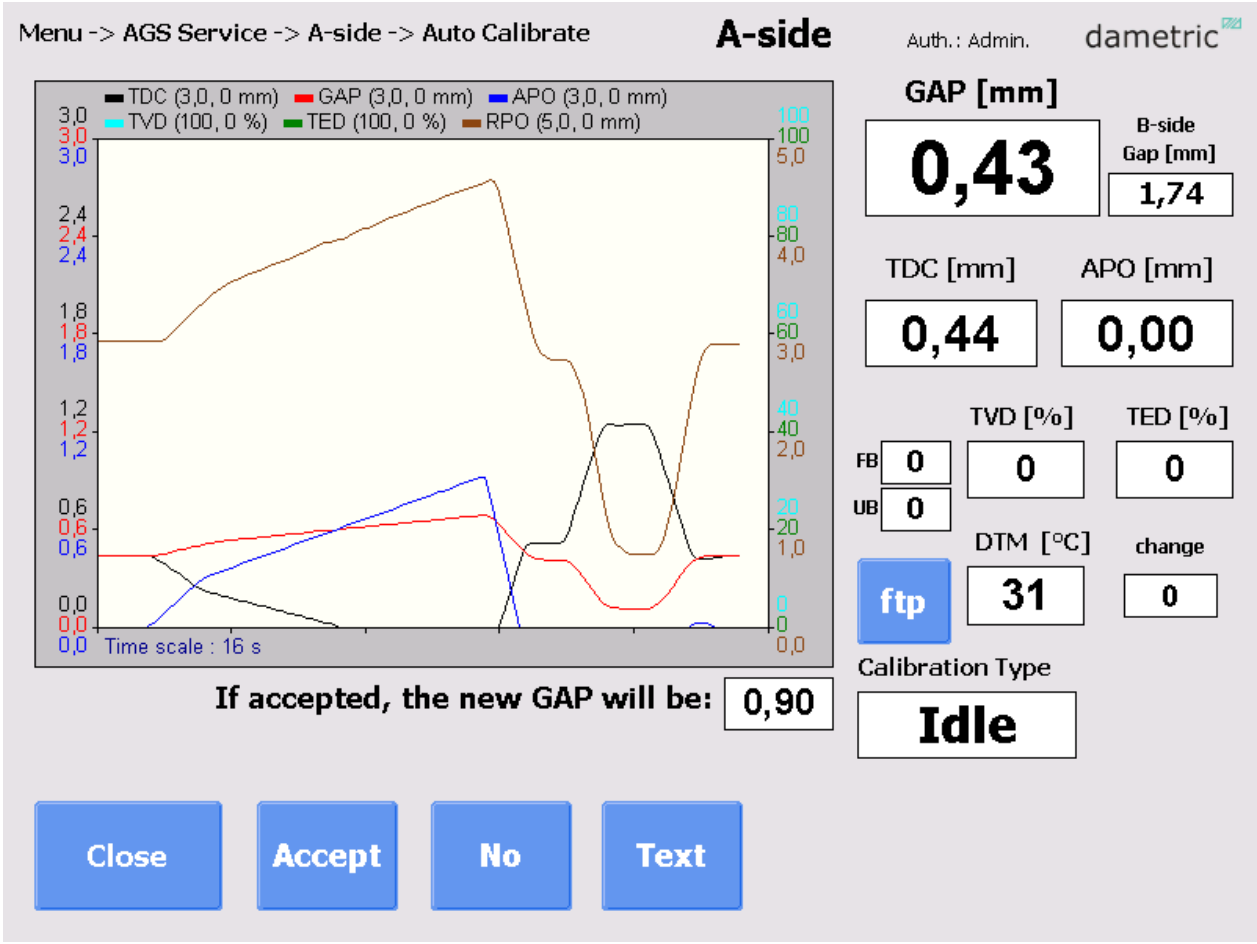
dametric

AGS Calibration



GMS CE Panel-PC

Manual

Table of contents

1 Overview

1.1 General

This manual describes the process of calibrating the TDC measuring tip in an AGS-sensor (AGS = Adjustable Gap Sensor).

