Operating Manual

Fluent® Dx

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1 About This Manual

This Operating Manual provides a comprehensive description of the Fluent Dx system (simply referred to as Fluent throughout the manual) and includes all the necessary information for its safe operation and proper maintenance. This manual must be read carefully before performing any work on the Fluent and before using it.
This chapter outlines the purpose of this manual and specifies the product referred to. Furthermore, it explains the use of symbols and conventions as well as further general information.
This manual pertains to the Fluent instrument itself. For important information on the submodules, please refer to the specific manuals for the modules.

This Operating Manual contains no software description. For more information on the software please consult the corresponding software manual. Refer to section "Reference Documents" [▸ 9].

1.1 Scope of This Manual

This manual applies to:

- Fluent Dx 480 (part number 30042094)
- Fluent Dx 780 (part number 30042095)
- Fluent Dx 1080 (part number 30042096)

1.2 Economic Operators

1.2.1 Manufacturer

Address of Manufacturer

Tecan Schweiz AG
Seestrasse 103
CH-8708 Männedorf
Switzerland

1.2.2 European Authorized Representative

Address of European Authorized Representative

Tecan Austria GmbH
Untersbergstrasse 1a
A-5082 Grödig
Austria

1.2.3 UK Authorized Representative

Address of UK Authorized Representative

Tecan UK Ltd.
Theale Court
11-13 High Street
Theale, Reading, RG7 5AH
UK

1.2.4 Australian TGA Sponsor

Address of Australian TGA Sponsor

Australian Sponsor
Emergo Australia
Level 20, Tower II
Darling Park
201 Sussex Street
Sydney, NSW 2000
Australia

1.3 Intended Use

The Fluent is an automated laboratory liquid handling platform for in vitro diagnostic use. The product is intended for the automation of clinical sample preparation and processing of clinical diagnostic assays using human specimens. The type of specimen and specific diagnostic protocol is defined and validated by the user for their selected clinical assay. The product is intended for healthcare professionals and professional laboratory use by trained personnel. The product is not intended for self-testing or near patient testing.

Additional information to the intended use
If a research-use-only (RUO) option or device is integrated with Fluent, the intended use changes to For Research Use Only. Not for use in diagnostic procedures.
If MCA 384 is integrated, the intended use changes to For General Purpose Use (GP).

IVD CE

1.4 Area of Use/ Area of Application

Fluent may be used in a variety of laboratory environments according to its intended use.

In each environment the individual laboratory is responsible for the validation of the Fluent instrument together with the specific liquids and labware used in the laboratory's application workflow or method.

1.5 Improper Use

Improper use may prejudice the Fluent safety concept.

- The Fluent must not be used with options or components that are not approved by Tecan.
- The Fluent is not explosion-proof and should not be installed in locations where there is a hazard of explosion.
- The Fluent should not be used in the absence of functional safety devices.

1.6 Warranty

The Fluent must not be used with components that are not approved by Tecan.

The use of unapproved components may impair the safety concept of the Fluent.

The use of unapproved components would invalidate any warranty of safety and compliance to national and international standards, as required for NRTL certification, and by EC directives, etc.

1.7 Trademarks

The product names, whether registered or unregistered trademarks, mentioned in this manual are reproduced solely for identification purposes and remain the exclusive property of their respective owners. For simplicity reasons, the trademark symbols such as ® and ™ are not repeated in the manual.

1.8 Reference Documents

This section provides a list of the documents that are needed or may be useful when using the Fluent.

The Doc IDs listed below are root numbers. Therefore, they do not contain information about the language, document version, or the medium (data storage medium, hard copy, downloadable file, etc.) of the document.

On the basis of your order configuration, the Operating Manuals for optional equipment apply as well.

Check the scope of the corresponding document to ensure that you are in possession of the correct version.

The Doc ID does not refer to ordering information. When placing orders, please refer to the number on the binder, CD casing, etc.

1.8.1 Instrument Manuals

- Fluent® Dx Operating Manual (Doc ID 403096)
- Fluent® Dx Reference Manual (Doc ID 403190)

1.8.2 Software Manuals

- Tecan Sample Tracking Add-on Software Manual (Doc ID 393933)
- FluentControl Application Software Manual (Doc ID 399935)
- Introspect Application Software Manual (Doc ID 400733)
- MissionControl Application Software Manual (Doc ID 401940)
- Fluent Secure Operating Manual (Doc ID 403097)

1.8.3 QC Kit Manuals

- QC Kit Application Manual (Doc ID 397069)
- QC Kit Application Software Manual (Doc ID 397070)

1.8.4 Other Reference Documents

- Fluent® Carousel Operating Manual (Doc ID 398350)

- HEPA hood (Doc ID Caron 70072)
- Frida Reader™ Application Manual (Doc ID 401882)
- Te-Shake™ Operating Manual (Doc ID 391496)
- Te-VacS™ Operating Manual (Doc ID 391236)
- Fluent® Stacker Operating Manual (Doc ID 398658)
- MIO2 Operating Manual (Doc ID 394934)
- Resolvex i300 Operating Manual (Doc ID 402756)

1.9 Compliance with Laws and Standards

The following declarations and certifications apply to Fluent:

- EC Declaration of Conformity with applicable EU Directives (CE mark)
- Nationally Recognized Testing Laboratory (NRTL) Certification
- (IECEE) CB Scheme Certification (CB mark)

For more detailed information about the marking, refer to section Type Plate.

1.10 Document Conventions

Cross-References

Cross-references appear as follows—e.g.:

Refer to section “Safety” [▷ 11]

- “Safety” refers to the corresponding section header
- The page number is given in square brackets

Prerequisites

Prerequisites appear as follows—e.g.:

✓ “General Safety Information” has been read.

Tips

Additional tips appear as follows—e.g.:

For safety conventions and symbols refer to chapter “Safety” [▷ 11].

Illustrations

The illustrations may show component versions which are not relevant to your Fluent.

2 Safety

This chapter describes the safety concept of Fluent, provides general rules of correct behavior, and warnings concerning hazards associated with the use of the Fluent.

2.1 Safety Message Conventions

2.1.1 Signal Words

Tab. 1: Signal Words

Signal Word	Meaning
⚠ DANGER	Indicates a hazardous situation that, if not avoided, will result in death or serious injury.
⚠ WARNING	Indicates a hazardous situation that, if not avoided, could result in death or serious injury.
⚠ CAUTION	Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.
NOTICE	Indicates a situation that is not hazard-related but, if not avoided, could result in damage to or malfunctioning of the equipment, or incorrect process results.

2.1.2 Safety Symbols

Crushing of hands

General warning

Laser beam

Optical radiation

Biohazard

No heavy load

Magnetic Field

2.2 General Safety Information

⚠ WARNING

Fluent is designed and built in accordance with the present state-of-the-art technology and the recognized technical safety regulations. Nevertheless, risks to users, property and the environment can arise if the Fluent is used without due care and attention.

The safety of all users and personnel depends on the strict observation of these safety instructions and awareness of the safety-related warnings provided in this manual.

- Please pay great attention to the following general safety information.
- This manual must always be available to all persons performing the tasks described herein.
- Always use the power cable supplied with the instrument.
- Do not use the power cable with other products.

- Legal regulations, such as local, state and federal laws concerning the use or application, as well as the handling, of dangerous materials in connection with the Fluent must be strictly followed.
- The operating company is responsible for defining instructions in accordance with company procedures and local legal requirements. The instructions provided by the operating company must be strictly observed.
- Observe the correct environmental conditions for storage and operation.
- Structural changes to the safety devices are forbidden.
- Damaged safety devices must be replaced immediately as described in this manual.
- The Fluent must not be modified in any way without prior consultation and written approval of Tecan. Authorized modifications to the system may only be performed by an FSE certified for the repair and upgrading of the Fluent. Tecan will reject any claim resulting from unauthorized modifications.
- Fire hazard caused by the improper use of the Fluent. The Fluent should not be installed in locations where there is a hazard of explosion.
- Fire hazard caused by flammable liquids or system liquid.
- Avoid the formation and accumulation of flammable vapors.
- Chemical, biological, and radioactive hazards can be associated with the substances used or the samples and reagents processed with the Fluent (e.g., during loading and unloading). The same applies to waste disposal.
  - Always be aware of possible hazards associated with these substances.
  - Use appropriate protective clothing, safety goggles, respirators, and gloves.
  - The handling of substances and the disposal of waste may be subject to local, state, or federal law, or to regulations with regard to health, environment, or safety. Strictly observe the corresponding provisions.
- Any contamination must be dealt with immediately as described in this manual.
- The user is responsible for ensuring that the Fluent is always operated under proper conditions, and that maintenance, service, and repair tasks are performed with care, on schedule, and only by authorized personnel.

- Risk of incorrect measuring results. After system care or maintenance has been performed, operation must only be resumed after the correct system operating conditions have been verified.
- Always use recommended consumables within expiration date and original spare parts for maintenance and repair to assure good system performance and reliability.
- Injury could result if skin comes in contact with system liquid on the instrument.
  - Always wear protective clothing according to GLP.
- Heavy load! Do not lift the instrument.
- Do not operate the system without deck trays and deck segments.
- Deck trays capture liquid spills that may occur in the manual deck loading area. The system should be operated with as many deck trays as possible installed below the deck to collect all liquid spills. Do not operate the system without deck trays.
- If carry-over is not tolerated, the use of disposable tips with filters is strongly recommended.
- Possible Crash. Do not place devices without Tecan model data on the deck.
- Extension 300 is designed for a maximum load of 40 kg (88 lbs.), and only for use with options that are lighter than 40 kg (88 lbs.).
- The Fluent is supplied with a biohazard safety sign which should be applied by the user in the event of use of biohazardous substances. Apply the label on the front door in a position visible to the user and convenient for the application. Refer to section “Product Safety Signs” [31].
- Options used on the worktable of the Fluent can generate strong magnetic fields, which may interfere with the function of medical devices implanted into or worn by an operator, such as pacemakers or insulin pumps. The Fluent is supplied with a safety sign of strong magnetic fields which should be applied by the user to the front door in a position visible to the user and suitable for the application in the event of use of options generating strong magnetic fields.
- The ethernet cable of the DeckCheck cameras will be installed by an FSE and must be installed on a PC running FluentControl at all times (EMC). The Ethernet interface is not allowed to be connected to a network.

2.3 Camera Privacy Statement

The Fluent system is equipped with cameras mounted on the inside front profile. The cameras are focused on the deck and rear deck. Views downwards through the acrylic-glass side panels are possible.

- The user is responsible for advising people in the room that cameras are in operation.
- The user is responsible for ensuring that the personnel could not be identified from pictures taken, for example if the instrument is adjacent (side-on) to a desk space or if rear or side panel cut-outs are made or if an acrylic-glass panel is used to replace the rear wall.

2.4 Application Risks

System function / Module	Possible failure mode	Potential failure effect	Possible / Potential cause	Labeling or mitigation
System	Insufficient maintenance	Safety or health of users: Potential contamination of instrument	Use error: Neglecting Operating Manual or maintenance instructions	The user must ensure the use of appropriate consumables and preventive maintenance instructions (refer to "System Care" [▷ 120]). User shall wear protective clothing, gloves and goggles according to GLP and prevailing local regulations.
System	Fire	Safety or health of users: Fire in operators lab (instrument burning)	Gas from volatile flammable liquids; spark from electronic board spreading	The instrument is not explosion proof and the customer shall ensure that there is no high vapor concentration (refer to "General Safety Information" [▷ 13]).
Module FCA & Air FCA	Wear out of Z-axis mechanics (Above average usage)	Safety or clinical conditions of sample: Potentially wrong Z-positioning in labware	Above average usage of device in combination with usage of disposable tips High percentage of piercing steps in application	The system informs the user if th Z-axes have reached 90% of the expected lifetime of the axis.
Module FCA & Air FCA	Wear out of P-axis mechanics (Above average usage)	Safety or clinical conditions of sample: Potentially wrong P-positioning in labware	Above average usage of device in combination with usage of disposable tips High percentage of piercing steps in application	The system informs the user if the P-axes have reached 90% of the expected lifetime of the axis.
Module FCA & Air FCA	Abrasion of X-drive cogwheel (Above average usage)	Safety or clinical conditions of sample: Potential contamination of samples with polyamide particles	Above average usage of device in combination with placing of critical labware on rear of instrument	Avoid placing particle-sensitive elements (e.g., samples and reagents) on rear of the instrument or place particle protection on top of labware (i.e., lids).

System function / Module	Possible failure mode	Potential failure effect	Possible / Potential cause	Labeling or mitigation
Module FCA & Air FCA	Interfering signals due to septum piercing	Safety or clinical conditions of patient sample: wrong cLLD leading to air aspiration and potentially false results	Interaction of the tip with the septum / foil	Work only with non-conductive foils for piercing applications in conjunction with liquid level detection on the FCA and Air FCA. Refer to the Reference Manual. The user must validate liquid detection in combination with piercing for FCA and Air FCA.
Module FCA & Air FCA	Wrong sample treatment, wrong cLLD due to foam or bubbles in reagent vial	Safety of process: wrongly processed samples	Bubbles or foam in the reagent vial cause a wrong cLLD and potential aspiration of air with FCA or Air FCA	The user is responsible to validate the application / process with respect to appropriate sample preparation.
Module FCA & Air FCA	Tip blockage	Safety or clinical conditions of patient sample: Potentially wrong pipetted volume	Aspiration at bottom of well (blockade of tip)	The user needs to validate the application to prevent aspiration too close to Z-max level of custom labware.
Module FCA & Air FCA	FCA tubing system: Growth of microorganisms	Safety or clinical condition of patient sample: wrong pipetted volume or contamination of samples	Growth of microorganisms (biofilm on the inner surface)	Use deionized water as system liquid for FCA and run daily maintenance to flush the system according to instruction under daily system care (refer to “System Care” [▶ 120]) also observing the allowed cleaning agents for that step.
Module MCA 96	Overflow of sample liquid in microplate during pipetting	Safety or clinical condition of patient sample: Potential cross-contamination of samples (overflow)	Wrongly defined Z-levels by user (e.g., aspiration from Z-max position)	Define safe positions for aspiration and dispensation. Refer to the Reference Manual.
Module MCA 96	Samples completely or partially miss the intended position in free dispense mode	Safety or clinical condition of patient sample: Potential cross-contamination	Electro-static charges at the tip end due to instrument usage outside specified conditions lead to sample remaining hanging on the tip or to uncontrolled spraying	The user must observe the specified operation conditions for MCA Liquid Handling especially instruction about the minimum required humidity (refer to “Environmental Conditions” [▶ 42]). The user must set the dispense height always within the well. Refer to the Reference Manual.

System function / Module	Possible failure mode	Potential failure effect	Possible / Potential cause	Labeling or mitigation
Module MCA 96	Mixing air instead of liquid (sample / reagent) for Mix-pipetting	Safety or clinical condition of patient sample: Samples potentially incorrectly processed resulting in false results	Inappropriate tracking parameters due to wrong combination of tips and microplates	The user should compare the real and virtual worktable using the name of the labware in the virtual worktable. The user should observe the unique color design (Tip type specific) and Labeling (for Filter and Non Filter) of DiTi Boxes. The user must check the worktable layout before starting a process.
Disposable Tip specific	Get DiTis: Incorrect tip type mounted	Safety or clinical condition of patient sample: Potentially no or short sample aspirated Potential cross-contamination of samples	Use error: Incorrect deck layout: user puts tip-box at wrong position: tips are shorter than expected Incorrect deck layout: user puts tip box with unfiltered tips instead of filtered tips on worktable Incorrect deck layout: user puts tip box at wrong position: tip has smaller volume than expected (e.g., 100 µl instead of 200 µl); tip length as expected; liquid aspirated in MCH	The user should compare the real and virtual worktable using the name of the labware in the virtual worktable. The user should observe the unique color design (Tip type specific) and Labeling (for Filter and Non Filter) of DiTi Boxes. The user must check the worktable layout before starting a process. The mechanical design ensures visibility of the white filter. The Reference Manual contains information about color coding of DiTi boxes and difference of length, and filtered DiTis. Refer to the Reference Manual.
Disposable Tip specific	Incomplete dropping of tips: Some contaminated tips remain hanging to the head and fall onto sample plates	Safety or clinical condition of patient sample: Potential cross-contamination	Electro-static charges caused	The user must observe the specified operation conditions for MCA Liquid Handling especially instruction about the minimum required humidity (refer to “Environmental Conditions” [▶ 42]). Disposable tips are not intended for reuse.

System function / Module	Possible failure mode	Potential failure effect	Possible / Potential cause	Labeling or mitigation
Module RGA	Plate loss due to crash with misaligned labware	Safety of process: Plate loss, loss of samples	If more than 4 microplates are stacked, misalignment can occur during transport	Plate movements have to be validated before running scripts with real samples. Refer to the validation checklist in the Application Software Manual.
Module FluentControl Software	WorktableBase: wrong DiTi status reported	Safety of Process: Cross-contamination / Wrong results	Cross-contamination due to wrong information about usage status of tips	Do not use “Set Tips Back” if failure mode leads to high severity risk.
Module FluentControl Software	Core.Scripting.Programming SetVariable at run time: wrong value	Process safety: wrong results	Error in software: variable is set to wrong value	Validate the application for the specific variable source, destination and ranges. Refer to the validation checklist in the Application Software Manual.
Module FluentControl Software	Core.Scripting.Programming QueryVariable at run time or script start: wrong UI presentation / acceptance of UI value	Process safety: wrong results	Numeric value is formatted or converted wrongly in UI	Validate the application for the specific variable source, destination and ranges. Refer to the validation checklist in the Application Software Manual.
Module FluentControl Software	Core.Scripting.Programming ImportVariable at runtime: wrong value imported	Process safety: wrong results	Wrong value is retrieved from import source	Validate the application for the specific variable source, destination and ranges. Refer to the validation checklist in the Application Software Manual.
Module FluentControl Software	Core.Scripting.Programming ExportVariable at run time: wrong value exported to file	Process safety: wrong results	Wrong value is written to export file	Validate the application for the specific variable source, destination and ranges.Refer to the validation checklist in the Application Software Manual.

System function / Module	Possible failure mode	Potential failure effect	Possible / Potential cause	Labeling or mitigation
Module FluentControl Software	API: Get/set variable or resolve expression fails	Process safety: wrong results	Wrong variable value retrieved or wrong value assigned / wrong expression result returned	Validate the application for the specific variable source, destination and ranges. Refer to the validation checklist in the Application Software Manual.
UVC light	Incorrect usage in application	Lack of effectiveness	Incorrect usage in application	Refer to specific instructions in section “Optical Radiation (UVC)” [30].
Tube rotator/ piercing tips (Mix & Pierce)	Incorrect usage in application	Lack of effectiveness	Incorrect usage in application	Refer to specific instructions in section “Mix & Pierce” [73].
Frida Reader	Incorrect usage in application	Lack of effectiveness	Incorrect usage in application	Refer to specific instructions in section “Frida Reader” [76].
Any	Ineffective usage in application	Lack of effectiveness in application	Lack of system Care	Refer to part specific instructions in chapter “System Care” [120]
Processing potentially hazardous materials	Contamination with potentially hazardous materials	Potential risks to users, property and the environment.	Lack of adherence to General safety information	Refer to part specific instructions in section “General Safety Information” [13].
MCA 96, cLLD	Incorrect measurement result	Wrong measurement: Detected liquid level does not apply to all wells of the microplate: Wrong test result or sample loss	Usage of inadequate/incompatible labware	Then cLLD feature can only be used in troughs.

System function / Module	Possible failure mode	Potential failure effect	Possible / Potential cause	Labeling or mitigation
MCA 96, general	Incompatibility of consumables / components / modules	DiTis lost during process: Potential unrecoverable sample loss. Potential cross contamination.	Usage of inadequate/incompatible consumables. An offset pick-up is commanded which is not compatible with the box or tray from which the DiTi's are to be mounted (e.g. wrong version of DiTi-tray). DiTi's are improperly mounted and lost during process	Use DiTi boxes with Tecan combi tray.
MCA 96, cLLD	Incorrect measurement result	Wrong measurement: False positive detection of cLLD subsystem.	User places different DiTi's onto the worktable other than reflected in the software. The number of mounted DiTi's deviates from the number DiTi's expected by the software due to a user action (e.g. user removes some DiTi's). False positive detections due to incorrect cLLD threshold.	Important, the number of DiTi's used for a cLLD detection, needs to correspond to that reflected in the software.
MCA 96, general	Sample contamination	Sample contamination due to spillage after crash. Wrong test result or sample loss.	Wrong parameters taken (wrong vector for pickup or drop, wrong tool type). Collision of MCA 96 head during vector move. For example with high labware on neighboring nests.	There are risks associated to erroneous usage of the vector move functionality.

System function / Module	Possible failure mode	Potential failure effect	Possible / Potential cause	Labeling or mitigation
MCA 96, general	Sample contamination	Safety or clinical condition of patient sample: Sample contamination: Potential cross contamination due to abrasion of the gripper belt.	Abrasion of belt material over life time: Abrasion particles of G-axis belt might fall into patient samples on the worktable and eventually contaminate the sample chemically.	Abrasion particles (from belts) anddust can fall onto the worktable and contaminate samples/chemicals. To prevent this, labware which contains such sensitive liquids should be protected by placing lids.
MCA 96, general	Sample contamination	Safety or clinical condition of patient sample: Potentially wrong Results: Potential cross contamination from spillage into adjacent plate cavities.	Splashing/spillage of sample liquid. Contamination of DiTi cones by liquid in gripped labware, e.g. when a full labware is thrown into waste and liquid spills up.	Empty first the labware, before disposing it.
MCA 96, general	Sample or reagent carryover (FC)	Contaminated DiTi cones and cylinder block resulting in potentially cross contaminated samples.	Device attempts to pick up DiTis. As the software cannot detect missing DiTi's it continues without error. The DiTi cones potentially come into contact with and aspirate liquid from trough	The MCA 96 cannot detect empty tip boxes when using tip box types where the rim of the tip is flush with the top surface of the box.
MCA 96, general	Splashing/ spillage of sample liquid	Sample contamination due to spillage because of not enough rigid labware.	Splashing/spillage of sample liquid because of usage of non rigid enough labware.	To avoid any deformation of labware, use only rigid enough labware to transport liquids.
MCA 96 general	Gripper Finger may be damaged after crash	Gripper Finger damaged	--	Check the Gripper Fingers and exchange when damaged.

System function / Module	Possible failure mode	Potential failure effect	Possible / Potential cause	Labeling or mitigation
Wash Station Mix and Pierce	Sample contamination	Waste wasn't draining correctly. Sample contamination due to incorrect draining of the waste and incorrect washing of the tips.	Incorrectly washed tips due to overflow of the wash station caused by blockage of the connection to the wash station.	The system should be maintained on a regular basis. The wash station connectors should be exchanged in 2-3 month cycles for whole blood applications to prevent clogging. Draining potentially corrosive liquids, such as 2% bleach, through the wash station, connectors and tubing should not be done without additional rinsing with neutral liquids, such as water, to prevent corrosion.

2.5 Operating Company

The operating company must ensure that the Fluent and in particular the safety features, function properly and that all the personnel in contact with the instrument are adequately trained.

Responsibilities

- Method and process validation.
- Defining the processes in compliance with the Standard Operating Procedures.
- Ensuring that installation and operational qualifications (IQ OQs) have been completed.
- Ensuring that all personnel in contact with the Fluent are adequately trained.
- Ensuring the availability of appropriate protective clothing and equipment.
- Ensuring the maintenance and safe operation of the Fluent.
- Requiring adherence to laboratory safety regulations and directives.

2.6 Method and Process Validation

While performing method and process validation, pay attention to the following:

- If using fixed tips with FCA, ensure that the wash procedure is effective for the expected sample concentration range and assay sensitivity.
- Check that pipetted volumes meet the precision and accuracy requirements of the process being automated.
- When using non-Tecan or custom labware and aspirating with tracking, ensure that the container definition is correct (i.e., the appropriate speed is used for tracking) to avoid air aspiration.
- The Phase Separator functionality has been verified for use with standard Tecan 1 ml disposable tips and 1 ml Tecan wide-bore disposable tips. For more information on supported Tecan consumables, refer to the Reference Manual (see “Reference Documents” [▷ 9]).

Responsibility of the Key Operator

- Validate liquid detection on the Fluent Stacker transfer station.
- Validate the correct usage of the MCA wash station by the application.
- Validate the application with regard to correct pipetting volumes and tracking.

- Validate the application to prevent aspiration too close to Z-max of custom labware.
- Validate piercing applications with regard to the downholders needed (active or passive).
- If chemicals and labware are not removed, the impact of UVC light on chemicals and labware present on the deck has to be evaluated and the assay validated.
- Include a manual post-run check for correct pipetting volumes.
- Personnel must be informed regarding the camera privacy statement (refer to “Camera Privacy Statement” [▶ 14]).

2.7 User Qualification

The laboratory personnel must be fully qualified and trained to operate the Fluent. The work described in this Operating Manual must only be performed by authorized personnel with the qualifications prescribed below.

Laboratory personnel must:

- have suitable technical training,
- be familiar with the laboratory safety regulations and directives,
- be familiar with the instructions for the safety elements of the instrument,
- use protective clothing and equipment,
- be familiar with and adhere to good laboratory practices,
- and have read and understood the instructions in the Operating Manual.

Tecan recommends that the operator attends an operator training course. Please ask the Tecan Customer Service about available courses. Refer to section “Customer Support” [▶ 200].

2.7.1 Operator

The operator (lab technician) works for the operating company.

Required Skills

- No specific application or system knowledge
- Command of local languages
- Command of English is preferable

The operator has application software access rights allowing him to run methods and perform system care and will receive necessary training from the Key Operator.

2.7.2 Key Operator

The key operator (application specialist) supports the operating company or works for the same company.

Required Skills

- Extensive application knowledge
- Limited system knowledge
- Command of local languages
- Command of English
- In-depth knowledge of the corresponding software manual

Responsi-bilities

- Instructing the operator
- Writing, running and validating methods
- Helping the operator to solve problems with the instrument

2.8 Safety Elements

⚠ CAUTION

Moving parts

The protection and safety elements installed on the Fluent must not be removed, disabled or overridden during operation.

- If any devices are removed (e.g., for maintenance work), all protection and safety devices must be reinstalled, re-enabled and checked before resuming operations.

Safety panels and safety sensors are integral parts of the Fluent, whereas instrument door locks and cabinet door locks can be included only in certain system configurations.

2.8.1 Safety Panels

Fluent is protected with safety panels:

The **front safety panel** can be opened and is fitted with door sensors that trigger an active stop. The front safety panel can be locked with optional door locks.

The Fluent with a MCA 96 arm, piercing tips or a Resolvex i300 may only be used with Full Front Safety Panel.

The door opening is supported by gas filled springs. For optimal safety and complete access to the instrument, the operator is required to open the door fully before proceeding.

The **diluter panel** can be opened without affecting Fluent operation (except for Fluents with UVC light option installed – the diluter panel sensor will trigger a fast stop when the panel is opened).

The **top and side safety panels** are fixed.

2.8.1.1 Front Safety Panels

The front safety panel prevents direct access to the robotic arms and to the elements on the instrument deck during operation. This is for the benefit of personal safety and improves method security. In addition, the front safety panel protects the user against spilling sample or reagent. There are different types of front safety panels.

Full Front Safety Panel

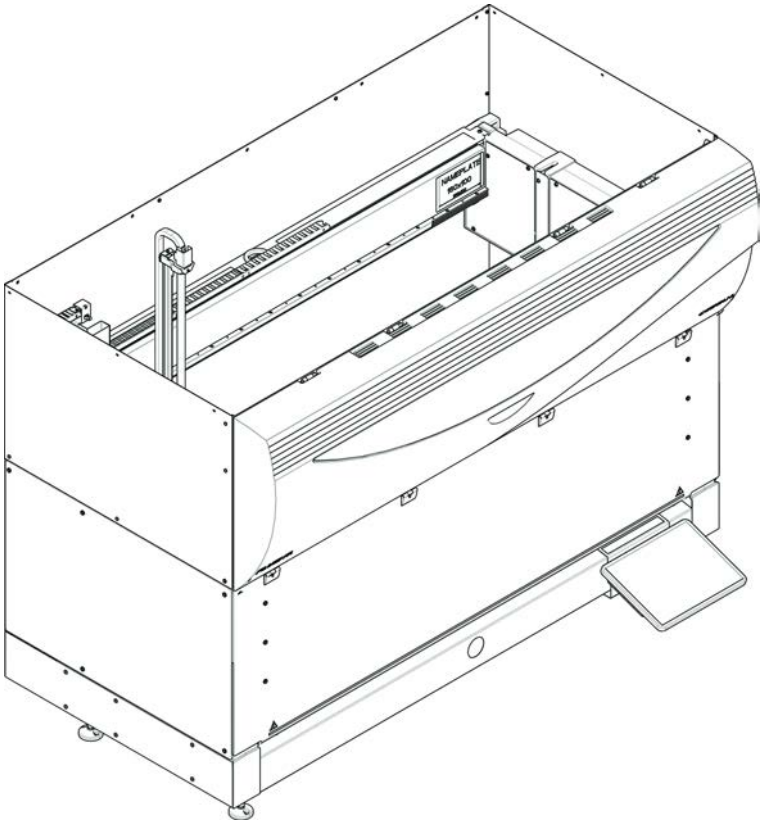


Fig. 1: Full Front Safety Panel

The full front safety panel has the following features:

- No access to moving parts (moving parts, mechanical hazards)
- Protection of the samples against outside influence (method safety)
- Protection against spilling sample or reagent

With full front safety panels, only batch-wise loading is possible.

