



Syrus LC III Upgrade for coating machines.

Innovations for a **better** world.



Syrus LC III upgrade Overview.

- New Cabinet with industrial standard components
- New Water and Compressed-air Supply
- New quartz crystal measurement system
- New High Voltage Power Supply
- OptiControl Overview
- New Vacuum Gauges and Valves set
- CE confirmation with documentation in national language
- Possibility to integrate options from LO or customer units

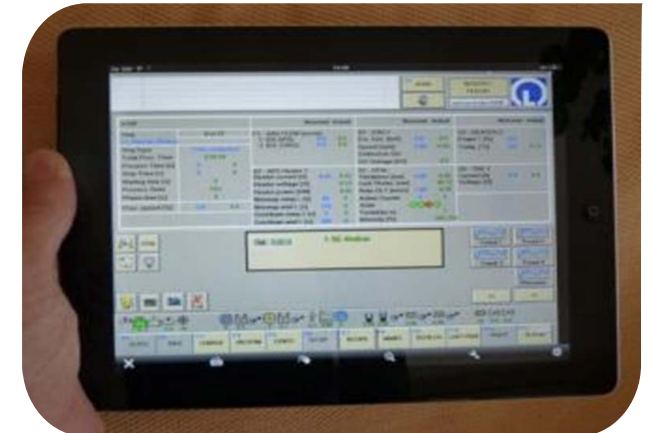
Syrus LC III is our
upgrade solution
for all machine
types



Scope of delivery varies from machine type, and the original scope of delivery

Syrus LC III Control System.

- Beckhoff TwinCAT 2.10 “Soft”-PLC
- Fast cycle time (approx. 10 ms) and fast communication to the visualization
- Beckhoff Bus Terminal System with EtherCat Couplers
- Remote Control via teamviewer
- Remote Control and access via Network and also possible with smart devices units
- Operating System with Microsoft Windows 7
- Based on Wonderware's Factory Suite 2000 - INTOUCH 12.0
- Complete new EtherVAT components



Syrus LC III

Installation.



Options

Syrus LC III

Bühler Options.

- Upgrade from APS to APSP*ro* (gas inlet system) or APSP*ro* compl. new incl. new power supplies
-



- Power Supplies for APS inside E-Cabinet with high speed arcmanagement



Syrus LC III

Bühler Options.

- Bühler Power Supply Controller for Mark I or Mark II+



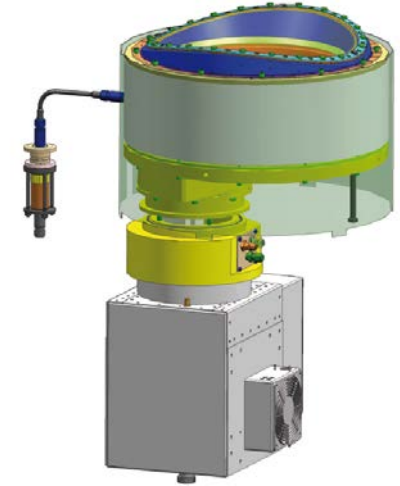
-
- Original Mark II Controller



Syrus LC III

Bühler Options.

- Bühler Lion 300 RF Source



-
- CCR RF Source IS 300



Syrus LC III

Bühler Options.

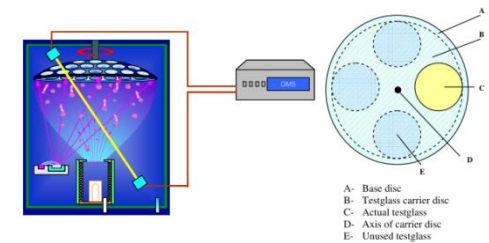
- Bühler OMS 5100 Optical Monitoring



- Bühler Combi Testglaschanger TGW 12/4 12 Testglasses and 4 Quarzes (patented)



- Bühler Testglaschanger on calotte (patent pending)



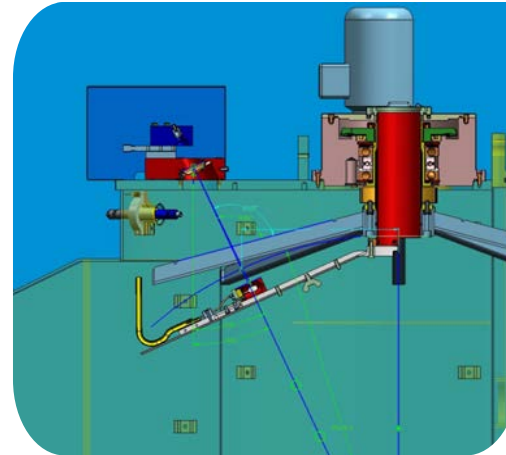
Syrus LC III

Bühler Options.

- Broadband Monitor System



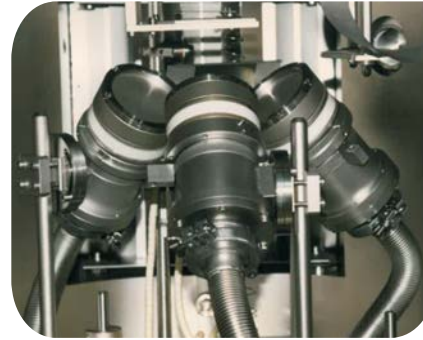
-
- Direct Monitoring (patented)



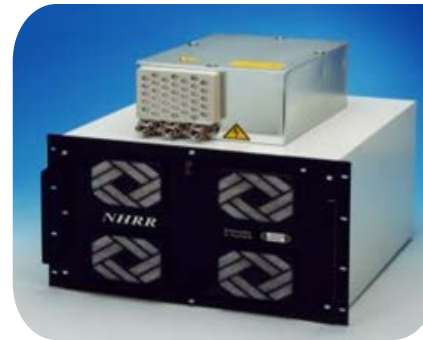
Syrus LC III

Bühler Options.

- Sputter Source



-
- High Voltage Power Supply



-
- Ceramic Heater



Syrus LC III

Bühler Options.