The calibration is fully automatic and will gently move the tip toward the rotating rotor until the touch-point is detected. A detected touch-point will stop the movement and save the actual value of the TDC. The tip is then moved backward within some tenths of a second to minimize the time that the tip is touching the rotor. It is moved backward to a span position which normally in 1.0 mm from the touch-point position. The system saves the span value of the TDC and then move the tip to the normal position (aligned with the stator plates) or to a position further out to save the TDC value at the linear check position.

These positions depend of the calibration type, idle or prod (production) and if the sensor is not calibrated in idle mode, an idle calibration must be performed first. Once the idle calibration is performed and accepted, the system will always suggest that the production calibration is used.

The production calibration is done recurrently to recalibrate the tip as the tip wears and due to that the shape of the rotor plates wear. The time between calibrations will depend of the process and the normal wear of the plates. We suggest a calibration once a week until proven that the change is so small that the time can be increased.

The AGS sensor holds the calibration status and then control which calibration type that is allowed.

1.2 The operator

The operator's role during the calibration is to supervise the process as long as the tip is moved toward the rotor. This is the most hazardous event of the process and if doubtful, the operator presses the HALT button to stop the movement.

The calibration procedure is designed to only save the TDC values at the different positions but not to change the valid calibration. The result of the calibration and the new gap value is instead presented to the operator whom will decide if to accept or to decline the calibration.

If accepted, the calibration will take effect and the gap value will be changed.

1.3 Interlocking

The procedure will be stopped if any of the electronic unit alarms or if the movement of the tip slips (slip alarm).

In a Metso RGP type refiner the procedure can be interrupted by the refiner interlocking logic.
A FeedGuard event will interrupt and also a GapGuard when the gap controller is active.

1.4 Touchpoint

The touch point is detected by measuring the generated vibration (TVD) and also measure the electric loop (TED) that will occur when the tip is contacting the rotor. Both methods have its own limit settings and the first detected condition will trigger the touch.

1.5 First calibration

The AGS must be calibrated when new plates or a new tip has been mounted. Both are usually changed at the same time to assure that the tip length and plate thickness matches.

In the Metso RGP refiner, the distance between the tip and the supporting edge matches the groove in the stator plate so the tip is sufficiently aligned with the plate when the AGS sensor is mounted.
For other refiner plates the tip has to be mechanically adjusted to a good alignment.
The refiner logic in a Metso RMS system must be changed so the plate gap can be lower than the plus and plus-plus limits. This is achieved by using the "Touch position switch" and running in local mode. Set to the on position (or CD / Flat for a CD-refiner) and move the plates together to about a 2.00 mm gap and then do an idling calibration of the tip.
The "Touch position switch" also controls the calibration type:

- activated - only idle calibration is allowed
- deactivated - only production calibration is allowed.

1.6 Sequential calibrations

The following calibrations are normally done in production and repetitively after a tried-out period. Maybe once a week or after a rotation change. A normal figure is that the gap change should be lower than 0.10 mm at each calibration. Consider a shorter period between calibrations if the change is higher.

1.7 Gap controller blocking (only RMS System)

The gap controller in the RMS system is blocked during the calibration but the GapGuard and the FeedGuard are active. It means that if the GapGuard or the FeedGuard is tripped, the calibration is stopped and the tip will return to the home position. Try again later.
You will be prompted if the gap controller is working when you try to start a calibration. Try again a couple of seconds later.

1.8 Plus/plus-plus logic (only RMS System)

It not allowed calibrating in remote mode with the plus/plus-plus logic active. Since the gap value might change when the tip is moved toward the rotor, it might just pass one of the plus or plus-plus limits resulting in a rotor or stator position change. We want the rotor and stator to maintain in the same position during the calibration or otherwise the calibration result will be faulty.