Full Front Safety Panel (UVC)

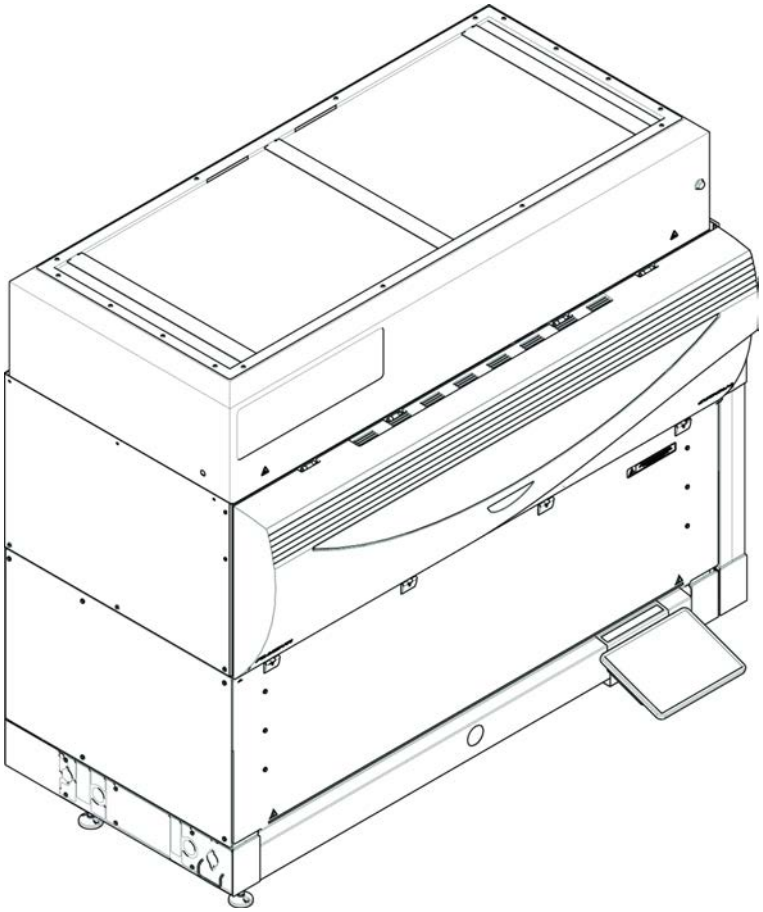


Fig. 2: Full Front Safety Panel (UVC)

The full front safety panel (UVC) has the following features:

- No access to moving parts (moving parts, mechanical hazards)
- Protection of the samples against outside influence (method safety)
- Protection against spilling sample or reagent
- Protection against optical radiation (UVC)

With full front safety panels, only batch-wise loading is possible.

⚠ CAUTION

Moving parts!

Moving MCA, FCA and Air FCA can cause hand injuries when reaching through the half front safety panel or of the front safety panel with expansion into the instrument during a run.

- Do not reach into the instrument during a run.

Half Front Safety Panel

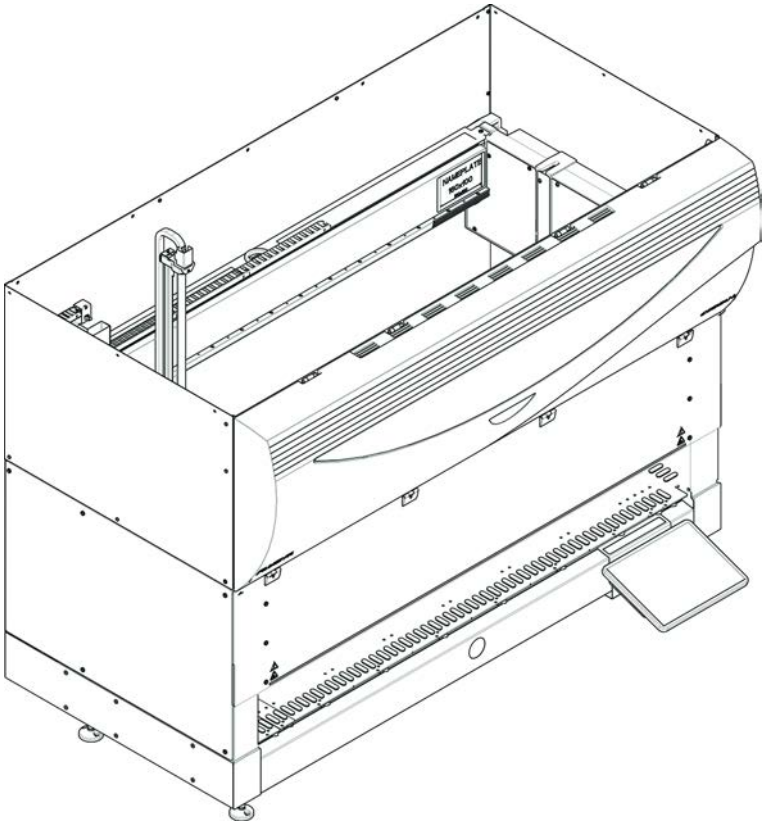


Fig. 3: Half Front Safety Panel

The half front safety panel has the following features:

- Restricted access to moving parts (moving parts, mechanical hazards)
- Protection against spilling sample or reagent

With the half front safety panel the operator has restricted access to the instrument deck. Loading and unloading runners is possible without opening the panel; i.e., the operator is enabled to reload samples or reagents during the method run.

Front Safety Panel with Expansion

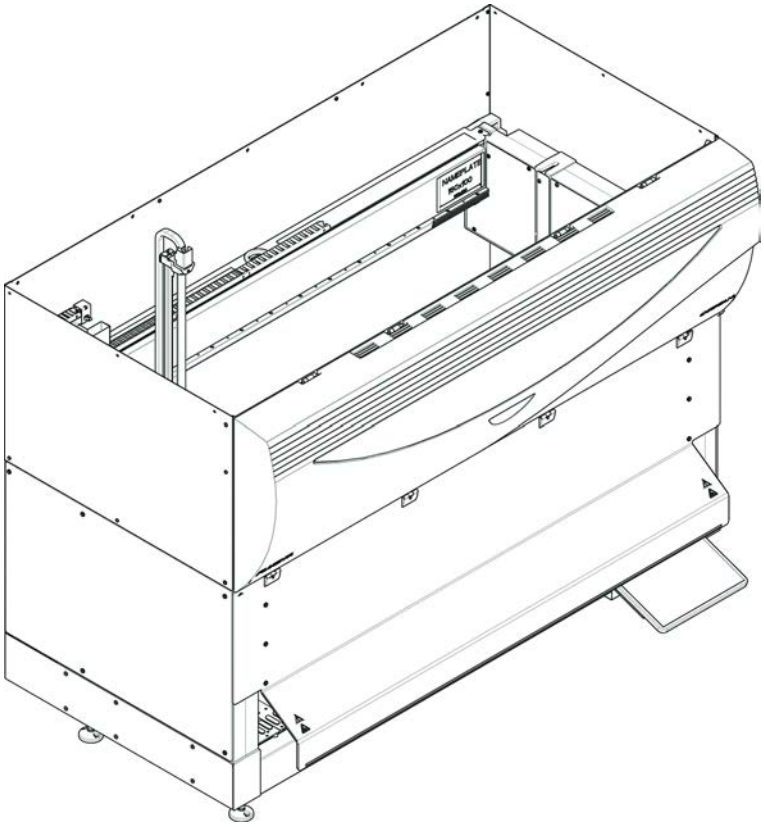


Fig. 4: Front Safety Panel with Expansion

The front safety panel has the following features:

- Restricted access to moving parts (moving parts, mechanical hazards)
- Protection against spilling sample or reagent
- Allows for the use of a front DiTi waste station, which protrudes from the deck and requires a downward-facing opening in the front safety panel.

With the front safety panel with expansion, only batch-wise loading is possible.

2.8.1.2 Safety Panels for Optional Devices

If an optional device is added to, or removed from, the side of the Fluent, an appropriate side safety panel must be installed. Please consult the “Customer Support” [▸ 200].

2.8.2 Instrument Door Locks (optional)

Two optional door locks can prevent the front safety panel from being opened and protect the ongoing process. This prevents unwarranted interruption of the process run. To stop a process, a pause request can be entered by means of the touchscreen.
Certain configurations require door locks. If a configuration is changed, an upgrade with door locks might be required. Please consult section “Customer Support” [▸ 200].

2.8.3 Cabinet Door Locks

If an RGA long axis has access below the deck, the cabinet door closest to the access point must be equipped with a door lock sensor option. If more than one access point below the deck is implemented or if the access point is changed during the life of the instrument, then each door near the access point must be equipped with a door lock sensor.

If the instrument has a HEPA hood or a Resolvex i300, all cabinet doors must be equipped with a door lock sensor.

2.8.4 Optical Radiation (UVC)

The Fluent can be equipped with an optional HEPA hood which includes a UVC light, or a separate UVC light option.

Exposure to UVC light radiation must be avoided as it can lead to injury. The UVC light switches off automatically when the front safety panel is opened, and in the case of the UVC light option also when the diluter cover is opened. Special UVC-resistant safety panels are installed on the Fluent in conjunction with UVC light.

UVC light can be used in decontamination procedures. The suitability and effectiveness of using UVC for individual processes must be validated by the user.

Please also refer to the manual provided by the HEPA hood manufacturer.

2.8.5 External Door Locks

External door locks will be implemented on Fluent installations in an external enclosure. The door panels of the external enclosure replace the mechanical safety function of the Fluent front safety panel and the cabinet doors, and the external door docks with integral sensors replace the door sensor and door lock functions of the Fluent front safety panel and cabinet doors.

External door locks do not allow an ActiveStop. To stop or pause the process a pause request can be entered by means of the touch screen.

2.9 Product Safety Signs

Safety signs are affixed to the Fluent for safety purposes. Damaged, lost or illegible safety signs must be replaced immediately as illustrated. For the meaning of safety symbols refer to section “Safety Message Conventions” [11].

Standard Instrument

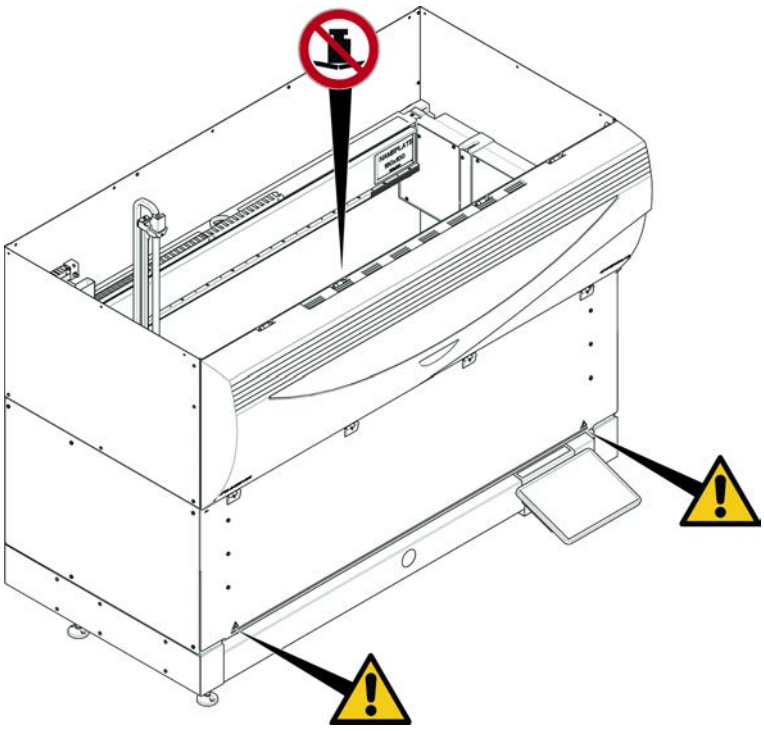


Fig. 5: Standard instrument

UVC

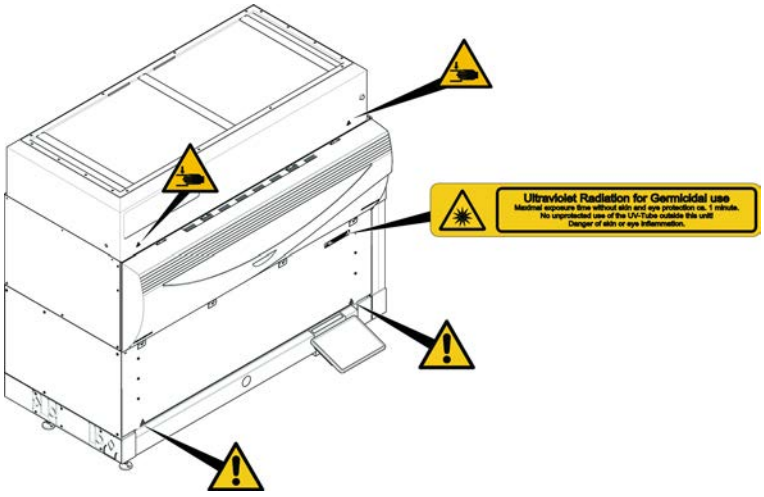


Fig. 6: Instrument with UVC

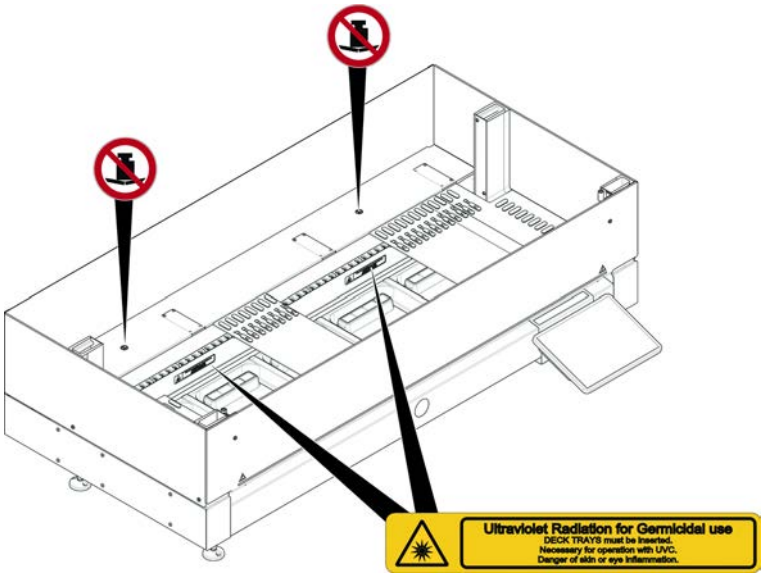


Fig. 7: Inside view

Biohazard

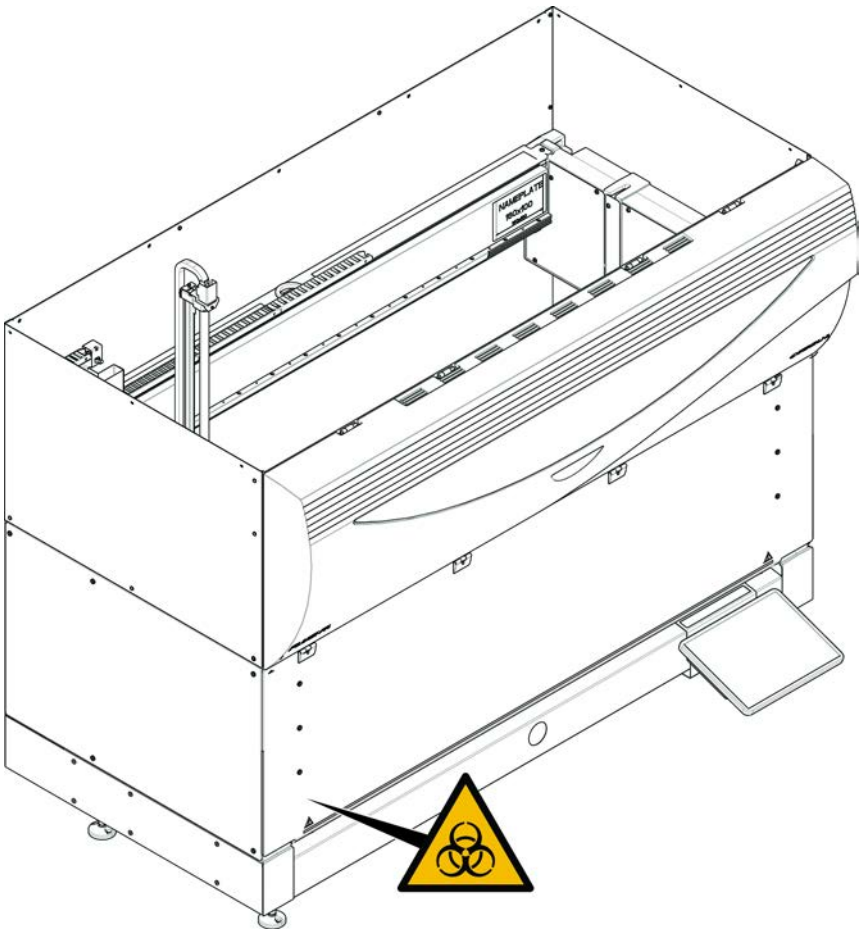


Fig. 8: Biohazard

The Fluent is supplied with a biohazard safety sign which should be applied by the user in the event of use of biohazardous substances.

Apply the label on the front door in a position visible to the user and convenient for the application.

Instrument with Half Front Safety Panel

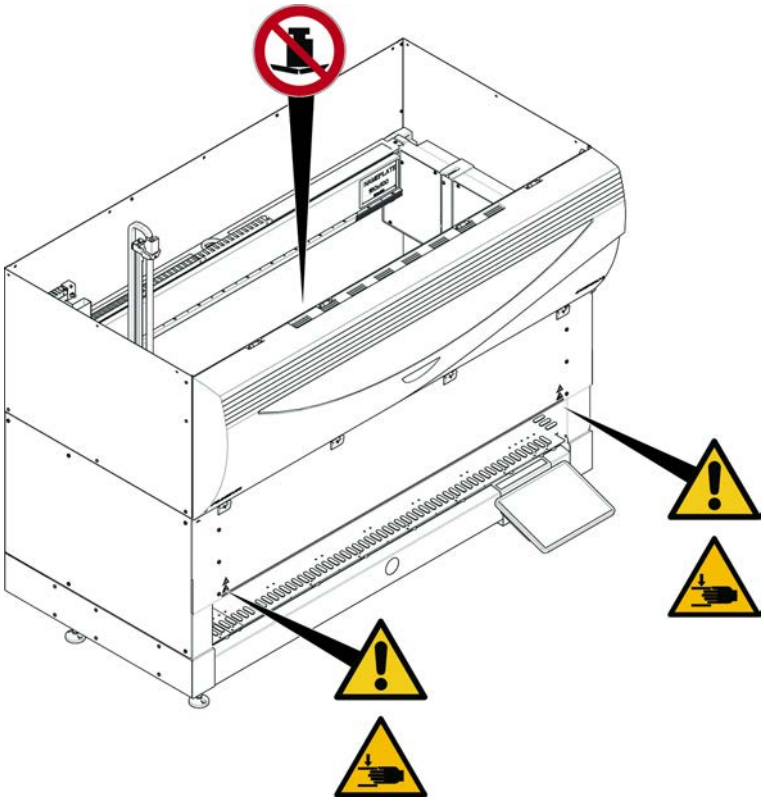


Fig. 9: Instrument with Half Front Safety Panel

Instrument with Front Safety Panel with Expansion

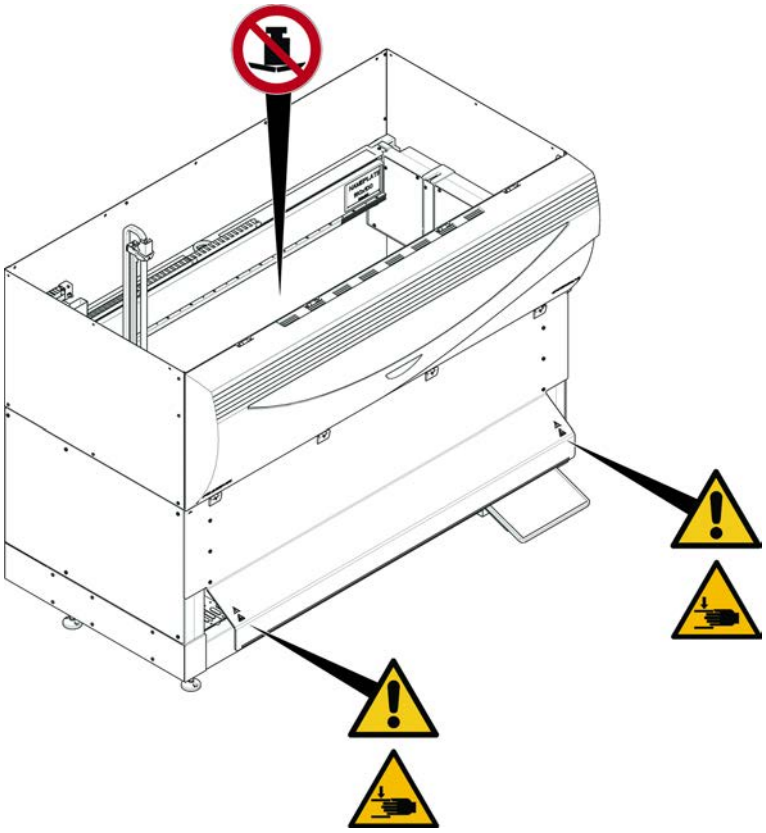


Fig. 10: Instrument with Front Safety Panel with Expansion

Deck Extension

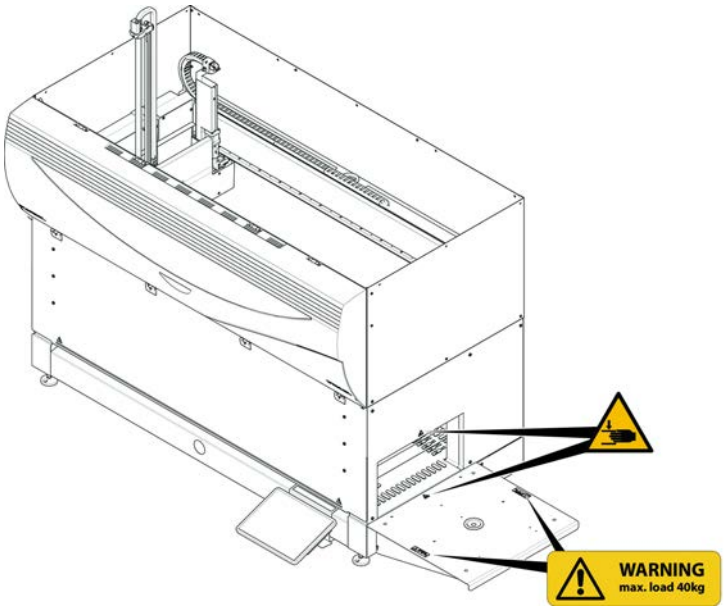


Fig. 11: Deck extension

2.9.1 Mix & Pierce Workstation

FCA Safety Shield

Fig. 12: Safety shield

2.10 Laser Radiation

Fluent can be equipped with laser barcode scanners. The laser radiation from these barcode scanners is a low-power, collimated beam in the visible spectrum. The laser classes of each barcode scanner, and of the entire Fluent system, are indicated on the laser safety label affixed to the corresponding hardware.

All modules with lasers are marked with the appropriate laser safety labels.

The Fluent instrument has been tested and certified according to IEC 60825-1:2007 and IEC 60825-1:2014.

⚠ CAUTION

The Fluent is a class 1 laser product pursuant to IEC 60825-1:2014 that emits laser radiation.

Dazzle, flash-blindness and afterimages may be caused by the laser beam.

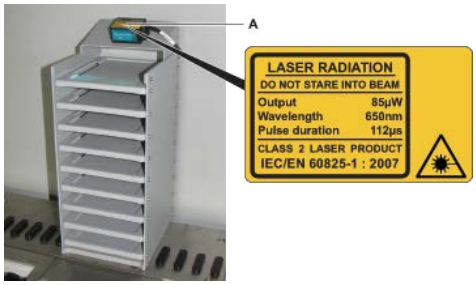
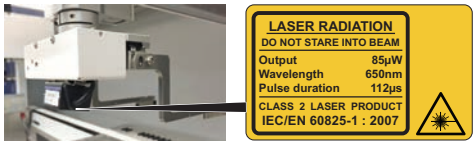
- Do not stare into the laser beam or into its reflections.

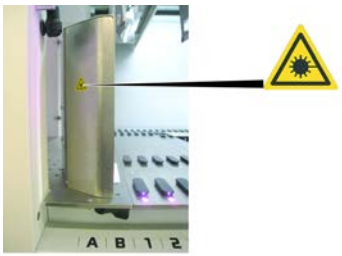
2.10.1 Laser Radiation Devices

A stand-alone barcode scanner can be mounted on a device.

Please ensure that the safety label is correctly affixed to the barcode scanner at all times:

- Explanatory Laser Radiation Label (A): Identifies a CLASS 2 LASER PRODUCT according to IEC 60825-1 that contains an embedded visible low power laser barcode scanner. Instructs the user not to stare into laser beam or its reflection.
- Class 2 lasers are only operated when the system is running and have no interface to the operator.

Label placement	Explanation
	Stand-alone barcode scanner mounted on a hotel: label located underneath the scanner.
	Stand-alone barcode scanner mounted on Robotic Gripper Arm: label located on the scanner.

Label placement	Explanation
	Loading ID: label located on the rear side of the scanner housing.
	Loading ID: label located on the side of the scanner housing.

2.11 Decontamination Declaration

In addition to regular system care, and in accordance with standard laboratory regulations, the Fluent and its parts and accessories must be thoroughly decontaminated in the following circumstances:

- Before any maintenance or service work is performed on the Fluent and, in particular, before an FSE intervention on the Fluent
- In the event of accidents (e.g., crash, spillage, etc.)
- Before returning the Fluent or its parts or accessories, to Tecan (e.g., for repair)
- Prior to storage
- Prior to disposal
- In general, before moving the Fluent or its parts from its location

The owner of the instrument has full responsibility for the effective decontamination of all the equipment.

Before any intervention on the Fluent by an FSE, and before returning the Fluent or its parts or accessories to Tecan, the owner of the instrument must complete and sign the Decontamination Declaration form, confirming that the decontamination has been performed in accordance with good laboratory practice guidelines. Contact your local service organization to obtain this form and refer to section Decontamination.

Tecan reserves the right to refuse to deal with any Fluent or its parts or accessories that is not accompanied by the Decontamination Declaration form.

2.12 Reporting Incident

Any serious incident that has occurred in relation to the device must be reported to the manufacturer and the competent authority of the Member State in which the user and/or the patient is established. Refer to the section Manufacturer for the manufacturer's address.