- Planetary Systems for extreme concave and convex substrates



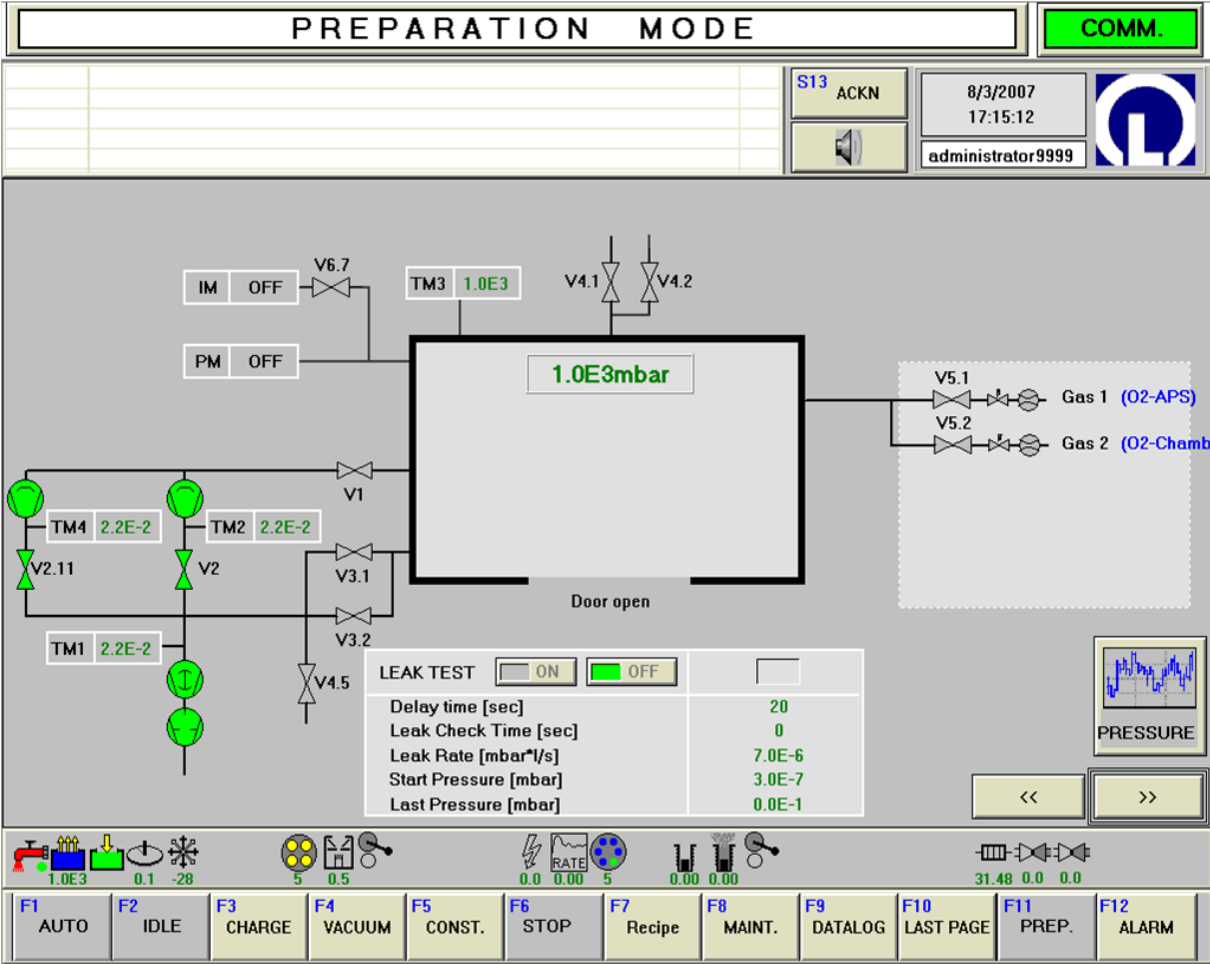
-
- Therm. evaporator



Syrus LC III Control System

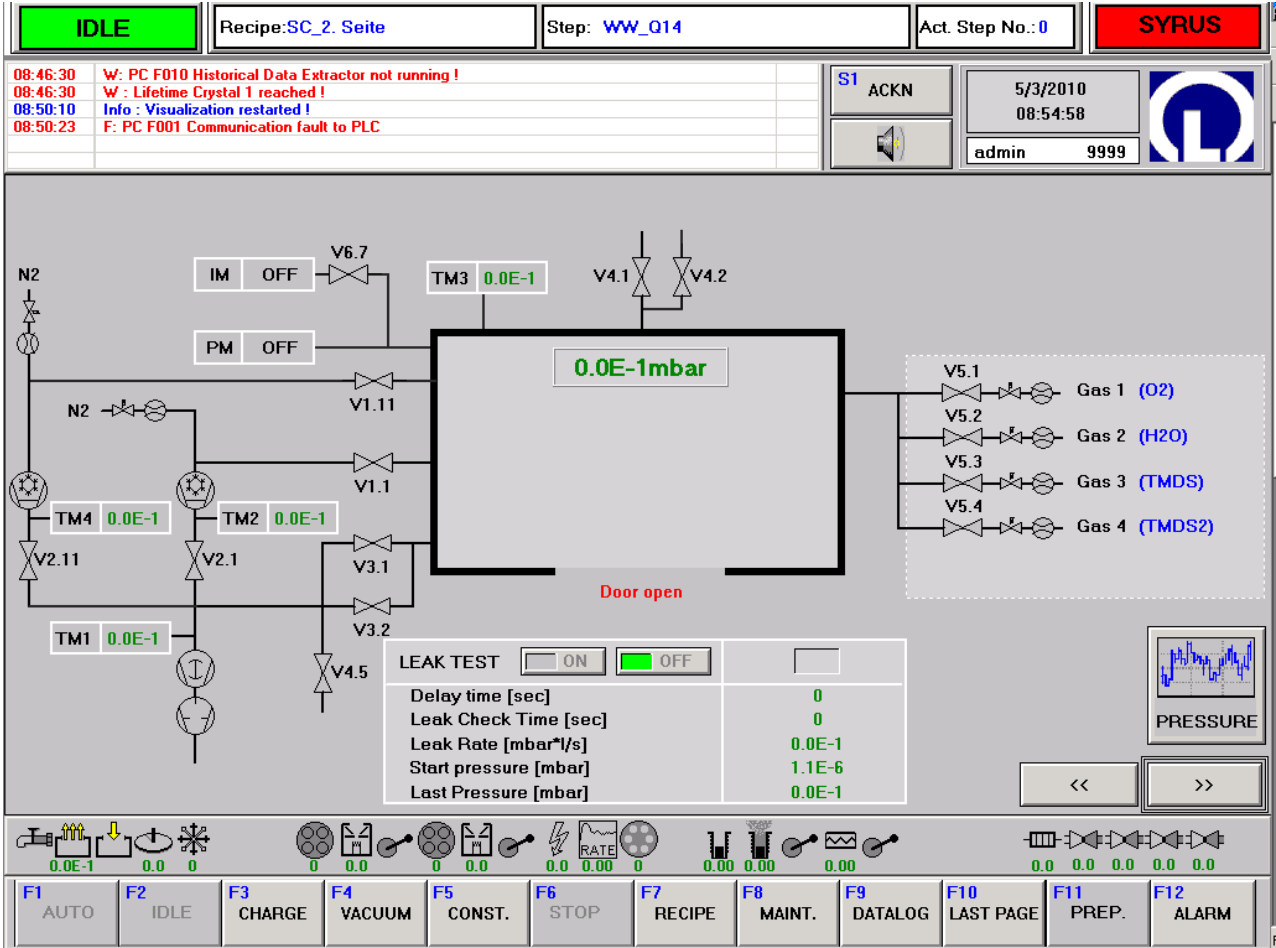
Syrus LC III Control System

OptiControl Overview.



Syrus LC III Control System

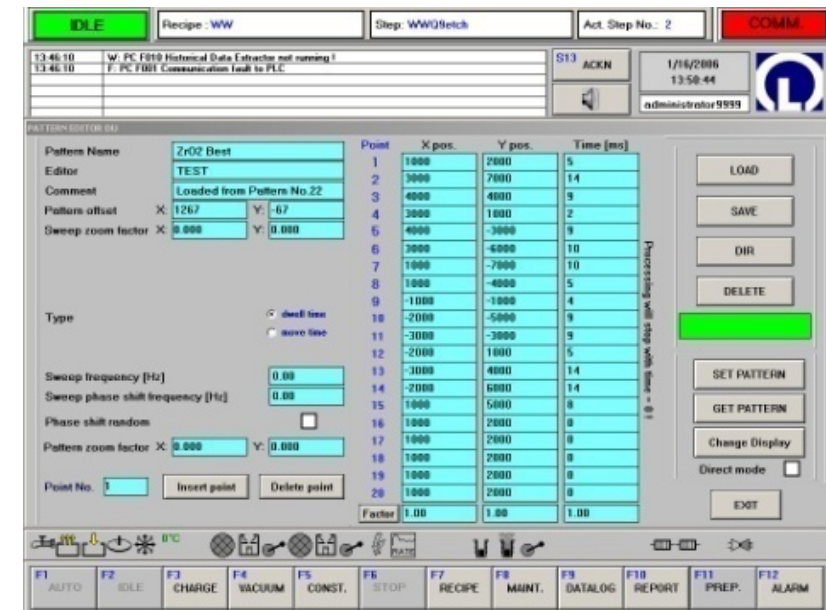
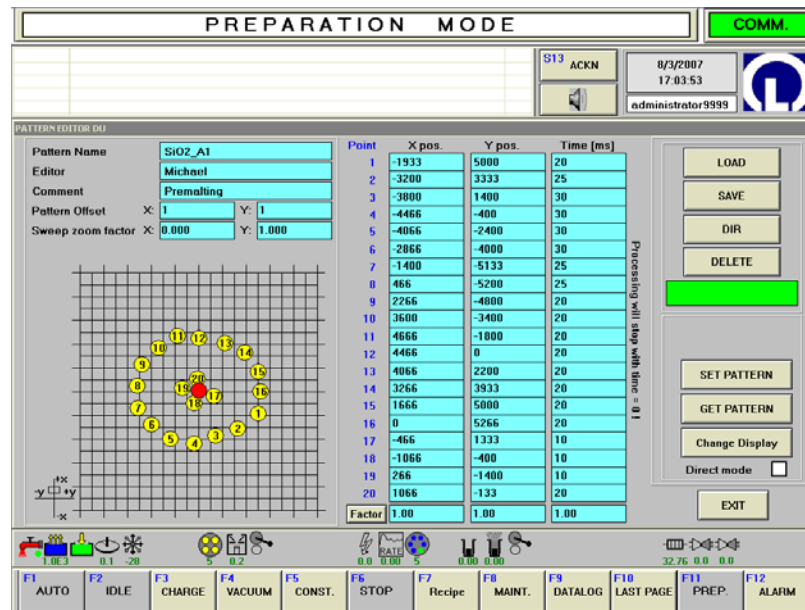
OptiControl Overview.



Syrus LC III Control System

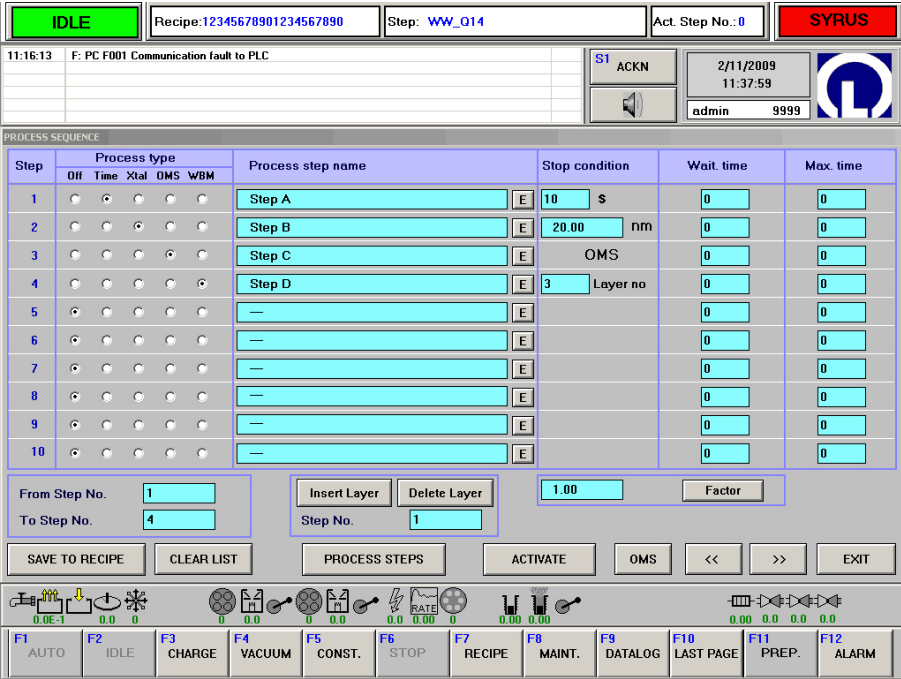
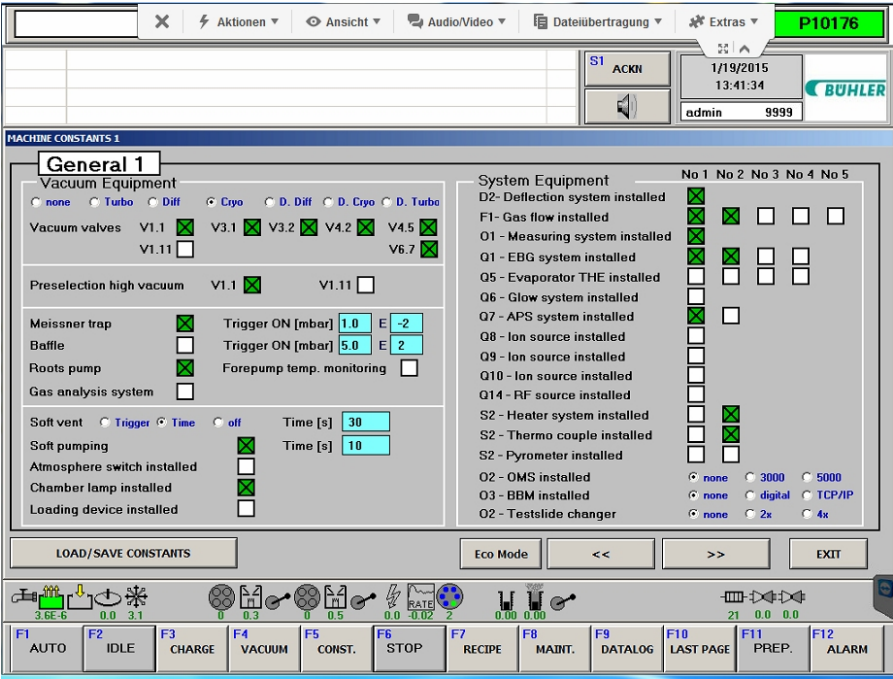
Beam deflection control system.

