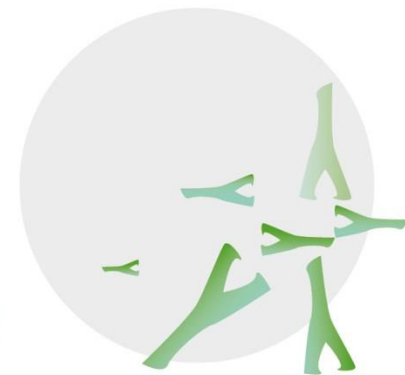




# Application Training STRATEC GEMINI





# STRATEC & DIASOURCE

**GEMINI**



**THE RIGHT COMBINATION**

**TUBE IN – RESULT OUT**

Fully automated microplate processor for low throughput applications

**stratec** ●●  
biomedical systems

**DIASource's ELISA**





# System overview



1. Cover with touch screen
2. Loading bay : rack system for samples and reagents
3. Tip ejection station and waste bags for disposable tips
4. Wash buffer bottles and waste bottles for the washer



# System overview (cont'd)



5. Pipettor
6. Service cover of washer
7. Plate transport
8. 3 positions for disposable tip racks
9. 2 positions for dilution plates, archiving plates or large reagent bottle.
10. Pipettor wash station, tip eject station and cover locking mechanism.
11. Loading bay barcode scanner and shield for protection between pipettor and loading bay.



# Rack system for samples & reagents

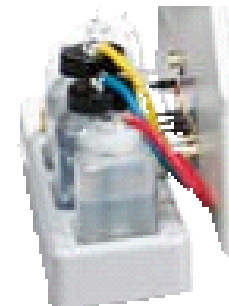
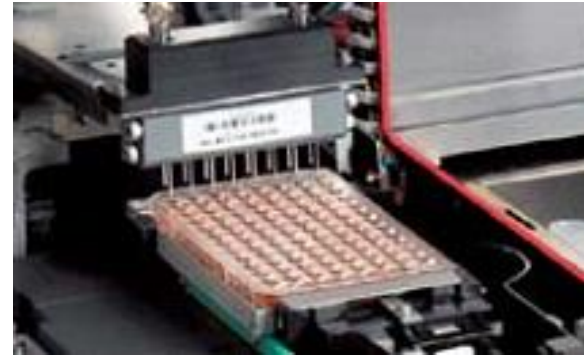
- 12 tracks for insertion of up to 12 racks
- Provided with bar-code scanner
- Racks identification:
  - T sample rack for 16 x 10 mm tubes
  - 2 reagent rack for 16 bottles for reagents (1 track)
  - 1 reagent rack for 8 bottles for reagents (2 tracks)
- Special racks on demand
- Sample and reagent: Up to 192 samples capacity  
Flexible: e.g. 144 samples + 8 reagents+ 16 controls





# Washer and Buffers

- Wash-head :
  - 2 x 8 channel
    - 8 dispense nozzles
    - 8 aspiration nozzles (longer ones)
  - Sweep mode, soak, top and bottom wash, variable pump speed
  - Precision 10% CV at 300  $\mu$ l
  - Residual volume <2.5  $\mu$ l in U-bottom (mean) <4  $\mu$ l in flat bottom (mean)
- 3 wash bottles
  - 1 x 1 Liter bottle (H<sub>2</sub>O Dist)
  - 2 x 2 Liter bottles (wash buffers)
  - Equipped with level sensors
- 2 waste bottles
  - 1 liquid waste (connected to waste container)
  - 1 overflow bottle