3 Technical Data

3.1 Type Plate

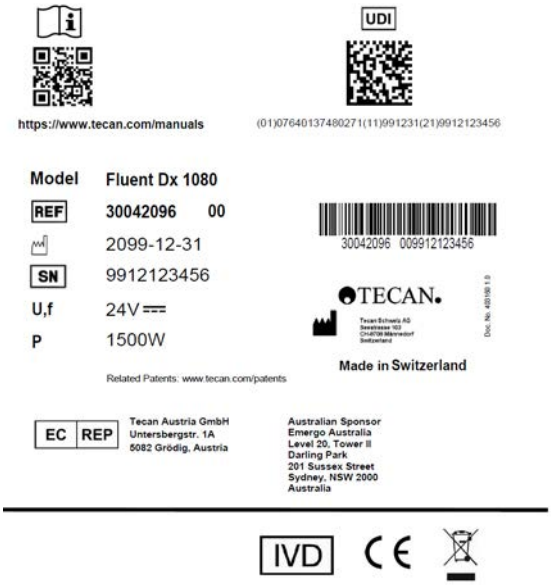


Fig. 13: Type Plate

The type plate is on the rear side of the Fluent and contains the following information:

Identification data	Model
	REF: Ordering information (material number and revision level)
	Date of manufacture (YYYYMMDD)
	SN: Serial number
Technical data	U, f: Supply voltage (Volts), frequency (Hertz)
	P: Power consumption (VA)
	Fuse: Fuse specification
Address data	Manufacturer's name and address
Conformity data	Conformity marking
	UDI: Unique Device Identification The UDI symbol identifies the data carrier on the label.
	EC REP: European Authorized Representative
	IVD: In vitro diagnostic medical device

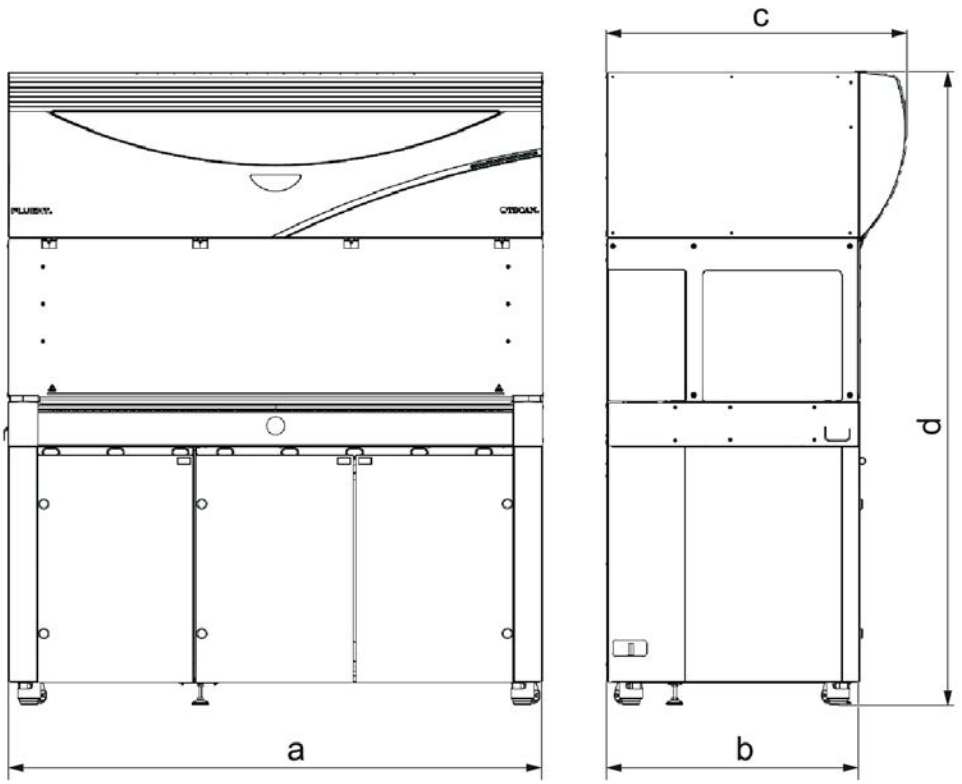
3.2 Serial Number Label

Fig. 14: Serial number label

A serial number label is affixed inside the housing on the right side of the instrument's back and bears the following data:

Identification data	Model
	REF: Ordering information (material number and revision level)
	SN: Serial number
Address data	Manufacturer's name and address

3.3 Dimensions and Weights



	Dimension	Fluent 480	Fluent 780	Fluent 1080
a	Overall length	1150 mm (45.28 in.)	1650 mm (64.96 in.)	2150 mm (84.65 in.)
b	Footprint depth	780 mm (30.71 in.)		
c	Overall depth	923 mm (36.34 in.)		
d	Overall height on cabinet	1977 mm (77.8 in.)		

Component	Fluent 480	Fluent 780	Fluent 1080
Base unit	120 kg (264.5 lb.)	140 kg (308.6 lb.)	190 kg (418.9 lb.)
Packaging	61 kg (135 lb.)	83 kg (183 lb.)	106 kg (234 lb.)
FCA	10.4 kg (22.9 lb.)		
RGA	10.2 kg (22.4 lb.)		
RGA-Z	10.6 kg (23.4 lb.)		
cXP	1.2 kg (2.6 lb.)		
MCA 96 including optional gripper	19.7 kg (43.43 lb.)		

3.4 Power Supply

NOTICE

Overheating of the Power Supply

The power supply unit can be damaged or destroyed.

- Power supply must not be covered.
- Power supply heat dissipation must be guaranteed.

External devices must not be connected to the power supply. They can lead to a reset or standstill of the Fluent

Tab. 2: Fluent power-input

Supply	Rating
Line voltage (single phase)	100–240 VAC
Input current	9.8 A (at 100 V) – 4 A (at 240 V)
Frequency	50–60 Hz

Tab. 3: Fluent power-output

Supply	Rating
Output voltage	24–28 V factory set: 25.2 V
Continuous power	500 W
Peak power (time limit)	1500 W for 3 seconds
Weight	3.8 kg (8.5 lbs.)

Max. mains supply voltage fluctuation: ±10% of nominal voltage.

Classification with regard to electrical safety according to EN/IEC standards:

Tab. 4: Electrical specifications (safety)

Overvoltage category	II	IEC 60664-1
Pollution degree	2	(EN) IEC 61010-1

3.5 Data and Power Connections

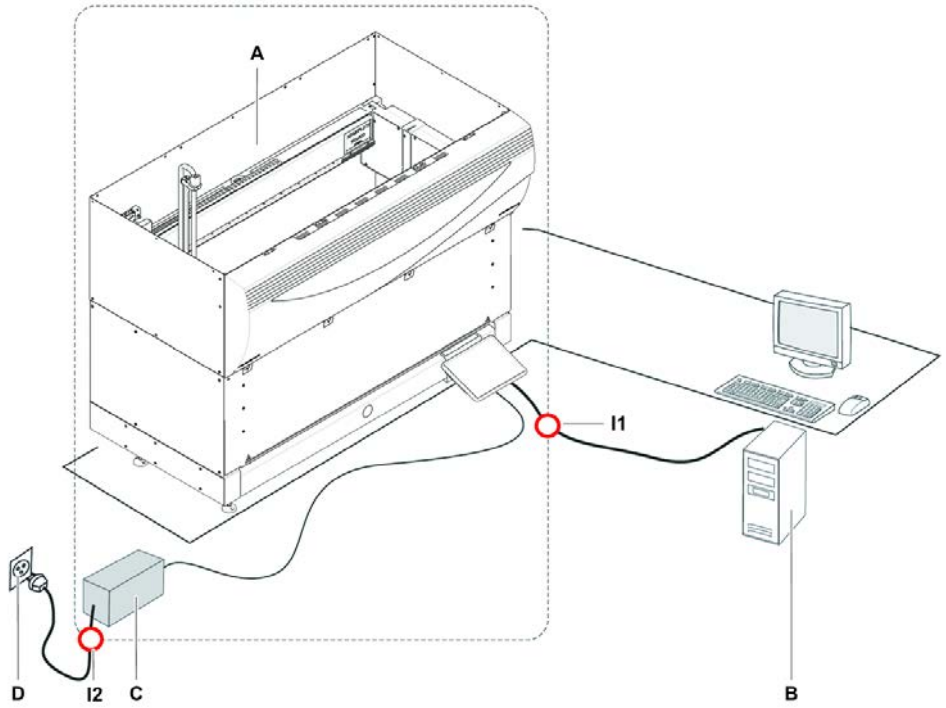


Fig. 15: Data and power connections

A	Fluent instrument	**B**	Control PC
C	Power supply unit	**D**	Wall outlet
I1	USB interface	**I2**	Power cord

The figure shows the components of a sample system with data and power connections. The Fluent instrument parts are shown within the rectangle. The instrument power switch is part of the power supply unit. The power cord is connected to a wall outlet for the mains power supply.

All data traffic to and from the Fluent passes via the USB interface. The USB cable is connected to the PC that controls the instrument.

3.6 Environmental Conditions

⚠ CAUTION

Incorrect Pipetting Volumes

Pipetting results can be influenced by operating conditions.

Condensation can influence electronic components.

- If the Fluent is stored or transported at temperatures below room temperature, after installation it will require a few hours for acclimatization.

The Fluent is intended for indoor operation and storage only.

Operating Conditions

Operating temperature	15–32°C (59–90°F)
Operating humidity	30–80% relative (non condensing) at 30°C (86°F)
Operating altitude	max. 2000 m above sea level

Operating conditions for liquid handling and pipetting:

Room temperature	20–25°C (68–77°F)
Operating humidity	30–60% relative (non condensing)
Operating altitude	about 500 m above sea level
Evaporation	An environment with increased airflow (due to laminar flow, air-conditioning or ventilation, etc.), increases the risk of evaporation that can reduce pipetting precision, especially with low volumes or volatile substances. **NOTICE! Ensure that validation conditions match the run conditions.**

Transport Conditions

Transport temperature	-20 to 60°C (-4 to 140°F)
Transport humidity	20–80% relative (non condensing)

Storage Conditions

Storage temperature	1–60°C (34–140°F)
Storage humidity	5–80% relative (non condensing) at 30°C (86°F) or below

3.7 Emission and Immunity

Noise Emission

< 60 dBA (sound pressure), measured at a distance of 1 m from instrument.
The noise level may exceed 78 dB for short moments while the process is running.

EMC

The Fluent complies with the emission and immunity requirements described in IEC 61326-1 and IEC 61326-2-6. However, the electromagnetic environment should be evaluated prior to the operation of the Fluent. It is the operator's responsibility to ensure that a compatible electromagnetic environment for the Fluent can be maintained in order that the Fluent will perform as intended.
The Fluent is classified as GROUP 1 CLASS B EQUIPMENT (CISPR 11).

This equipment is designed for use in a BASIC ELECTROMAGNETIC ENVIRONMENT (IEC 61326-1) and PROFESSIONAL HEALTHCARE FACILITY ENVIRONMENT (IEC 61326-2-6).
It is likely to perform incorrectly if used in an INDUSTRIAL ELECTROMAGNETIC ENVIRONMENT (IEC 61326-1) and a HOME HEALTHCARE FACILITY ENVIRONMENT (IEC 61326-2-6).

If it is suspected that performance is affected by electromagnetic interference, correct operation may be restored by increasing the distance between the equipment and the source of the interference.

Do not operate the Fluent in close proximity to sources of strong electromagnetic radiation (e.g., unshielded intentional RF sources), as these can interfere with the proper operation.

FCC15

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

3.8 Pipetting precision and accuracy acceptance criteria

Fluent Dx can only be purchased with Fluent Dx software license. An in-field upgrade of the instrument from General Purpose Use or RUO instrument to Fluent Dx is not possible.

If a research-use-only (RUO) option or device is integrated with Fluent, the intended use changes to For Research Use Only. Not for use in diagnostic procedures.

An on-site integration of MCA 384 on Fluent Dx will change the intended use to "General Purpose" and the Operating Manual Doc ID 399706 will apply.

Tab. 5: Pipetting precision and accuracy acceptance criteria Liquid Flexible Channel Arm (liquid FCA) for use with capacitive liquid level detection (cLLD)

Fluent Control cLLD Liquid Class	Liquid FCA				
	Piercing Tip 5000 ul syringe Std vol tubing	Piercing Tip 1250 ul syringe Std vol tubing	Std fixed tip 1250 ul syringe Std vol tubing	Low vol tip 250 ul syringe Low vol tubing	Te-PS 250 ul syringe low vol tubing
DMSO Contact Wet Single			Example	Example	Example

Fluent Control cLLD Liquid Class	Liquid FCA				
	Piercing Tip 5000 ul syringe Std vol tubing	Piercing Tip 1250 ul syringe Std vol tubing	Std fixed tip 1250 ul syringe Std vol tubing	Low vol tip 250 ul syringe Low vol tubing	Te-PS 250 ul syringe low vol tubing
DMSO Free Multi			12 x 50 ul CV≤1.0% AC±2.0%	12 x 5 ul CV≤3.5% AC±5.0%	Example
DMSO Free Single			5 ul CV≤3.0% AC±6.0%	1 ul CV≤4.0% AC±5.0%	1 ul CV≤5.0% AC±8.0%
			10 ul CV≤2.0% AC±2.0%	2 ul CV≤3.5% AC±4.0%	2 ul CV≤3.0% AC±6.0%
			1000 ul CV≤0.25% AC±0.75%	10 ul CV≤2.0% AC±2.0%	10 ul CV≤0.8% AC±1.0%

Tab. 6: Pipetting precision and accuracy acceptance criteria Liquid Flexible Channel Arm (liquid FCA) for use with capacitive liquid level detection (cLLD)

Fluent Control cLLD Liquid Class	Liquid FCA					
	DiTi 1000 wide bore 1250 ul syring	DiTi 1000 1250 ul syringe Std vol tubing	DiTi 350 1250 ul syringe Std vol tubing	DiTi 200 1250 ul syringe Std vol tubin	DiTi 50 1250 ul syringe Std vol tubing	DiTi 10 1250 ul syringe Std vol tubing
DMSO Contact Wet Single		Example		Example	1000 ul CV≤8.0% AC±10.0%	
DMSO Free Multi		12 x 50 ul CV≤2.5% AC±3.0%	Example	12 x 10 ul CV≤6.0% AC±4.0%	6 x 5 ul CV≤5.0% AC±5.0%	

Fluent Control cLLD Liquid Class	Liquid FCA					
	DiTi 1000 wide bore 1250 ul syring	**DiTi 1000 1250 ul syringe Std vol tubing**	**DiTi 350 1250 ul syringe Std vol tubing**	**DiTi 200 1250 ul syringe Std vol tubin**	**DiTi 50 1250 ul syringe Std vol tubing**	**DiTi 10 1250 ul syringe Std vol tubing**
DMSO Free Single		10 ul CV≤2.5% AC±3.0%	10 ul CV≤2.0% AC±2.0%	10 ul CV≤2.0% AC±2.0%	1 ul CV≤8.0% AC±10.0%	1 ul CV≤8.0% AC±10.0%
					2 ul CV≤3.0% AC±5.0%	
		100 ul CV≤0.5% AC±1.5%	100 ul CV≤0.4% AC±1.5%	200 ul CV≤0.4% AC±1.0%	10 ul CV≤1.5% AC±2.0%	10 ul CV≤2.0% AC±2.0%
					50 ul CV≤0.75% AC±2.0%	

Tab. 7: Pipetting precision and accuracy acceptance criteria Liquid Flexible Channel Arm (liquid FCA) for use with capacitive liquid level detection (cLLD)

Fluent Control cLLD Liquid Class	Liquid FCA				
	Piercing Tip 5000 ul syringe Std vol tubing	**Piercing Tip 1250 ul syringe Std vol tubing**	**Std fixed tip 1250 ul syringe Std vol tubing**	**Low vol tip 250 ul syringe Low vol tubing**	**Te-PS 250 ul syringe low vol tubing**
Ethanol Free Multi			12 x 50 ul[3] CV≤2.5% AC±3.0%		
Ethanol Free Single			50 ul[3] CV≤1.0% AC±3.0%		
Serum Free Multi			Example		
Serum Free Single			5 ul CV≤5.0% AC±8.0%		
Whole Blood Pierce Single[5]		200 ul[6] CV≤2.0% AC±3.0%			

Fluent Control cLLD Liquid Class	Liquid FCA				
	Piercing Tip 5000 ul syringe Std vol tubing	Piercing Tip 1250 ul syringe Std vol tubing	Std fixed tip 1250 ul syringe Std vol tubing	Low vol tip 250 ul syringe Low vol tubing	Te-PS 250 ul syringe low vol tubing
Whole Blood Pierce Multi	4 x 1000 ul CV≤1.5% AC±2.0%				

Tab. 8: Pipetting precision and accuracy acceptance criteria Liquid Flexible Channel Arm (liquid FCA) for use with capacitive liquid level detection (cLLD)

Fluent Control cLLD Liquid Class	Liquid FCA					
	DiTi 1000 wide bore 1250 ul syring	DiTi 1000 1250 ul syringe Std vol tubing	DiTi 350 1250 ul syringe Std vol tubing	DiTi 200 1250 ul syringe Std vol tubin	DiTi 50 1250 ul syringe Std vol tubing	DiTi 10 1250 ul syringe Std vol tubing
Ethanol Free Multi				6 x 10 ul[3] CV≤6.0% AC±4.0%		
Ethanol Free Single		Example		Example	30 ul[3] CV≤0.75% AC±2.0%	
Serum Free Multi	12 x 50 ul CV≤5.5% AC±5.0%	Example	Example	6 x 25 ul CV≤3.5% AC±5.0%	Example	
	6 x 100 ul CV≤3.5% AC±5.0%					
	4 x 200 ul CV≤3.5% AC±5.0%					

Fluent Control cLLD Liquid Class	Liquid FCA					
	DiTi 1000 wide bore 1250 ul syring	DiTi 1000 1250 ul syringe Std vol tubing	DiTi 350 1250 ul syringe Std vol tubing	DiTi 200 1250 ul syringe Std vol tubin	DiTi 50 1250 ul syringe Std vol tubing	DiTi 10 1250 ul syringe Std vol tubing
Serum Free Single	20 ul CV≤5.5% AC±8.0%	Example	Example	Example	10 ul CV≤2.0% AC±5.0%	Example
	100 ul CV≤1.5% AC±2.0%					
	500 ul CV≤0.5% AC±1.0%					
	900 ul CV≤0.5% AC±1.0%					
Whole Blood Pierce Single						
Whole Blood Pierce Multi						

Tab. 9: Pipetting precision and accuracy acceptance criteria Liquid Flexible Channel Arm (liquid FCA) for use with capacitive liquid level detection (cLLD)

Fluent Control cLLD Liquid Class	Liquid FCA				
	Piercing Tip 5000 ul syringe Std vol tubing	Piercing Tip 1250 ul syringe Std vol tubing	Std fixed tip 1250 ul syringe Std vol tubing	Low vol tip 250 ul syringe Low vol tubing	Te-PS 250 ul syringe low vol tubing
Water Pierce Single		200 ul[6] CV≤1.5% AC±3.0%			
Water Contact Wet Single	Example	Example	Example	Example	0.2 ul CV ≤10.0% AC±15.0% (value not incl. in LC)

Fluent Control cLLD Liquid Class	Liquid FCA				
	Piercing Tip 5000 ul syringe Std vol tubing	Piercing Tip 1250 ul syringe Std vol tubing	Std fixed tip 1250 ul syringe Std vol tubing	Low vol tip 250 ul syringe Low vol tubing	Te-PS 250 ul syringe low vol tubing
Water Free Multi			12 x 50 ul CV≤2.0% AC±2.0%	12 x 5 ul CV≤2.5% AC±5.0%	Example
Water Free Single			5 ul CV≤3.0% AC±3.0%	0.5 ul CV≤6.0% AC±10.0%	0.5 ul CV≤6.0% AC±10.0%
			10 ul CV≤1.75% AC±2.5%	1 ul CV≤3.5% AC±8.0%	1 ul CV≤4.0% AC±6.0%
			1000 ul CV≤0.3% AC±0.75%	10 ul CV≤1.0% AC±2.0%	10 ul CV≤0.8% AC±1.0%

Tab. 10: Pipetting precision and accuracy acceptance criteria Liquid Flexible Channel Arm (liquid FCA) for use with capacitive liquid level detection (cLLD)

Fluent Control cLLD Liquid Class	Liquid FCA					
	DiTi 1000 wide bore 1250 ul syring	DiTi 1000 1250 ul syringe Std vol tubing	DiTi 350 1250 ul syringe Std vol tubing	DiTi 200 1250 ul syringe Std vol tubin	DiTi 50 1250 ul syringe Std vol tubing	DiTi 10 1250 ul syringe Std vol tubing
Water Pierce Single						
Water Contact Wet Single		Example		Example	Example	Example
Water Free Multi	6 x 100 ul CV≤6.5% AC±5.0%	12 x 50 ul CV≤2.0% AC±2.0%	12 x 10 ul CV≤3.5% AC±2.0%	12 x 10 ul CV≤3.5% AC±1.5%	6 x 5 ul CV≤4.0% AC±3.0%	
	4 x 200 ul CV≤3.5% AC±5.0%					

Fluent Control cLLD Liquid Class	Liquid FCA					
	DiTi 1000 wide bore 1250 ul syring	DiTi 1000 1250 ul syringe Std vol tubing	DiTi 350 1250 ul syringe Std vol tubing	DiTi 200 1250 ul syringe Std vol tubin	DiTi 50 1250 ul syringe Std vol tubing	DiTi 10 1250 ul syringe Std vol tubing
Water Free Single	20 ul CV≤2.5% AC±5.0%	10 ul CV≤2.0% AC±3.0%	10 ul CV≤2.0% AC±2.0%	10 ul CV≤1.8% AC±2.5%	1 ul CV≤6.0% AC±8.0%	0.5 ul CV≤8.0% AC±10.0%
	100 ul CV≤1.0% AC±2.0%	100 ul CV≤0.3% AC±0.5%			2 ul CV≤3.0% AC±4.0%	1 ul CV≤4.0% AC±5.0%
	500 ul CV≤0.5% AC±2.0%	1000 ul CV≤0.2% AC±0.5%	100 ul CV≤0.3% AC±1.0%	200 ul CV≤0.2% AC±0.75%	10 ul CV≤1.0% AC±2.0%	10 ul CV≤1.0% AC±1.0%
	900 ul CV≤0.5% AC±2.0%				50 ul CV≤0.5% AC±1.5%	

Tab. 11: Pipetting precision and accuracy acceptance criteria Air Flexible Channel Arm Multisense (Air FCA MS) for use with capacitive liquid level detection (cLLD)

Fluent Control cLLD Liquid Class	Air FCA			
	DiTi 1000 ul wide bore	DiTi 1000 ul	DiTi 1000 ul clear	DiTi 350 ul
DMSO Contact Wet Single				
DMSO Free Multi		Example		Example
DMSO Free Single		Example		Example

Tab. 12: Pipetting precision and accuracy acceptance criteria Air Flexible Channel Arm Multisense (Air FCA MS) for use with capacitive liquid level detection (cLLD)

Fluent Control cLLD Liquid Class	Air FCA				
	DiTi 200 ul	Diti 200 ul clear	DiTi 50 ul	DiTi 50 ul Clear	DiTi 10 ul
DMSO Contact Wet Single			1 ul CV≤8.0% AC±10.0%		

Fluent Control cLLD Liquid Class	Air FCA				
	DiTi 200 ul	Diti 200 ul clear	DiTi 50 ul	DiTi 50 ul Clear	DiTi 10 ul
DMSO Free Multi	Example		4 x 10 ul CV≤5.0% AC±5.0%		
DMSO Free Single	10 ul CV≤1.5% AC±3.0%		1 ul CV≤6.0% AC±5.0%		Example

Tab. 13: Pipetting precision and accuracy acceptance criteria Air Flexible Channel Arm Multisense (Air FCA MS) for use with capacitive liquid level detection (cLLD)

Fluent Control cLLD Liquid Class	Air FCA			
	DiTi 1000 ul wide bore	DiTi 1000 ul	DiTi 1000 ul clear	DiTi 350 ul
Ethanol Free Multi		Example		Example
Ethanol Free Single		Example	100 ul CV≤1.5% AC±2.5%	Example
			500 ul CV≤1.0% AC±2.5%	
MasterMix Free Multi		Example		Example
MasterMix Free Single		Example		Example
Serum Free Multi	12 x 25 ul CV≤8.0% AC±5.0%	6x100 ul CV≤2.0% AC±1.0%		Example
	12 x 50 ul CV≤5.0% AC±5.0%			
	6 x 100 ul CV≤3.0% AC±5.0%			
	4 x 200 ul CV≤3.0% AC±5.0%			

Fluent Control cLLD Liquid Class	Air FCA			
	DiTi 1000 ul wide bore	DiTi 1000 ul	DiTi 1000 ul clear	DiTi 350 ul
Serum Free Single	20 ul CV≤5.0% AC±5.0%	Example	10 ul CV≤6% AC±5.0%	100 ul CV≤0.3% AC±0.5%
	100 ul CV≤1.0% AC±2.0%		100 ul CV≤1.0% AC±2.0%	
	500 ul CV≤0.5% AC±1.0%		500 ul CV≤0.5% AC±2.0%	
	900 ul CV≤0.5% AC±1.0%			

Tab. 14: Pipetting precision and accuracy acceptance criteria Air Flexible Channel Arm Multisense (Air FCA MS) for use with capacitive liquid level detection (cLLD)

Fluent Control cLLD Liquid Class	Air FCA				
	DiTi 200 ul	Diti 200 ul clear	DiTi 50 ul	DiTi 50 ul Clear	DiTi 10 ul
Ethanol Free Multi	6 x 10 ul CV≤3.0% AC±4.0%		Example		
Ethanol Free Single	Example	3 ul CV≤6.0% AC±12.0%	40 ul CV≤1.0% AC±1.0%	1 ul CV≤8.0% AC±15.0%	Example
		5 ul CV≤6.0% AC±12.0%		10 ul CV≤3.0% AC±4.0%	
		10 ul CV≤3.5% AC±5.0%		40 ul (w/filter) CV≤1.0% AC±2.0%	
		100 ul CV≤1.0% AC±4.0%		50 ul (w/o filter) CV≤1.0% AC±2.0%	

Fluent Control cLLD Liquid Class	Air FCA				
	DiTi 200 ul	Diti 200 ul clear	DiTi 50 ul	DiTi 50 ul Clear	DiTi 10 ul
MasterMix Free Multi	Example		6 x 5 ul CV≤5.0% AC±5.0%		
			4 x 10 ul CV≤3.0% AC±5.0%		
MasterMix Free Single	Example		5 ul CV≤3.0% AC±5.0%		Example
Serum Free Multi	6 x 5 ul CV≤8.0% AC±7.5%		6 x 5 ul CV≤8.0% AC±5.0%		
	6 x 25 ul CV≤3.0% AC±3.0%				
Serum Free Single	100 ul CV≤0.3% AC±0.5%	5 ul CV≤3% AC±8.0%	5 ul CV≤3.5% AC±5.0%		Example
		10 ul CV≤2.0% AC±6.0%	10 ul CV≤1.0% AC±1.0%		
		100 ul CV≤1.0% AC±2.0%			

Tab. 15: Pipetting precision and accuracy acceptance criteria Air Flexible Channel Arm Multisense (Air FCA MS) for use with capacitive liquid level detection (cLLD)

Fluent Control cLLD Liquid Class	Air FCA			
	DiTi 1000 ul wide bore	DiTi 1000 ul	DiTi 1000 ul clear	DiTi 350 ul
Water Free Multi	6 x 100 ul CV≤6.0% AC±5.0%	12 x 50 ul CV≤2.0% AC±1.0%		12 x 10 ul CV≤4.0% AC±2.0%
	4 x 200 ul CV≤3.0% AC±5.0%	6 x 100 ul CV≤1.0% AC±1.5%		6 x 20 ul CV≤1.5% AC±2.5%

Fluent Control cLLD Liquid Class	Air FCA			
	DiTi 1000 ul wide bore	DiTi 1000 ul	DiTi 1000 ul clear	DiTi 350 ul
Water Free Single	20 ul CV≤2.0% AC±5.0%	10 ul CV≤1.2% AC±2.0%	10 ul CV≤3% AC±8.0%	10 ul CV≤0.6% AC±1.5%
	100 ul CV≤0.5% AC±2.0%		100 ul CV≤0.75% AC±2.0%	
	500 ul CV≤0.5% AC±2.0%	100 ul CV≤0.3% AC±0.5%	500 ul CV≤0.5% AC±1.0%	200 ul CV≤0.2% AC±0.5%
	900 ul CV≤0.5% AC±2.0%			

Tab. 16: Pipetting precision and accuracy acceptance criteria Air Flexible Channel Arm Multisense (Air FCA MS) for use with capacitive liquid level detection (cLLD)

Fluent Control cLLD Liquid Class	Air FCA				
	DiTi 200 ul	Diti 200 ul clear	DiTi 50 ul	DiTi 50 ul Clear	DiTi 10 ul
Water Free Multi	12 x 10 ul CV≤4.0% AC±2.0%		6 x 5 ul CV≤6.0% AC±5.0%		
Water Free Single	10 ul CV≤0.6% AC±1.5%	5 ul CV≤4% AC±8.0%	1 ul CV≤4.0% AC±8.0%	1 ul CV≤10.0% AC±20.0%	0.5 ul CV≤5.0% AC±9.5%
		10 ul CV≤3.0% AC±4.0%	5 ul CV≤0.8% AC±1.5%	10 ul CV≤1.5% AC±2.0%	
	200 ul CV≤0.2% AC±0.5%	100 ul CV≤0.75% AC±1.0%	10 ul CV≤0.5% AC±1.0%	40 ul (w/filter) CV≤0.5% AC±1.0%	10 ul CV≤ 0.8% AC±2.0%
			50 ul CV≤0.3% AC±0.5%	50 ul (w/o filter) CV≤0.5% AC±1.0%	

Tab. 17: Pipetting precision and accuracy acceptance criteria Air Flexible Channel Arm Multisense (Air FCA MS) for use with pressure liquid level detection (pLLD)

FluentControl pLLD Liquid Class	Air FCA			
	DiTi1000F	DiTi200F	DiTi50F[1]	DiTi10F
Hexane Free Single	100 ul CV≤1.0% AC±1.5%	10 ul CV≤3.5% AC±2%	10 ul CV≤3% AC±1.5%	Example
	500 ul CV≤0.6% AC±1.0%	100 ul CV≤1.5% AC±1%	45 ul CV≤1.5% AC±1.0%	
Water Free Single[2]	10 ul CV≤2% AC±2%	10 ul CV≤2% AC±2%	5 ul CV≤1.5% AC±1.5%	2 ul CV≤5% AC±9.5%
	100 ul CV≤0.5% AC±1%	195 ul CV≤0.5% AC±1%	10 ul CV≤2% AC±2.5%	10 ul CV≤ 2% AC±3%

Tab. 18: Pipetting precision and accuracy acceptance criteria Multi Channel Arm 96 (MCA 96) for use with capacitive liquid level detection (cLLD)

FluentControl cLLD Liquid Class	MCA 96	
	DiTi 1000 F	DiTi 10F
DMSO Free Single	1000 ul CV≤1.5%	1 ul CV≤9%
Water Free Single	1000 ul CV≤1.5%	1 ul CV≤4%

Performance specification key (example)

Lowest volume tested	10ul
CV specification	CV≤2.0%
Accuracy specification	AC±3%

Definitions

- CV:
  Measure of the dispense precision that indicates the extent of variability in relation to the mean of the measurements.
- AC:
  Dispense accuracy that indicates how close the measurement is to the target value.

