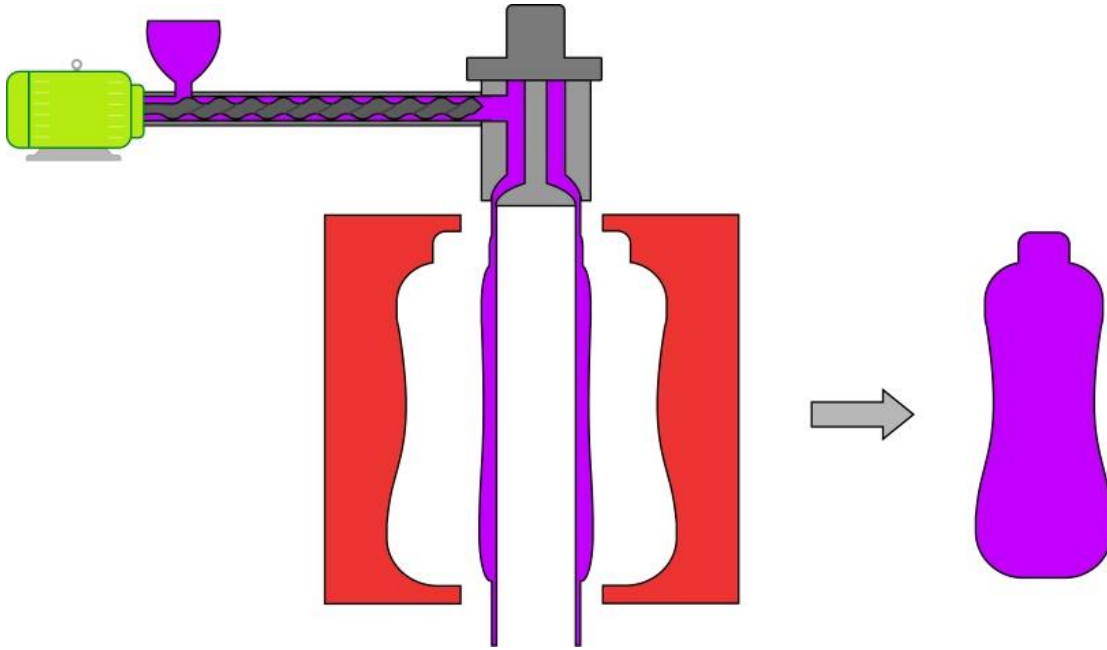


Parison (Wall Thickness) Control

Parison control means dynamically controlling thickness of Parison to get a uniform thickness container on an Extrusion Blow Moulding machine. It helps to maintain the required thickness axially and radially on the product made out of Extrusion/Injection Blow Moulding (BM).

What is Parison?

Now what is a Parison? It is the tubular form molten plastic made on a Blow Molding machine by extruding or injecting. This viscous melt plastic called Parison is put into two halves of Blow Molds and shaped to the form of cavity of mould by blowing compressed air.



Why control required?

When the Parison comes out of the die head of the BM machine it will be in the molten state. Due to the self-weight the Parison will elongate resulting in a thinner top portion compared to the bottom portion. This will cause uneven thickness in the article made. Also the complex geometries of the product to be molded necessitate varying the parison thickness to get more uniform product wall thickness.

The advantages:

- Uniform article wall thickness and hence improved quality due to lesser thermal stresses during processing.
- Balanced distribution of thickness and hence possibility for reduction in weight.
- Reduction in top and bottom wastage and hence higher production.
- Reduced cooling time due to uniformity of thickness and hence higher production.

Closed loop control (Multi-point Parison Programmer)

Closed loop electro-hydraulic control system can be fitted on the machine to control the parison thickness at several points (30 times or 100 times or more). Since this is a closed loop system the accuracy is much better than ordinary system and the resulting container will have most uniform thickness.

Axial Wall thickness Control

All the above described systems are for thickness control in axial direction of Parison. This is the most common Parison controls.

Radial Wall thickness Control (PWDS)

Other than the axial wall thickness control, for some specific and complex products, thickness control in radial direction is required. This is achieved by transforming the uniform annular space through which parison comes out to elliptical shape.