- Pattern management integrated in OptiControl Software
- Unlimited number of patterns
- Easy exchange of patterns between different machines
- Points and dwell time for each point
- Points and move time between points



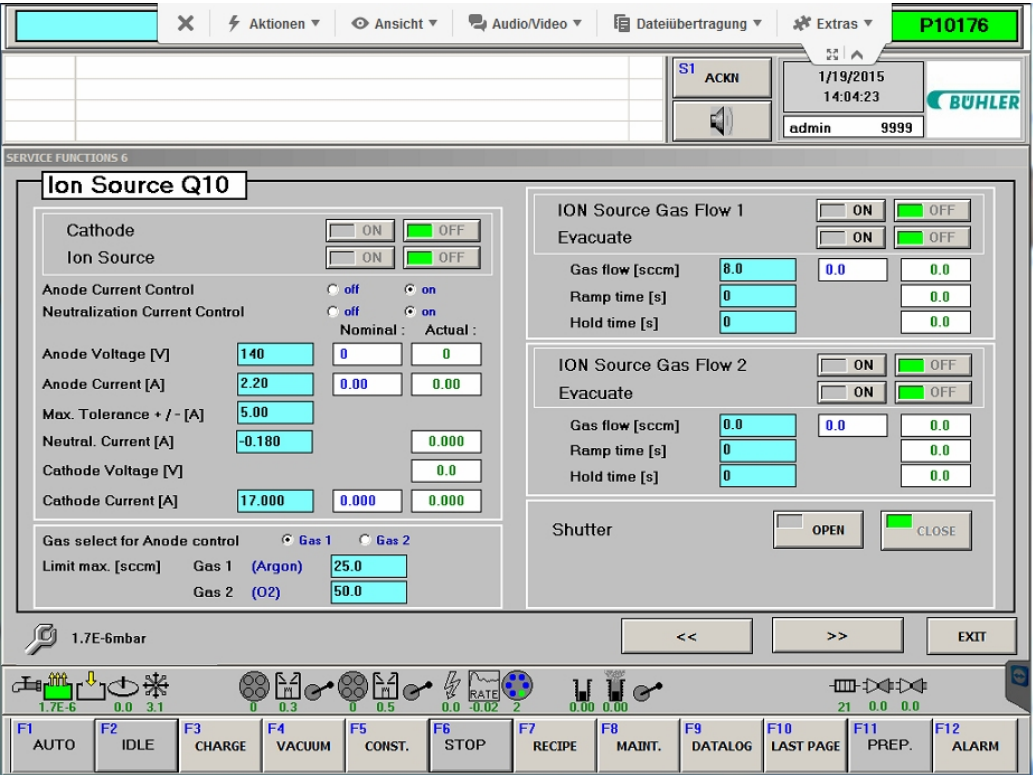
Syrus LC III Control System

with BBM, OMS 5100 or WBOMS.



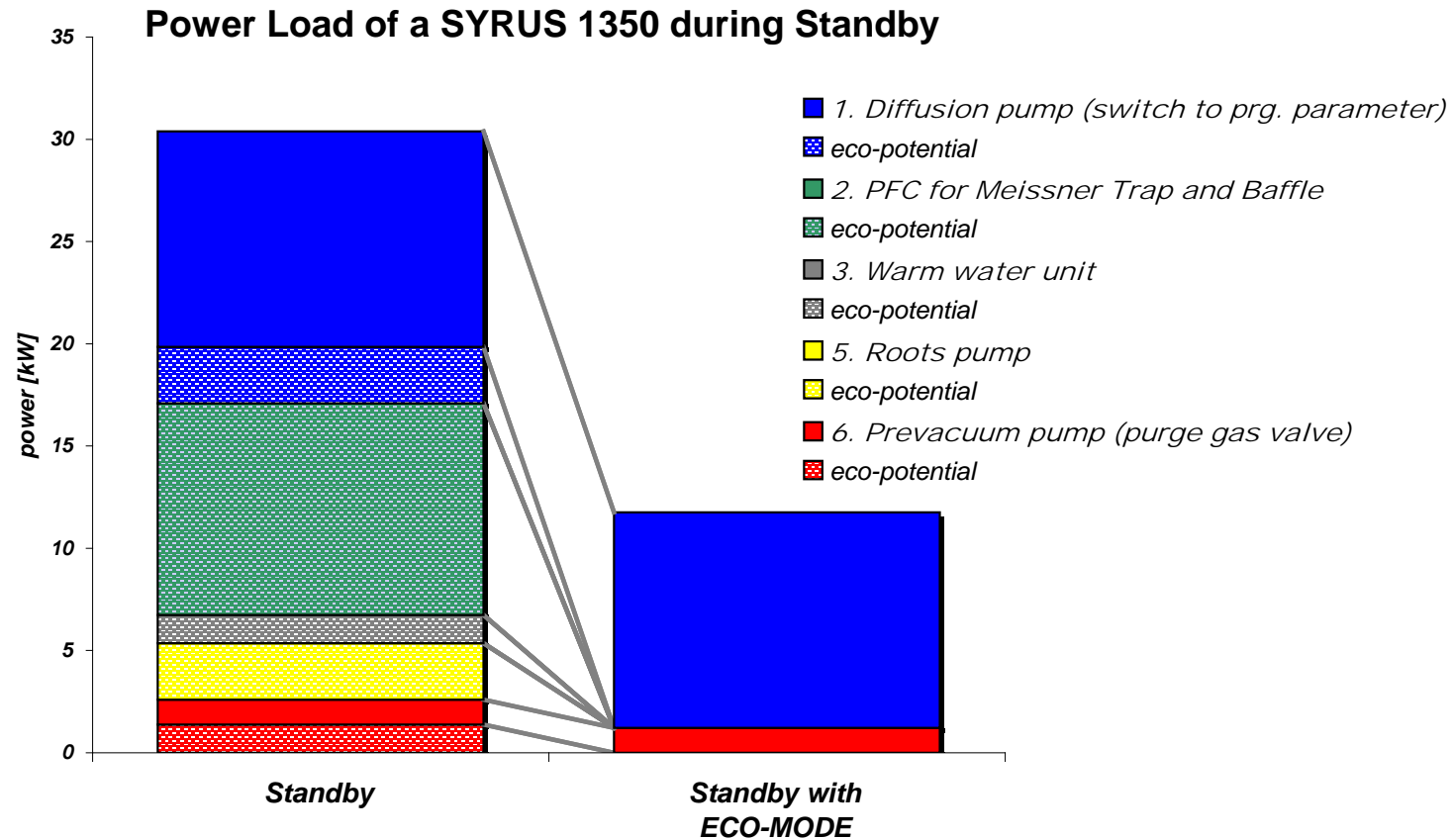
Syrus LC III Control System

for Bühler Mark I / Mark II Power Supply with Controller.



Syrus LC III Control System

ECO Mode Details.