Measuring conditions

The values have been measured according to the following protocol.

- Measurements obtained on standard Fluent instruments operated within the specified liquid handling environmental conditions and maintained according to system care instructions.
- Minimum of 96 measurements
- The specified CV and average accuracy are the maximum values obtained overall and per channel.

Only Tecan disposable tips guarantee the achievement of the performance specified for the Tecan pipetting instruments.

Calibration may be required for volumes of 5 µl or below.

The DMSO pipetting values are performed with water as system liquid.

A mastermix formulation containing 50% glycerol is used for Air FCA.

Notes

1	Specified for 50ul DiTi part number 30200712 (supplier specific)
2	Water Free Single pLLD liquid class supported from FluentControl version 3.7 onwards
3	Achieved with pre - Drop/Get tipblock command to push wash solution out
4	0.2ul possible with advanced customization of parameters (contact expertline for information)
5	With excess volume
6	Performance specifications for free dispense into non-piercable labware
Example	Template Liquid class supplied in FluentControl with no performance specification
Blank cell	No template liquid class supplied in FluentControl
ul	Alternative form for microliter, used instead of µl

Mean value

$$\overline{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$$

Standard deviation

$$s = \sqrt{\frac{1}{n-1}\sum_{i=1}^{n}(x_i - \overline{x})^2}$$

Coefficient of variation

$$CV = \frac{s}{\overline{x}} * 100\%$$

Accuracy

$$\frac{(\overline{x} - V)}{V} * 100\%$$

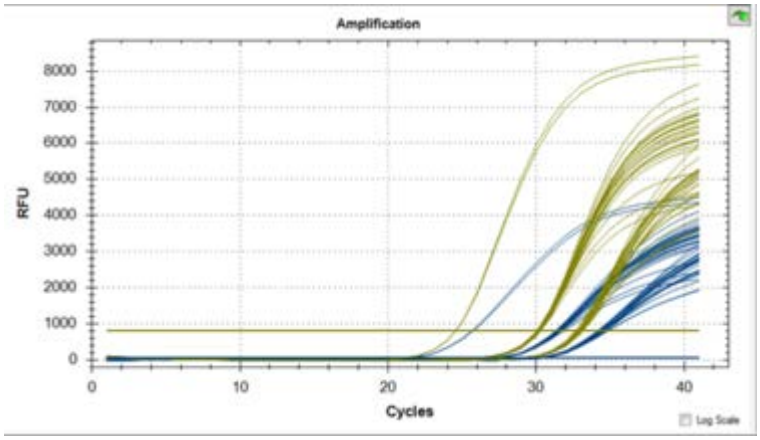
x̄	Mean value
n	Number of data points
Σ	Sum symbol
I	Index starting with 1
x_i	i- value of data set
s	Standard deviation
CV	Coefficient of Variation

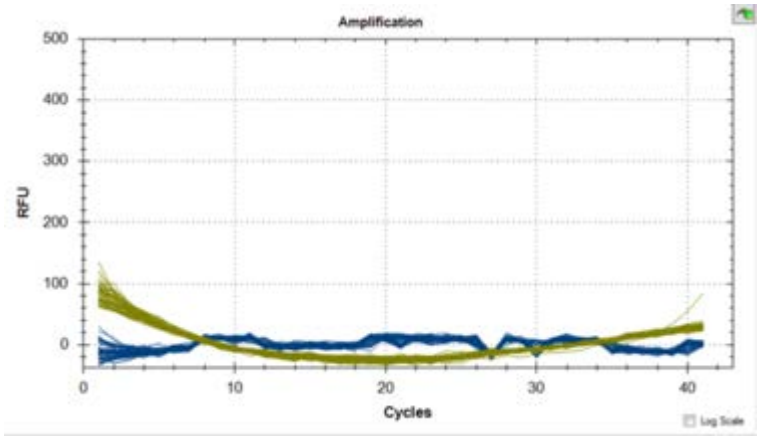
Cross-Contamination Testing

Checkerboard Method for Cross-Contamination Assessment

Acceptance Criteria:
The Ct values of the fluorescent dyes FAM and VIC in the no-template control (NTC) or negative control wells must be either N/A or >37 for all runs. Additionally, the Ct values of FAM and VIC in the positive control wells must be valid (≤37). The Ct value indicates the cycle number at which the fluorescence signal of a sample exceeds the threshold, indicating the detection of the target nucleic acid.

Results:
An example of qPCR results is provided below. The first graph shows the expected amplification curves for the positive control wells, with Ct values <37. The second graph confirms the absence of amplification in the no-template control wells, with Ct values recorded as N/A.


Amplification
RFU
8000
7000
6000
5000
4000
3000
2000
1000
0
0
10
20
30
40
Cycles
Log Scale


Amplification
RFU
500
400
300
200
100
0
0
10
20
30
40
Cycles
Log Scale

4 Description of Function

This chapter explains the basic function of the Fluent, illustrates the structure and provides a functional description of the assemblies.

4.1 Overview

The Fluent is used for pipetting tasks with robotic arms. The robotic arms can aspirate from and dispense to various containers, such as sample tubes or microplates.

The Fluent is available in three different sizes:

- Fluent 480
- Fluent 780
- Fluent 1080

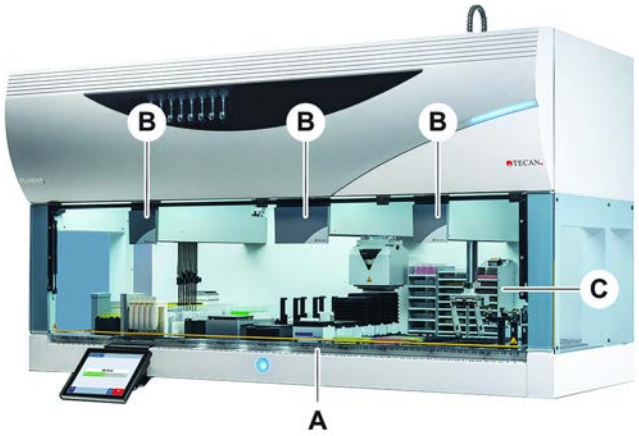


Fig. 16: Instrument overview (instrument may differ from illustration)

A	Deck	**B**	Robotic arms
C	Options and devices		

An earthquake protection kit for areas prone to earthquakes is also available.
For further information, please refer to section "Customer Support" [▶ 200].

4.2 Deck

Segments

The Fluent deck, which is the sample zone of the instrument, is composed of segments. Deck segments are interchangeable deck components that can have various dimensions and features. **CAUTION! Do not operate the system without deck segments.**

Grid Number

The segment width is expressed in grid numbers. A grid is 25 mm wide and corresponds to the distance between the positioning pins of a segment.

Grid numbers are also used for expressing the location of segments or runners on the deck.

4.2.1 Carriers

Fig. 17: Fluent deck

A Runner **B** Segment

Carriers are deck components designed to hold labware or consumables on the deck.

Runners are carriers that slide on and off the grid segments and usually hold sample tubes or reagent troughs.

Segments are static elements locked onto the deck. Some segments have nests (nest segments) that hold labware, such as microplates or deep well plates, or consumables such as DiTi boxes. Some segments have grid pins (grid segments) for loading and unloading runners.

4.2.2 Deck Trays

Fig. 18: Deck tray

Deck trays, which are placed beneath the dynamic deck segments, capture liquid spills that may occur in the manual deck loading area. The system should be operated with as many deck trays as possible installed below the deck to collect all liquid spills. **CAUTION! Do not operate the system without deck trays and deck segments.**

Cut outs in deck trays for tools and instruments are allowed only for the cabinet version.

The raised areas in each deck tray are designed to allow cut-outs without affecting the catchment volume. These cut-outs accommodate through-deck waste chutes or other device integrations when using the cabinet mounted version. For through-deck access points, trays can be placed on a shelf in the cabinet below integrated devices.

Fig. 19: Deck trays beneath the deck segments

Deck trays will not be present where the RGA requires access to a device beneath the deck. A set of deck trays is included with the instrument. The deck trays can be washed or replaced as needed. Refer to section End of Day.

4.2.3 Placement on Segment

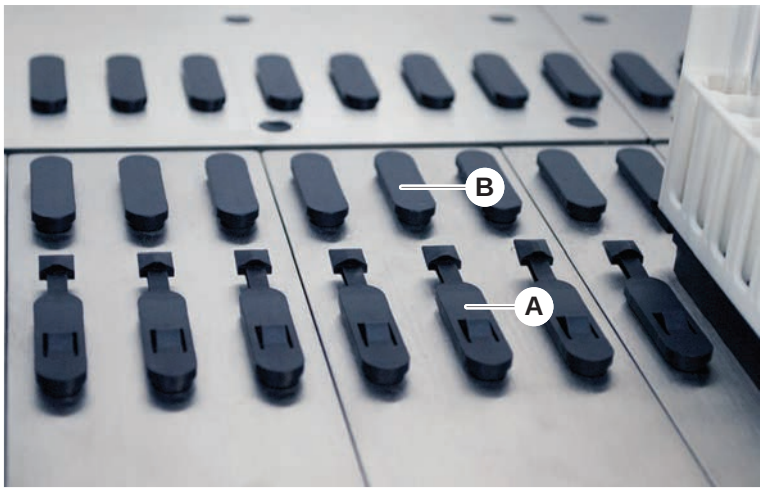


Fig. 20: Lock pins and positioning pins

A Lock pins **B** Positioning pins

Fluent uses pins to position runners, adapters, or options correctly on a segment. The runners are designed to slide onto the pins. Their positioning can then be checked by reading the grid number on the front of the instrument. The lock pins hold the runners in position.

4.2.4 Segment Position

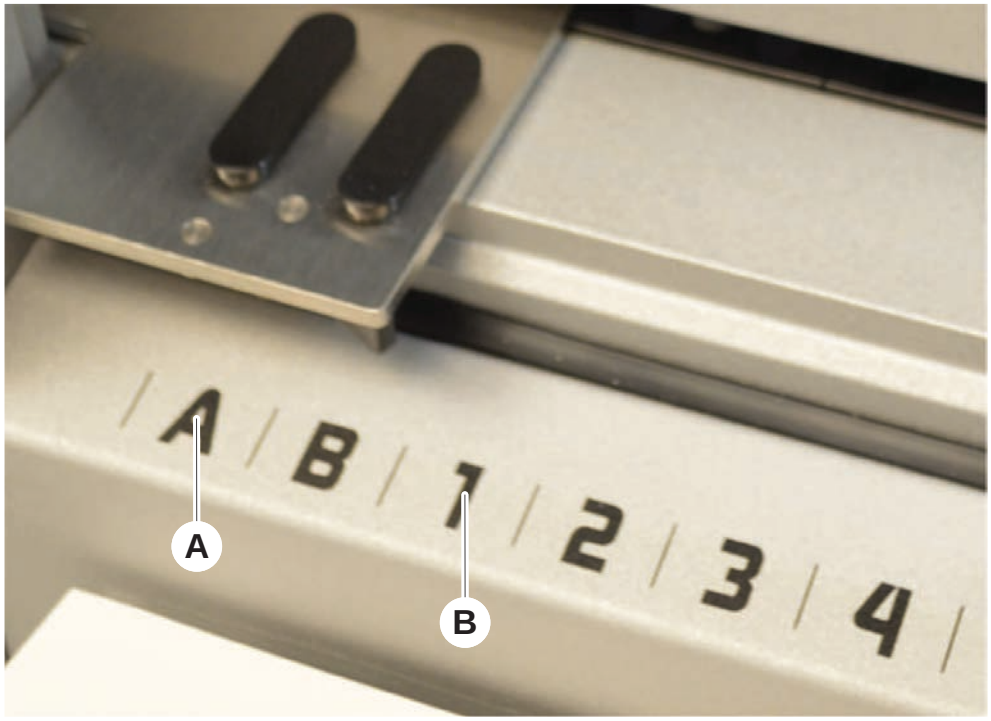


Fig. 21: Side positions and grid positions

A Side positions **B** Grid position

The side positions (AB, YZ) can be used to place labware handled by the RGA.

With the FCA or MCA, pipetting is not possible in side positions.

The numbered grid positions (1–n) are accessible to pipetting arms. In multiple arm configurations, however, not all numeric grids are accessible to all pipetting arms. Restrictions may apply depending on the instrument's arm configuration.

4.3 Robotic Arms

Fluent can be equipped with various robotic arms:

- Flexible Channel Arm (FCA)
- Multiple Channel Arm (MCA 96)
- Robotic Gripper Arm (RGA)

The robotic arms can be equipped with various arm accessories.

4.3.1 Flexible Channel Arm (FCA)

Fig. 22: Flexible Channel Arm

If carry-over is not tolerated, the use of disposable tips with filters is strongly recommended.

The FCA (A) is equipped with pipetting tips and can control liquid handling for up to 8 separate channels.

The FCA configured with DiTi adapters has an optional FCA gripper enabling certain labware moves—refer to “FCA Gripper” [▷ 71].

4.3.1.1 FCA with Liquid System (Liquid FCA)

The FCA with a liquid displacement system is filled with system liquid that is supplied by syringe pumps. It is used to pipette liquids with different volume ranges, depending on the tips and the syringe size used. The liquid FCA can be configured with a choice of fixed, washable tips or with disposable tip adapters.

Tecan recommends using deionized water as system liquid.

4.3.1.2 FCA with Air System (Air FCA)

The FCA with an air displacement system is used to pipette liquids by moving a plunger inside the pipetting channel. The Air FCA is configured with disposable tip adapters.

4.3.2 Multiple Channel Arm 96 (MCA 96)

The MCA 96 is a robotic arm with a multiple channel pipetting head. All 96 pipetting head channels aspirate and dispense simultaneously. The MCA 96 arm has the following key features:

Fig. 23: MCA 96 Head / Gripper

- Compatible with conductive FCA-DiTi portfolio up to and including 1000µl
- Pipetting range from 1ul to 1000µl
- Conduct a (capacitive) liquid level detection (cLLD)
- Conduct a partial DiTi pickup and offset pipetting (e.g. for dilution) using tip products with Tecan combi tray)
- Optional gripper for simple labware handling tasks

The MCA 96 head work with conductive disposable tips on the MCA 96 for compatibility with cLLD.

The cLLD on the MCA 96 is only verified to be used in troughs.

The first tip entering a liquid triggers the cLLD signal. Unequal fill heights (e.g. in manually filled wells of a microplate) could lead to unintended processing and erroneous results.

Use only cLLD compatible carriers and labware with the MCA 96. Use compatible trays for partial DiTi pickup: Tecan SLAS tray. See Reference Manual (Ref. [4]) for details.

The optional, field-ungradable gripper on the MCA 96 fulfills the purpose of simple labware handling tasks.

The gripper can be used e.g. for the following tasks:

- Move microplates and DWP's in landscape mode on target positions on the worktable
- Work with stacked DiTi trays by throwing away empty layers in waste
- Handling of microplate lids

The MCA gripper is built as a submodule on the MCA head, so it is a compact, cost-efficient alternative to a dedicated robotic gripper arm (RGA). The MCA 96 gripper is not able to perform more complex labware handling tasks, such as:

- Access to hotels
- Handling labware in portrait orientation
- Tasks including rotations

These complex tasks still require a dedicated robotic gripper arm (RGA) to be added to the system. The MCA 96 gripper consists of the same finger exchange station as for the RGA gripper.

4.3.3 Robotic Gripper Arm (RGA)

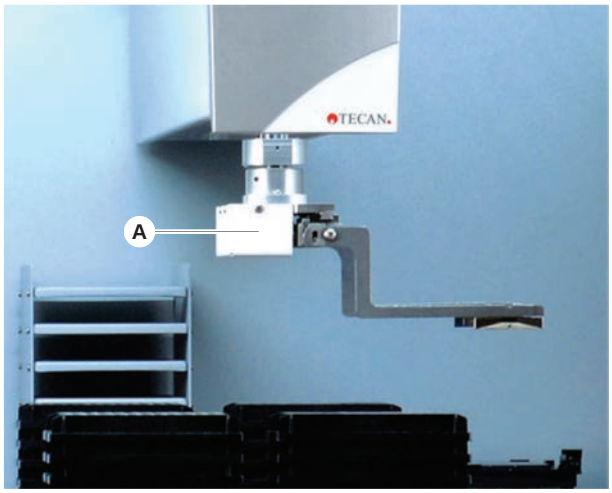


Fig. 24: Robotic Gripper Arm

The RGA (A) is a robotic arm with a gripper head and gripper fingers. The RGA transports microplates and other labware between deck positions, peripheral devices and labware storage:

A standard height Robotic Gripper Arm (RGA standard Z) can access objects located on the deck or on the lower deck.

A tall Robotic Gripper Arm (RGA long Z) can access objects located on the deck, on the lower deck and below.

4.3.3.1 Robotic Gripper Head

The RGA can be equipped with two different robotic gripper head options.

The regular gripper head offers a choice of gripper fingers that are manually exchangeable.

The Finger Exchange System (FES) offers automatic finger exchange with a choice of gripper finger sets. Finger sets are mounted on a docking station mounted on a standard nest segment. Finger sets are automatically picked up and placed by the robotic arm. Finger type and finger exchange are monitored. Any or all fingers may be used within a single method.

4.3.4 Arm Accessories

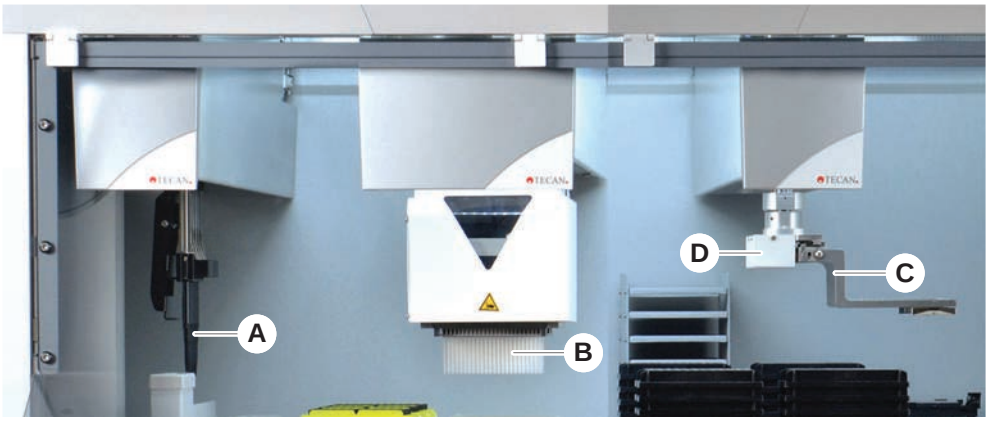


Fig. 25: Arm accessories

A	Fixed tips	**B**	Disposable tips
C	Gripper fingers	**D**	Barcode scanner for the RGA

4.3.4.1 Fixed Tips

If carry-over is not tolerated, the use of disposable tips with filters is strongly recommended.

Washable reusable tips for aspiration and dispense are available for the FCA and MCA.

4.3.4.2 Disposable Tips

Tips are provided in trays or boxes (single or nested) depending on the type. Tips are discarded or re-racked after aspiration. Tips are discarded, with the Disposable Tip Ejection System, into a waste chute mounted on a deck segment.

4.3.4.3 Gripper Fingers

Different types of gripper fingers are available for the RGA regular gripper head and the MCA 96 gripper, both featuring the Finger Exchange System (FES).

Eccentric Gripper Fingers

Eccentric gripper fingers transport microplate-based objects within and beyond the pipetting area. Grasp plate objects from sides. Two variants are available:

- Standard length fingers for loading microplates into hotels and devices.
- Eccentric long fingers for loading deeper devices such as the 4-slot, cell-plate, monitored incubator.

MCA 96 Eccentric Gripper Fingers

The MCA 96 eccentric gripper fingers, transport microplate-based objects within the pipetting area. This finger type can grasp plate objects underneath the MCA 96 gripper head. (This finger type is NOT compatible to the RGA gripper.)

Centric Gripper Fingers Centric gripper fingers transport microplate-based objects inside and below the pipetting area. Grasp plate objects from above. Applicable only for the RGA regular gripper head.

Tube Fingers Tube fingers transport tube-based objects inside and below the pipetting area. Applicable only for the RGA regular gripper head.

4.3.4.4 Barcode Scanner

The RGA can be equipped with a horizontal scanner for barcodes on microplates and DiTi boxes.

The laser class safety instructions must be read carefully and must be followed.

Please also refer to the manual provided by the barcode scanner manufacturer.

4.4 Liquid System (Liquid FCA)

Fig. 26: Liquid system (Liquid FCA)

The liquid system is designed for the efficient washing, inside and outside, of fixed pipetting tips.

4.5 Options and Devices

Example list of options and third party devices for the integration on Fluent. Certain options from Tecan and third-party devices that can be used with Fluent are for research use only (RUO).

In this section research-use-only options and devices are marked with an asterisk (*).

For further information, please refer to section "Intended Use" [8].

Passive Options

- Hotel (plate storage device)
- Cabinet
- Dust cover
- FCA gripper

Active Options

- HEPA hood
- Fluent Stacker

- MIO2
- Te-Shake
- Te-VacS
- Fluent Carousel
- Resolvex i300
- Piercing Tips and Tube Rotator
- FRIDA Reader

For further information, please refer to section “Reference Documents” [9].

- Washers based on HydroControl
- Balances based on the MT-SICS level 1 standard
- SiLA-compliant devices*
- Agilent Sealer*
- Inheco ODTC
- Inheco Heating Cooling using the MTC/STC controller
- Cytomat 10*, 20*, 200*, and 6000*

Barcode Readers

- Fluent ID tube barcode scanner
- Barcode readers of the Keynence BL-1300 series

Readers

- Tecan Readers controlled by Magellan
- Spark and SparkControl Magellan*
- Ziath 2D flat-bed-reader*

Please also refer to the manuals provided by the option, device or third party device manufacturer. The instructions must be read carefully and must be followed.

4.5.1 Fluent ID Tube Barcode Scanner

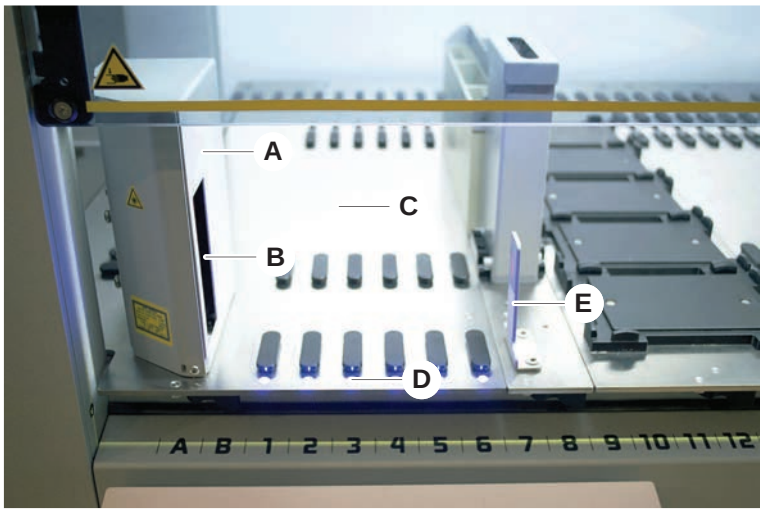


Fig. 27: Fluent ID

A	Scanner housing	**B**	Laser barcode scanner
C	Loading area	**D**	LEDs
E	Reflector		

The Fluent ID is an optional module that can be incorporated to scan tube barcode labels as tube runners are loaded onto the deck. Each Fluent ID module includes six dedicated grid positions for loading and scanning the barcode labels of up to six runners. The reflector is used to detect empty tube positions in a runner. A graphic interface on the touchscreen monitor provides guidance for the Fluent ID operation.

The laser radiation from the barcode scanner is a low-power, collimated beam in the visible spectrum with the following properties:

- Wavelength: 655 nm
- Pulse duration: 150 µs
- Maximum power of energy output: 1.0 mW

4.5.1.1 Fluent ID Compatible Tube Runners

The Fluent ID tube runners are each designed for one type of tube:

- Runner with 32 positions for 10 mm diameter tubes
- Runner with 32 positions for 13 mm diameter tubes
- Runner with 26 positions for 16 mm diameter tubes
- Runner with 32 positions for 2ml Eppendorf Safe-Lock tubes

Optional plugs can be used to block two positions of a 26-position runner in order to use it as a 24-position runner, allowing parallel pipetting out of tubes in multiples of eight.

4.5.2 FCA Gripper

Overview

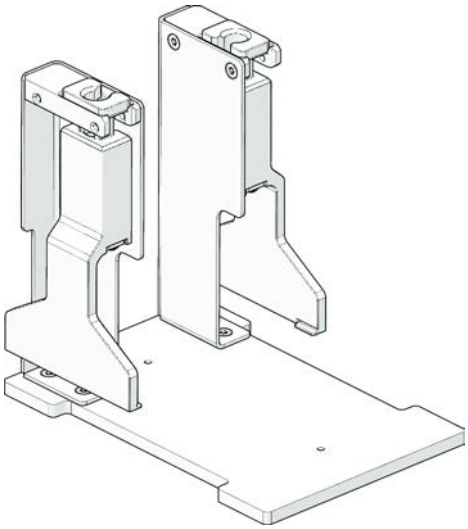


Fig. 28: FCA gripper

The FCA gripper is an option for the FCA configured with DiTi adapters that—in addition to pipetting—allows the FCA to perform some labware moves. The FCA can automatically get and drop the FCA gripper fingers during the run.

FCA Gripper Fingers

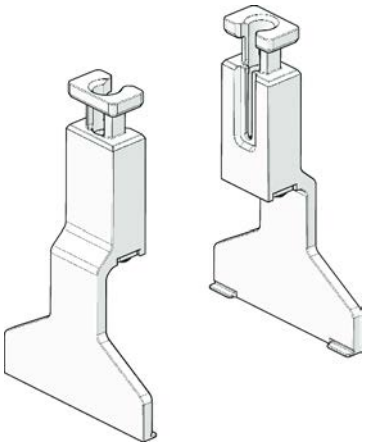


Fig. 29: FCA gripper fingers

The FCA gripper fingers need to be replaced after 2 years or 20000 cycles usage (one cycle defined as pickup, use and park). The cycles will be monitored with a counter defined in the Fluent Control software.

FCA Gripper Docking Station Nest

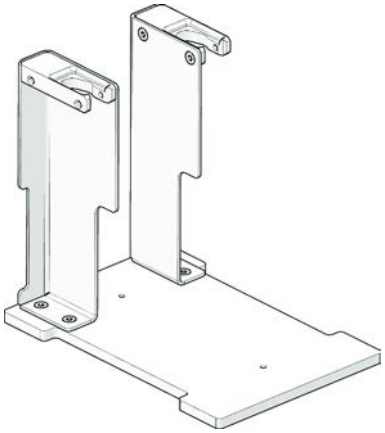


Fig. 30: FCA gripper docking station nest

The FCA gripper docking station nest is used for storing the FCA gripper fingers. It can be mounted like a standard microplate nest on a deck segment.