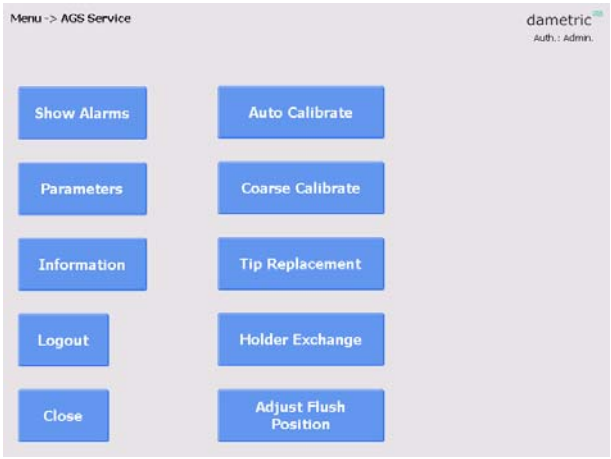
1.9 Production stability blocking

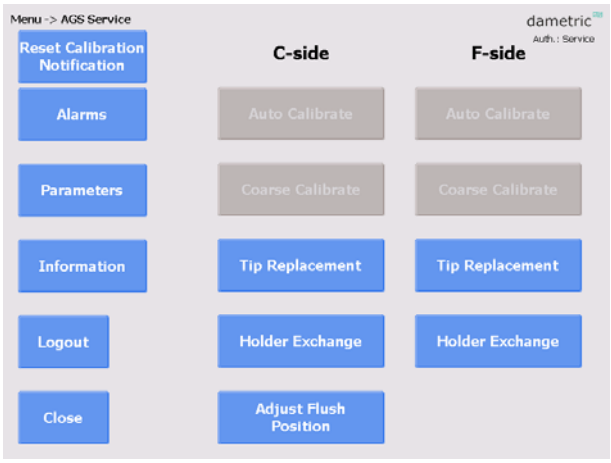
If the temperature (DTM), rotor position, or stator position change more than a user-selected amount, the calibration will be halted. Depending on which node is calibrated, either rotor position or stator position will be used, except in a CD-system where both will always be used.
This will only work in production mode.

1.10 Production stability

We advise that the operator checks the production stability before the calibration is executed. Open the trend form and watch the plate gap. If the gap is stable, go on with the calibration.
In case of an unstable gap with large fluctuations, consider to first lower the production to get a stable signal and then perform the calibration.

2 AGS Service form





The AGS service form is reached by pressing the **MENU** button from the normal display form.
The layout of this form will change for different kind of refiners.

2.1 Show Alarms

Press the button and a text window will show the alarms for you. The following alarm messages are related to the calibration logic and can be seen if the AGS sensor is not fully calibrated.

"AGS-x not coarse calibrated".

The sensor is not coarse calibrated and are therefore not allowed to be auto calibrated. See about Coarse calibration later in this chapter.

"AGS-x not calibrated in idle".

The sensor has not been calibrated in idle mode. It means that the GAP reading is NOT reliable and therefore the refiner cannot be put into production. Do an AGS Idle calibration to clear this alarm.

"AGS-x not calibrated during production".

The sensor has not been calibrated in production. It only informs the operator that this has not been done. It is normal to do the first production calibration after some 24 hours of operation so the refiner house and stand has reached its normal working temperature.

2.2 Parameters

This button is showed if logged in as "Service" and is used to edit the calibration parameters.
The calibration related parameters is shown with a short description and the allowed range settings.
If two sensors are used in the system, the parameters for each side (node) can be turned on or off with the Node buttons.
To alter a parameter, do like this:

- Select the parameter by marking its name (a description of the parameter is shown at the top of the screen).
- Press the **EDIT** button and a new window with a key pad is shown.
- Enter the new value by using the key pad on the screen.
- Press the **SAVE** button. The program will give a warning if the entry is forbidden.

2.2.1 Parameter description

<u>Panel-PC parameters</u>

PPC - Acceptance – Gap decrease limit
: Allowed distance to decrease the GAP value as a result of the calibration.

PPC - Acceptance – Gap increase limit
: Allowed distance to increase the GAP value as a result of the calibration.

PPC - Acceptance – Rotor position change
: Allowed rotor position change during the calibration. Normally 0.05 mm.

PPC - Acceptance – Tip temp. increase limit
: Allowed tip temperature (DTM) increase during the calibration. Normally 5 ºC.

PPC - AGS Calibration Notification

The number of days until recommending a new AGS calibration. Typical 14 days.

PPC - Production Calibration alarm

Generate an alarm if the AGS is not calibrated in production. Normally 0.

TDC Parameters

TDC – Offset cal. value (idle)

An offset value added to the zero and span calibration parameters during idle calibration. Normally 0.00 mm.

TDC – Span cal. value

The span value used at the AGS calibration (usually 1.00 mm higher than the zero cal. parameter). Normally 0.00 mm.

TDC – Zero cal. value

The zero value used at the AGS calibration. Normally 0.00 mm.