Time based and position based Control

In the continuous extrusion blow moulding time based systems are used. That is the parison thickness is controlled on a definite interval of time. Here the total time for one parison cycle is divided by the number of points to calculate the time interval.

In accumulator type extrusion blow moulding either a time based or a position-based system can be used. In position based system a potentiometer senses the position of the push out (accumulator) cylinder stroke and programs the profile points with respect to the position. In time based system the profile points are programmed with respect to the time taken for parison push out. To overcome the variations in time the controller automatically updates the time in each cycle and uses it for programming the next cycle.

Prepare To Work

After having some explanatory informations, let us prepare our parison to work.

!!! IMPORTANT NOTICE:

ALL NECESSARY CONNECTION MUST BE CARRIED OUT BY AN EXPERIENCED TECHNICIAN BEFORE GOING TO CONTROLLER SETUP.

MAIN SETUP

This menu can be reached work menu by tapping



MAIN SETUP



First of all, you can select your language which is comfortable for you, then user account should be set **AUTHOR** by giving **Password: "12345"** and then tapping.



High level password is **PROGRAMMER** and it's **Password: "649049"**, this user can change other users passwords. To do so, please log in as **PROGRAMMER** and set new passwords on the dialog comes up by tapping .



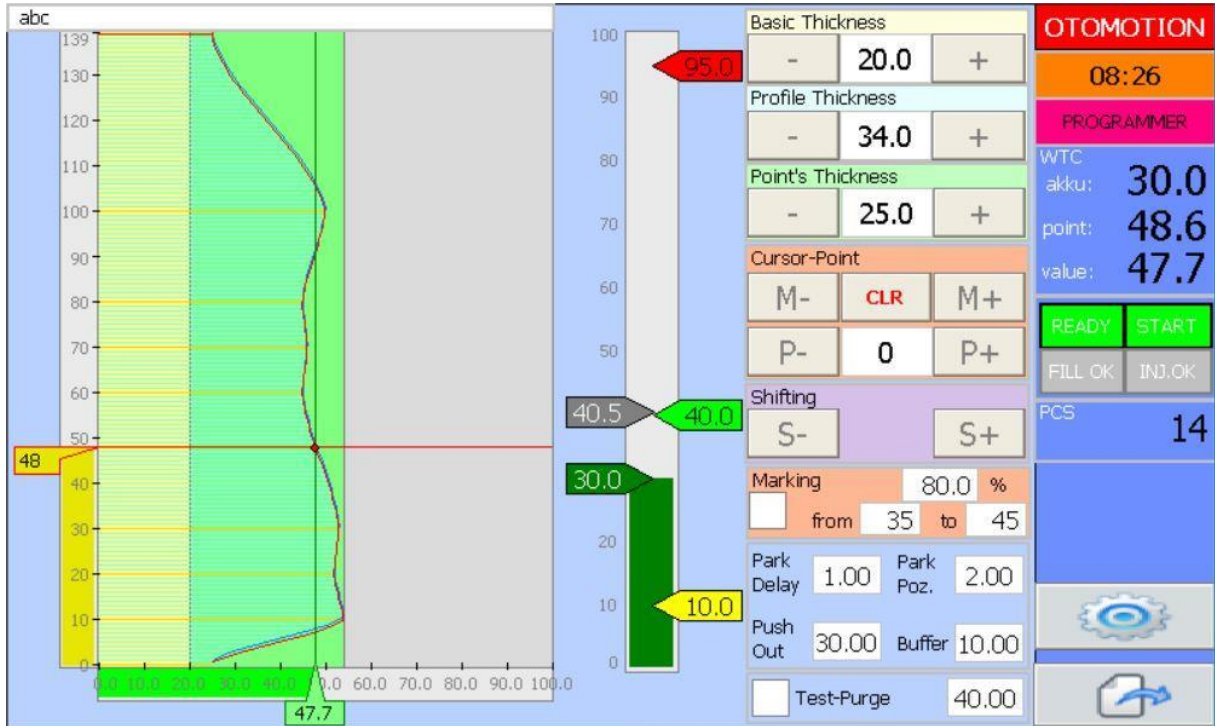
Now we can jump over **PARISON** page by tapping