4.5.3 Mix & Pierce

The Fluent Mix & Pierce Workstation is designed for applications that transfer liquid from and to rubber capped sample tubes without removing the caps by piercing through the rubber caps.

Tube septa can only be pierced once.
Repeated piercing of the same tube is not supported.

BD Vacutainer® tubes with Hemogard closure and Greiner Vacuette® tubes with non-ridged Pull Cap and Safety Twist Cap have been tested for piercing.
Piercing of tubes with rubber stoppers/plugs is not supported.

Piercing tips should be changed on a regular basis.
The usage has been verified for 20 000 piercings/tip.

The Fluent Mix & Pierce Workstation is configured with up to 2 liquid FCAs, a deep wash station and up to 4 Tube Rotators, depending on the Fluent base unit size. Tube Rotators can be integrated on any Fluent base unit size and support tube barcode reading, sample mixing, piercing and aliquoting. For more information on supported tube types refer to section “Tube Rotator Runners” [▷ 74].

The workflow can be divided into the following steps:

1. Barcode scanning while tube loading
2. Mixing of tube contents
3. Piercing and liquid handling with the FCA in the Tube Rotator with Piercing Tips
4. Washing and decontamination of Piercing Tips in the deep wash station and decontamination troughs
5. Repetition of step 2 and continuation
6. An extended flush of the wash station, including the central waste, front and back cleaners, is recommended at the end of the script.

4.5.3.1 Tube Rotator

The main purpose of the Tube Rotator Module is to mix the liquid content of the tubes and to serve as a carrier for piercing and pipetting actions. A single Tube Rotator has a capacity of 5 Tube Rotator Runners with 24 tubes each (i.e., 120 tubes total capacity).

The device contains the following subcomponents:

- An integrated Tube Barcode Scanner in order to scan the sample barcodes during loading
- An optional deep wash station with deep troughs for decontamination of Piercing Tips and an error tube holder. The error tube holder can be used to save samples in case of piercing errors. The wash station is placed next to the rotating drum.

- A rotating drum with tube downholder that accommodates up to five Tube Rotator runners. The drum performs the sample mixing by either 360° rotation or oscillation at different angles and speeds. The downholder (cover) supports the piercing process.
- The Tube Rotator with Tube Rotator Runners support capacitive liquid level detection before and after aspiration as well as after liquid dispense (liquid arrival check) through closed tubes (optional setting).

– The Tube Rotator is installed by the FSE and must not be moved by the key operator or user.

4.5.3.2 Tube Rotator Runners

Tube Rotator runners are designed for the use on the Tube Rotator and to support piercing functionality. There are different tube runners to accommodate the supported tube types for piercing:

- 13x75mm BD Tube Rotator Runner, 24 tube positions
- 13x100mm BD Tube Rotator Runner, 24 tube positions
- 13x75mm Greiner Tube Rotator Runner, 24 tube positions
- 13x100mm Greiner Tube Rotator Runner, 24 tube positions
- 16x100mm Tube Rotator Runner, 24 tube positions

Multi-dispense is only supported for Greiner Vacuette® tubes with a non-ridged pull-cap and Safety Twist Cap.

Tubes with rubber stoppers are not compatible and can't be pierced.

Tab. 19: Tube and runner compatibility

Product Line	Tube			Runner	
	Diameter [mm]	Length [mm]	Labware Definition	Compatible Runner	Bridge Color
Greiner Vacuette	13	100	13x100mm Greiner Vacuette with septum	1x24 13x100mm Greiner Tube Rotator Runner	gray
	13	75	13x75mm Greiner Vacuette with septum	1x24 13x75mm Greiner Tube Rotator Runner	
	16	100	16x100mm Greiner Vacuette with septum	1x24 16x100mm Tube Rotator Runner	black
BD Vacutainer	13	100	13x100mm BD Vacutainer with septum	1x24 13x100mm BD Tube Rotator Runner	white
	13	75	13x75mm BD Vacutainer with septum	1x24 13x75mm BD Tube Rotator Runner	
	16	100	16x100mm BD Vacutainer with septum	1x24 16x100mm Tube Rotator Runner	black

4.5.3.3 Piercing Tip Protection

Fig. 31: Piercing tip protection

The piercing tip protection is a cap that is used for covering the sharp apex of the piercing tips during tip replacement and troubleshooting. It protects the user against injury and the tips against damage.

The piercing tip protection is for one-time use only. After usage all piercing tip protections have to be discarded into the biological waste container.

4.5.3.4 Piercing Tip Removal Tool

Fig. 32: Piercing tip removal tool

The piercing tip removal tool is used for retracting a piercing tip stuck in a tube that cannot be retracted with software commands.

4.5.4 Frida Reader

Fig. 33: Frida Reader

The Frida Reader is intended for automated quantitation and normalization of nucleic acids. Samples to be measured with the Frida Reader need to be cooled at 4°C lest sample evaporation can impair measurement results.

⚠ CAUTION

Vibrations can cause wrong results!

Vibration of the sample drop can cause incorrect measurement results and impair the safety or clinical condition of the patient sample.

- A stable floor is a prerequisite for an appropriate installation location.
- During Frida Reader measurements no internal or external vibration sources are allowed nearby.
- Please avoid sources with the resonance frequency. In particular vibrations around 36 Hz (2160 rpm) and around 42 Hz (2520 rpm) shall be avoided as these are resonance frequencies of a hanging drop.

⚠ CAUTION

Room illumination can cause wrong results!

Room illumination above the module can interfere with the measurement, cause incorrect measurement results, and impair the safety or clinical condition of the patient sample.

- The robotic system has to have a non-transparent cover top, a front and back panel, to prevent ambient light at the measurement position of the Frida Reader.

4.5.5 Phase Separator

The Phase Separator is designed to detect separation phases between liquids of different viscosity. As such, it is independent of the separation phase being visible from outside the labware. The Phase Separator can be used in applications that require the clean transfer of a liquid phase from a source to a destination labware.

The following represents a typical workflow:

✓ Centrifugation of the source labware with liquid mixture to generate a distinct phase between liquids.

✓ The liquids must differ in their viscosity to enable phase formation during centrifugation.

1. Load decapped tubes on the Fluent deck and use a barcode scanner (e.g., Fluent ID) for full traceability. Take care not to disturb the layer between the phases/ liquid fractions during loading.
2. Start the protocol defined for separation of the fractions. The Phase Separator function of the Air FCA will detect the phase between the liquids and start the transfer of fraction of interest to the destination labware.

More than one phase can be extracted from the source labware. The removal of, at least, part of the upper phase is required to prevent spillage of liquid (overflow of labware) on the deck and to prevent potential contamination of the pipetting channel above the disposable tip during phase detection.

For technical specifications refer to the Reference Manual. For details on FluentControl software refer to the Application Software Manual. Refer to “Reference Documents” [9].

The liquid phases must be clearly separated. For the separation of whole blood to plasma and blood cells, the quality and pre-treatment of the samples is essential. Parameters that can have an effect on phase detection in blood samples are sample quality (lipemia, hemolysis), storage time, storage temperature, transportation conditions, centrifugation conditions (time, rcf, temperature, ramp, rotor type), distortion of the phase after centrifugation, etc.
For optimized phase separation results, blood samples should be processed as fast as possible after withdrawal. Sample treatment and storage conditions should follow the specific tube manufacturer’s recommendation.

Centrifugation at 2500 rcf for 10 minutes at room temperature with a slowdown ramp lead to a clean phase separation for plasma samples (Tecan internal testing conditions).

To prevent liquid spillage from tubes during aspiration and phase detection, the tubes should not be filled to the rim. Phase detection usually requires a fast downwards movement in the tube combined with a slow aspiration speed, leading to an increase of the liquid level during detection.
For tubes with high fill volume a removal of liquid from the top is recommended before phase detection is started.

4.5.6 Resolvex i300

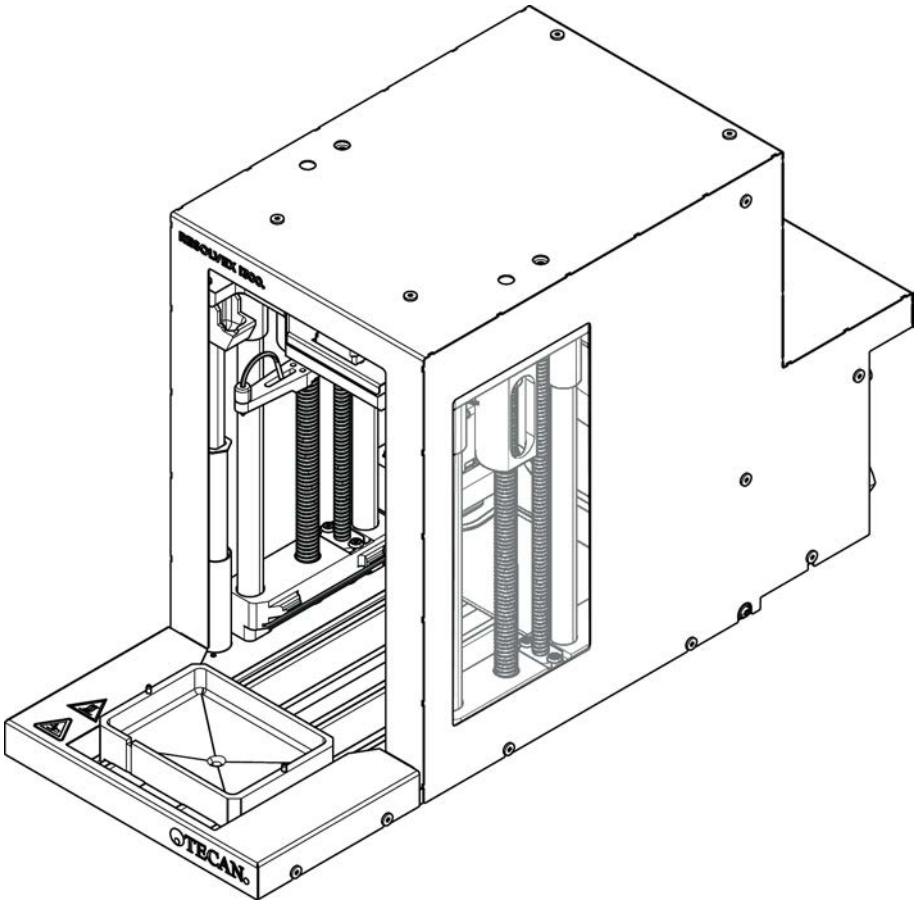


Fig. 34: Resolvex i300 worktable module

The Resolvex i300 is a module which can be integrated into the Fluent platform. The Fluent platform can then handle liquids and transfer labware from a worktable directly on the Resolvex i300 module within the same software framework.

The Resolvex i300 is a laboratory instrument which allows to automate a range of laboratory processes using the following main functions:

- Pressurizing filter columns (fully or partially loaded) with air or nitrogen
- Stacking and unstacking of filter plates on collection plates with an integrated labware lift
- Protection of samples from cross-contamination during stacking and unstacking of filter and collection labware using an integrated drip protector
- Dispensing of liquids into the filter or collection labware (optional)
- Evaporation of liquids out of the collection labware with heated gas, such as air or nitrogen (optional)

Typical application workflows of the Resolvex i300 include the following laboratory processes:

- Solid phase extraction processes (SPE) for mass spectrometry sample preparation workflows

- Supported liquid extraction (SLE)
- Other filtration, purification or concentration workflows using positive pressure

For further information and before performing any work with the Resolvex i300, consult the Resolvex i300 Operating Manual. Refer to “Reference Documents” [▷ 9].

5 Control Elements

5.1 Operating Elements

Fig. 35: Operating elements

A	Clamp lever	**B**	Touchscreen

Clamp levers lock and unlock the segments.

The touchscreen displays methods and descriptions, allowing the operator to control the instrument.

5.2 User Interface

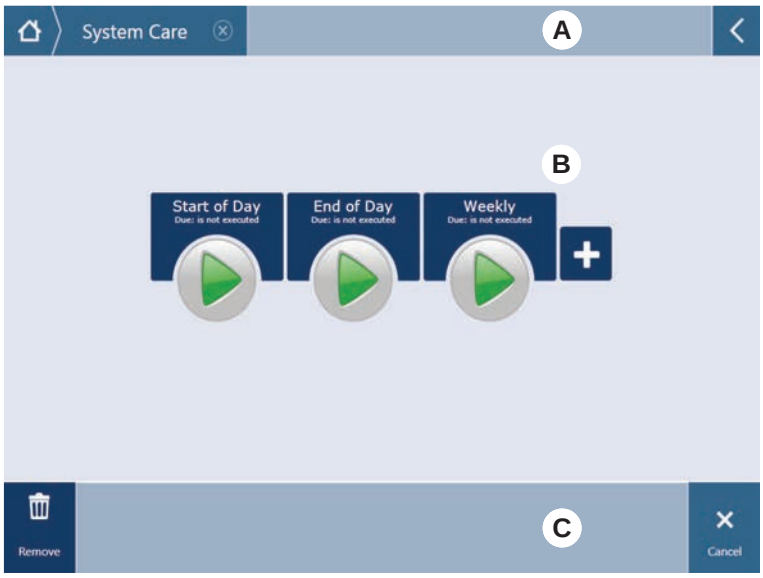


Fig. 36: User interface of FluentControl

A	Navigation path	**B**	Working area
C	Display/Option/Action buttons		

Through the user interface of FluentControl the operator has access to method runs for operation and system care.

5.2.1 Navigation Path

Use the navigation path to understand and navigate the hierarchy of FluentControl.

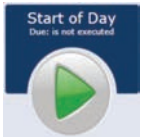
Tab. 20: Navigation path buttons

Button	Name	Function
	Home	Press to return to the home page.
	Navigation pane	To display current and previous selections.
	Menu expander	Press the menu expander button to reveal options such as light controls and to switch operators.

5.2.2 Working Area

Access methods and descriptions through the working area of the user interface. Details about the method run status are also displayed here.

Tab. 21: Working area buttons

Button	Name	Function
	Run	Press to start the selected method.
	Add	Press to add more methods to your quick start list.
	Selected method	The method currently selected that will be run when Continue is pressed.
	Available method	A method that can be selected by clicking on it.
	Quick start button	Press to start the selected method immediately.

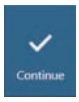
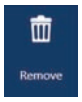
Tab. 22: Working area display

Display	Display Function
	Displays the status and the remaining time for the method run.
Assay 1 is ready to be started.	Description of the currently selected method or additional information on the current action.

5.2.3 Display, Option and Action Buttons

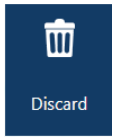
Tab. 23: Display, option and action buttons

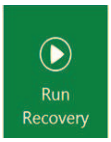
Button	Name	Function
	Ok	Press to confirm.
	Cancel	Press to cancel.

Button	Name	Function
	Continue	Press to continue.
	Pause	Press to request a run pause at the end of the current action.
	Stop	Press to halt a run immediately, even in the middle of the current action. If feasible, the system will offer the possibility of restoring or continuing the run.
	Remove	Press to remove the method from the quick start view.
	View mode	Press to toggle between list view and quick start views.
	Sort by	Press to toggle method run display between alphabetical and most recent sorting.

5.2.4 Method Recovery Buttons

Tab. 24: Display, option and action buttons

Button	Name	Function
	Discard	Press to discard a recovered method status.
	–	Press to move to the next screen.
	Recovery Point	Press to return to the previous screen (“Recovery Point”).

Button	Name	Function
	Run Recovery	Press to continue the run.

5.2.5 DeckCheck Buttons

Tab. 25: DeckCheck buttons

Button	Name	Function
	Left camera	Displays the camera picture taken from the left camera (Fluent 780/1080 only). An exclamation mark appears on the icon if a layout discrepancy has been seen with this camera.
	Center camera	Displays the camera picture taken from the center overview camera. An exclamation mark appears on the icon if a layout discrepancy has been seen with this camera.
	Right camera	Displays the camera picture taken from the right camera (Fluent 780/1080 only). An exclamation mark appears on the icon if a layout discrepancy has been seen with this camera.
	Pause Alternate	Screen alternates between reference and live pictures: Press this button when either reference or live picture is displayed to hold that picture static.
	Resume Alternate	Picture is static: Press to resume alternating between Reference and Live pictures.
	Check	Activates a recheck of the system—for example when some corrections have been made. Door closure will be prompted. For a 3-arm system, the middle arm must move: If the door is not closed the check will be made, however the middle arm will block one camera.

Button	Name	Function
	Ignore & Continue	Appears only if configured for that command in the method. Allows any highlighted discrepancies to be ignored and the script run will continue.
	Continue	Appears when all discrepancies have been resolved or if the system has not found any discrepancies and the option **show always** has been selected for the command. This may allow subtle color changes to be seen by eye that the system did not recognize.

Tab. 26: Displays

Display	Descripotion	Function
	Reference picture	The reference picture is stored in the script command displaying the desired deck layout.
	Live picture	The live picture taken by the cameras while running the script.
	Discrepancy (difference to reference picture)	Red squares mark areas where discrepancies have been found between the reference and live pictures. The marked area may include more than one error.

5.3 Error Signals and Instrument Status

Fig. 37: Status lamps

A Power status lamp **B** Top status lamp

The status lamps indicate the instrument status by means of different color, steady or flashing lights. The top status lamp is only active when software is running.

Tab. 27: Light signals from status lamps

Signal	Color	Mode	Instrument status
■	–	off	The instrument is switched off (disconnected from the power supply).
▮▮▮▮	white	“heartbeat”	The instrument is switched on (control software connected, modules not initialized yet).
□	white (power lamp only)	continuous	Instrument “power on” state (control software is not connected).

Signal	Color	Mode	Instrument status
	color scheme of FluentControl user interface	“heartbeat”	**Idle mode** All modules are initialized; the instrument is ready to run a method. After about one hour in Idle mode, the instrument will switch to standby mode. **Standby mode** All axes are braked. The arms are not in ZeroG and cannot be moved manually. To activate the instrument, run a method or request the key operator to select the Move Tool for ZeroG mode.
	yellow	continuous	**Teach mode** The instrument “learns” positions. In this mode the user can move the robotic arms manually.
	green	continuous	A method (script or process) is running. This is the regular **“production” mode**.
	red	flashing	**Error state** The control computer screen or the touchscreen displays an error message.
	color is user configurable	flashing	**User prompt** System waiting for a user interaction.
	green	flashing	**Active stop** This is an intentional pause triggered by the runtime controller or by opening a safety panel. The instrument pauses to allow user interaction with the deck. The operator can resume the method.

5.4 Fluent ID Status LEDs

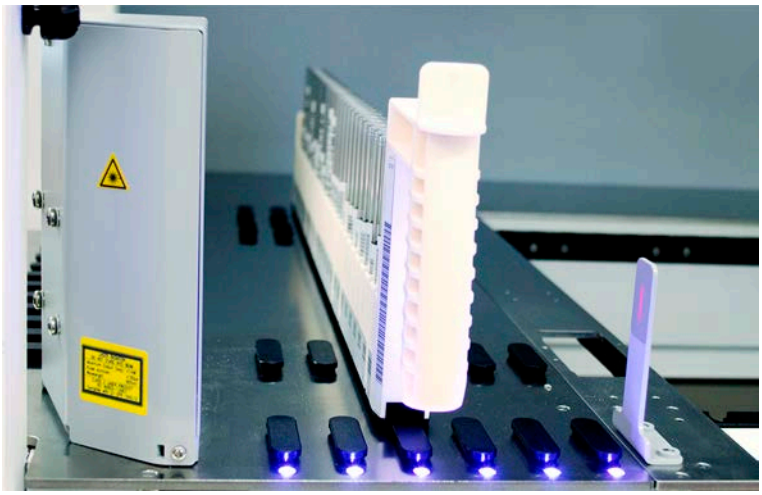


Fig. 38: Fluent ID LEDs

The Fluent ID LEDs signal the following states:

Tab. 28: Fluent ID LEDs

Signal	Color	Mode	Instrument status
	–	off	Fluent ID is idle.
	white	continuous	Fluent ID power on (but not yet initialized).
	blue or custom color	flashing	Ready for runner loading or unloading.
	green	continuous	Barcodes successfully scanned. Runner supervised. Do not unload as this will interrupt the run.
	red	flashing	Error state Error message and required action are displayed on the touchscreen.

6 Operation

6.1 Safety Instructions for This Chapter

⚠ CAUTION

Wrong results or contamination of instrument!

Wrong results or contamination of the instrument may occur if the installation qualification and operation qualification have not been performed or if the operating procedures that are given in this manual are not followed.

- Installation qualification and operating qualification records are available and known.
- Methods and processes, including pipetting parameters, must be validated by the key operator.
- Liquid level detection in conjunction with piercing applications for FCA and Air FCA must be validated by the key operator.
- For whole blood applications using Piercing Tips and Tube Rotator and concentrated corrosive decontamination solutions, it is recommended to exchange both wash station connectors (at the wash station and at the system liquid container) every three months to prevent clogging and wear and tear of the connectors. Potentially corrosive liquids must be neutralized before drainage or wash station must be rinsed with neutral liquids such as water.
- The operator must be trained on the operating procedures, methods and processes.

⚠ CAUTION

Biological and chemical contamination of the user!

Damaged FCA gripper fingers can lose plates. Dropped plates can cause contamination by hazardous substances.

- Check the FCA gripper fingers after a crash.

⚠ CAUTION

Sharp edges and points!

The Piercing Tips of the Fluent Mix & Pierce Workstation have pointed tips and sharp edges that can cause injuries.

- When loading the instrument, move the FCA to a save position with a software command.
- After an error, cover the piercing tips with piercing tip protections and move the FCA manually to a save position. Refer to section “Piercing Tip Protection” [▷ 75].

⚠ CAUTION

Biological contamination of the system!

In the Fluent Mix & Pierce Workstation, blood can contaminate the caps of the tubes.

- Handle tubes with care.
- Wear protective equipment.

NOTICE

Malfunction due to corrosive liquids!

Drainage of corrosive concentrated liquids, such as 2% bleach, through the wash station and tubing can cause malfunction of the wash station connectors.

- Potentially corrosive liquids must be neutralized before drainage or wash station must be rinsed with neutral liquids such as water.

6.2 Operating Modes

Fluent can be run in three different operating modes:

Operator — **Routine Operating Mode**

- Normal operating mode, where the application or routine system care tasks are run.
- Fluent is monitored by the FluentControl software runtime controller.

Key Operator — **Method Definition Mode**

- This operating mode is used to perform special tasks such as adjustment to set the method.

FSE **Service Mode**

- This operating mode is used to perform special tasks such as tests to ensure the operating readiness.
- A Service certificate is required to run this mode.

⚠ CAUTION

Arm Crashes into Worktable Objects

Fluent arms can be moved manually. Ensure that manual moves of the arms are performed smoothly with the arm held. Do not crash the arms into solid objects, including the arm range mechanical stop

6.3 Putting into Operation

6.3.1 Switching On the Instrument

To switch on the instrument, proceed as follows:

1. Switch on the power on the power switch (A) on the rear of the external power supply.

When the instrument is powered up, the power lamp will light up blue. Refer to section "Error Signals and Instrument Status" [▶ 87].

If the status lamp does not light up, start up the PC or contact the key operator.

2. Start up the FluentControl software. Refer to section "Starting FluentControl" [▶ 93].

6.3.2 Starting FluentControl

- ✓ Operating procedures must be available and known.
- ✓ Installation qualification and operating qualification records are available and known.
- ✓ System care has been performed.
- ✓ Instrument is switched on.

1. Launch the software with **Start** > **All programs** > **Tecan** > **FluentControl**.
   *After a few seconds the **Start** screen appears.*

6.3.3 User Login

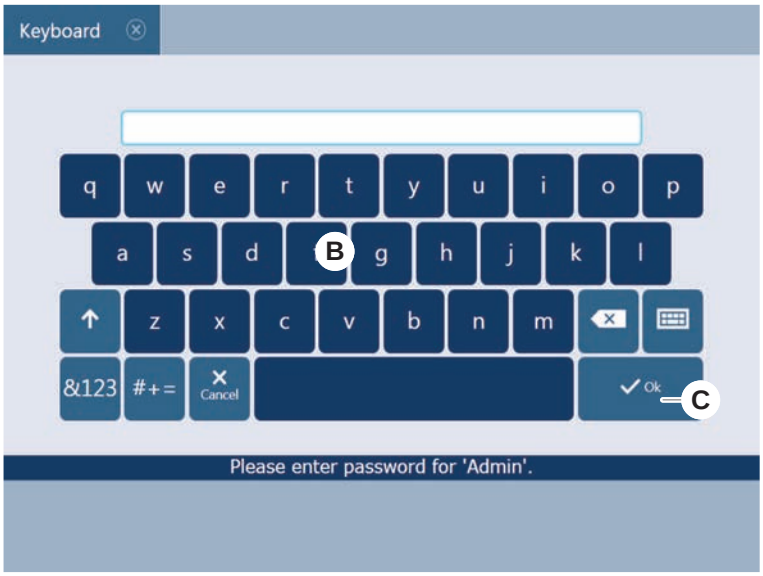
To log in to FluentControl, proceed as follows:

- ✓ Fluent Dx Software is installed.
- ✓ FluentControl has started.
- ✓ User Management is activated in FluentControl and the process has been defined.

1. Select the assigned user profile (A).

2. Enter password on the keyboard (B).

3. Press **OK** (C).



Following log-in, the instrument is automatically initialized.

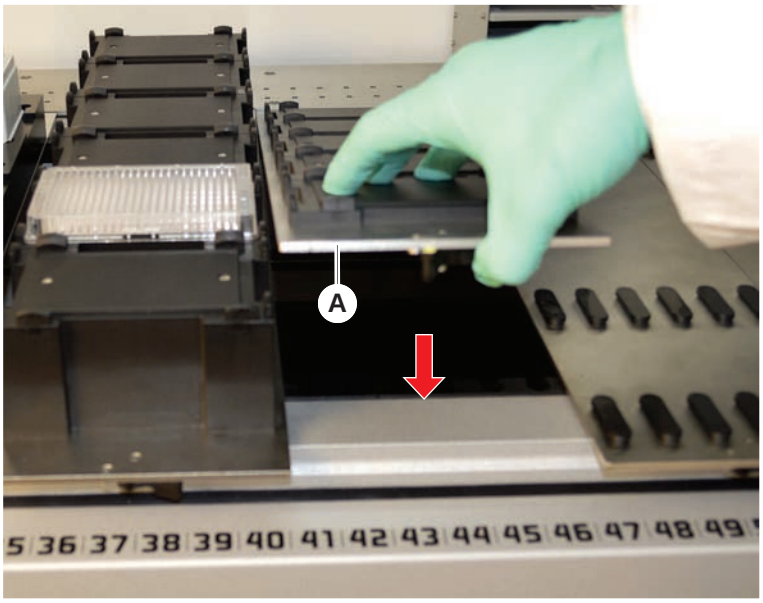
6.3.4 Placing Segments

To place segments, proceed as follows:

- ✓ All segments, carriers, options and devices must be placed in accordance with the selected method.
- ✓ Segments are cleaned and in perfect condition.
- ✓ Segments are placed in the corresponding grid position.

1. Lower the segment onto the rear of the deck.
2. Align the rear edge to the rear channel cover or the instrument extension.

3. Carefully lower the front part of the segment (A).



4. Turn the clamp lever from left to right, to its closed position. Refer to section “Checking Segment” [▷ 193].

6.3.5 Removing Segments

Fluent ID segments are not designed to be removed! They are connected directly to the instrument electronics. Connection to electronics can only be made by a qualified FSE.

Please consult section Customer Support.

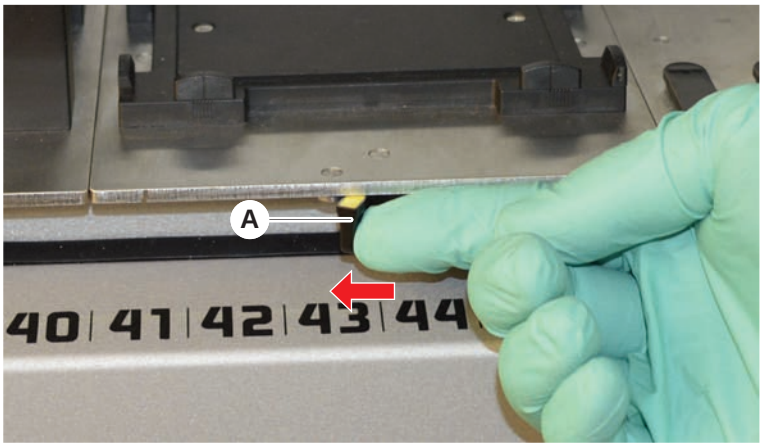
To remove segments, proceed as follows:

✓ All reagents, samples, racks, runners and plates have been removed from the segment.