TED = Touchpoint Electric Detection parameters

TED – Numbers of sectors for touch

The number of sectors (1-12) to determine the TED touchpoint. This is linked to the TED limit parameter (both idle and prod.). For touch – the TED value must be higher than the limit in at least the specified number of sectors). Normally 3 sectors.

TED – Touch limit level, idle (electric)

The TED limit to determine the TED touchpoint in idle calibration. This is linked to the TED sector parameter. Normally 20 %.

TED – Touch limit level, prod (electric)

The TED limit to determine the TED touchpoint in production calibration. This is linked to the TED sector parameter. Normally 20 % but set to 0 (deactivated) if chemicals are added.

TVD = Touchpoint Vibration Detection parameters

TVD – Touch limit level, idle

The TVD limit to determine the touchpoint in idle calibration. Normally 20 %.

TVD – Touch limit level, production

The TVD limit to determine the touchpoint in production calibration. Normally 50-70 %.

Check the 'GmsCe20Ags Cal parameters EN.pdf' manual for more detailed description of the parameters.

2.3 Information

The button presents a descriptive text on the screen.

2.4 Login / Logout

The presence of the buttons in this form is determined by the authorization level (login code) and the calibration status.
The "***Operator***" level of login will allow the user only to do the **Auto Calibrate** function.
The "***Service***" level will disable the **Auto Calibrate** but enable the **Coarse Calibrate**, **Tip Replace**, **Holder Exchange** and **Parameters** buttons.
The "***Administrator***" level will allow all functions but must, of course, be used with more knowledge and understanding of the system.

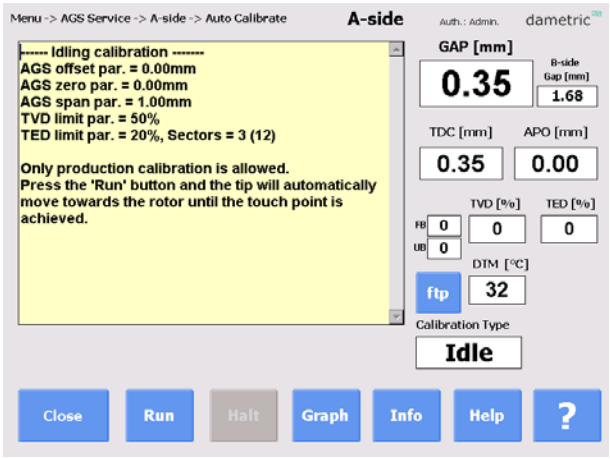
2.5 Auto Calibrate

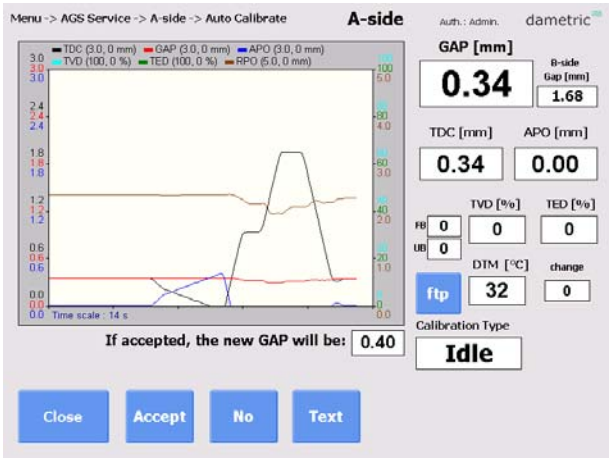
The Auto Calibrate button is used to start the calibration procedure of the selected sensor.
This function is described in the following page.

2.6 Coarse Calibrate

This button is sometimes not shown and sometimes disabled (light grey). The authorization level (login code) and the calibration status will determine the presence of this button. The function will coarse calibrate the sensor tip and thereby destroy the existing calibration values. Use only this button if a new sensor tip has been mounted and it is not calibrated with the refiner running.
See section 4 later in this manual.