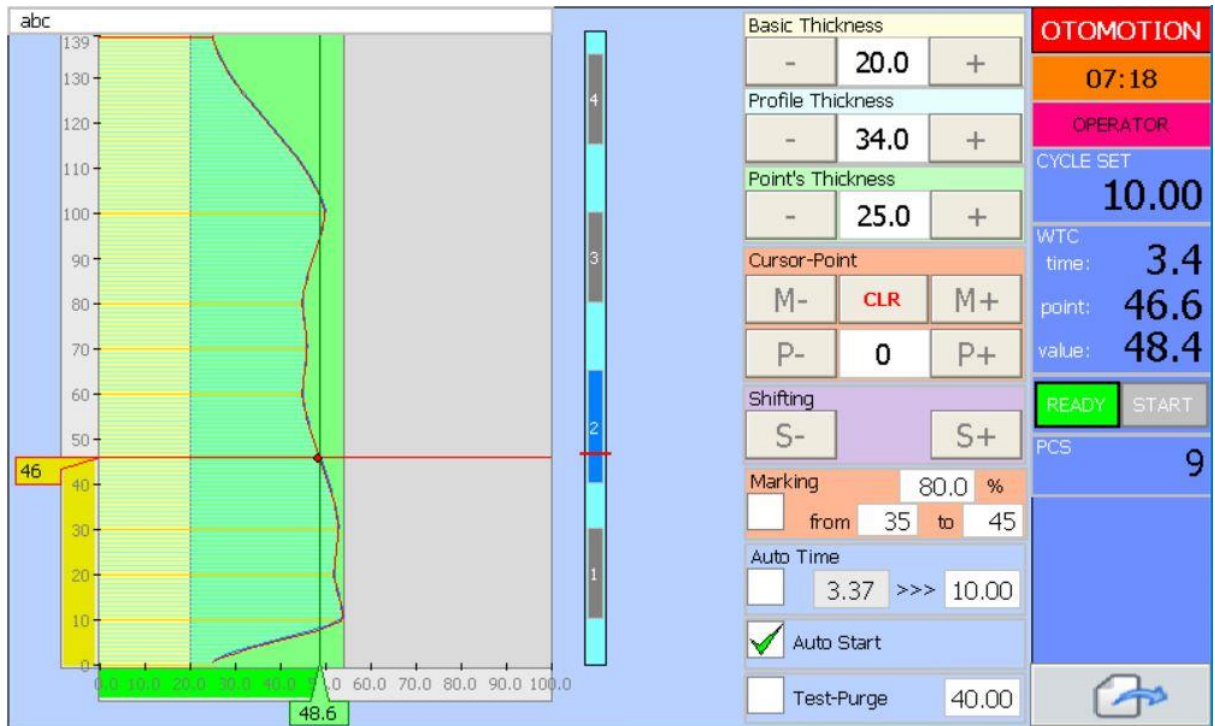
The system decides which parison page will be displayed by the parameter of the selection of Injection (Extrusion) on the calibration page we will explain further.

PARISON PAGE

Injection (Accumulator) type :



Extrusion type:



You can adjust **Basic Thickness**, **Profile Thickness**, **Point's Thickness** by tapping **+** and **-** buttons or you can input directly on the keypad dialog by giving on value of it.

In order to Interpolate between two points, this points should have **Master Point** property, This Master property can be given/removed by tapping **ADD** or **CLR** button to the point when the cursor on it.

You can scroll and select the point by tapping **P+** or **P-** or write directly number of the point on the keypad dialog by giving on value of it.

As soon as you change Point's Thickness value of a point, this point will be Master Point automatically.

You can scroll and select the Master Point by tapping **M+** or **M-** then change the **Point's Thickness** and also **Master Point** property easily.

You can shift the profile up an down by tapping **S+** and **S-** buttons.

You can also put a **mark** temporarily on the parison by giving **from & to points** to be marked between and %: Percentage of the mark thickness.

Test-Purge: When you check this option, the parison goes to specified value for maintenance purpose.

Injection Type Specific Parameters;

Park Delay: When Push out completed, then WTC start command released parison waits for the this park delay time at the last point value then goes to **Park Position** value.