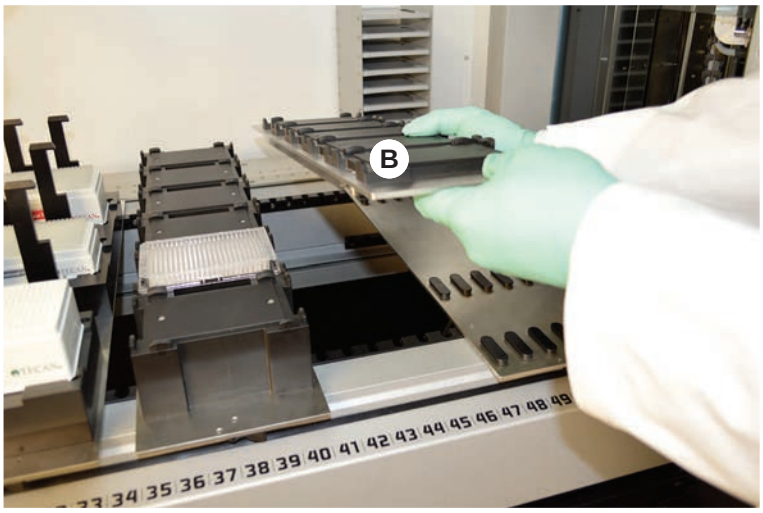
✓ Nothing is placed on the segment.

1. Turn the clamp lever (A) from right to left to the open position.

The segment is unlocked and the yellow mark on the clamp lever is visible.



2. Push the segment forward by approximately 4 mm.
3. Lift the segment (B) at the front.



4. Store the segment in a clean and dry location to avoid any damage.

6.3.6 Loading Standard Runners

NOTICE

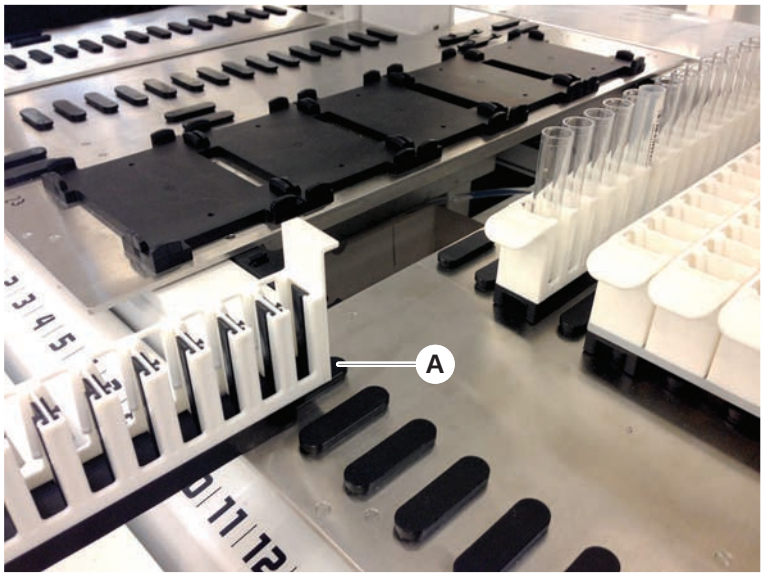
Damage due to improper loading or unloading

Damage to runners and pins.

- Align the runner horizontally with the deck.
- Support the front end of the runner with one hand.
- During unloading, ensure that the runner clears all pins before lifting the runner.

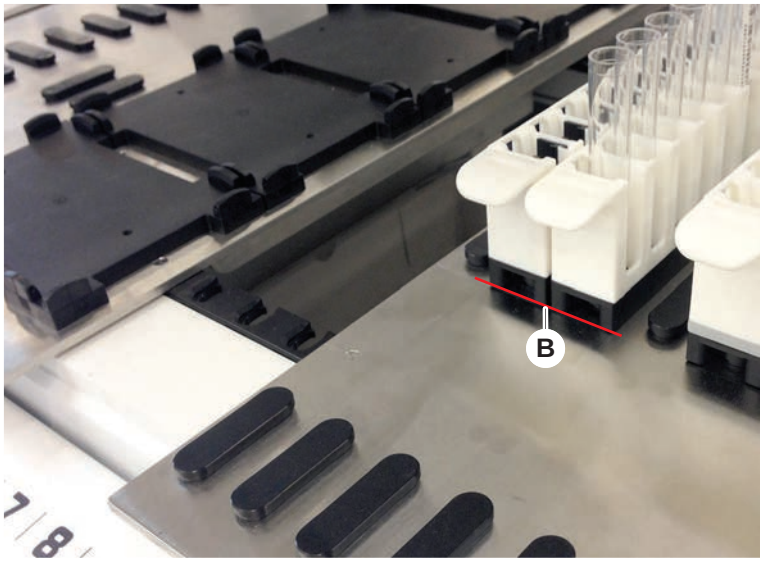
To load runners, proceed as follows:

1. Align the runner with the respective grid position (A).



2. Push the runner to the stop position.
3. Ensure that the runner locks the segment securely.

   This can be felt in the last couple of millimeters before the runner touches the stop position.



To unload runners, proceed as follows:

1. Pull the runner horizontally at the level of the deck until fully removed from the loading area.
2. Support the front end of the runner with one hand.
3. Ensure that the runner clears all pins before lifting the runner.

6.3.7 Checking the Deck Layout

Ensure that the carriers, labware and devices installed on the deck correspond to the deck layout defined for the method.

NOTICE

Equipment damage!

Incorrect segment and labware positioning on the worktable may cause arms to crash.

- Always ensure that the physical deck configuration and loaded labware matches the FluentControl worktable configuration.
- Always ensure that labware is fitted correctly in the nests. Refer to “Position Labware” [▷ 169].

NOTICE

Magnetic field creates interference!

A strong magnetic field (north pole up) at the aspiration position may interfere with the tip-presence sensor and may lead to unexpected errors (e.g., **DiTi lost**).

- Ensure that no strong magnet is placed in an SBS-position adjacent to the aspiration position.

Fluent ID segments can only be removed by the FSE because of the connection to the electronic board below the deck.

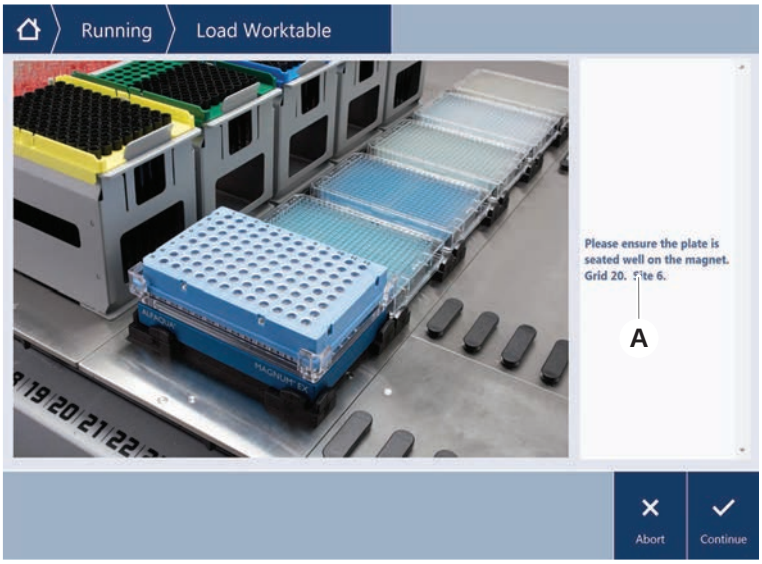
✓ Method must be prepared by the key operator.

✓ The consumables are consistent with the consumables defined in the method.

✓ Fluent ID tube runners must only be loaded after the method has started, when prompted on the touchscreen.

1. Follow the instructions displayed on the touchscreen.

The illustration shows an example of an instruction (A) displayed on the touchscreen:



6.4 Before Starting a Method

The following checklist must to be completed before starting a method.

Tab. 29: Checks before starting a method

Instrument/Component	Task	Reference/Activities
Process validation	Ensure that the method you are selecting has been validated, before starting a production run.	Contact the key operator for further information.
Touchscreen	Follow the instructions on the touchscreen. **NOTICE! The instructions provided by the key operator must be strictly observed.** If no instructions are displayed, follow the task list below.	–

Instrument/Component	Task	Reference/Activities
Segments, carriers, options and devices	Ensure that all segments, carriers, options and devices are installed and secured. Ensure that only objects intended for use in the method are present on the deck. Ensure that the test run is successfully completed.	If the test run fails, contact the key operator to perform the test run again.
Samples and reagents	Ensure that all samples, reagents and labware are loaded correctly. **NOTICE! Barcode scanning only takes place after the method is started. Ensure that the Fluent ID deck is clear of runners before the start of the method. The runners must only be loaded when the prompt is displayed on the touchscreen.**	–
Waste tubing (liquid systems only)	Ensure that the waste tubing is routed correctly.	Visually inspect the waste tubing to ensure that they are not kinked or squashed.
Wash system (liquid systems only)	Ensure that the system liquid and waste container are correctly connected.	Refer to section “Checking the Tubing on System Liquid Container and Waste Container” [▷ 101].
Wash system (liquid systems only)	Ensure that the system liquid container is filled to the correct level. Ensure that the waste container is empty.	Refer to section “Connecting the System Liquid Container and Waste Container” [▷ 150].
Wash system (liquid systems only)	Ensure that the correct system liquid is used as defined in the method.	–

Instrument/Component	Task	Reference/Activities
Disposable tip waste and wash station unit	Ensure that the disposable tip waste and the wash station unit are clean.	Refer to section "Cleaning Disposable Tip Waste and Wash Station Unit" [▷ 144].
	Ensure that covers for waste chutes for aerosol containment are mounted.	–
Disposable tips	Ensure that the correct tips are loaded. Ensure the tip waste is empty.	–
Fixed tips	Ensure that fixed tips are clean and undamaged.	Visually inspect the fixed tips to ensure that they are clean. Visually inspect the fixed tips with a dentist mirror to ensure that the coating is intact.
Deck	Ensure that the carriers, labware and devices installed on the deck correspond to the deck layout defined for the method.	Refer to section "Checking the Deck Layout" [▷ 98].
Labware	Ensure that all labware is positioned securely. If microplates exhibit sideways movement, ensure the labware positioners are correct.	Refer to section "Position Labware" [▷ 169].
Tube Rotator	Ensure that no positioning pins or lock pins are missing on the Tube Rotator.	Refer to section "Replacing Lock Pins and Positioning Pins" [▷ 195]

6.4.1 Checking the Tubing on System Liquid Container and Waste Container

⚠ CAUTION

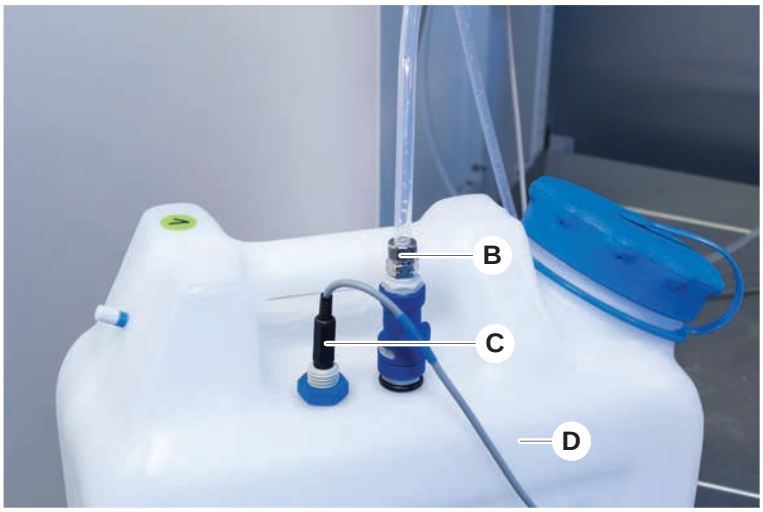
Sample contamination!

In case of a dual liquid FCA configuration, different types of system liquids can be used for each arm. Connecting the wrong system liquid container to an arm may cause sample contamination.

- Label each system liquid container with the corresponding system liquid name.

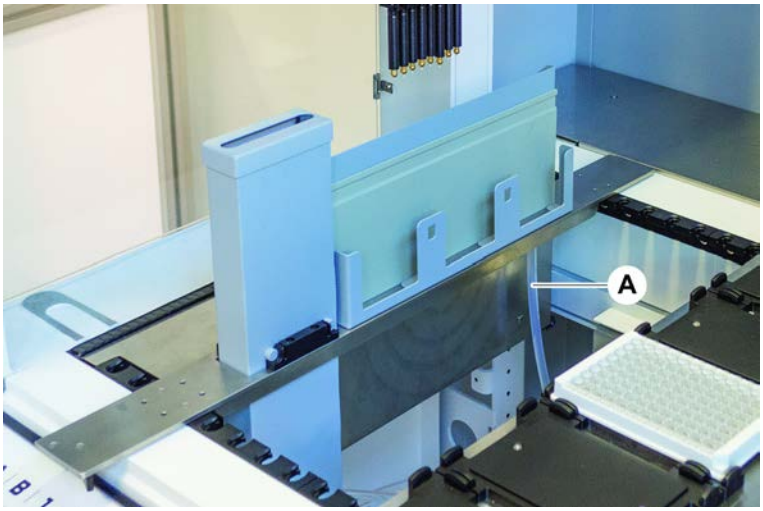
✓ The wash system must be correctly installed.

1. Check that the tube (B) is correctly connected to the system liquid container (D).
2. If present, check that the liquid detection sensor (C) is correctly connected to the system liquid container (D).



6.4.2 Checking Waste Container Tubing

1. Check that tube (A) is connected to the waste container (D).



2. Check that the tubes (C) and (D) are correctly connected to the waste container.
3. If present, check that the liquid detection sensor (E) is correctly connected to the waste container.

4. Screw on the lid (F).

6.5 Running a Method

A method is a collection of scripts or processes defined in the FluentControl software. The method can be executed in a run.

The key operator writes a method that can be executed as follows.

NOTICE

Instrument damage!

Instrument damage can result if the deck is not correctly set up or if the software is incorrectly operated or misused.

- Ensure that all safety devices are installed and functional.
- Ensure that the carriers, labware and devices installed on the deck correspond to the deck layout defined for the method.
- Ensure that only objects intended for use in the method are present on the deck.

6.5.1 Starting a Method

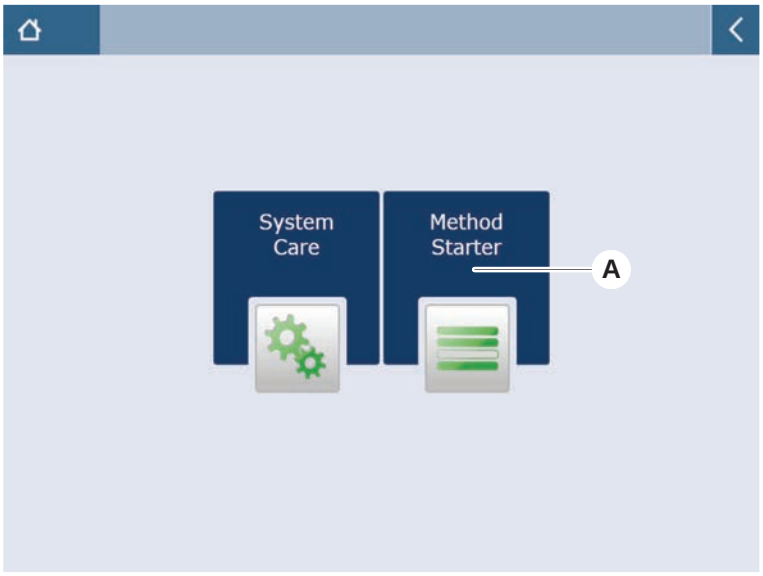
✓ FluentControl has been started.

✓ Section User Login has been performed.

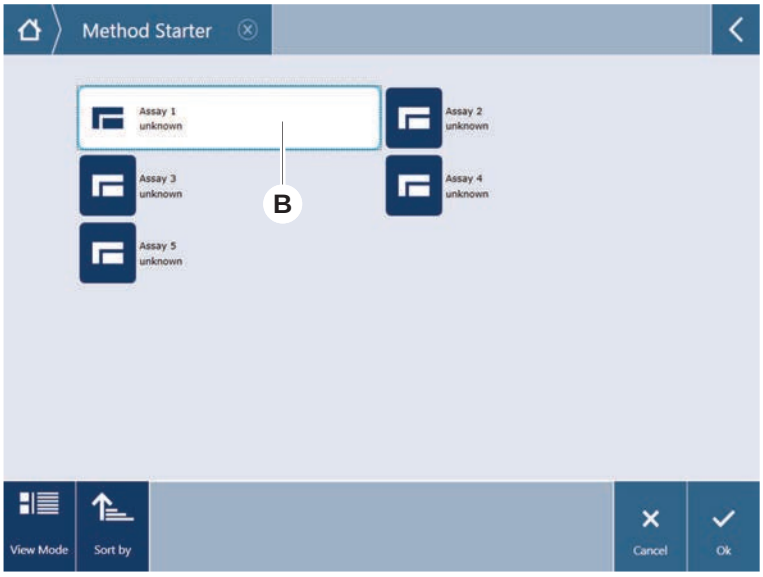
✓ Section Checklist before Starting a Method has been performed.

1. Select **Method Starter** (A).

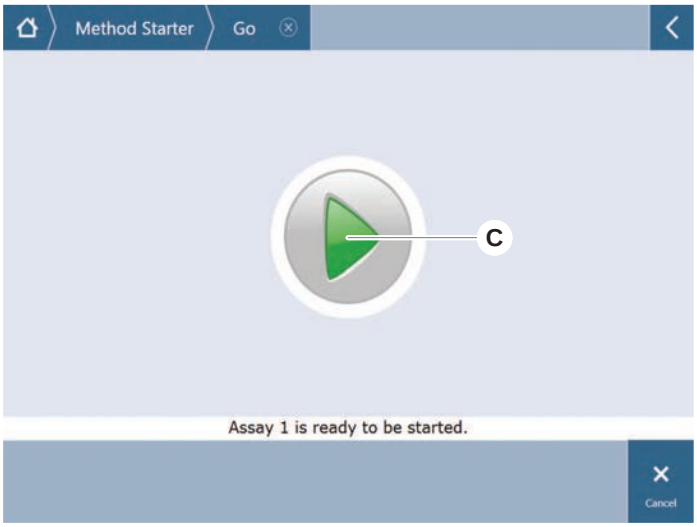
Button lights up as soon as it is touched.



2. Select the method (B) to be executed.
   Selected method is highlighted.
3. Press **OK**.

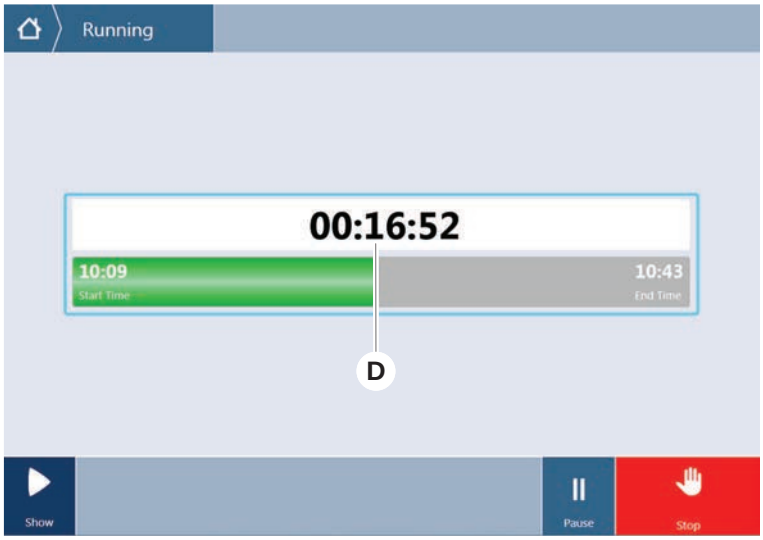


4. Press **Run** (C).

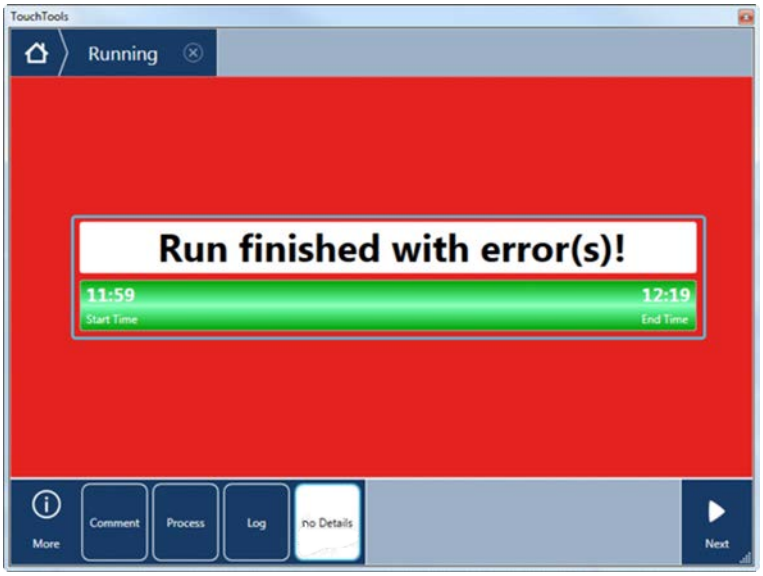


5. Follow the instructions on the touchscreen.
6. If your script includes DeckCheck pay attention to any differences in the actual Live Deck layout compared to the expected Reference Deck layout. Refer to DeckCheck Operation.
7. Wait for the method run to end.

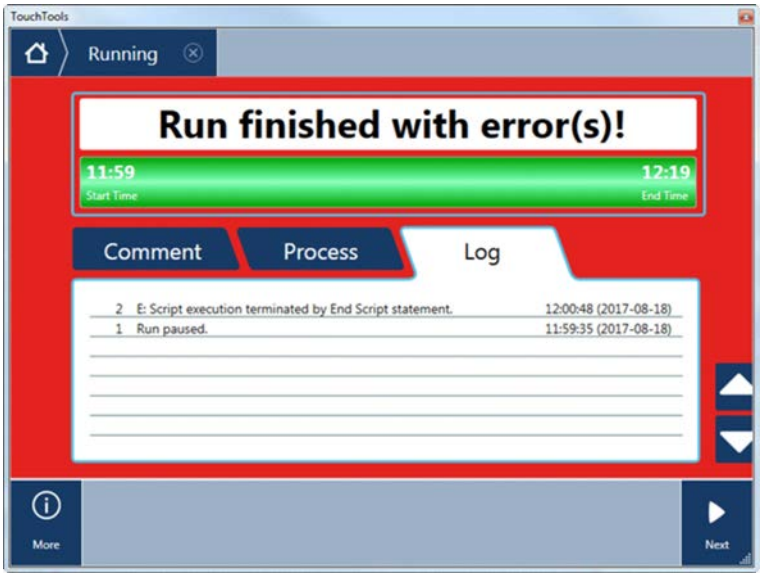
   The screen displays the approximate time (D) when the method run will end.



8. If the **Run finished with error(s)!** message appears, press **Log** to review the errors and warnings.

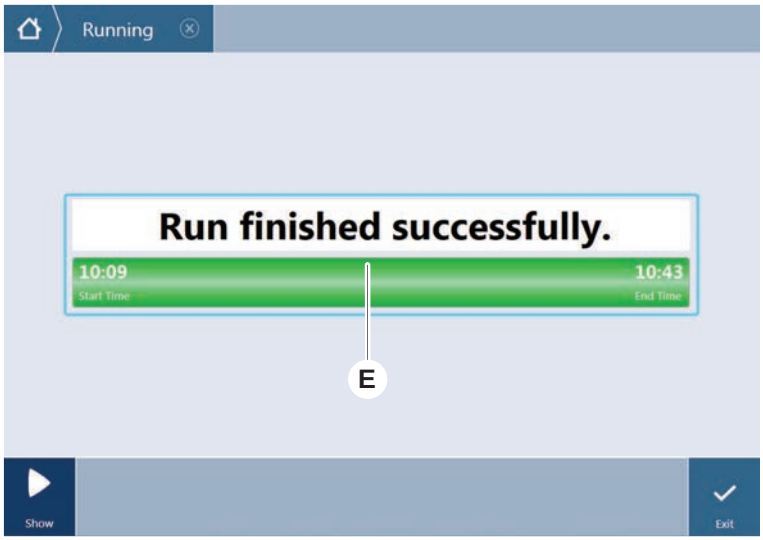


9. Press **Next** to return to Home screen.



10. Press **Exit**.

The screen below (E) is displayed when the method run ends.



6.5.2 Loading and Unloading Fluent ID Runners

⚠ CAUTION

The Fluent is a class 1 laser product pursuant to IEC 60825-1:2014 that emits laser radiation.

Dazzle, flash-blindness and afterimages may be caused by the laser beam.

- Do not stare into the laser beam or into its reflections.

6.5.2.1 Loading Fluent ID Runners

NOTICE

Damage due to improper loading or unloading

Damage to runners and pins.

- Align the runner horizontally with the deck.
- Support the front end of the runner with one hand.
- During unloading, ensure that the runner clears all pins before lifting the runner.

✓ Fluent is equipped with a Fluent ID tube barcode scanner.

✓ Tubes are loaded in the runners with barcode label facing left.

✓ All the tubes in a runner have the same size and shape. For tube runner types refer to section “Fluent ID Compatible Tube Runners” [▶ 70].

1. Select and start the method using the touchscreen.

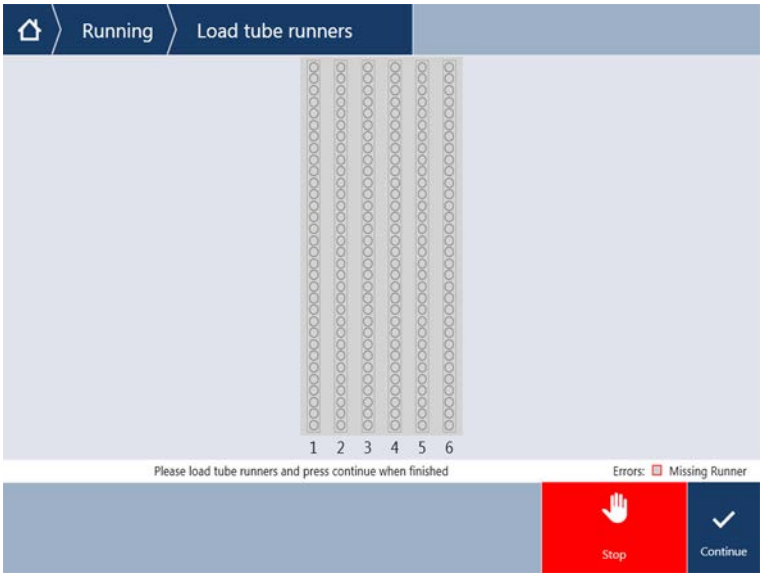
   *The LEDs start flashing and the message **Please load tubes** is displayed on the touchscreen.*

   When using different tube types, ensure that the correct type of runner is used for each specific grid.

2. Support the front end of the runner with one hand.

3. Hold the runner horizontally at the level of the deck.
4. Push the runner to the stop position.

5. Slide the tube runners, one after another, onto the dedicated grids in the Fluent ID loading area.



6. Check that all barcodes were successfully scanned.

   The LEDs turn green when the tube runners are in the loaded position and all barcode labels have been scanned successfully.

For Fluent ID LED status description refer to section "Fluent ID Status LEDs" [▶ 89].

7. In the event of a barcode scanning error, unload the runner, correct the problem and load the runner again.
8. Pull the runner horizontally along the deck until it is fully removed.

The Fluent ID reads every code multiple times as it passes the scanner. For small and narrow tubes (i.e., diameter ≤ 10 mm) reduce the speed of manual loading to enable all reads and reduce error reports.

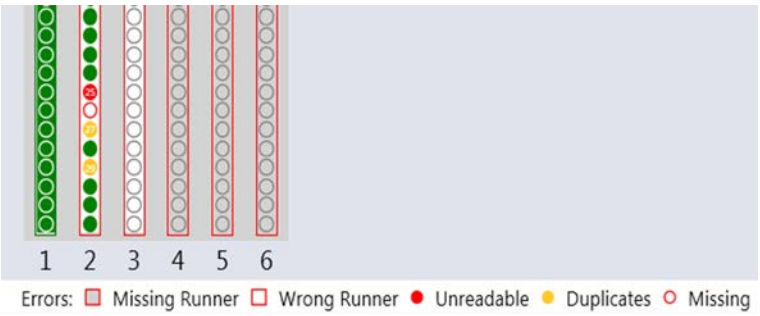


Fig. 39: Barcode reading confirmation displayed on the touchscreen

Tab. 30: GUI meaning (runner)

Square (runner)	Meaning
Green	All tube barcodes in runner read successfully.
White with red outline	Wrong type of runner for this grid position.