3 Auto Calibrate





3.1 The text boxes

Text window – This window can either present the flow of the process or a live graph of the important signals during the calibration.
GAP – The gap between the plates. This will remain almost constant during the process due it is the sum of the TDC and the APO. Some change is allowed since this is a re-calibration.
TDC – The distance between the tip and the rotor.
APO – The position of the tip. It is 0.00 when the tip is aligned with the stator plates.
TVD – The measured touch point vibration level. The **FB** value indicates the TVD level within the full frequency band while the **UB** value indicates the TVD value in the upper frequency band. The TVD value in the centre box is a mix of the two vales and the mix can be changed a parameter.
TED – The measured electric touch point level. The reading will indicate “n/a” if the measurement is not enabled.
DTM – The temperature measured inside the AGS tip. The “**change**” value will indicate the relative temperature since the calibration started. If the “change” value increases rapidly during the calibration it will probably mean that something is wrong. Push the **HALT** button and find out the reason. Also, a limit can be set, causing the calibration to automatically cancel if the limit is exceeded.
Calibration Type – Indicates “PROD” or “IDLE. If allowed and shown, the operator can switch between the types by a SET button. This can be changed on some system in the AGS Parameters window.
If accepted, the new Gap value will be: – This value will appear after the calibration is completed and it is now up to the operator to accept or decline the calibration result.

3.2 The buttons

Close – press this button to close the form.
Run – The procedure is started when the button is pressed. NOTE. Supervise the process once the button is pressed and until the touch point is reached. Do NOT leave the refiner panel in this state.
Halt – The button is seen as long as the tip is approaching the rotor. This will halt the tip movement temporarily and use the Run button to continue the movement. Once the touch point is detected the button will be hidden.

Stop – The STOP button is shown after that the touch point has been detected. If pressed now, the procedure will be stopped and the tip will be returned to the home position.
Info – Presents a text box on the screen that explains some of the text from this manual.
? – Press first this button and then a text box or a button and an explanatory text will appear.
Set – (not shown) switches between idle and production calibration if allowed.

The following buttons will appear later in the procedure:
Accept – Press this button if to accept the calibration result. See the "new Gap value" to check what the new gap value will be if the result is accepted.
Decline – Select this alternative if the calibration result is not within reason.
See later in this manual how to determine if to accept or to decline the calibration result.

3.3 Calibration logic

The AGS-sensor and sensor amplifier (DCA or DCM) share the calibration status of the senor. This interlocking occurs after a new AGS tip has been installed.

- Id-number. An accepted tip-id number allows the tip to be used and recalibrated forever. A not accepted id allows recalibrations only 5 days after the tip exchange.
- Coarse calibration. A coarse calibration procedure is included in the tip exchange procedure and should therefore always be performed prior to the start of the refiner.
- Idle calibration. This calibration requires that the tip is coarse calibrated. The idle calibration is acknowledged first after it has been accepted by the operator. In RGP-refiners for Metso, a digital output is triggered enabling that the refiner can be set in production.
- Production calibration. This calibration can be performed after that the idle calibration has been accepted. A production calibration is performed periodically (1 to 3 weeks depending of plate wear) to eliminate signal change due to wear of the segment surface and the AGS tip.

3.4 Auto calibration procedure

This item describes the flow of the procedure.

3.4.1 Start requirements

The procedure can not start until some requirements are fulfilled. The first requirement that is not fulfilled will appear in the information text.

- *"The AGS cannot be calibrated due to a step motor slip alarm. Go back to the main menu and the alarm will be cleared."*
  The movement of the tip has slipped causing a slip alarm. Step back to the normal display form and the slip alarm will be cleared automatically. Then try again.
- *"The calibration cannot start due to that the TVD level is too high (more than 75% of the cal. limit). Wait for a lower production level or check the settings.*"
  The TVD level is too high. The touch point is based upon a drastic change in the TVD level and if the start level is too high, the required change is not possible. Lower the production level or raise the TVD level for touch point (use the Parameters button from the AGS Service form.
- *"The calibration cannot start due to that the TED level is too high (more than 75% of the cal. limit). Check the settings.*"
  The TED level is too high relative the limit parameter. The TED value is heavily affected by chemicals in the process and also dependent of the insulating layer around the AGS tip. Increase the limit parameter or in worst case, disable the TED from the touch point detection by setting the limit parameter to zero.

- *"The calibration cannot start because the TDC value is out of its calibration range (> 2.50 mm). Adjust by moving the rotor closer!"*
  The Gap value is higher than 2.50 mm. Close the plate gap so it is lower than 2.00 mm.
- In RMS systems the idle/production selection is controlled by the PLC/DCS.