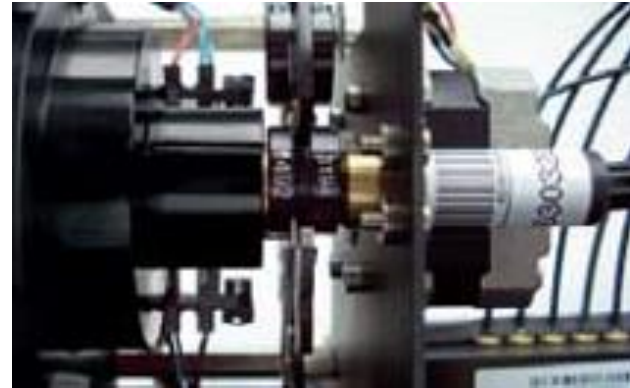
# Incubator & stacker

- Incubator
  - 2 independent heatable incubator chambers
  - T° between ambient and 45°C
  - Shaking possible 20 Hz (1Hz = 60 rpm)
  - Temperature uniformity:  $\pm 1.5^{\circ}\text{C}$   
(with in-process temperature monitoring)
  
- Stacker
  - Located below incubator
  - 3 light-protected incubation chambers
  - Only room-temperature incubation



# Photometer

- Photometric range 0 to 3.0 OD
- Halogen light source :
  - Spectral range 400 nm to 700 nm
  - up to 8 filters
  - Filter wheel
- Detector : 8 Photodiodes
- Read time < 15 sec single, < 30 sec dual
- Precision 1% CV at 1.0 OD
- Accuracy  $\pm 0.005$  OD or 2.5% (whichever is greater)
- Linearity 0 to 2.000 OD  $\pm 1\%$

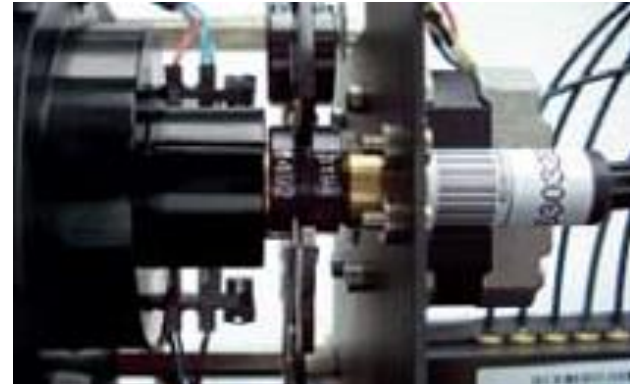






# Photometer (con'td)

- Standard equipped with 3 filters : 450 , 492 and 620 nm
- Single or dual wavelength reading
- Polychromatic reading
  - Linear regression
  - User-defined regression
- End point and kinetics
- Shaking





# Pipettor & diluter pump

- Dilutor pump
  - Microprocessor controlled
  - 1000  $\mu\text{l}$  syringe
  - Tubular system filled with system liquid (deionised water)
  - System liquid container : level sensor
- Pipettor
  - Disposable tips to avoid cross-contamination
    - Tips : liquid level detecting (LLD) capacity
    - Change of capacitance
    - 2 types : 300  $\mu\text{l}$  and 1100  $\mu\text{l}$
  - Automatically flushed between aspirate / dispense cycle





# Pipettor & diluter pump (cont'd)

- Min / max. volumes:
  - 10  $\mu\text{l}$  to 300  $\mu\text{l}$  with 300  $\mu\text{l}$  tip
  - 301  $\mu\text{l}$  to 1000  $\mu\text{l}$  with 1100  $\mu\text{l}$  tip
- Precision: (single dispense):
  - < 3% CV at 20  $\mu\text{l}$
  - < 3% CV at 100  $\mu\text{l}$
- Precision: (multi dispense):
  - < 10% CV at 16 x 20  $\mu\text{l}$
  - < 3% CV at 8 x 100  $\mu\text{l}$
- Features:
  - Pipetting pressure monitoring, capacitive liquid level detection, tip detection, mixing, multiple dilution steps, archiving





# Capacity and throughput

- Flexible scheduling of up to three plates
  - 2 + 1 plate processor
- Combination of multiple assays on one plate
- Initial loading of up to 192 samples
- Continuous loading
- Three disposable tip rack positions
- Two deep-well plate positions for pre-dilution and /or archiving
- Bi-directional LIS connectivity
- Additional functionality through middleware software
  - Operates with single or multiple GEMINI installations
  - Provides smooth real time bi-directional communication between device and LIS