Push Out: This volume is injected out, and parison profile is synchronised to this volume, It means that melt pushing out (0-PushOut) calls for (0-MaxPoint) value. For 7" Parison package MaxPoint is 139, this can be 179 or 199 for other sizes.

Buffer: This volume is intend to left in the akku (melt container).

Extrusion Type Specific Parameters;

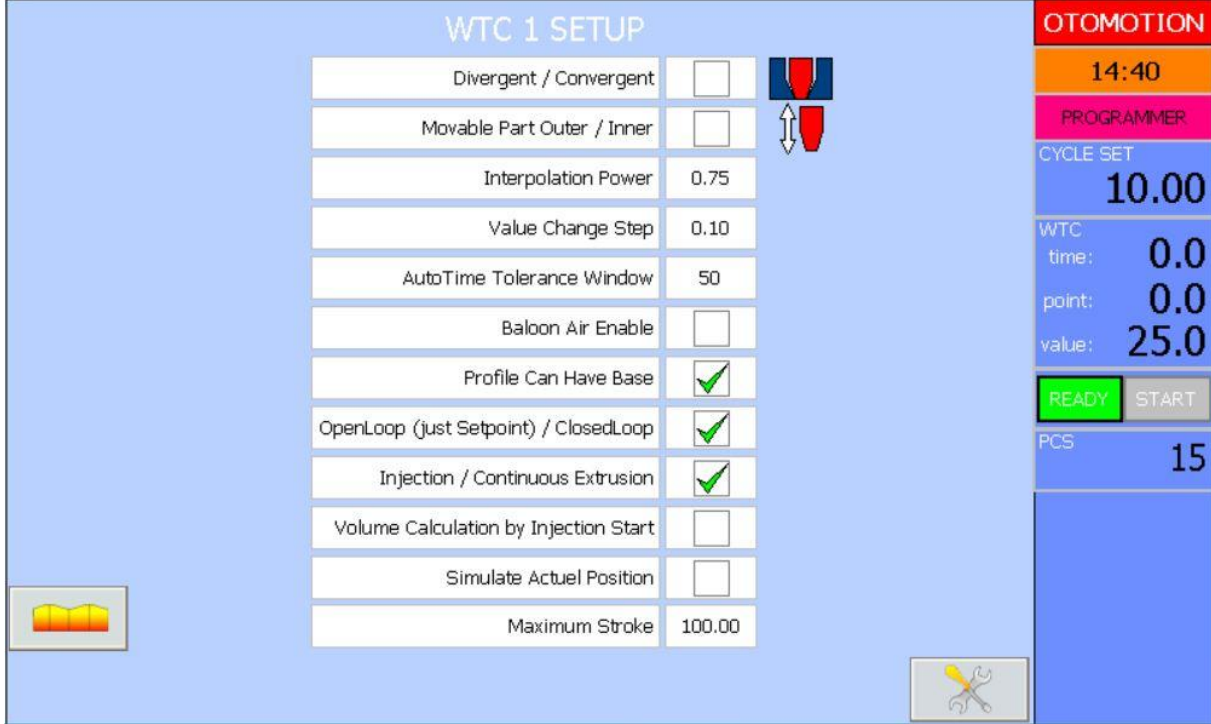
Auto Time: When this is ticked, the parison triggered by means of for instance knife cut, the time between sequential two trigger signals is calculated automatically and sets **Parison Time** otherwise **Parison Time** will be static parameter which user can change.

Parison Time: Parison profile synchronised to this time, It means that melt pushing out (0-Parison Time) calls for (0-MaxPoint) value.

Auto Start: This parameter is for test purpose, to start the parison by without a trigger signal.

So far so good this was general how operate informations let us jump over WTC Setup Page for Technician Level by taking user permission for minimum Technician then tapping 

WTC SETUP PAGE (Technician User Level)



WTC 1 SETUP	
Divergent / Convergent	<input type="checkbox"/>
Movable Part Outer / Inner	<input type="checkbox"/>
Interpolation Power	0.75
Value Change Step	0.10
AutoTime Tolerance Window	50
Baloon Air Enable	<input type="checkbox"/>
Profile Can Have Base	<input checked="" type="checkbox"/>
OpenLoop (just Setpoint) / ClosedLoop	<input checked="" type="checkbox"/>
Injection / Continuous Extrusion	<input checked="" type="checkbox"/>
Volume Calculation by Injection Start	<input type="checkbox"/>
Simulate Actual Position	<input type="checkbox"/>
Maximum Stroke	100.00

Divergent / Convergent: Parison Die type needs to be selected according to your type. This parameter effects calibration minimum and maximum points automatically.