Square (runner)	Meaning
Grey with red outline	Missing runner. A runner should be loaded in this grid position.

Tab. 31: GUI meaning (tube position)

Circle (tube position)	Meaning
Green	Barcodes successfully read.
Red	Unreadable barcode
Orange	Duplicate barcode
White with red outline	Missing tube. A tube should be loaded in this position.

When the 2 ml Safe-Lock tube runner is used, it is not possible to differentiate missing tubes from unreadable barcodes. Missing tubes are reported as unreadable barcodes.

6.5.2.2 Unloading Fluent ID Runners

✓ The run has finished or a run is in progress and the LEDs are flashing with the message **Please unload tubes** displayed on the touchscreen.

1. Pull the runner horizontally along the deck until it is fully removed.

6.5.3 Loading and Unloading of Tube Rotator Runners

6.5.3.1 Loading of Tube Rotator Runners

⚠ CAUTION

Biocontamination of the system and/or user!

Damaged sample tubes can implode leading to spillage of sample on the Tube Rotator.

- Ensure that no damaged tubes are loaded on to the Tube Rotator.

✓ Fluent is equipped with a Tube Rotator.

✓ Tubes are loaded in the Tube Rotator runners with barcode label facing left.

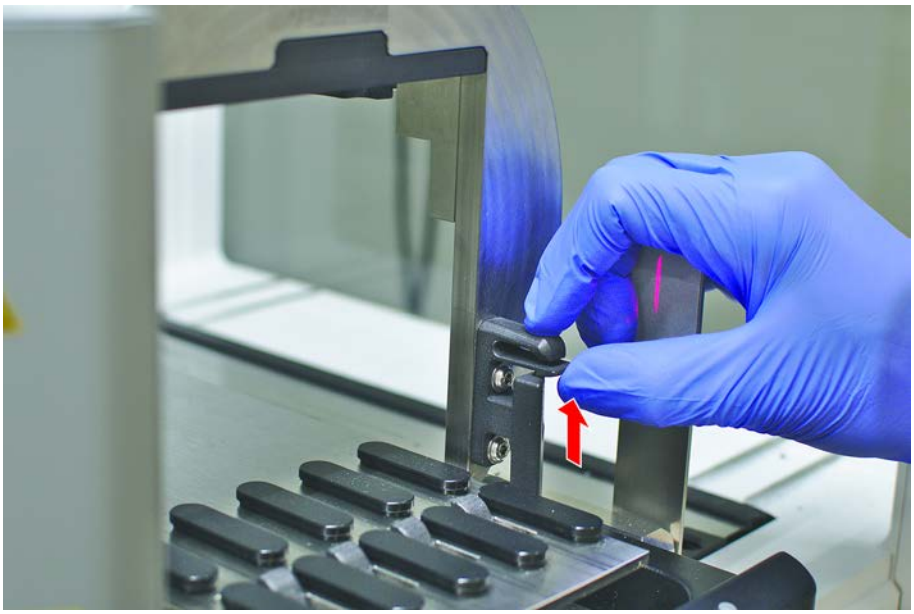
✓ All the tubes in a runner have the same size and shape. For tube runner types refer to section “Tube Rotator Runners” [▶ 74].

1. Select and start the method using the touchscreen.

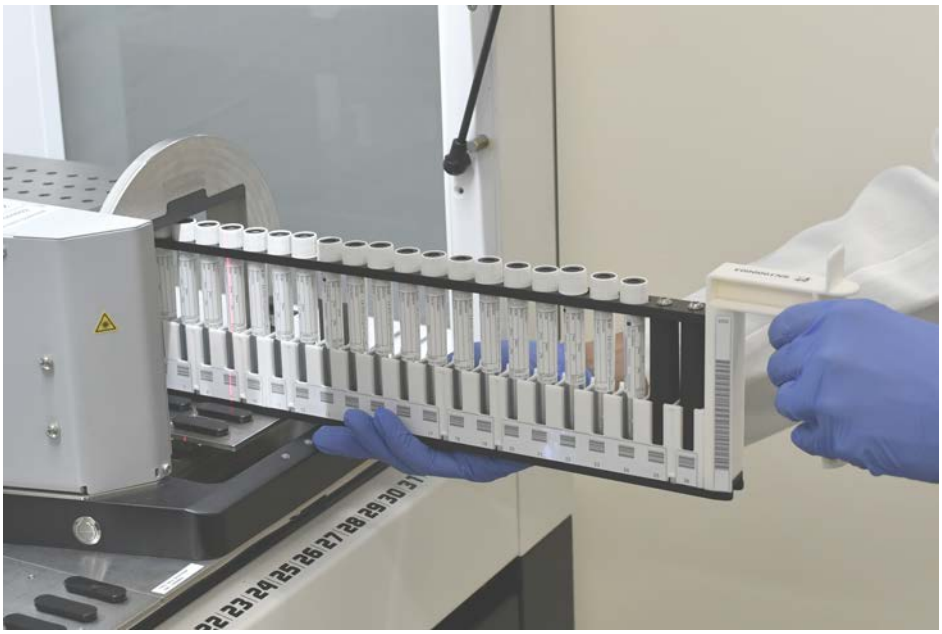
   *The LEDs start flashing and the message **Please load tubes** is displayed on the touchscreen.*
   When using different tube types, please ensure that you chose the correct runner per tube type (either BD or Greiner). Please also ensure that you load

tubes of different heights in the corresponding runners: The tubes are always held in position by the runner bridge in the height of their caps. The tube bottoms always have to sit tightly in the tube inserts of the runners.

2. Open the runner locking lever.

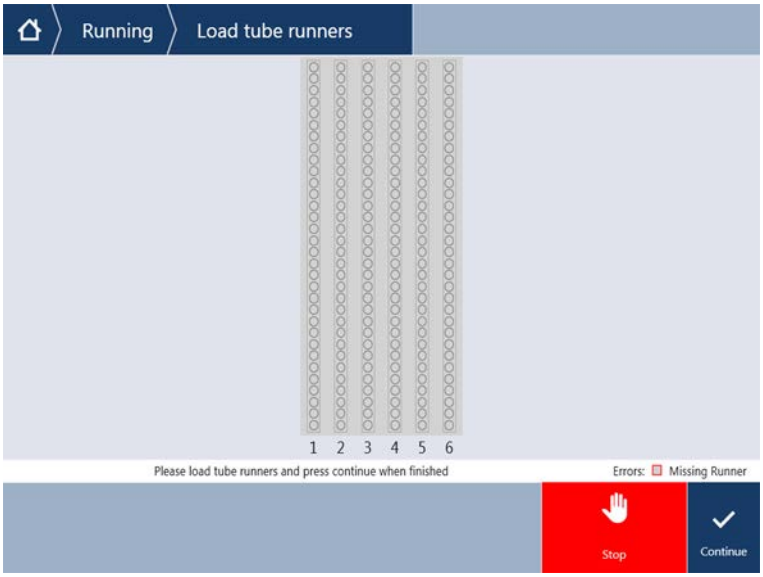


3. Support the front end of the runner with one hand.



4. Hold the runner horizontally at the level of the deck.
5. Push the runner to the stop position.

6. Slide the Tube Rotator runners, one after another, onto the dedicated grids on the Tube Rotator.



7. Check that all barcodes were successfully scanned.

   The LEDs turn green when the tube runners are in the loaded position and all barcode labels have been scanned successfully.
   For Tube Rotator LED status description refer to section "Fluent ID Status LEDs" [▶ 89].

8. In the event of a barcode scanning error, unload the runner, correct the problem and load the runner again.
9. Close the runner locking lever.

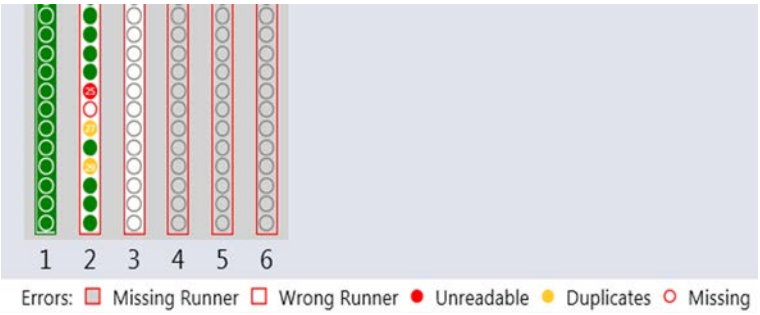


Fig. 40: Barcode reading confirmation displayed on the touchscreen

Tab. 32: GUI meaning (runner)

Square (runner)	Meaning
Green	All tube barcodes in runner read successfully.
White with red outline	Wrong type of runner for this grid position.
Grey with red outline	Missing runner. A runner should be loaded in this grid position.

Tab. 33: GUI meaning (tube position)

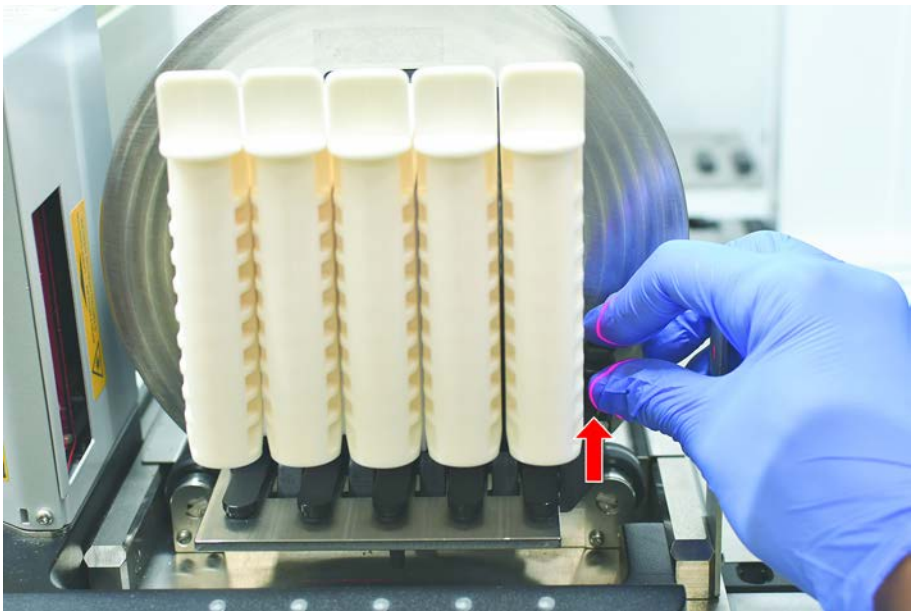
Circle (tube position)	Meaning
Green	Barcodes successfully read.
Red	Unreadable barcode
Orange	Duplicate barcode
White with red outline	Missing tube. A tube should be loaded in this position.

6.5.3.2 Unloading of Tube Rotator Runners

Do not store Tube Rotator Runners that are loaded with tubes outside the liquid handling operating conditions. Refer to section "Environmental Conditions" [▶ 42].

- ✓ The run has finished or a run is in progress and the LEDs are flashing with the message **Please unload tubes** displayed on the touchscreen.
- ✓ The Tube Rotator is in horizontal home position.

1. Open the runner locking lever.



2. Pull the runner horizontally along the deck until it is fully removed.

Tube Rotator segments can only be removed by the FSE because of the connection to the electronic board below the deck.

- Method must be prepared by the key operator.
- The consumables are consistent with the consumables defined in the method.
- Tube Rotator Runners must only be loaded after the method has started, when prompted on the touchscreen.

6.5.4 Resetting Errors

If a message is displayed, proceed as follows:

Message

1. Check the display function, button function or error message. Refer to sections “Working Area” [▷ 82] and “Method Recovery Buttons” [▷ 84].
2. Follow the instructions in this manual and on the touchscreen to correct the error.
3. Continue the method run. Refer to section “Display, Option and Action Buttons” [▷ 83].

If the status lamp lights up or changes color, proceed as follows:

Status Lamp

1. Check the instrument status. Refer to section “Error Signals and Instrument Status” [▷ 87].
2. If the Fluent is equipped with a Fluent ID tube barcode scanner, check the Fluent ID tube barcode scanner LED status. Refer to section “Fluent ID Status LEDs” [▷ 89].
3. Check the display function, button function or error message. Refer to sections “Working Area” [▷ 82] and “Method Recovery Buttons” [▷ 84].
4. Check the troubleshooting table. Refer to section “Troubleshooting Tables” [▷ 156].

5. If the problem cannot be solved, please consult “Customer Support” [▷ 200].

6.6 DeckCheck Operation

If your script includes use of the DeckCheck the DeckCheck camera system will take pictures of the worktable after loading and compare the actual Live layout to the Reference layout.

The DeckCheck takes approximately 20 seconds for a 3-arm/ 3-camera system and approximately 12 seconds for 1- or 2-arm/ single camera system to take pictures of the deck and display the comparison of the live and reference layouts (assuming that the PC configuration is appropriate—refer to FluentControl Application Software Manual).

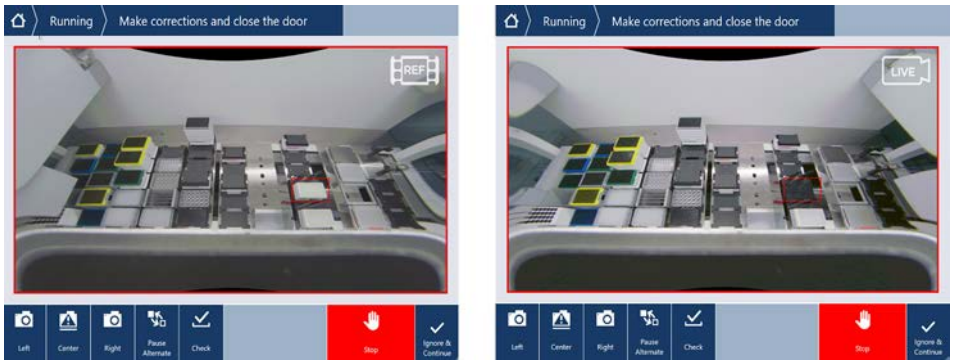
Note that for the first use after Instrument power only, the DeckCheck command will need longer to display first result—this may take a few minutes.

During this time the rear LED will be switched on.

On 3-arm Fluent systems the middle arm needs to move between left and right positions (on 1- or 2-arm systems, the left and right arms will be positioned on the far left and far right sides respectively.) For this arm move the front door must be closed. If the image is taken while the door is open, one camera will generally be blocked by the middle arm or by any arm that has been moved manually.

During the DeckCheck process the touchscreen displays shapes moving across the screen and **Taking Images** followed by **Checking**. After 12–20 seconds depending on the instrument size and configuration the deck images will be displayed in alternating mode. The image displayed will be the first camera with a noted discrepancy starting from the left.

DeckCheck screen displaying a discrepancy relative to the Reference picture. Here, the Reference picture shows that a plate should be present and the center camera has detected the discrepancy.



If you are offered the **Ignore & Continue** bottom, the run will continue with the prevailing worktable. Select the **Ignore & Continue** button if you are certain there are no more differences to the required worktable and before closing the door. Select **Check** if you wish to take new images of the Deck—note that if the door is not closed on a 3-arm systems the image will be taken but the middle arm will obstruct the camera. A check is otherwise automatically executed when the door is closed.

Note that if the script includes the option **show always**, the screen above will be displayed and no discrepancies are highlighted. However, the reference and live pictures will alternate and it may be that there are small differences that are not captured by the system but are easily seen by eye—for example some color differences, single missing tubes/tips or small lateral shifts. Refer to the limits listed below.

If discrepancies are detected these will be highlighted.

To correct differences:

1. Open the door and replace or correct the position of the highlighted items.
2. The DeckCheck will work continuously to compare the corrected Live situation with the Reference layout.
3. Use the DeckCheck buttons to look at differences captured by each of the cameras or, to pause the view and hold the Reference picture as needed. *When no further differences are detected the green continue button will appear.*
4. Select **Continue** to proceed with the method.

*If any remaining differences are in fact judged acceptable (e.g., total number of tips may be variable at the start of the method or liquid levels vary significantly at the beginning of the run) you may select **Ignore & Continue** if offered in the script by your key operator.*

Some layout differences may not be highlighted by the DeckCheck—e.g., the following colored FCA tip trays:

Difference between MCA head adapter types:

- Yellow/ orange

- White/ orange
- Grey/ all colors

MCA 96 different tip types

Missing tubes on partially loaded tube runners

Trough 300 SBS

Microplates rotated through 180 degrees

Microplate well shape (e.g., round versus flat bottomed or PCR well)

Plates in peripheral hotels 10 ml/ 25 ml troughs as insert

Some transparent lids

Many of these differences are however clearly visible in the switch between live and reference layouts.

6.7 Method Recovery

FluentControl offers the option to recover from errors—e.g.:

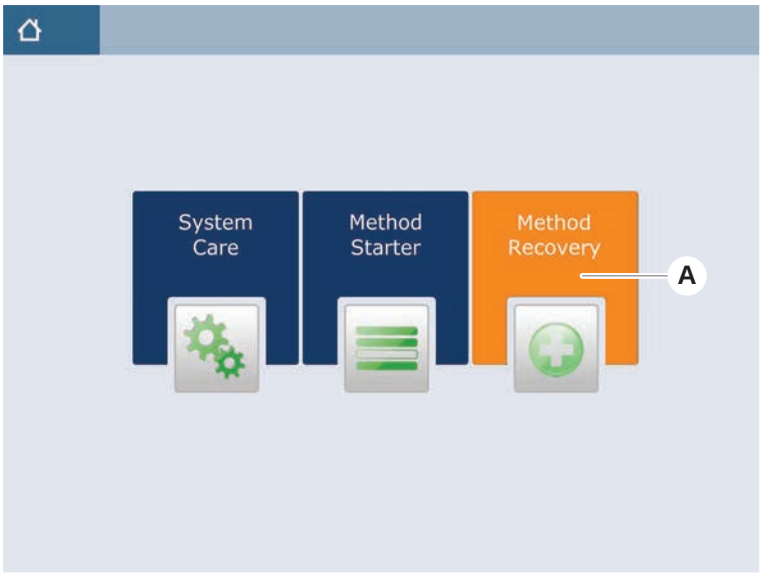
Previous method run was aborted or had a fatal error: The method recovery option offers the possibility of continuing from the point at which failure occurred in the previous run.

After a method was aborted or had a fatal error, daily maintenance shall be executed. Refer to "Daily System Care" [124].

6.7.1 Switching to Method Recovery Mode

✓ Key operator has enabled the method recovery option in FluentControl.
✓ Previous method run was aborted.

1. Select **Method Recovery** (A).

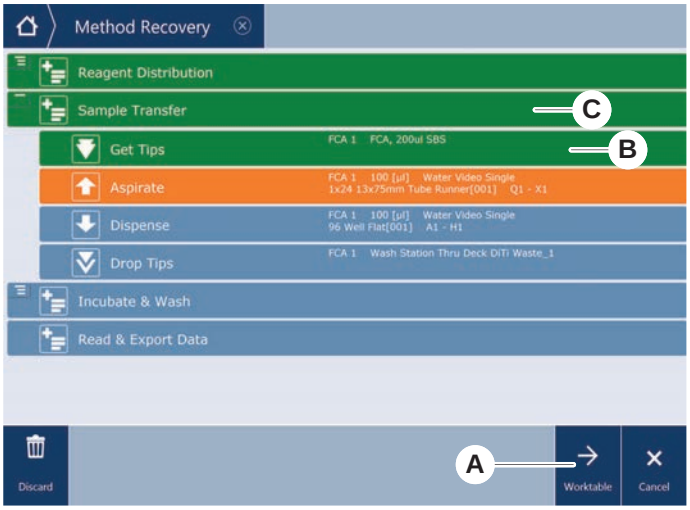


6.7.2 Recovering a Method Run

✓ Section “Switching to Method Recovery Mode” [▷ 117] has been performed.

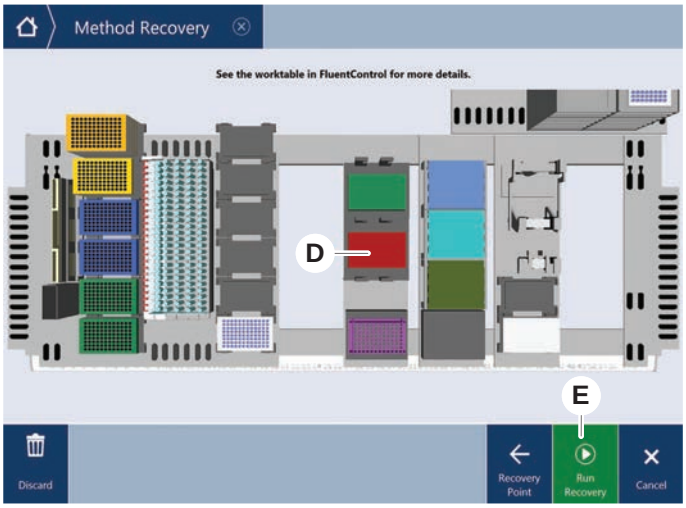
1. Select continue to the next screen (A).

   The screen displays the last script line executed (C) and the script line where failure occurred—the recovery point (B).



2. Select required buttons described in section “Method Recovery Buttons” [▷ 84].
3. Ensure that the physical deck layout of the Fluent matches the worktable layout (D) displayed on the touchscreen.
4. Select **Run Recovery** (E).

   The system will start.



6.8 Switching Off the Instrument

If no method is running, the instrument switches to standby mode. The instrument does not need to be switched off at the mains.

To switch off the instrument, proceed as follows:

1. Stop any method and select the standby mode on the touchscreen.
2. Ensure the instrument is in standby mode. Refer to section “Error Signals and Instrument Status” [87].
3. Place the robotic arms in a move free area.
4. Switch off the power using the power switch (A) on the rear of the external power supply.

7 System Care

This chapter gives instructions on all system care tasks to be performed to maintain the Fluent in good working condition.

Only operate the Fluent when it is in good working condition. Strictly observe the system care instructions as described in this manual. To ensure optimum performance and reliability, perform the maintenance and cleaning tasks regularly.

In the event of any problems and for inquiries please consult section “Customer Support” [▷ 200].

⚠ CAUTION

Arm Crashes into Worktable Objects

Fluent arms can be moved manually. Ensure that manual moves of the arms are performed smoothly with the arm held. Do not crash the arms into solid objects, including the arm range mechanical stop

7.1 Decontamination

Decontamination, according to standard laboratory regulations, is required under the circumstances listed in section “Decontamination Declaration” [▷ 37].

⚠ WARNING

Contamination!

Substance residues on the Fluent can cause personal injury and affect the integrity of the process.

- Decontaminate the Fluent and its parts and accessories before any interaction.

The decontamination method must be defined by the key operator based on the type of contaminant and degree of contamination. Guidance on the selection of decontamination agents and application modes is provided in this chapter.

For information on Hydrogen Peroxide Vapor treatment refer to the Reference Manual. Refer to Reference Documents.

⚠ CAUTION

Incorrect measurement results of the Frida Reader!

If no insert is mounted, the Frida Reader may deliver incorrect measurement results.

- Use the red blind plug, if the insert is taken out (e.g., for cleaning).

7.2 Cleaning Agents

7.2.1 Cleaning Agents Specifications

Special cleaning agents are required for system care. All the recommended cleaning agents have been carefully selected and tested.

NOTICE

Reduced effectiveness and chemical compatibility!

There is no guarantee for the effectiveness of cleaning agents and chemical compatibility if other cleaning agents than those recommended by Tecan are used.

- Only use cleaning agents recommended by Tecan.
- Cleaning agents are defined for each specific use in the system care tables. Do not use cleaning agents if not specified for use for a specific task.

The following table specifies the cleaning agents specified for use as outlined in the system care tables and the system care activities:

Tab. 34: Cleaning agents for use as described in the System care tables

Agent	Specification
DI water	Distilled or deionized water
Alcohol	70% ethanol, 100% isopropanol (2-propanol)
Weak detergent	Liqui-Nox
Surface active agent	Contrad 70, Contrad 90 / Contrad 2000, Decon 90
Disinfectant	Bacillol plus, SporGon
Surface disinfectant (for nucleic acid contamination)	DNAzap
Weak acid	sulfuric acid 0.3M, 10% acetic acid, 30-40% formic acid
Base	sodium hydroxide 0.1M
Bleach	2% sodium hypochlorite
System liquid	As defined in the method. Note that Aqueous solutions with salt content should be flushed out during system inactivity—e.g., overnight or weekends. See System Care End of Day.

7.2.2 Commercial Cleaning Agents

All instructions—given by the manufacturer of the cleaning agents or provided in this manual—for handling the cleaning agents must be carefully read and followed.

The table below lists a number of commercially available cleaning agents and disinfectants, specified for use as outlined in the system care tables and the system care activities.

Tab. 35: Commercial cleaning agents

Cleaning Agent	Agent category	Manufacturer
DNAzap	Surface disinfectant (for surfaces contaminated with nucleic acids)	Ambion www.ambion.com
Decon, Contrad	Surface active agent	Decon Laboratories www.deconlabs.com
SporGon	Disinfectant	Decon Laboratories www.deconlabs.com
Bacillol Plus	Disinfectant	www.bode-chemie.com
Liqui-Nox	Weak detergent	Alconox www.alconox.com

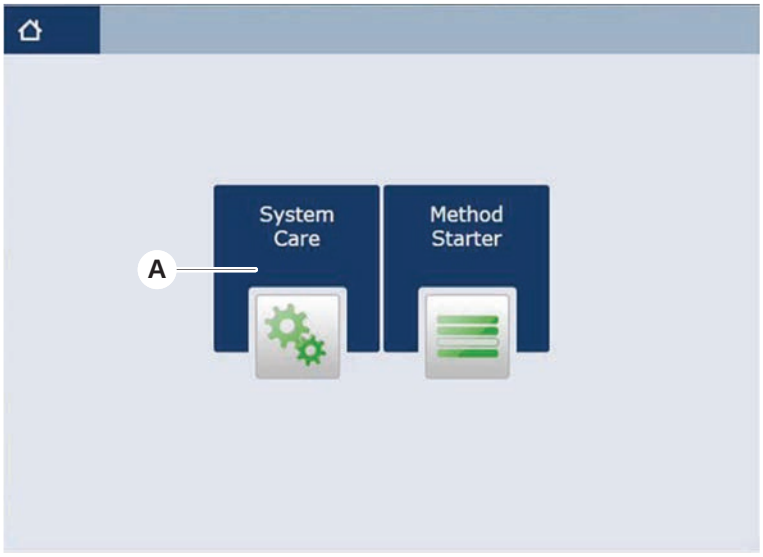
7.3 System Care Mode

The key operator defines the system care methods required according to the system care tables provided in “System Care Tables” [▶ 123]. The **System Care** mode, accessed on the touchscreen, provides guidance for system care tasks.

7.3.1 Switching to System Care Mode

✓ System care methods must be available.

1. Select **System Care** (A).



2. Select the task to be executed.

3. Press **Run** to initiate the system care method.
4. Carry out the system care tasks.

7.3.2 Resetting Errors

If a message is displayed, proceed as follows:

Message

1. Check the display function, button function or error message. Refer to sections "Working Area" [▶ 82] and "Method Recovery Buttons" [▶ 84].
2. Follow the instructions in this manual and on the touchscreen to correct the error.
3. Continue the method run. Refer to section "Display, Option and Action Buttons" [▶ 83].

If the status lamp lights up or changes color, proceed as follows:

Status Lamp

1. Check the instrument status. Refer to section "Error Signals and Instrument Status" [▶ 87].
2. If the Fluent is equipped with a Fluent ID tube barcode scanner, check the Fluent ID tube barcode scanner LED status. Refer to section "Fluent ID Status LEDs" [▶ 89].
3. Check the display function, button function or error message. Refer to sections "Working Area" [▶ 82] and "Method Recovery Buttons" [▶ 84].
4. Check the troubleshooting table. Refer to section "Troubleshooting Tables" [▶ 156].
5. If the problem cannot be solved, please consult "Customer Support" [▶ 200].

7.4 System Care Tables

To ensure optimum performance and reliability, perform the maintenance and cleaning tasks as recommended.

The tasks in the system care tables can only be carried out in the System Care mode. Refer to section "System Care Mode" [▶ 122].

The system care tasks must be performed at regular intervals—namely, daily, weekly, and monthly system care.