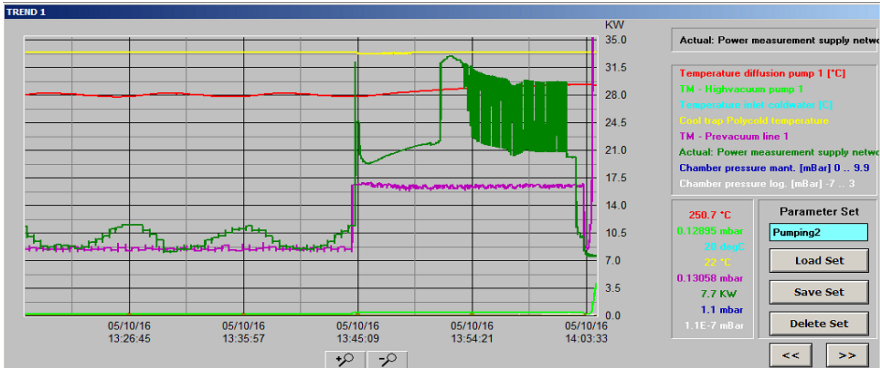
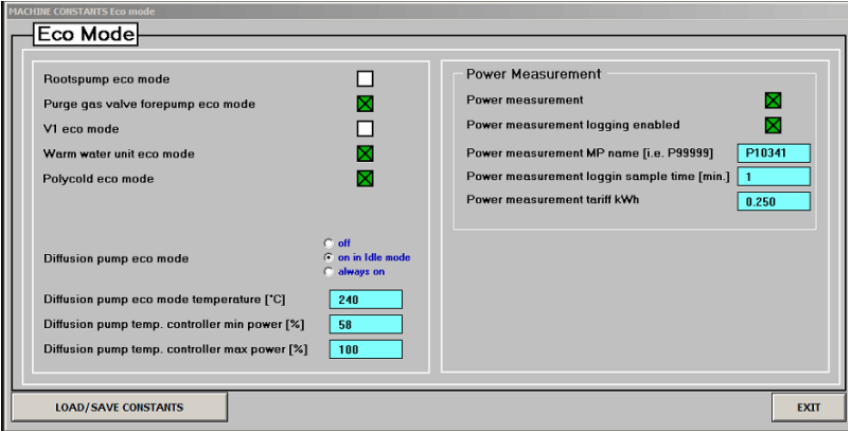
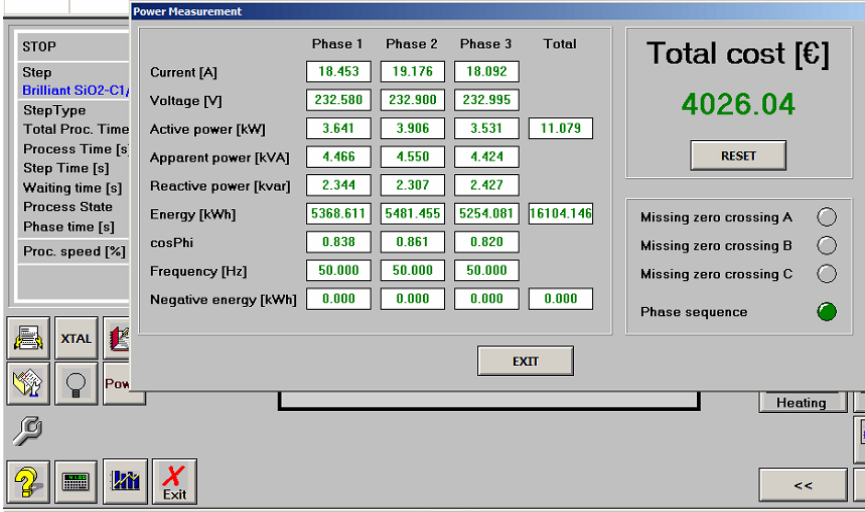


Syrus LC III Control System

ECO Mode.

Display for Power Management

Configurations for ECO Mode



Syrus LC III Control System

Machine Configuration.

13:58:07 F077: THE #1 crucible high current contact runtime

S1 ACKN 5/9/2016 14:59:24 BUHLER
admin 9999

MACHINE CONSTANTS 1


General 1

Vacuum Equipment

☐ none
 ☐ Turbo
 ☒ Diff
 ☐ Cryo
 ☐ D. Diff
 ☐ D. Cryo
 ☐ D. Turbo

Vacuum valves V1.1 ☒ V3.1 ☒ V3.2 ☒ V4.2 ☒ V4.5 ☒
 V1.11 ☐ V4.12 ☒ V4.22 ☐ V6.7 ☒

Preselection high vacuum V1.1 ☒ V1.11 ☐

Cooling Unit  EtherCAT peripherie ☒

Roots pump ☒ Forepump temp. monitoring ☐
 Gas analysis system ☐ Forepump ☒ 1 ☐ 1+2













Soft vent ☒ Trigger ☐ Time ☐ off
 Soft pumping ☒ Time [s] 5

Atmosphere switch installed ☐
 Chamber lamp installed ☒
 Loading device installed ☐

System Equipment

	No 1	No 2	No 3	No 4	No 5
D2- Deflection system installed	<input checked="" type="checkbox"/>				
F1- Gas flow installed	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Q1 - Measuring system installed	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Q1 - EBG system installed	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Q5 - Evaporator THE installed	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Q6 - Glow system installed	<input type="checkbox"/>				
Q7 - APS system installed	<input type="checkbox"/>	<input type="checkbox"/>			
Q8 - Ion source installed	<input type="checkbox"/>				
Q9 - Ion source installed	<input checked="" type="checkbox"/>				
Q10 - Ion source installed	<input type="checkbox"/>				
Q14 - RF source installed	<input type="checkbox"/>				
S2 - Heater system installed	<input type="checkbox"/>	<input checked="" type="checkbox"/>			
S2 - Thermo couple installed	<input type="checkbox"/>	<input checked="" type="checkbox"/>			
S2 - Pyrometer installed	<input type="checkbox"/>	<input type="checkbox"/>			
O2 - OMS installed	<input type="radio"/> none	<input type="radio"/> 3000	<input type="radio"/> 5000		
O3 - BBM installed	<input type="radio"/> none	<input type="radio"/> digital	<input type="radio"/> TCP/IP		
O2 - Testslide changer	<input type="radio"/> none	<input type="radio"/> 2x	<input checked="" type="radio"/> 4x		

LOAD/SAVE CONSTANTS Eco Mode << >> EXIT

 3.2E-4
  30.0 22.4
  0
  10.6
  1
  0.3
  8.0
  0.00
  6
  0.00
  0.00
  22 0.0 0.0

F1 AUTO F2 IDLE F3 CHARGE F4 VACUUM F5 CONST. F6 STOP F7 RECIP F8 MAINT. F9 DATALOG F10 LAST PAGE F11 PREP. F12 ALARM

Syrus LC III Control System

Machine Configuration.

13:58:07 F077: THE #1 crucible high current contact runtime

S1 ACKN 5/9/2016 15:04:00 BUHLER
admin 9999

MACHINE CONSTANTS 10

Crystal measurement O1

Quarz crystal measuring system ☐ XTC
☐ Not used
☒ SQM or XMS

WFS control system crystal installed ☐

Rate monitor SQM active ☒

Frequency monitoring:
Fault delay time [s] 3
Max. freq. tol. proc. / pre + post phase [Hz] 100 20
Timepower change xtal delay time [s] 2

Frequ. Monitoring Channel 1

Process phase
☐ Warning
☐ Fault
☐ TP warning
☒ TP change

Pre + post phase
☐ disable
☐ Warning
☐ Fault

SQM Ch. 1 ☒
Ch. 2 ☐
Ch. 3 ☐
Ch. 4 ☐
Ch. 5 ☐
Ch. 6 ☐

MFX 1 installed ☐ Positions 6

MFX crystal six type
☐ Leybold UPM
☐ QSK 621
☒ Leybold digital signals
☐ Dual meas. head dual channel
☐ Dual meas. head single channel
☐ Inficon crystal six

Channel 1

Dual head: Use second paramter set for second ch. ☐

Xtal Monitoring
☐ Off
☐ Process counter
☒ Xtal lifetime
☐ Process counter + Xtal lifetime

Use OMS 3K TG field in sequence for MFX position ☐

LOAD/SAVE CONSTANTS << >> EXIT

3.2E-4 30.0 22.4 0 10.5 1 0.3 8.0 0.00 6 0.00 0.00 22 0.0 0.0

F1 AUTO F2 IDLE F3 CHARGE F4 VACUUM F5 CONST. F6 STOP F7 RECIPE F8 MAINT. F9 DATALOG F10 LAST PAGE F11 PREP. F12 ALARM

Syrus LC III Control System

Operation Modes.

- **Idle Mode**
 - All components switched off, except pumping system
 - Switch to Eco Mode

- **Preparation Mode**
 - Service / Manual Mode
 - Components can be switched on manually
 - All interlocks are respected

- **Automatic Mode**
 - Automatic processing of recipe
 - Possibility to stop, vent, continue, repeat during automatic process

Syrus LC III Control System

Operation Modes.

PREPARATION MODE

COMM.

PROCESS PARAMETER Q1

Process Step NameTiO2_APS-IRcut_MY

EBG 1

Selection

☐ off

☒ on(soak)

☐ degassing

☐ leave

☐ constant

☒ controlled

☐ off

☒ on

☐ off

☒ on

EBG

HV:

Phase 1

Phase 2

Phase 3

0

0

0.0

13

2

200.0

13

2

248.0

Take over soak power 3

☐

Cathode Current [A]

17.0

Shutter position

☐ close

☒ open

Shutter delay time [s]

0

Crucible

☐ off

☒ on

Crucible Pocket No.

1

Deflection Set

TiO2_A_MY

Relative Offset X

1.00

Relative Offset Y

1.00

5

1.0

0.0

0.00

5

0.00

0.00

32.76

0.0

0.0

F1

AUTO

F2

IDLE

F3

CHARGE

F4

VACUUM

F5

CONST.

F6

STOP

F7

Recipe

F8

MAINT.

F9

DATALOG

F10

LAST PAGE

F11

PREP.