Movable Part Outer / Inner: Like Parison Die type this parameter also needs to be selected according to your movable part. This parameter effects calibration minimum and maximum points automatically too.

Interpolation Power: This parameter specifies interpolation power for transition between master point (for smooth S set it to 0.75) it is recommended , (for linear set it to 1.0).

Value Change Step: This parameter specifies increasing or decreasing step of a valu when you adjust **Basic Thickness**, **Profile Thickness**, **Point's Thickness** by tapping **+** and **-** buttons

AutoTime Tolerance Window: This parameter specifies a window percentage when calculating AutoTime between sequential triggers, newly Calculated AutoTime should be greater than Minus Percentage and less than Plus Percentage of just before calculated AutoTime, otherwise newly calculated AutoTime is dismissed, the old AutoTime still valid.

Baloon Air Enable: When Extrusion type selected, parison tip is may closed by helping of a guillotine cut, then parison needs to be blown slightly while flowing through the Die before going to mold, this option gives you a possibility control an air valve according to parison points in 4 zones by helping of a digital output.

Profile Can Have Base: When this is selected, Basic Thickness is static and not updated as profile changed. This way profile can have it's own offset thickness between Basic Thickness and Profile Thickness. Otherwise every change of profile, the minimum point of profile is calculated and assumed Basic Thickness so Basic Thickness refreshed.


OpenLoop (just setpoint) / ClosedLoop: Some of the hydraulic valves has it's own control logic, and can do position control itself, this time it is enough to drive them by a reference setpoint. Select this option if your configuration so that. Otherwise ClosedLoop is done internally and PID parameters are active.

Injection / Continuous Extrusion: Two different work model should be selected first, according to this selection working scnerio and related pages will be active.

Volume Calculation by Injection Start: This parameter is very useful when Injection mode, Accumulator level (volume) is captured in every injection start, and push out volume taken this volume to do so every injection synchronised by push out volume. INJ OK and FILL OK outputs also activated to help your machine automation handshaking.

Simulate Actual Position: When this is selected, Output Reference value is used as if feedback. It is mostly used for maintenance purpose.

Maximum Stroke: This parameter defines your maximum Parison Die gap distance. You can work 100% as default or you can give real measures XXmm. Visulation and some parameters will be changed and recalculated for this parameter. This parameter will affect calibration Maximum Engineered values also. So This parameter must be changed before the calibration process.

Let us jump over the WTC Calibration Page for Author Level by taking user permission for minimum Author then tapping 

WTC CALIBRATION PAGE (Author User Level)


OTOMOTION

WTC 1 CALIBRATION

SI11: Injection Position (%) <small>11</small>		SI12: WTC Position (%) <small>12</small>		SO06: WTC Reference (%) <small>6</small>	
Raw Data Actual(AIN)	<input type="text" value="0.00"/> V	Raw Data Actual(AIN)	<input type="text" value="2.97"/> V	Actual Engineered Data	<input type="text" value="18.0"/> %
Raw Data Max.(AIN)	<input type="text" value="10.00"/> V	Raw Data Max.(AIN)	<input type="text" value="10.00"/> V	Engineered Data Max.	<input type="text" value="60.0"/> %
Raw Data Min.(AIN)	<input type="text" value="0.00"/> V	Raw Data Min.(AIN)	<input type="text" value="0.00"/> V	Engineered Data Min.	<input type="text" value="0.0"/> %
Engineered Data Max.	<input type="text" value="100.0"/> %	Engineered Data Max.	<input type="text" value="60.0"/> %	Raw Data Max.(AOUT)	<input type="text" value="10.00"/> V
Engineered Data Min.	<input type="text" value="0.0"/> %	Engineered Data Min.	<input type="text" value="0.0"/> %	Raw Data Min.(AOUT)	<input type="text" value="0.00"/> V
Actual Engineered Data	<input type="text" value="0.0"/> %	Actual Engineered Data	<input type="text" value="17.8"/> %	Raw Data Actual(AOUT)	<input type="text" value="3.00"/> V