3.4.2 Idle calibration

The calibration logic will force the system to select the idle calibration if this is not done previously. In RMS systems, the signal "Touch Position" must be enabled.

- The procedure is started when the Run button is pressed.
- The tip is moved toward the rotor.
  The TVD and TED levels are increasing and when the tip starts to hit the rotor and when a calibration limit is passed, the touch point is established. The system stores the TDC value as a zero calibration value.
- The tip is then moved out to the span position. This is the difference between the zero and span calibration parameters and is normally 1.00 mm. The speed of the tip is 0.25 mm/s so this takes about 4 seconds. The system will store the TDC value as the span calibration value after the TDC values has stabilized.
- The tip then moves to the linear check position which is the distance as the difference between zero and span positions, normally 2.00 mm. The TDC value is then stored.
  Finally the system will move the tip to the normal position which is aligned with the stator plates.
- The result of the calibration is presented to the operator as soon as the tip is in normal position. The operator decides if to accept or decline the calibration.
  The calibration result can be changed drastically if this is the first idle calibration after a coarse calibration, so the normal step is to accept the calibration.
- The system will then present the result of the linearity check. The normal measure is to accept the suggested change of linearity curves. If no change is needed, the system will tell you this.
- The calibration is then completed and the result can be seen in the **Calibration Log** which can be started from the **Menu** form.

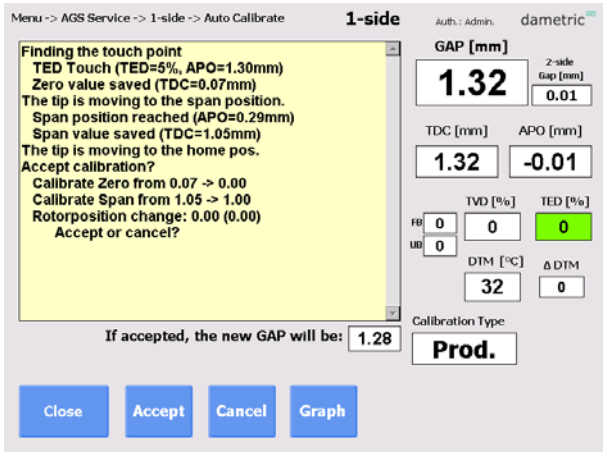
3.4.3 Production calibration

The AGS must first be idle calibrated before a production calibration can start.
In RMS systems, the signal “Touch Position” must be disabled.

- The procedure is started when the Run button is pressed.
- The tip is moved toward the rotor. The movement speed is determined of the measured TDC value and the touch point vibration value.
  The TVD level is increasing when the tip starts to hit the rotor and when the TVD calibration limit is passed, the touch point is established. The system stores the TDC value as a zero calibration value.
  The system will force a touch point if the TDC is less than -0.10 mm. This is a safe method to save the tip if, for instance, the TVD signal is lost without an alarm. This is noted in the text box if it happens. The calibration needs to be repeated until a valid touch point is achieved, if the forced touch point was not caused by a malfunctioning TVD.
- The tip is then moved out to the span position. This is the difference between the zero and span calibration parameters and is normally 1.00 mm. The speed of the tip is 0.25 mm/s so this takes about 4 seconds. The system will store the TDC value as the span calibration value after the TDC values has stabilized.
- Finally the system will move the tip to the normal position which is aligned with the stator plates.
- The result of the calibration is presented to the operator as soon as the tip is in normal position. The operator decides if to accept or decline the calibration.
  The calibration result should not be changed too much relative a previous idle or production calibration, so allow only small changes before the calibration is accepted.
- The calibration is then completed and the result can be seen in the **Calibration Log** which can be started from the **Menu** form.

3.4.4 Accept or Decline

3.4.4.1 Indicators of the calibration result



The result of the calibration can be seen in the text window and in a text box that will appear once the calibration is completed.
Pay close attention to the value in text box next to “If accepted, the new GAP will be:” because it will indicate what the gap will be if you accept the calibration. In the text window you can also see how much the TDC values was at the zero point “Zero value saved (TDC=0.00)” and the span point “Span value saved (TDC=1.00)”.
An example: You are running at a gap of 0.50 mm and the result of the calibration is 0.60 mm. If you accept this result, the new gap will be 0.60mm and the gap controller will soon move the plates together 0.10 mm to the set-limit value (0.50 mm).