F12

ALARM

PLANT

GAS - F1

XTAL - 01

APS - Q7

HEATER - S2

SAVE

ACTIVATE

EXIT

X

24

Bühler Syrus LC III Upgrade

BUHLER

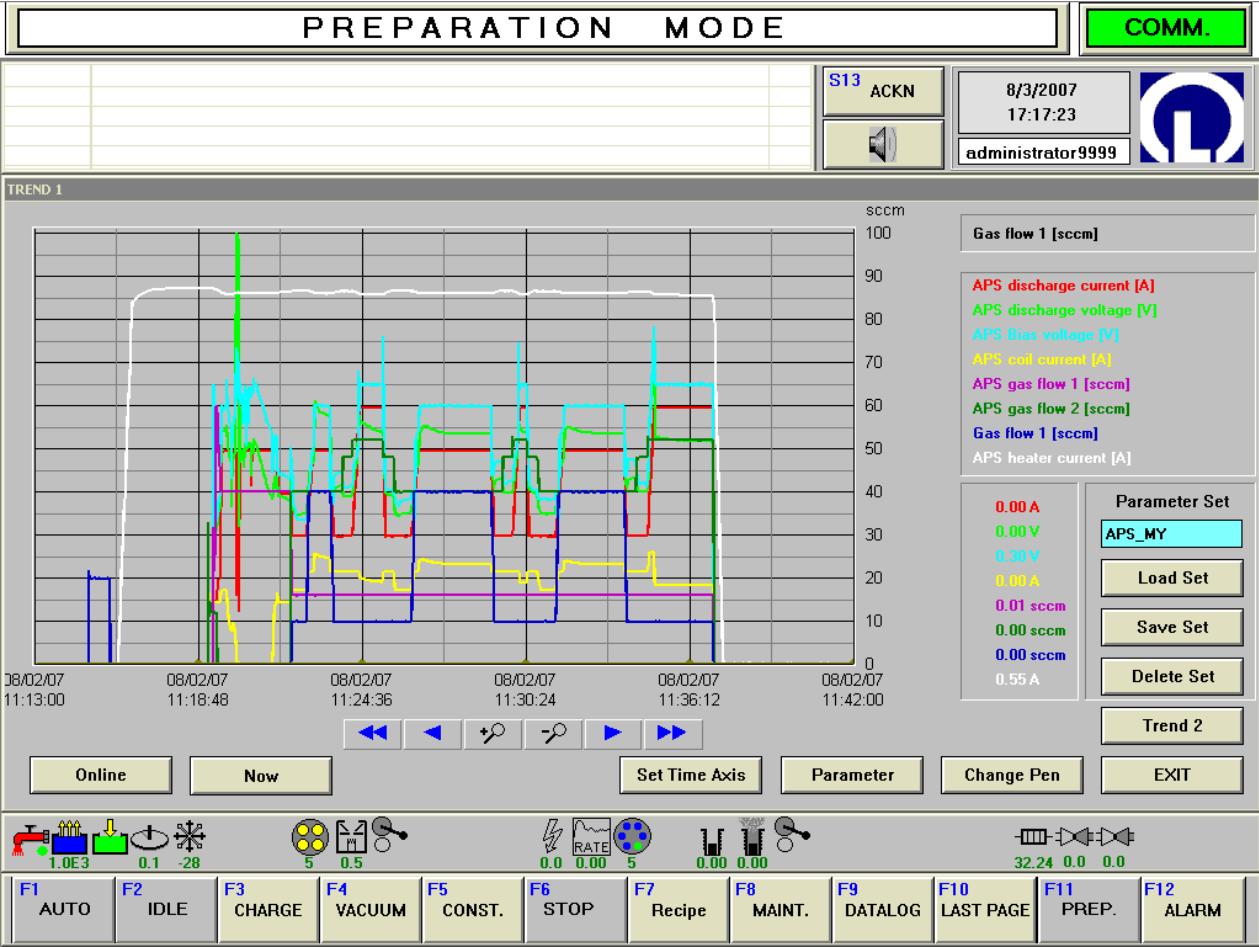
Syrus LC III Control System

Recipe Management.

- Recipes and layers and machine constants are stored in standard CSV files / separated files
 - recipe.csv
 - layer.csv
 - machine.csv
 - pattern.csv
- Possibility to use Microsoft Excel to configure Mode
- Easy transfer between different machines via network and PC
- CSV-Tool for offline recipe management
- Process data transfer from Optilayer program

Syrus LC III Control System

Trends and Data Logging.





Syrus LC III Control System

Trends and Data Logging.

PREPARATION MODE

COMM.

					S13 ACKN	8/3/2007 17:18:01	
						administrator9999	

HISTDATA EXTRACTOR

HISTORICAL LOGFILE DIRECTORY : F:\DATALOG

DATABASE DIRECTORY : D:\USER\OPTICONTROL


EXTRACT START DATE (MM/DD/YY) : 8/2/2007

EXTRACT START TIME (HH:MM:SS) : 16:57:59

EXTRACT DURATION : 2922S

EXTRACT INTERVAL : 1S

EXTRACT TO FILENAME : F:\REPORT\07080205.CSV


ACTIVE

Data Select

COMMON

LAYER

GAS - F1

XTAL - O

EBG - Q1

APS - Q7

HEAT-S2

THE - Q5


MAINT.


START EXTRACTION


RESTART


INIT


EXIT


 1.0E3

 0.1 -28

 5 2.9

 RATE 0.0 0.00 5

 0.00 0.00

 32.52 0.0 0.0

F1 AUTO

F2 IDLE

F3 CHARGE

F4 VACUUM

F5 CONST.

F6 STOP

F7 Recipe

F8 MAINT.

F9 DATALOG

F10 LAST PAGE

F11 PREP.

F12 ALARM

Syrus LC III Control System

Crystal Measurement System.

13:58:07 F077: THE #1 crucible high current contact runtime

S1 ACKN 5/9/2016 15:04:00 admin 9999

BUHLER

MACHINE CONSTANTS 10

Crystal measurement O1

Quarz crystal measuring system ☐ XTC ☐ Not used ☒ SQM or XMS

WFS control system crystal installed ☐

Rate monitor SQM active ☒

Frequency monitoring:

Fault delay time [s] 3

Max. freq. tol. proc. / pre + post phase [Hz] 100 20

Timepower change xtal delay time [s] 2

MFX 1 installed ☐ ☒ Positions 6

MFX crystal six type ☐ Leybold UPM ☐ QSK 621 ☒ Leybold digital signals ☐ Dual meas. head dual channel ☐ Dual meas. head single channel ☐ Inficon crystal six

Channel 1

Dual head: Use second paramter set for second ch. ☐

Xtal Monitoring ☐ Off ☐ Process counter ☒ Xtal lifetime ☐ Process counter + Xtal lifetime

Use OMS 3K TG field in sequence for MFX position ☐

Frequ. Monitoring Channel 1

Process phase ☐ Warning ☐ Fault ☒ TP warning ☐ TP change

Pre + post phase ☐ disable ☒ Warning ☐ Fault

SQM Ch. 1 ☒ Ch. 2 ☐ Ch. 3 ☐ Ch. 4 ☐ Ch. 5 ☐ Ch. 6 ☐

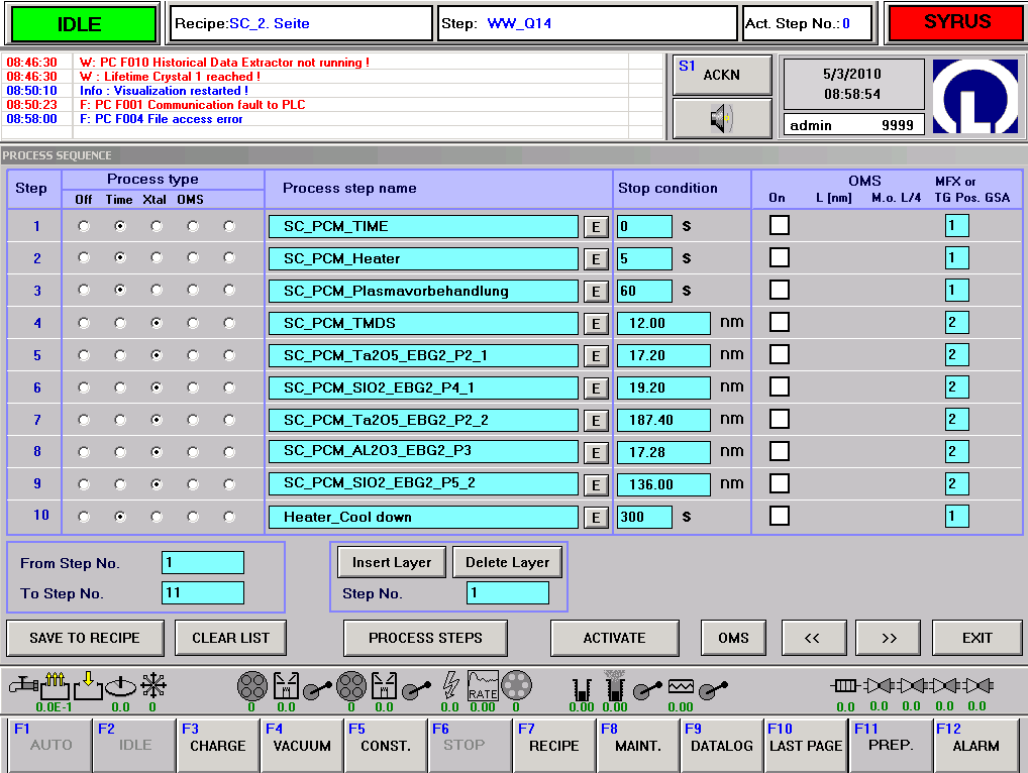
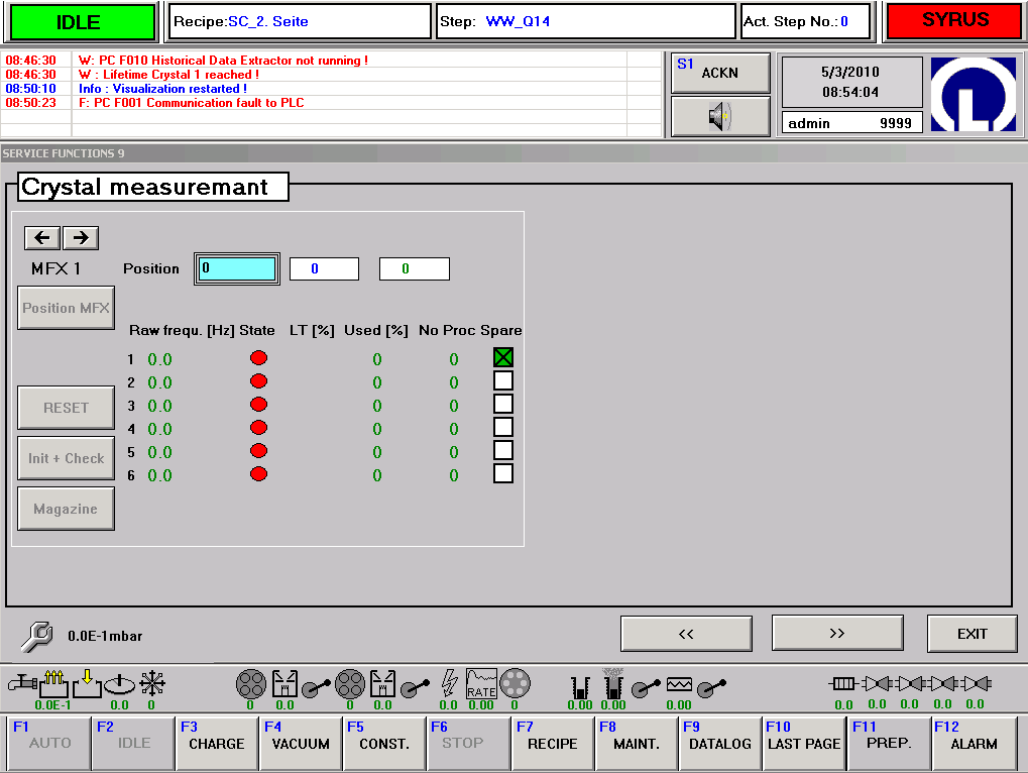
LOAD/SAVE CONSTANTS << >> EXIT

