut Y and turn nut Z to adjust the gauge head to an appropriate height. Then re-tighten lock nut Y.

The large aluminium knob X is used to set the tension of the suspension springs. The suspension should push the gauge head against the upper limit stop of the vertical guide, but not too hard, so that the strip is not considerably lifted by the gauge head. In that case reduce the suspension load. It is set correctly, when the gauge head is slightly lowered by the strip when it is forwarded to the measurement position. During measurement, the gauge head should float slightly below the limit stop Z.. When measuring very thin strip, the bottom limit stop might be lowered a little, so that the lower guide rolls put less load to the strip. However, the height must not be reduced too far. The lower guide rolls must be permanently driven by the passing strip.

The working pressure of the pneumatic cylinder should not exceed 1 bar, in order to ensure that the gauge is able to follow the strip movements soft enough. Adjust pressure spring and pneumatic pressure in such a way, that the gauge head does not swing up and down to much.

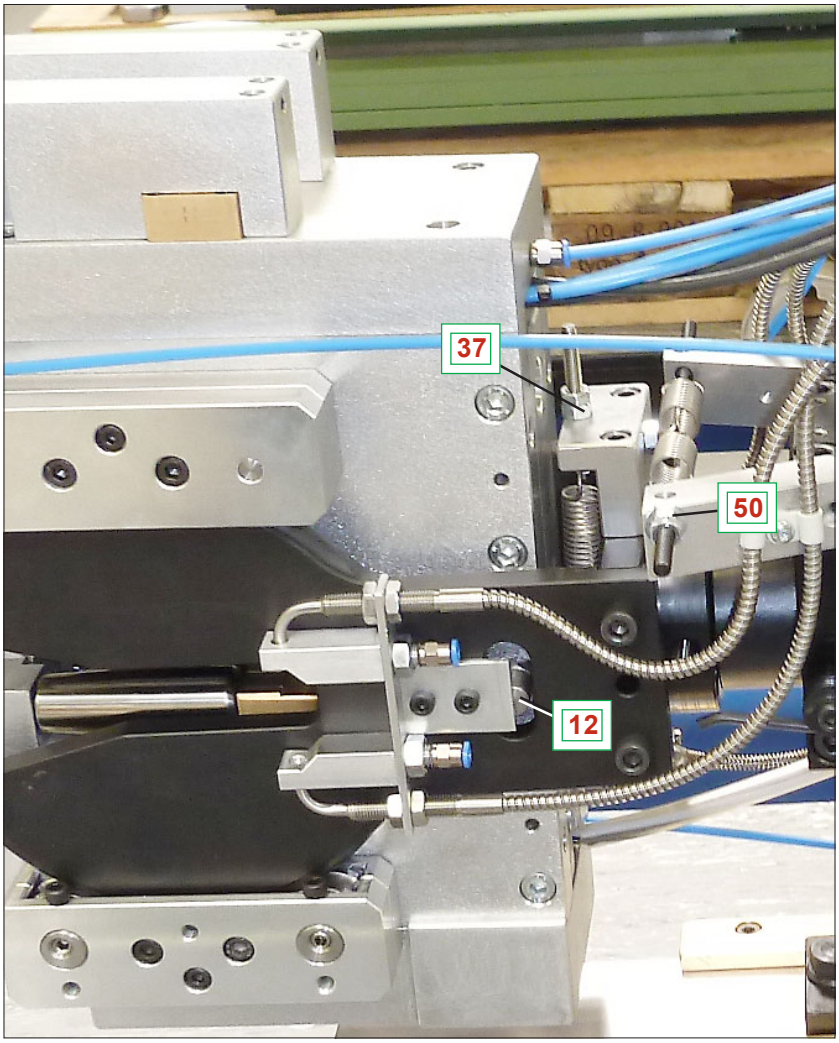


Inclination of the gauge head

The gauge with „pn/ka“ has pneumatically operated guide rolls which hold on to the strip and align the gauge head within the spring suspension of the ka-device, so that the measurement transducers do always stand perpendicular to the strip surface.