!!! WARNINGS ON FULLY OPEN/CLOSE CALIBRATION
 1- This operation can break your die connections if something not suitable.
 2- Please select first proper Parison Die and Moveableparts model.
 3- Be sure that open button opens the die and close button closes so.
 4- Press OPEN until the Parison Die fully open and then release the button.
 5- Press CLOSE until the Parison Die fully closed and then release the button.
 6- After Calibration is done, Do not forget to release the Calibration Mode.
 Please Tap message box if you are aware of the warnings.

HELP

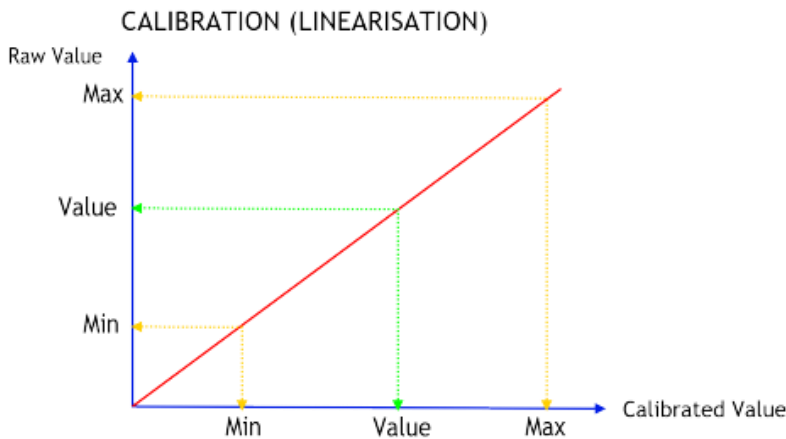


%80

Gains

Our Analog Inputs and Outputs uses following calibration method,

Raw Value is analog voltage value, **Calibrated Value** is engineered and displayed value which is used in the program calculations.



Injection Position: Accumulator melt volume (if you work model Injection).

WTC Positon : Actual position of the Parison.

WTC Reference: Valve control voltage for bare valves or Setpoint Reference Controller for Closed Loop Valves.

! Please tap message box if you red warnings

Injection Position Calibration

! This operation should be carried out fully empty akku (melt container).

- Please take the level sensor probe physically as if at the minimum level, at this point, write **Injection Position's Actual Raw Data** value into **Raw Data Min** value.
- Please take the level sensor probe physically as if at the maximum level, at this point, write **Injection Position's Actual Raw Data** value into **Raw Data Max** value

☺ Now your Injection (Akku) Position is Calibrated.

Test if it is running properly at a few levels you imagined.

WTC Position Calibration

Fully Open/Close Calibration Mode

Tap the Calibration button. 

Now you are in fully open/close calibration method for WTC Position.

OTOMOTION

WTC 1 CALIBRATION


SI11: Injection Position (%) 11		SI12: WTC Position (%) 12		SO06: WTC Reference (%) 6	
Raw Data Actual(AIN)	0.00 V	Raw Data Actual(AIN)	0.00 V	Actual Engineered Data	39.9 %
Raw Data Max.(AIN)	10.00 V	Raw Data Max.(AIN)	10.00 V	Engineered Data Max.	60.0 %
Raw Data Min.(AIN)	0.00 V	Raw Data Min.(AIN)	0.00 V	Engineered Data Min.	0.0 %
Engineered Data Max.	100.0 %	Engineered Data Max.	60.0 %	Raw Data Max.(AOUT)	10.00 V
Engineered Data Min.	0.0 %	Engineered Data Min.	0.0 %	Raw Data Min.(AOUT)	0.00 V
Actual Engineered Data	0.0 %	Actual Engineered Data	0.0 %	Raw Data Actual(AOUT)	6.66 V

OPEN

2.50 V

CLOSE

HELP



☐ Test-Purge 48.00

%20

%50

%80

Closed Loop Gains

Kp
2.00

Ki
0.02

Kd
0.01

Adjusting the WTC Position in Closed Loop

Please Remove the Parison Die in order to prevent any breakage of it by means of oscillation or forcing the limits. Normally this should not be any problem, but some parison hydraulics more than enough strong or some Parison Dies less than enough strong so Parison Die can get broken as touches and forces at the limits.