3.2E-4 30.0 22.4 0 10.5 1 0.3 8.0 0.00 6 0.00 0.00 22 0.0 0.0

F1 AUTO F2 IDLE F3 CHARGE F4 VACUUM F5 CONST. F6 STOP F7 RECIPE F8 MAINT. F9 DATALOG F10 LAST PAGE F11 PREP. F12 ALARM

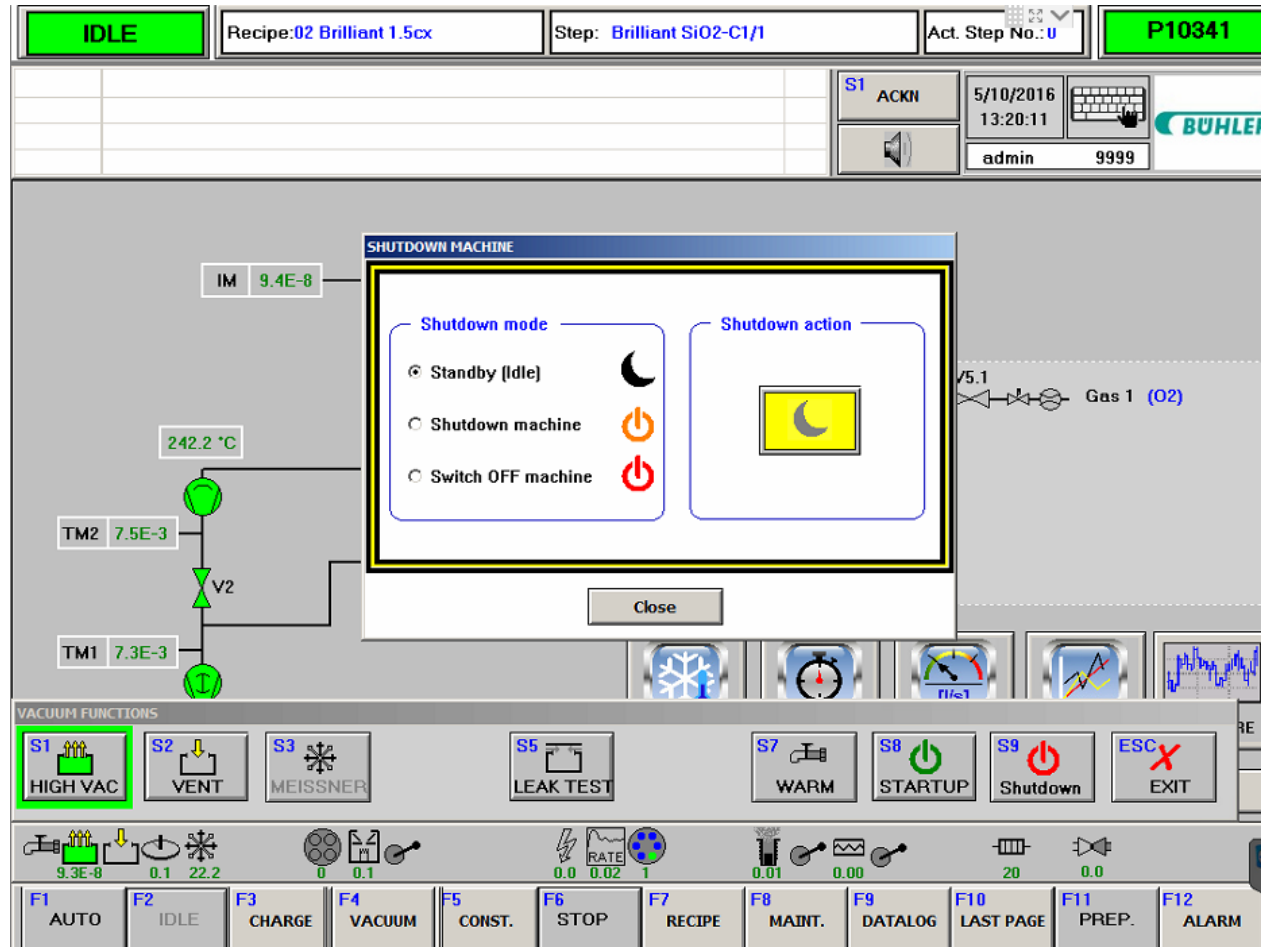
Syrus LC III Control System

Crystal Measurement System.



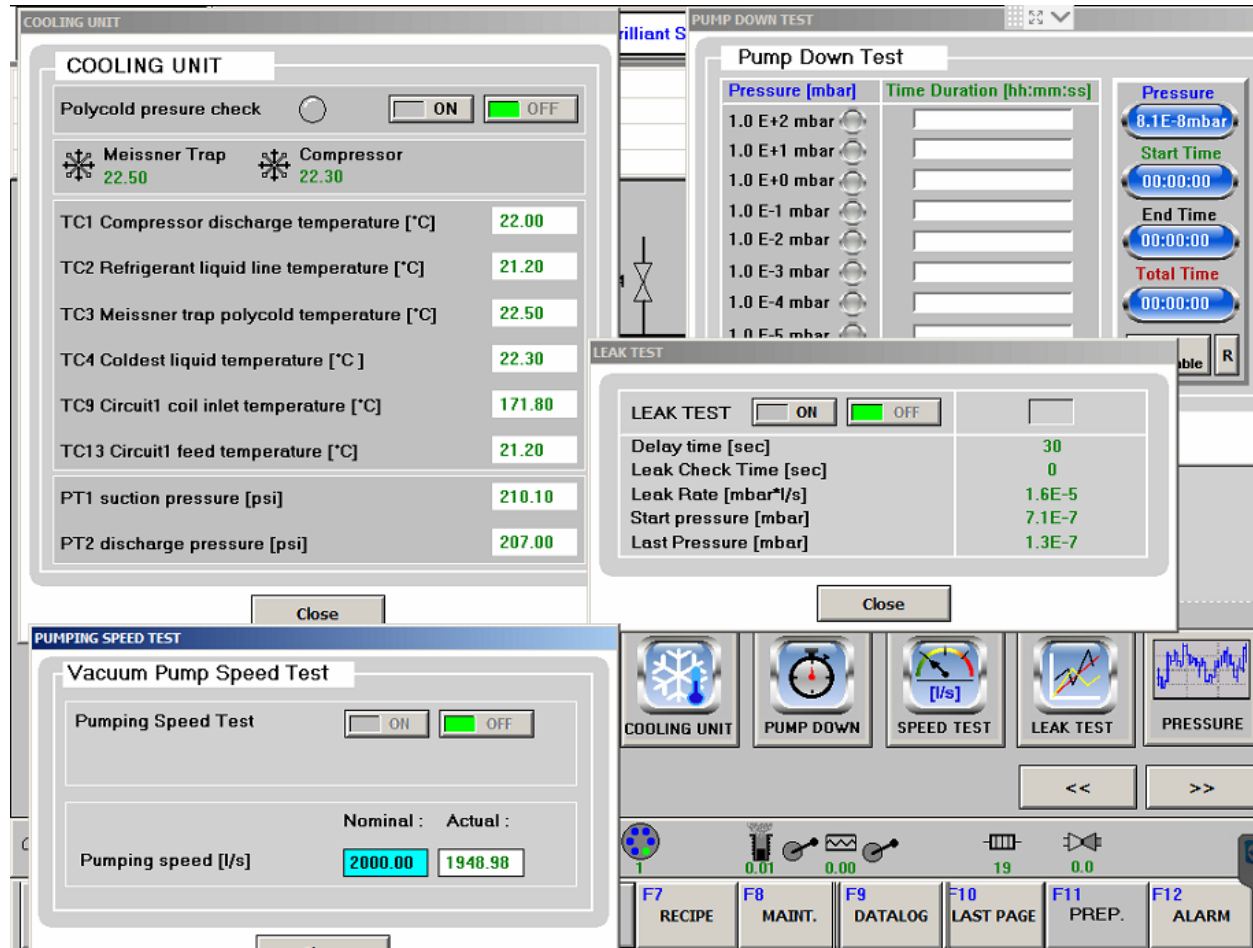
Syrus LC III Control System

New Features – Startup and Shutdown.