# Safety and In-process control

- Aspirate check option
- Pipetting pressure monitoring option
- Capacitive liquid level detection
  - for optimal identification of
    - fibrin clots
    - and insufficient volume.
- Colorimetric dispense verification
- Positive identification of bar-coded samples and reagent
- Liquid pipettor for disposable tips (300  $\mu$ l or 1100  $\mu$ l)



# Standard equipment

- 1 x STRATEC GEMINI
- 1 x 10 L waste container
- 1 x 10 L system liquid container
- 2 x Washer bottle , 2000 ml
- 1 x Washer bottle , 1000 ml
- 2 x aspirate bottles, 1000 ml
- 1 x tray , wash bottle
- 1 x holder , waste bags
- 2 x plate carrier
- 1 x power card , EURO
- 1 x set, cleaning , washer
- 2 x inlays , LLD (set of 2)
- 1 x rack, reagent (2 tracks)
- 4 x rack, sample
- 1 x rack, standard and/or controls
- 1 x adapter rack, set of 6
- 1 x disposable tips 300  $\mu$ l (box/960)
- 1 x disposable tips 1100  $\mu$ l (box/960)
- 10 x waste bags, w/label biohazard





# Walk-away system

- BUT :
- 3 type of interventions during a run
  - When tips need to be reloaded
  - When an unstable reagent need to be loaded
  - When a system error or a pipetting error occurs



# Pipetting errors

- Actions pre-programmed in assay programming
  - Raise alarm and stop
  - Log and continue
  - Manually pipette and the end of step
- Action is always logged in Event Log





# Continuous Loading

- Advantage
  - Allows the user more samples  
and/or
  - Use more than 3 testplates within a single run
- Reloading within the existing worklist
- Worklist options can be modified



# Elimination of assay drift

- Definition of assay drift :

Pipetting samples (or dispensing reagents) into a whole plate can be fairly long, the time span between the moment when the first strip or the last strip will be pipetted (dispensed) will be significant.



When these strips get washed , they get washed almost simultaneously (washing = faster).

In other words,the waiting time between pipetting (dispensing) and washing is much longer for the wells of the first strip than those of the last strip.

For some assays , this can create problems : inconsistent results from one strip to another.



## Elimination of assay drift (cont'd)

- « Eliminate assay drift caused by this operation »
  - Can be selected for each step defined in the pipette dialog in the assay
- If enabled :
  - Software will calculate time required for all pipette steps in which this option is enabled
- Drift compensated during next wash-step
  - The first cycle of the following wash-step is delayed according the duration of the previous calculated pipette steps
- So : Pipette time (assay drift enabled) = time for first wash cycle



## Elimination of assay drift (cont'd)

- Sequence of following wash step is :
  1. Aspirate / dispense first strip – first wash cycle
  2. Delay (according calculated pipette time)
  3. Aspirate / dispense second strip – first wash cycle
  4. Delay (according calculated pipette time)
  5. ....
  6. Aspirate / dispense last strip – first wash cycle
  7. Aspirate / dispense remaining wash cycles **without** delay
  8. Final aspirate cycle
- Pipette time = total time of steps 1 to 6