3.4.4.2 Idle calibration

The normal way is to always accept the idle calibration results. The result of the calibration will depend of the magnetic properties of the steel in the plates and also the plate pattern. Note that the zero value can vary a great deal, values down to -3.00 mm or up to +1.00 mm can be seen.

3.4.4.3 Production calibration

Since the production calibration is a re-calibration it means that the alteration in the calibration result should be fairly low relative to the last calibration. It is normal that changes less than 0.10 mm should be accepted. If the change is too high, you can always decline and try to calibrate again.

3.4.4.4 Acceptance checks

If the production calibration results in a gap change above a user-selected limit, the calibration will not be accepted, or at least be warned for. The limit for this check can be changed in the AGS Parameters window.

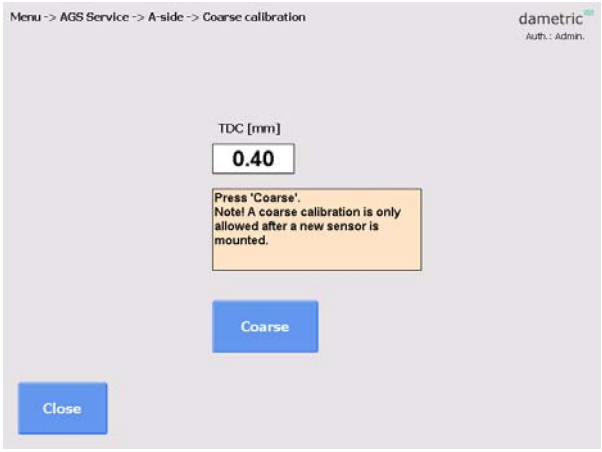
3.5 Calibration log

Sometimes it is useful to see the previous calibration. Go then to the Menu form and press the Calibration Log button. The last 200 calibrations are then listed.
You can see the time and the result of the previous calibrations.

4 Coarse Calibrate

The button must be enabled to use the manual Coarse Calibrate function.
Note that this calibration will destroy the current calibration and that the refiner has to be calibrated in idle again before taken into production.
Also note the rotor position might interlock this procedure (if enabled).

- Run the plates as far apart as possible (at least more than 5 mm apart).
- Press the Coarse button to calibrate.



5 TDC Mode

In RMS systems, the user can select to run the RMS/AGS system in standard TDC mode. This is useful if there is an AGS sensor alarm that will disable the AGS calibration. The user can then do a standard TDC calibration by moving the rotor until it touches the stator plates. This prevents, of course, a calibration during production.
View the procedure in the “GmsCeAgs Calibration TDC EN” manual.

6 Abbreviations

CE ™. Operating system from Microsoft.

TDC - True Disc Clearance. Plate gap measured with a sensor placed in level with the stator segment.

AGS - Adjustable Gap Sensor. A TDC sensor with moveable tip which can be moved forward and backwards for calibration.

GMS – Gap Monitoring System. A measurement system for measure and presentation of the signals in a refiner, e.g. the plate gap and plate gap temperature.

RMS – Refiner Monitoring System. A measurement system for measure and presentation of the signals in a refiner, e.g. the plate gap and plate gap temperature for Metso type refiners.

DTM – Disc Temperature Monitor. The plate gap temperature measured inside in the plate gap with a TDC- or AGS sensor.

TVD – Touch point Vibration Detector. A measured value off the touch point signal between the disc plates. The signal is used to define the zero position (plate gap = 0) and is the basis of the zero calibration of a TDC- or AGS sensor.

TED – Touch point Electric Detector. The electrical touch point signal between the disc plates. The signal is used to define the zero position (plate gap = 0) and is the basis of the zero calibration of a TDC- or AGS sensor.

APO – AGS Position. A signal for the position of the tip in an AGS sensor. It is zero when the tip is in level with the stator segment. The signal is increased when the tip is moved towards the rotor and decreased when it is behind the segment edge.

RPO – Rotor Position. A signal for the rotor axial position. (for LC refiners).

HPM – Hydraulic Pressure. A signal for hydraulic pressure for positioning of the stator in a Twin-60 refiner.

DCM – Disc Clearance Module. Measurement module for the plate gap and plate gap temperature.

ACM – AGS Control Module. Acts as a link between the AGS (Adjustable Gap Sensor) and the CAN-interface.

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