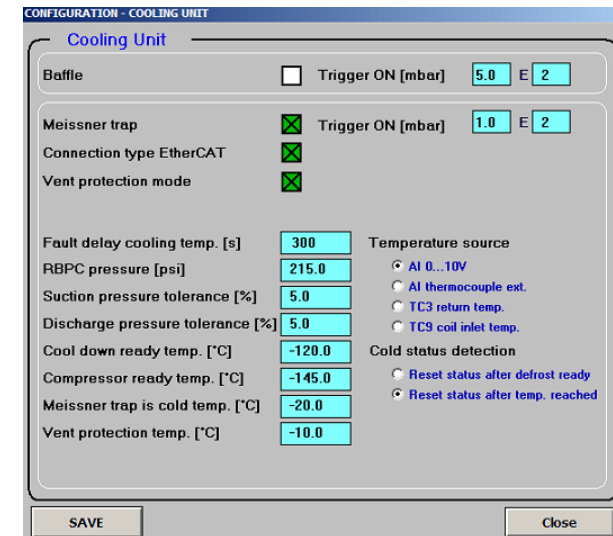
Syrus LC III Control System

New Features – Pumping System.



Functions for checking machine and pump status

Configuration of Meissner Trap, Cooling Unit Implementation

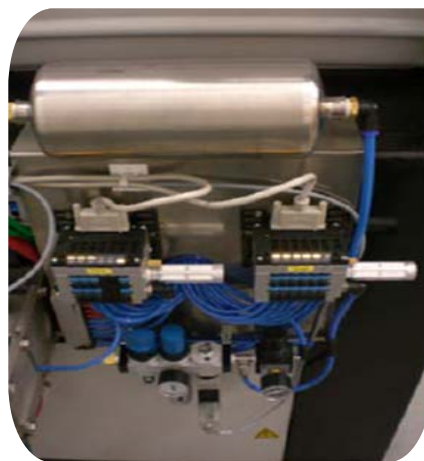


Examples

SyrusPro with Syrus LC III



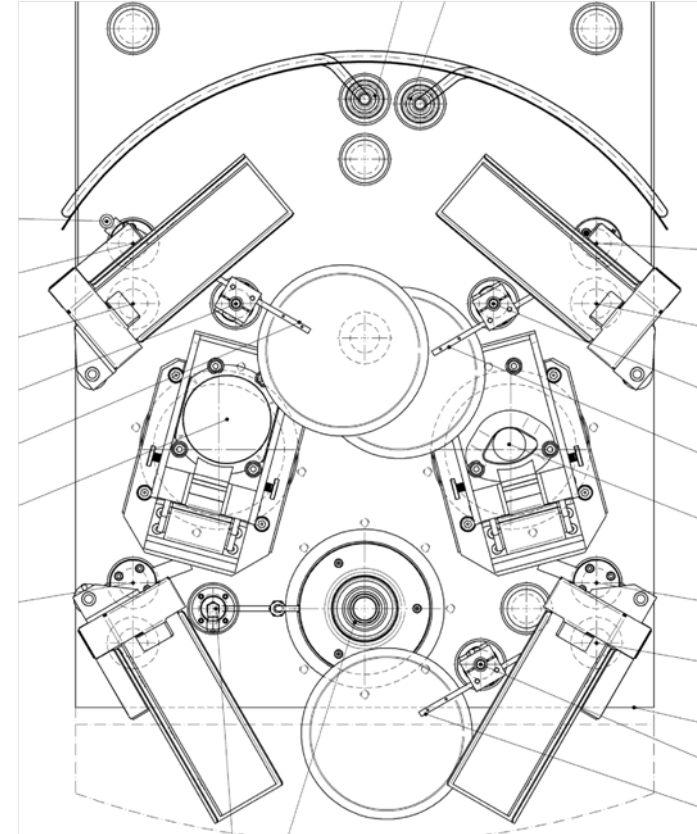
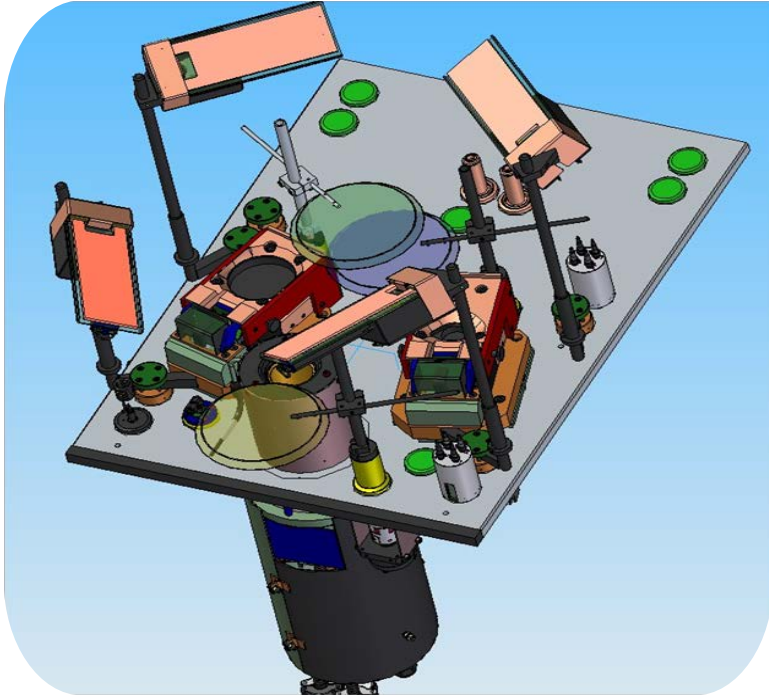
Syrus LC III examples (BAK 760)



Syrus LC III examples (BAK 760)



Syrus LC III examples (BAK 760 with APS and HPE 6)



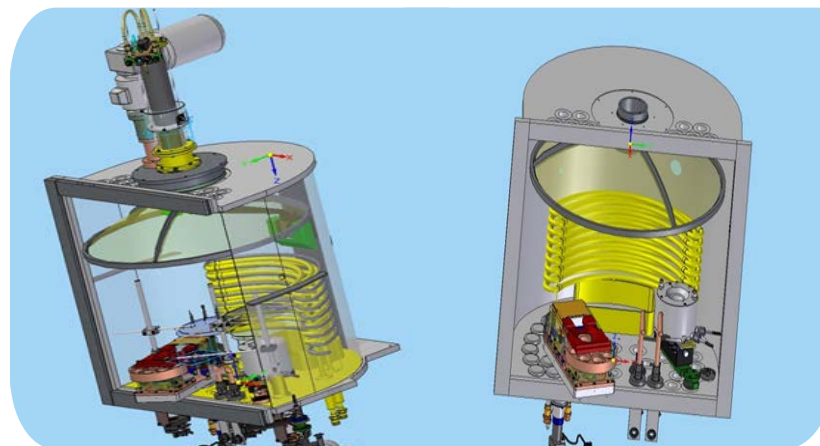
Syrus LC III examples (BAK 760 with APS and HPE 6)



Syrus LC III examples (A 1100 with APS and HPE 12/10)



Syrus LC III examples (A 700 with Mark II and HPE 12/10)



Syrus LC III examples

Bell machine from 1952.



Syrus LC III examples

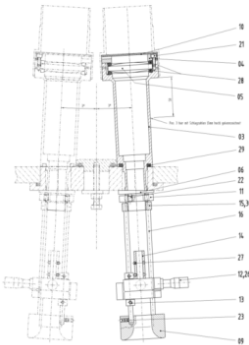
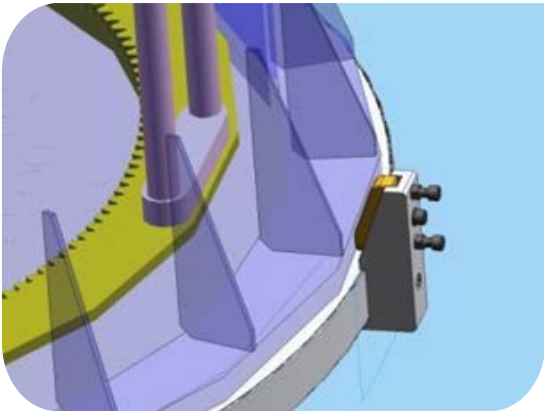
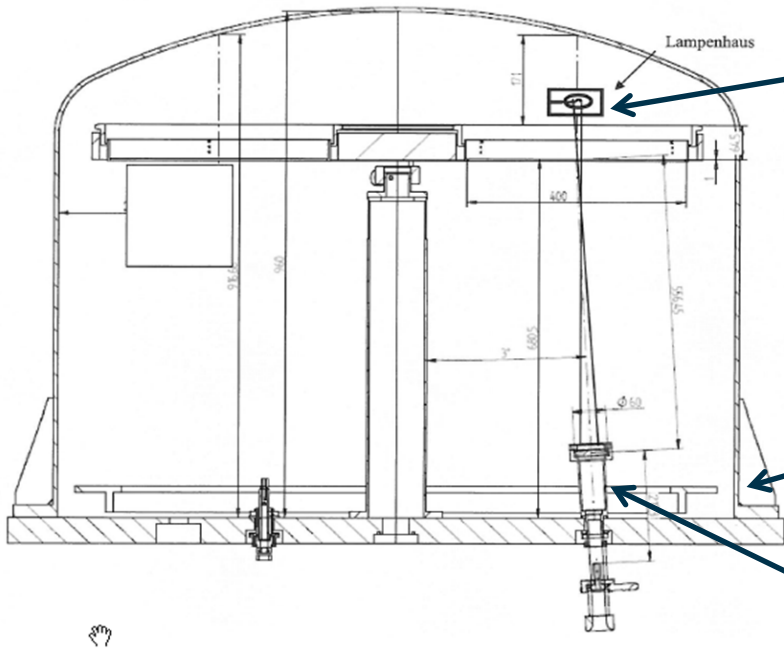
Bell machine from 1952.



Syrus LC III examples

Bell machine from 1952.

OMS 5000
and
direct monitoring



Syrus LC III examples

Satis 1200.



Syrus LC III

BAK 760 with 2 Sputter sources.