!!! So Remove the Parison Die, You do not take a risk.

- *Please Select proper Parison Die Model and Movable Part model which you have.*
- *Please check OPEN and CLOSE button works by shortly pressed and seeing the Die movement. Be sure that OPEN button Opens the Die and CLOSE button closes the Die. If not please change the valve connection polarity.*

Parison valve needs 0 to +10V reference for let say + opening direction, 0 to -10V reference for - closing direction commonly.

- *You will give +2.5V for + direction as long as by tapping OPEN button, and see the Die **fully opened and stucked** then release the button. Now you have set **WTC Position's Raw Data Max** by Actual Raw Data value.*
- *You will give -2.5V for - direction as long as by tapping CLOSE button, and see the Die **fully closed and stucked** than release the button. Now you have set **WTC Position's Raw Data Min**, by Actual Raw Data value.*

☺ Now your WTC Position is Calibrated.

!!! Do not forget to exit fully open/close calibration method by tapping  button.

Adjusting the WTC Position in Open Loop

- *You can follow same steps for closed loop. But since the parison valve expect only position reference this time, you need to try and find correct reference voltage for **fully open** Die than at this point you have set **WTC Position's Raw Data Max** by Actual Raw Data value by releasing OPEN button.
Keep this voltage value found for setting WTC Reference's Raw Data Max.*
- *Try and find correct reference voltage for **fully closed** Die than at this point you have set **WTC Position's Raw Data Min** by Actual Raw Data value by releasing CLOSE button.
Keep this voltage value found for setting WTC Reference's Raw Data Min.*

☺ Now your WTC Position is Calibrated.

!!! Do not forget to exit fully open/close calibration method by tapping  button.

WTC Reference Calibration

Engineered Data Max and Engineered Data Min parameter is already defined by Maximum Stroke parameter. It is nothing to do more.

Adjusting the WTC Reference in Closed Loop

Raw Data Max= 10.00V and Raw Data Min= -10.00V is okay if you want parison valve as fast possible. That is all for closed loop.

Adjusting the WTC Reference in Open Loop

While adjusting WTC position in Open Loop you already found and kept WTC Reference's Raw Data Max and Raw Data Min parameter.

☺ Now your WTC Refence is Calibrated.

!!! Do not forget to exit fully open/close calibration method by tapping  button.

Closed Loop Gain Adjustment

When calibrations has done, the last step is Closed Load Gains Kp, Ki, Kd should be tuned for good control.

Please set Kp=0.1 Ki=0.01, Kd=0.01 for the begining and select Test-Purge and set Test Position=%50 of Max Stroke (you can do it easily by tapping %50 button),

and increase Kp by step of 0.1 starting from Kp= 0.1 as long as see the oscillation on the Parison Die, find the maximum value satisfies without oscillation. Than you can increase Ki by step of 0.1 and find minimum value satisfies without swing. Leave Kd=0.01

☺ It Is OKAY.

You can test the performance of the PID by changing Test Position (you can do it easily by tapping %20 %50 %80 buttons or set it whatever) and watching the WTC Actual Position following this changes.

RECIPE PAGE (Foreman User Level)

You can jump over RECIPE page by tapping  in the Main Setup Page.

You can store well adjusted product settings in the recipe container folder for further call back. This operations can be carried out at the Recipe page.