This special ka-device has the center of the gauge head rotation exactly in the measurement spot between the two transducers. This allows to measure always in the same distance to the strip edge, even on strip with a considerable crossbow.

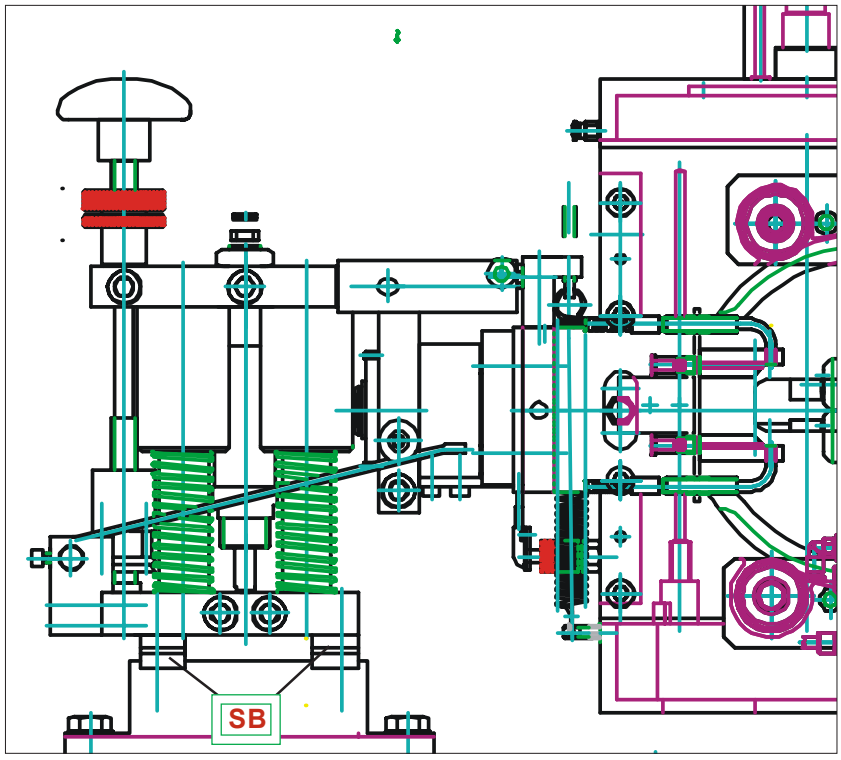
The guide rolls are tapered in order to ease the load on the strip even in case of a considerable crossbow. The synchronization of the upper rolls serves the same purpose, since it ensures that the upper rolls are always parallel to the lower rolls.



The tension of the ka-suspension can be set by means of the locked nut 37. Bolt 12 forms the limit stop for the rotation in the ka-device. The rotation of the gauge head in the rotary bearing at the rear is dampened by two springs. Their tension can be adjusted by the two locked nuts 50. Under normal conditions, the gauge head should stand perpendicular in both of these two axes when it is traversed to its rear limit position.

Strip breaking

The vertical guiding is connected to the slidebase by two shear blocks. This helps to ease the impact on the gauge and its suspension in case of strip breaking. The shear blocks are made from cast iron and easy to replace.



The bottom side of the shear blocks SB is fastened to the sled, while their top side is fastened to the base plate of the vertical guiding.

Safety precautions

The gauge head might become hot. Check temperature before touching it !

The gauge head is heavy. Handle it only with two persons or use appropriate lifting gear.

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

If the gauge zero has shifted, traverse the gauge to the rear limit position in order to set it to zero. Then check the gauge with an adjustment plate with integrated slip gauge (optional addition, available from Vollmer). If the result is OK, the measurements can go on.

If the measurement does not indicate the thickness of the sample, check the entire gauge. Take special care of the diamonds, the easy movement of the transducer rams and the alignment of the transducer holes in the C-frame.

Notes