Syrus LC III

Examples.

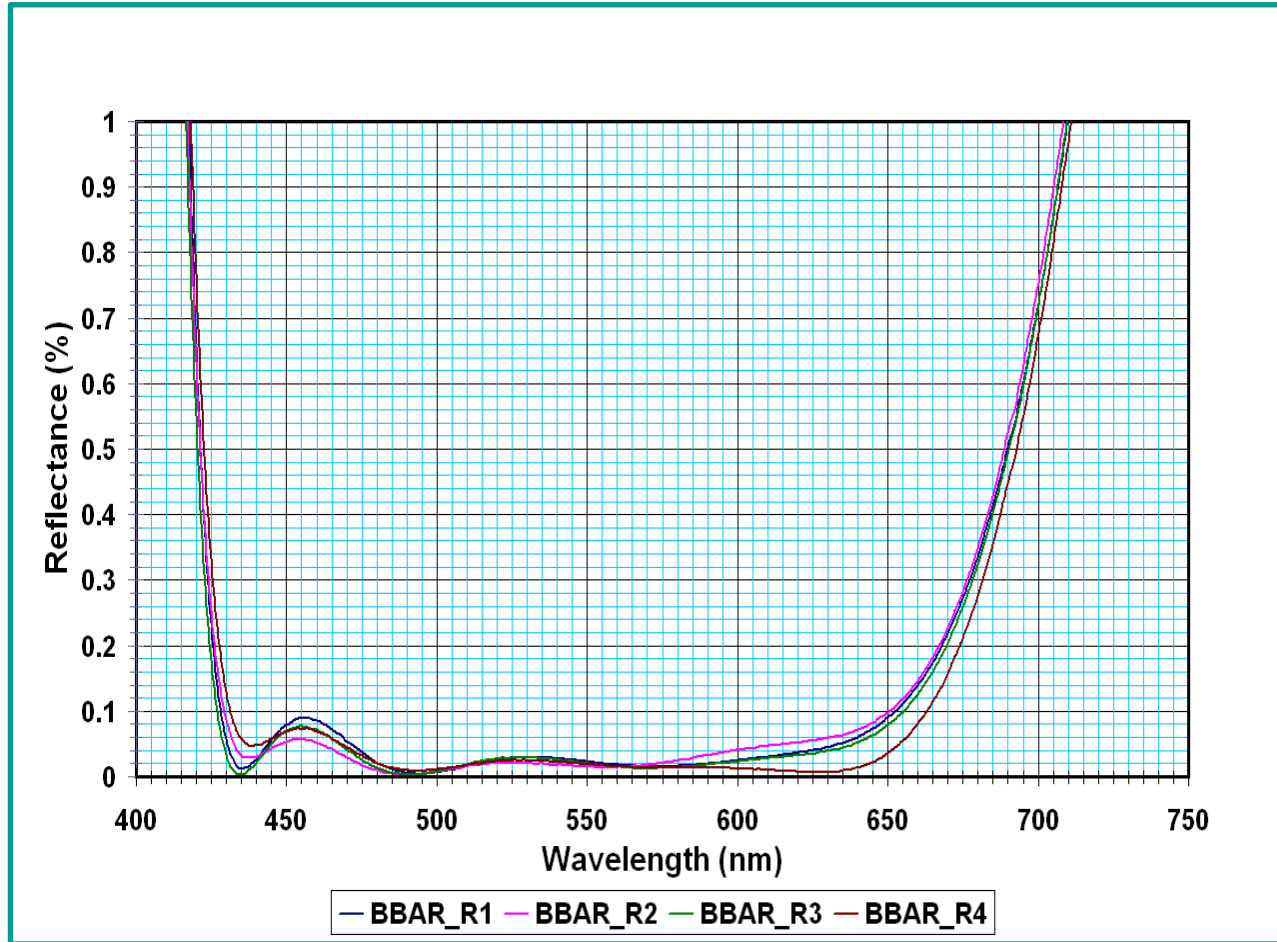


Modernization of a
complete
production on a
software platform

Process know-how

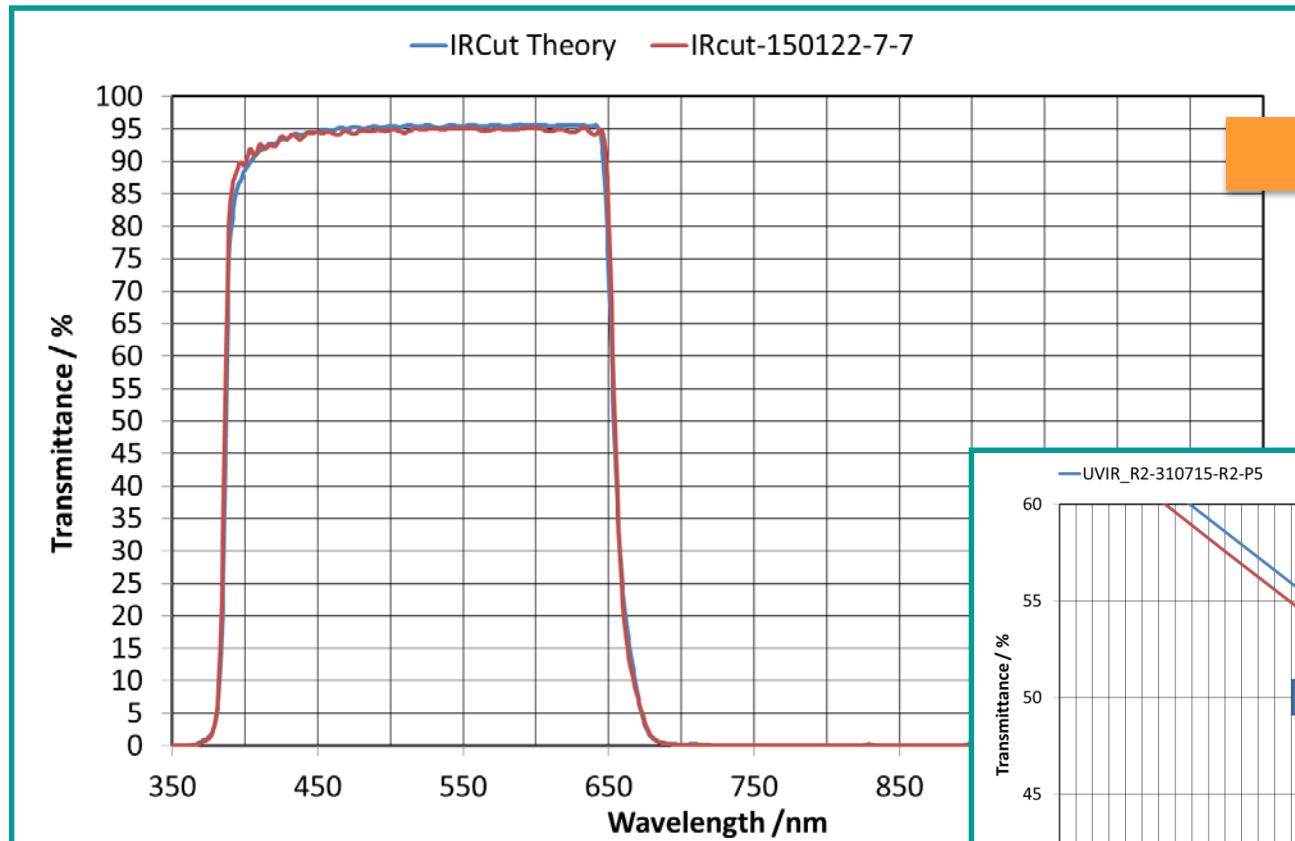
Syrus LC III Control System

Process know-how.

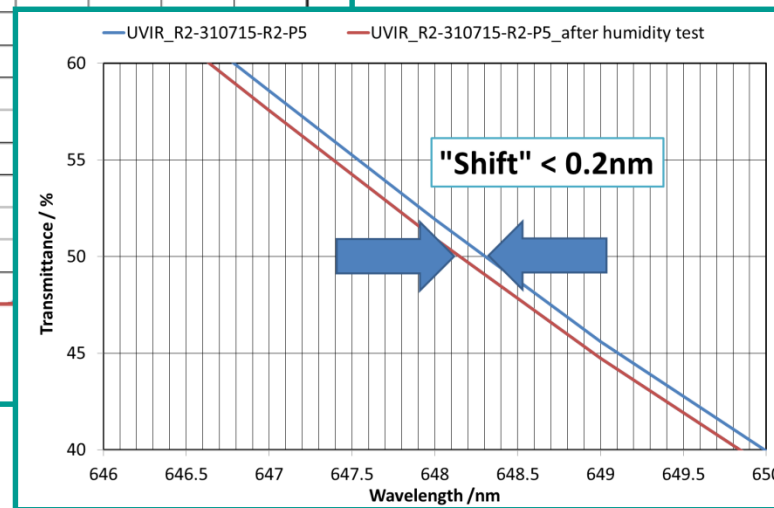


Syrus LC III Control System

Process know-how.



Very low shift
after humidity test



Key benefits

Syrus LC III

Key benefits.

- Short installation time
- Using industry standard components with short lead time
- New developments (hardware / software) from Bühler are available as an option
- Integration of non Bühler components on request
- Data Logging, external programming, remote maintenance
- Processes and process know-how of Bühler
- Support and service from the plant from one hand (Bühler)

**Our approach is
to reach total
customer
satisfaction**



Syrus LC III

Upgrades manufacturing locations.



In the Region for the Region.

Differentiation through expansion of global service network.

90 service stations worldwide...

... for customer service along the entire lifecycle of their solutions.

- Continued investment in our skills on-site with our Service Academy.
- Ongoing initiatives for the reduction of our reaction time for customer enquiries.
- Commitment to highest service quality.



Engineering Customer Success.

Bühler 2017