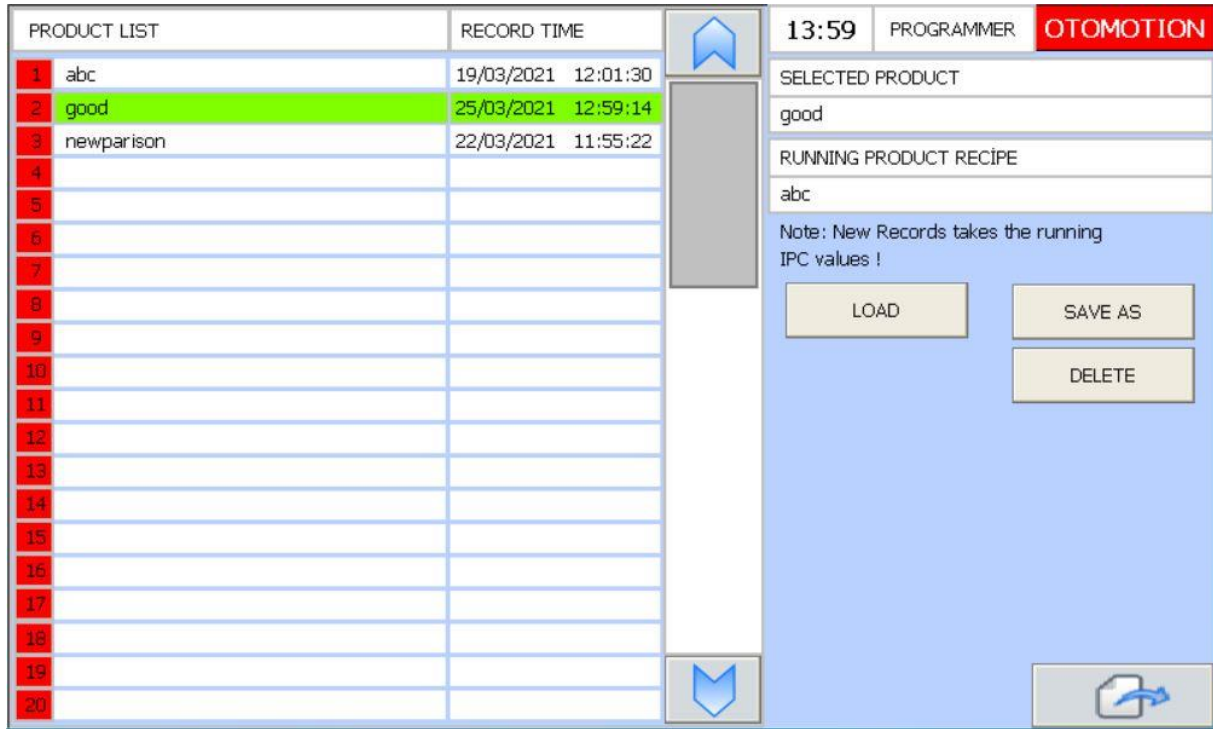
PRODUCT LIST		RECORD TIME	13:57 PROGRAMMER OTOMOTION	
1	abc	19/03/2021 12:01:30	<div> <div>SELECTED PRODUCT</div> <div>abc</div> <div>RUNNING PRODUCT RECIPE</div> <div>abc</div> <div>Note: New Records takes the running IPC values !</div> <div> <div>LOAD</div> <div>SAVE AS</div> <div>DELETE</div> </div> <div> <div>SAVE AS PRODUCT</div> <div>ENTER THE NAME TO SAVE AS PRODUCT</div> <div>good</div> <div> <div>CANCEL</div> <div>YES</div> </div> </div> </div>	
2	newparison	22/03/2021 11:55:22		
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! New recipe record data keeps actual values running in the controller.

For a new product record, tap SAVE AS button, and give a name in the dialog and then tap the YES button.

☺ Now your new product record has been created.

Whenever you want to call a product record back and please select the record in the product list and tap on it to select and then tap LOAD button that is all you need to do.



You can delete a product record the same way, please select the record to be deleted by tapping on then tap DELETE button.

☺ Now your product record has been deleted from the product list.

Technical Specifications

Parison Controller	CP2606	CP2612	CP2615
CPU:	Arm Cortex A8 1Ghz.	Arm Cortex A8 1Ghz.	Arm Cortex A8 1Ghz.
Size:	7 inches Resistive Touch	12 inches Capacitive Touch	15 inches Capacitive Touch
Resolution:	800x480	800x600	1024x768
Parison Points:	140	180	200
Minimum PushOut Time:	3 sec (option available for 1 sec)		
Interpolation Type:	Infinite Polynomial		
Minimum Refresh Time:	1500 msec. (option available for 500 µsec)		
Analog Resolution:	12 Bits (option available for 16 Bits)		
Analog Response Time:	<500 µsec		

Thank you for preferring Otomotion's Parison Controller ☺