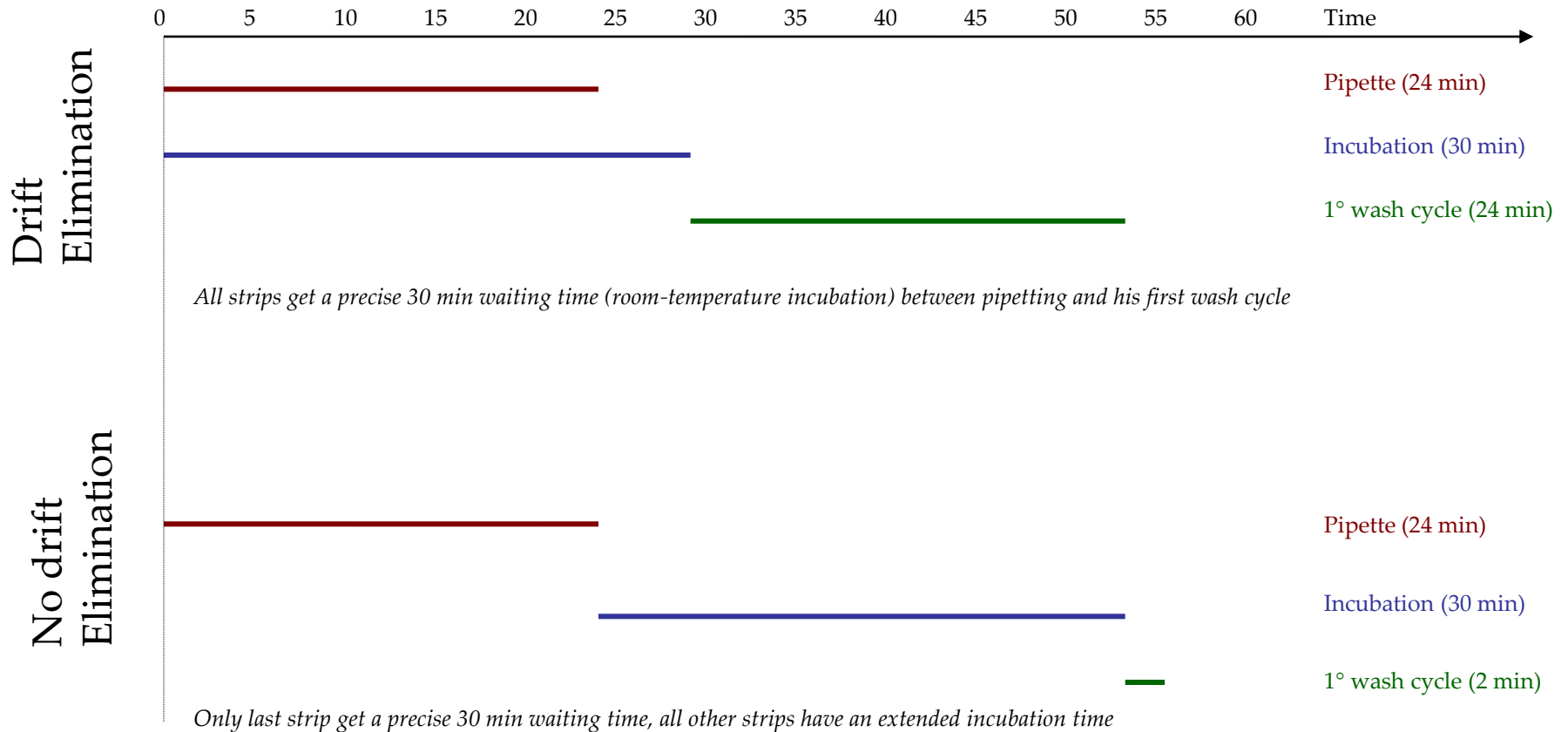


## Elimination of assay drift (cont'd)

- BUT : dispensing reagents —————> influence on incubation time
- Elimination assay drift results in increase (for all strips except the first one) of the waiting time span between pipetting (dispensing) and washing
- Duration of plates room-temperature incubation between those two steps has to be reduced accordingly.
- This reduction would be different for each strip, and therefore be difficult to define.
- Solution : check the incubation time from the start of the previous assay step item in the incubation dialog box. This way , all strips will have an indentical incubation time.



# Elimination of assay drift (cont'd)





# Oversoak volume

- Oversoak = 10 % of **total** dispensed volume
- Example: dispense 50  $\mu\text{l}$  reagent in every well
  - Dispense volume = 50  $\mu\text{l}$
  - N° of multishot = 16
  - Oversoak = 80  $\mu\text{l}$  (10 % of 16 x 50  $\mu\text{l}$ )
- Total aspirate volume must < 990  $\mu\text{l}$ 
  - Total aspirate volume = [(N° of Multishots x Disp. Volume)+oversoak volume]
- In general: Oversoak discarded (not back to source)
- Use of volume offset : N° of multishots > syringe capacity  
-----> N° of multishots per dispense steps will be reduced



# Maintenance

- Daily maintenance
- Weekly maintenance
- Monthly maintenance
- Special Maintenance procedures





# Maintenance (cont'd)

- Daily Maintenance
  - System liquid container
    - check volumes
  - Waste liquid container
    - Check level of waste and discard eventually
  - Pipettor
    - Check pipettor tubing and syringe for air bubbles



# Maintenance (cont'd)

- Weekly Maintenance
  - Washer cleaning / decontamination
    - Clean the wash head with the cleaning needle
    - Decontamination procedure
      - start assay with decontamination liquid
      - Start assay with deionized water to rinse washer
  - Daily Maintenance
  - Check washer performance (WS reagents)



# Maintenance (cont'd)

- Monthly Maintenance
  - Weekly maintenance
  - Instrument & Accessoires cleaning / decontamination
    - Clean wash buffer bottles
    - System liquid container : check filter
    - Clean head of pipettor
      - Use lint-free soft cloth , moistened with ethanol
  - Perform a back-up
  - Performance evaluation
    - Check performance of pipettor (PE reagents)



# Maintenance (cont'd)

- Special Maintenance procedures
  - Visually check tubing
    - Make sure tubing are clean free from deposit or residue
    - Eventually flush and decontaminate
  - Visually check syringe and three-way valve
    - Syringe has to be clean and leak free ----→ call service
    - Valve : dripping ----→ call service for replacement
  - Heavy Liquid overflow
    - Switch off Gemini immediately
    - Clean & Decontaminate affected area with absorbance paper
    - Before switching on instrument, identify source of problem --→ call service
  - Washer malfunction ---→ clean washer
  - Power supply malfunction
  - Photometer malfunction
    - Reader confidence check with Reader Verification Plate



# Reader Verification Plate (RVP)

- The Reader Verification Plate
  - Certified by the manufacturer (Stratec)
  - Valid for three years
- Applied in case of
  - In case of suspicion of Photometer malfunction
  - Regular as confidence check (Service Engineer)
  - As part of Maintenance (Service Engineer)



# Reader Verification Plate (RVP)

- Functions of the Reader Verification Plate
  - Accuracy
  - Linearity
  - Uniformity
    - To verify every optical channel measures the same value
  - Optical Alignment
    - To verify the measurements are taken at the optimum position within the MT-plate
  - Cross Talk
    - To verify cross talks between optic channels remains below stated reference limits
  - Dynamic Range
    - To verify that dynamic spans stated reference dynamic range of 2.5 OD
  - Filter Wavelength
    - To verify the correct filter is installed and control on central wavelength
  - Filter Blocking test
    - To verify correct filter has no major defects : defected filter will unblock light
  - Precision test
    - To verify the measurements remains constant within repeated readings of the same sample



# Archiving Samples

- Independent sample archiving
  - Archiving run
- Archiving samples within a normal run
  - Automatically archive ALL the samples tested
  - To archive SOME of the samples tested
  - Imported worklist with archiving orders (from LIMS)
- Multiple archiving possibility
- Archiving large volumes (> 1000 ml)



# Archiving samples cont'd

- Export archiving files
  - Ayyymmdd.txt (yy = year , mm = month, dd = day)
- Archiving report :
  - Secondary tubes
    - Sample ID , volume and flags
    - Tested : as normal samples
  - Secondary MT-plate
    - Primary tube ID , archive plate ID , location within plate, volume and flags
    - Tested : as archived samples





# Product Support

- Dedicated email adres (Hot line)
  - [productsupportSTRATECGEMINI@diasource.be](mailto:productsupportSTRATECGEMINI@diasource.be)
- Dedicated telephone line
  - + 32 (0) 474 69 23 74
- Website : distributors extranet
  - Login and password
  - Technical bulletin
  - Application bulletin



# Maintenance

- **At Start-up**

- Check the level of system liquid in the system liquid container. If low, refill it.
- Check the level of waste liquid in the waste liquid container. If full or nearly full, empty and decontaminate it.
- Dispose waste liquid in accordance with legal regulations for biological hazardous waste.
- Check pipettor tubing and syringe for air bubbles or leakages as these can cause pipetting errors.