7.4.1 Daily System Care

7.4.1.1 Beginning of Day

Run the **DailySystemCare** method, if made available by the key operator; or perform each individual task, applicable to your Fluent arm configuration, listed in the table below in chronological order.

Tab. 36: Beginning of day system care table

Instrument/ Component	System Care Task	Cleaning Agent/ Disposable Product/ Device	Reference/ System Care Activities
Piercing tips	Visually inspect the piercing tips for deposits. Clean if necessary. Inspect that tips are not bent.	70% ethanol or 2% bleach and lint-free cloth	Refer to section "Cleaning Piercing Tips" [▶ 135].
Disposable tip cones and fixed tips	Inspect for damage and deposits	–	This task is included in the **Daily System Care** method. **NOTICE! Disposable tips are not intended for reuse.**
Fixed tips	Clean. Inspect that tips are not bent. Visually inspect with a dentist mirror to ensure that the coating is intact.	70% ethanol or 100% isopropanol and lint-free cloth	Refer to section "Cleaning Fixed Tips" [▶ 135].
System liquid container (Liquid FCA with fixed tips)	Ensure it is clean and full with no visible bubbles Ensure that the tubing to container connectors are joined properly	–	This task is included in the **Daily System Care** method.
Liquid waste container (Liquid FCA with fixed tips)	Ensure that it is empty Ensure that the tubing to container connectors are re-joined properly	–	This task is included in the **Daily System Care** method.
Disposable tip waste bag	Ensure that it is empty	–	Refer to section "Changing Disposable Tip Waste Bag" [▶ 147]. This task is included in the **Daily System Care** method.

Instrument/ Component	System Care Task	Cleaning Agent/ Disposable Product/ Device	Reference/ System Care Activities
Liquid system (Liquid FCA)	Ensure that it is clean	System liquid, alcohol, DI water	This task is included in the **Daily System Care** method or can be run separately as **Liquid FCA Routine Flush Maintenance** method. Refer to section "Cleaning Liquid Path" [▷ 149].
Liquid system (Liquid FCA)	Visually check for absence of droplets on the tips or DiTi cone after flushing	–	This task is included in the **Daily System Care** method.
Gripper fingers	Check that fingers are straight and level Inspect for damage and misalignment	–	In case of misalignment refer to section "Robotic Gripper Arm (RGA) Troubleshooting" [▷ 165]. Deformation or damage. Please consult section "Customer Support" [▷ 200].
FCA gripper fingers	Inspect for damage	–	Replace if damaged. For ordering information refer to the Reference Manual. Refer to section Reference Documents.
Frida Reader	Remove the blind plug and fit the insert into the Frida Reader	–	Refer to section "Frida Reader" [▷ 153].

⚠ CAUTION

Incorrect measurement results of the Frida Reader!

If no insert is mounted, the Frida Reader may deliver incorrect measurement results.

- Use the red blind plug, if the insert is taken out (e.g., for cleaning).

7.4.1.2 End of Day

The following table lists the daily system care tasks at the end of the day in chronological order:

Tab. 37: End of day system care table

Instrument/ Component	System Care Task	Cleaning Agent/ Disposable Product/ Device	Reference/ System Care Activities
Deck trays	Check for spills and clean or replace as needed.	DI water, alcohol, weak detergent, disinfectant, base, bleach, DNAzap	Refer to section "Cleaning Deck Trays" [▷ 140].
Segments Fluent ID housing	Clean	DI water, alcohol, weak detergent, disinfectant, base, bleach, DNAzap **NOTICE! The scanner window requires different cleaning agents than the segment itself.** Refer to "Weekly System Care" [▷ 128].	Refer to section "Cleaning Runners and Segments" [▷ 140]. **WARNING! Do not stare into the laser beam.**
Reflector foil (Fluent ID, Tube Rotator)	Clean and inspect for damage	Alcohol **NOTICE! The reflector foil requires different cleaning agents than the segment itself.**	Damage. Refer to section "Replacing Fluent ID Reflector Foil" [▷ 142].
Runners	Clean	DI water, alcohol, weak detergent, disinfectant, surface active agent, weak acid, base, bleach, DNAzap	Refer to section "Cleaning Runners and Segments" [▷ 140].
Fixed tips	Clean	Alcohol, bleach, lint-free cloth	Refer to section "Cleaning Fixed Tips" [▷ 135].
Disposable tip cones	Clean	Alcohol, lint-free cloth	Refer to section "Cleaning Disposable Tip Cone" [▷ 134].
Wash and waste station (Liquid FCA)	Clean	DI water, alcohol, weak detergent, disinfectant	Refer to section "Cleaning Disposable Tip Waste and Wash Station Unit" [▷ 144].
Disposable tip waste slide and waste covers	Clean	DI water, alcohol, weak detergent, disinfectant	Refer to section "Cleaning Disposable Tip Waste Slide" [▷ 145].
Liquid system (Liquid FCA)	Flush	System Liquid **NOTICE! If the liquid system has a high salt content, flush with deionized water.**	Run the **Liquid FCA Routine Flush Maintenance** method.

Instrument/ Component	System Care Task	Cleaning Agent/ Disposable Product/ Device	Reference/ System Care Activities
Disposable tip waste bag	Change	Recommended bag specifications: W x L: 300 mm x 600 mm; Thickness: 0.5 mm Material: Polypropylene, Polyethylene or copolymer (autoclavable) **NOTICE! The waste bag used must comply with the local safety guidelines.**	Refer to section "Cleaning Disposable Tip Waste Slide" [▷ 145].
System liquid container (Liquid FCA)	Ensure that it is clean	System liquid	Refer to section "Connecting the System Liquid Container and Waste Container" [▷ 150].
Waste container (Liquid FCA with fixed tips)	Empty and clean	DI water, alcohol, weak detergent, surface active agent, disinfectant, base, bleach	Depending on your local laboratory rules/regulations clean daily or weekly. Refer to section "Connecting the System Liquid Container and Waste Container" [▷ 150].
Safety panel	Clean	DI water, alcohol, weak detergent	Refer to section "Cleaning Safety Panels" [▷ 144].
Tube Rotator	Clean surfaces, downholder and wash station	Linth-free cloths with 2% bleach, 70% ethanol or 100% isopropanol	Refer to section "Cleaning the Tube Rotator" [▷ 135].
Piercing tips	Visually inspect the piercing tips for deposits. Clean if necessary.	70% ethanol or 2% bleach and lint-free cloth	Refer to section "Cleaning Piercing Tips" [▷ 135].
Piercing Tip wash station and waste tubing	Clean the wash station and tubing of the residual sample material.	DI water, weak detergent, disinfectant. Do not use bleach without rinsing the wash station components with water afterwards.	Execute an extended flush of the wash station, incl. all compartments (front, center and back of the wash station).

Instrument/ Component	System Care Task	Cleaning Agent/ Disposable Product/ Device	Reference/ System Care Activities
Frida Reader	Remove the insert and fit the blind plug into the Frida Reader	–	Refer to section "Frida Reader" [▷ 153].

7.4.2 Weekly System Care

Weekly system care should be performed on the last working day of each week.

Run the **WeeklySystemCare** method, if made available by the key operator; or perform, in addition to the daily tasks, each individual task, applicable to your Fluent arm configuration, listed in the table below in chronological order.

Tab. 38: Weekly system care table

Instrument/ Component	System Care Task	Cleaning Agent/ Disposable Product/ Device	Reference/ System Care Activities
Liquid system (Liquid FCA)	Clean	Depending on the liquid handled by Fluent Decon, Contrad, base, weak acid, disinfectant Followed by water, alcohol and system liquid flushes	Refer to section "Cleaning Liquid Path" [▷ 149].
Liquid FCA	Check the correct tightness of the syringes at the valve interface and the correct tightness of the syringe plunger at the plunger lock screw.	–	Refer to section "Checking Tightness of Syringes" [▷ 150]
DiTi cones	Check tightness of DiTi cone	–	Refer to section "Tightening a DiTi Cone" [▷ 152]
Liquid FCA	Perform a leakage test (Liquid FCA)	–	Run the **Liquid FCA Leakage Test**.
Air FCA	Perform a leakage test (Air FCA)	–	Run the **AirFCA Leakage Test and cLLD Self Test**.
Air FCA MultiSense	Perform the MultiSense Air FCA cLLD self test	–	Run the **AirFCA Leakage Test and cLLD Self Test**.
System liquid container	Clean	DI water, alcohol, weak detergent, surface active agent, disinfectant, base, bleach	Refer to section "Cleaning the System Liquid Container and Waste Container" [▷ 150].

Instrument/ Component	System Care Task	Cleaning Agent/ Disposable Product/ Device	Reference/ System Care Activities
Wash station (Liquid FCA)	Clean	Detergent or antiseptic solution	–
RGA gripper finger pads	Remove particles and residues from gripper finger pads	Lint free cloth with alcohol	Wiping with cleaning agent.
Docking station and Gripper fingers (attachment interface)	Remove particles and residues from gripper finger attachment interface (PCBA, magnet and conus)	Lint free cloth with alcohol	Wiping with cleaning agent.
Stand-alone barcode scanner window	Clean	Weak detergent	**WARNING! Do not stare into the laser beam.** Refer to the barcode scanner manufacturer's manual. Refer to section "Laser Radiation Instrument" [▶ 36].
Fluent ID and Tube Rotator scanner window	Check for dirt and damage Clean if necessary	Weak detergent DI water for rinsing	**WARNING! Do not stare into the laser beam.** Clean and rinse using a soft cloth.
Fluent ID and Tube Rotator reflector	Check for dirt and damage Clean if necessary	Weak detergent DI water for rinsing	**WARNING! Do not stare into the laser beam.** Clean and rinse using a soft cloth.
FCA gripper	Clean	Alcohol	–
Tube Rotator	Check presence and tightness of lock and positioning pins. Tighten or replace the pins if necessary	–	Refer to section "Replacing Lock Pins and Positioning Pins" [▶ 195].
MCA 96	Perform a leakage test	–	Run the **MCA 96 leakage** method

Instrument/ Component	System Care Task	Cleaning Agent/ Disposable Product/ Device	Reference/ System Care Activities
MCA 96	Conduct a pipetting performance test	–	Run the **MCA 96 pipetting performance** method if: • Cone seal lifetime has reached 90% • 10ul tips or 50ul tips are used Fluent Control shall emit a warning to this effect once 90% of the cone seal lifetime has been reached.

7.4.3 Monthly System Care

The following table lists the monthly system care tasks in chronological order:

Tab. 39: Monthly system care table

Instrument/ Component	System Care Task	Cleaning Agent/ Disposable Product/ Device	Reference/ System Care Activities
Software	Restart the computer	–	Switch computer off. Wait 10 seconds. Switch computer on again.
Arm guide	Clean	Cotton swab or a lint-free cloth on a screw-driver	Refer to section “Cleaning Arm Guide” [▶ 151].
MCA 96	Cleaning MCH 96	Lint free cloth with alcohol, compressed air	Refer to section “Cleaning MCH 96” [▶ 154]

7.4.4 Periodic System Care

The intervals at which these tasks must be performed should be determined by the key operator.

The following table lists the system care tasks in chronological order:

Tab. 40: Periodic system care table

Instrument/ Component	System Care Task	Cleaning Agent/ Disposable Product/ Device	Reference/ System Care Activities
Cone-sleeve connection	Remove particles Clean surfaces	Alcohol, lint-free cloth	--
UVC light	Check for fingerprints. Clean if necessary.	Alcohol, lint-free cloth	--
MCA 96 Gripper Fingers	visual inspection of gripper fingers, especially after crashes of gripper fingers	Check for any dirt and damages on the gripper fingers. If dirty clean them by using alcohol and a lint-free cloth.	--

7.4.5 Yearly System Care

The yearly system care helps to maintain the accuracy and precision and to minimize instrument downtime. It also helps to prolong the life-span of the Fluent.

Please contact the local Tecan service organization to schedule the yearly system care appointment. Please consult section “Customer Support” [▶ 200].

7.4.6 Biennial System Care

The following preventive maintenance tasks must be performed every 2 years:

Tab. 41: Biennial system care

Component	Task	Reference
FCA gripper	Replace FCA gripper fingers. Reset counter in FluentControl.	For ordering information refer to the Reference Manual. Refer to “Reference Documents” [▶ 9].

7.5 System Care Activities

To perform the system care activities described below, proceed as follows:

- Switch to System Care mode. Refer to section “System Care Mode” [▶ 122].
- Follow the instructions as described below.

7.5.1 Moving the Instrument on a Cabinet within the Laboratory

⚠ CAUTION

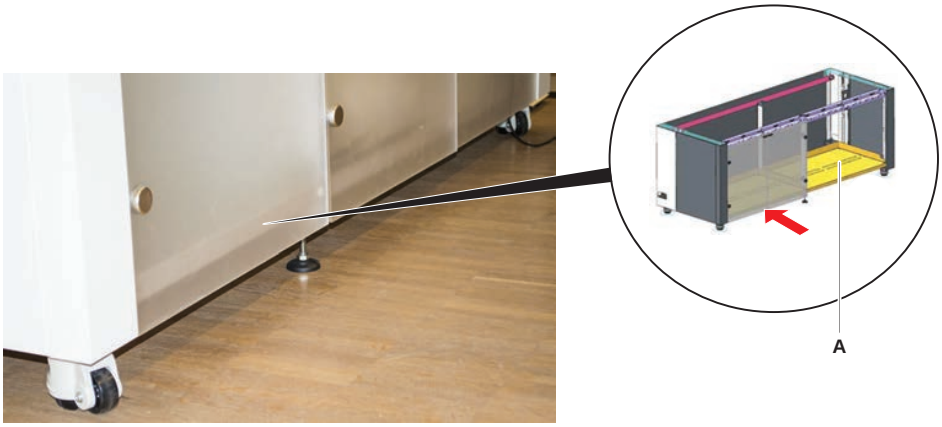
Damage to the cabinet!

Cabinet shelves may have been removed, for example, for centrifuge installation or waste cart. Moving the instrument placed on a cabinet without installed cabinet shelves may damage the cabinet and cause injuries.

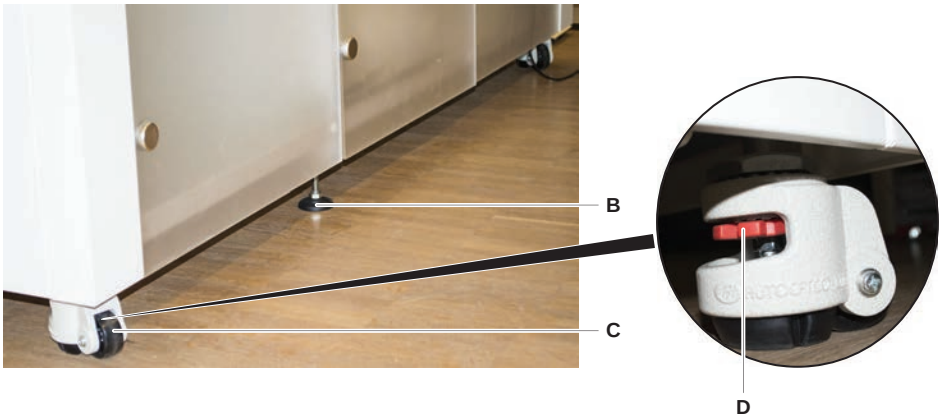
- Before moving the instrument, install the cabinet shelves.
- Only move the cabinet on a flat floor with no steps or ruts. If steps or ruts are encountered use the Fluent lifting bars to lift the system over the obstruction or contact your service representative.

To move the instrument on a cabinet within a room, proceed as follows:

1. Ensure that the cabinet is safely parked and secured against rolling away.
2. Ensure that the cabinet shelves (A) are installed.



3. Turn the nut on the cabinet feet (B), using an open-end spanner.
4. Turn the red screw (D) on the cabinet feet (C) until the lock is released and the wheels are in the moving position.

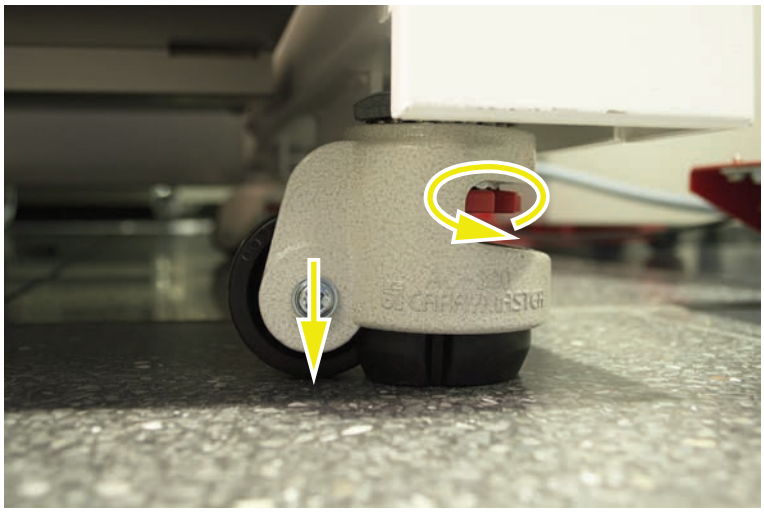


5. Move the instrument on the cabinet to the new location.
6. Ensure that the cabinet is safely parked and secured against rolling away.

7.5.1.1 Leveling the Instrument

To level the instrument, proceed as follows:

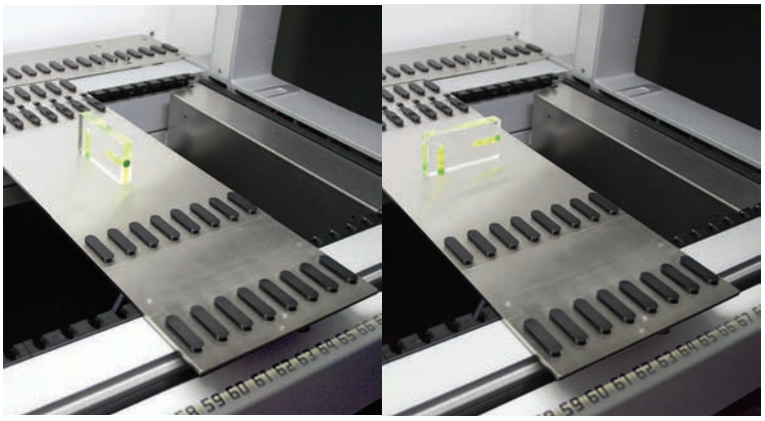
1. Using an open-end wrench, lower all adjustable feet until the cabinet wheels can be rotated by hand.



2. Loosen the locknut (A) on the corresponding foot.

3. Place the reference segment according to the grid positions listed below.
   Instrument size 480: Grid position left side 1 and grid position right side 21.
   Instrument size 780: Grid position left side 1 and grid position right side 41.

Instrument size 1080: Grid position left side 1 and grid position right side 59.



4. Use the spirit level to ensure that the instrument is horizontally and vertically aligned.
5. Adjust the cabinet level as required (clockwise to raise, counterclockwise to lower).

6. After leveling the instrument, retighten the locknuts on the cabinet feet.
7. Ensure that the cabinet is safely parked and secured against rolling away.

7.5.2 Cleaning Disposable Tip Cone

To clean the disposable tip cone, proceed as follows:

1. Clean the disposable tip cones with alcohol, using a lint-free cloth.
2. Check the disposable tip cones and the protruding tip during system care.

   For liquid FCA: Ensure that the tubing extension protruding outside of the cone is not damaged.
3. Ensure that the tubing extensions are clean and free of deposits.

7.5.3 Cleaning Fixed Tips

⚠ CAUTION

Risk of injury from fixed tips during cleaning

Pipetting fixed tips can cause injuries.

- Avoid contact with the pipetting tips and contact with aerosols when accessing the worktable, by wearing adequate protective clothing.

To clean the fixed tips, proceed as follows:

1. Clean the fixed tips with alcohol, using a lint-free cloth.
2. Ensure that the fixed tips are clean and free of deposits.

7.5.4 Cleaning Piercing Tips

To clean the piercing tips run the **Piercing Tip Cleaning Maintenance** method. This method needs to be adjusted according to your worktable setup.

The script includes the following steps:

1. Prepare the worktable (i.e., labware and hardware).
2. Pierce to Z-start of 8 empty capped tubes on a Tube Rotator or on a tube downholder carrier.
3. Manually clean the accessible part of the piercing tips with 70% ethanol or 2% bleach using a lint-free cloth. Avoid contact with the sharp apex of the piercing tips.
4. Perform wash commands after manual cleaning.

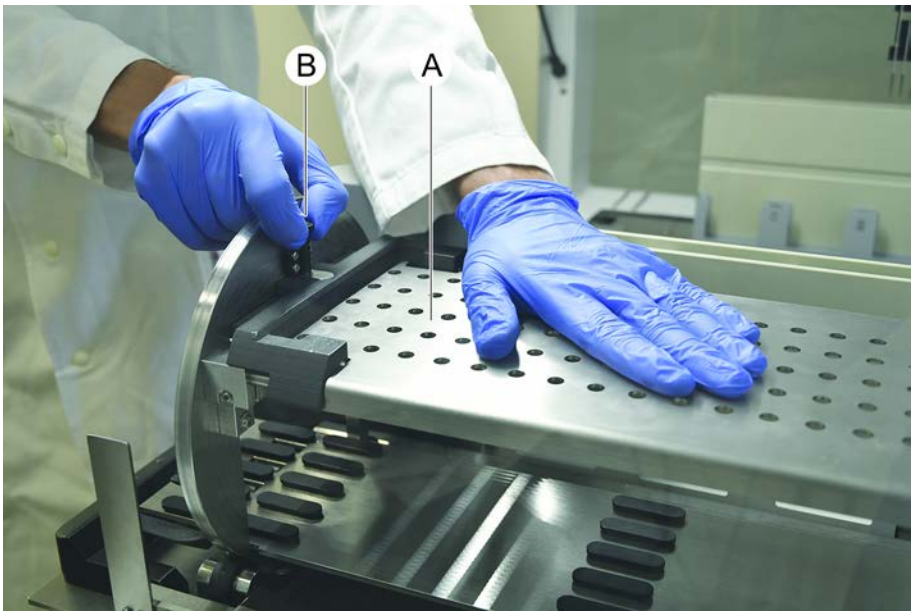
7.5.5 Cleaning the Tube Rotator

General Cleaning Procedure

1. To clean any parts of Tube Rotator use lint-free cloths and soak them with one of the following cleaning liquids: 2% bleach, 70% ethanol, 100% isopropanol
2. Wipe the parts with the soaked cloths to clean and disinfect.
   Use cotton swabs to clean areas that cannot be reached with a lint-free cloth.
3. Wipe off the cleaning liquids with cloths soaked with water within 5 minutes after applying the cleaning liquids.

Removal and Cleaning of Tube Downholder Plate

1. To release the downholder plate (A) hold it with one hand and pull the downholder locking pin (B) with the other hand.



2. Remove the downholder plate from the tube rotator.

3. Clean the downholder plate according to the general instructions above or alternatively the tube downholder can be incubated in a bath with 2% bleach for maximal 2 hours.

Cleaning of the Tube Rotator Surfaces

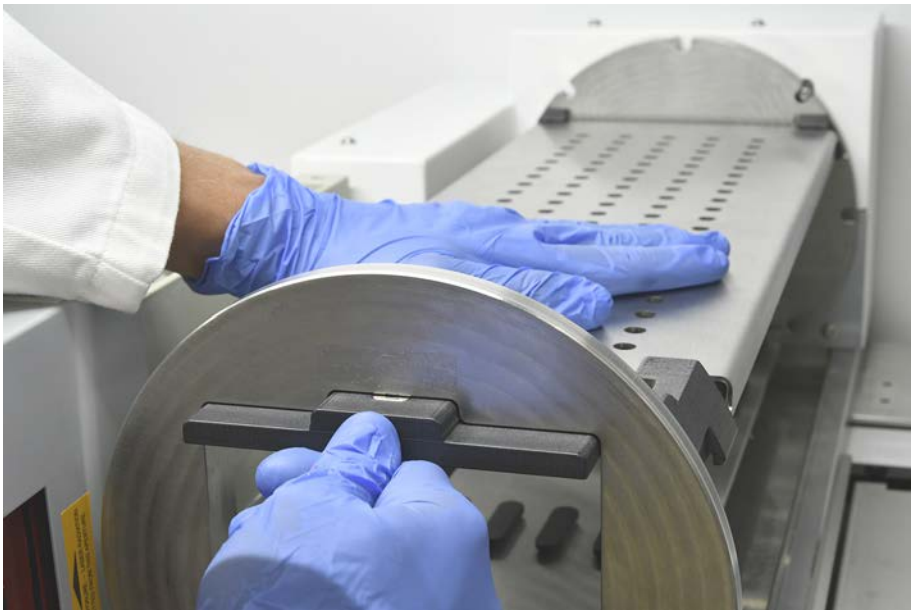
1. Clean the accessible surfaces of the Tube Rotator according to the general instructions above.

2. To change the drum position manually, hold the drum with one hand and press the solenoid release button.

3. Rotate the drum manually and release the solenoid release button.
4. Rotate the drum until it is locked by the solenoid.
5. Clean the surfaces that were not accessible before according to the general instructions above.

Mounting of the Downholder Plate

1. Place the downholder plate on top of the tube rotator drum.
2. Press the downholder plate towards the bottom of the instrument with one hand and push the black slider to the back in order to lock the downholder plate into position.



7.5.6 Cleaning the Tube Rotator Wash Station

General Cleaning Procedure

- ✓ The wash station can be cleaned on the worktable or it can be unmounted for cleaning.
- ✓ Use a bottle brush instead of cloths for better access.

1. To clean any parts of wash station use lint-free cloths and soak them with one of the following cleaning liquids: 2% bleach, 70% ethanol, 100% isopropanol
2. Wipe the parts with the soaked cloths to clean and disinfect.
3. Wipe off the cleaning liquids with cloths soaked with water within 5 minutes after applying the cleaning liquids.

Unmounting of Tube Rotator Wash Station

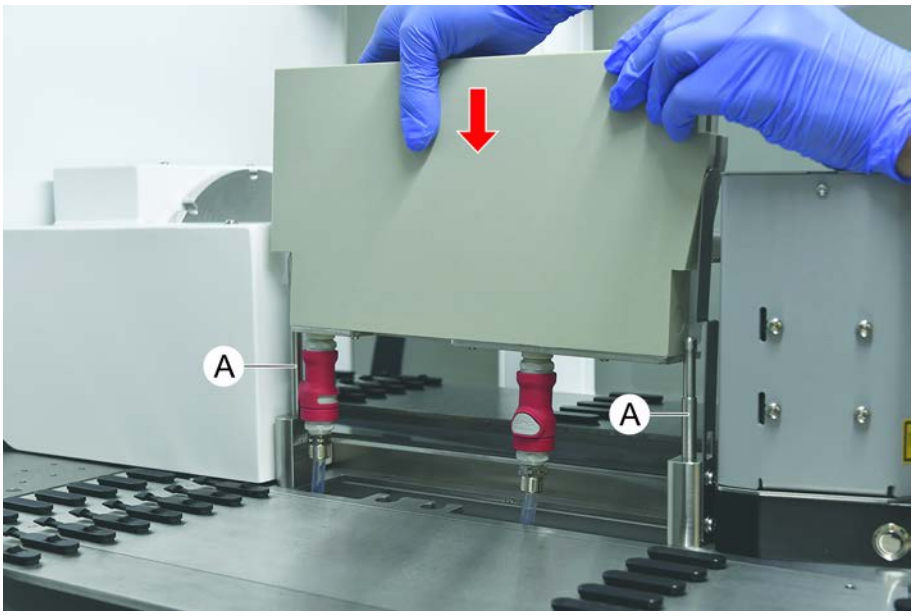
1. Press the wash station release lever towards the barcode scanner housing and lift the wash station with the other hand.

2. Disconnect the waste tubing and place the connectors into the waste tubing holders.

Mounting of Tube Rotator Wash Station

1. Connect the waste tubing connectors.

2. Mount the wash station on to the guidance shafts (A) and press it onto the base plate.
   Verify that the release lever snaps back into place and holds the wash station in position.



7.5.7 Cleaning Runners and Segments

To clean the runners and segments, proceed as follows:

NOTICE

Malfunction of liquid detection (cLLD)!

Possible malfunction of the liquid detection (cLLD) due to compromised contact between runner and deck segment.

Always ensure that the runners and segments are clean and dry.

1. Remove the runners from the instrument deck.
   Segments and nests are getting cleaned in place.
2. Wipe the surface of the runners, segments and nests with the cleaning agent.
   Rinse the runners, segments and nests with DI water.
3. Place the runners back on the instrument deck.

7.5.8 Cleaning Deck Trays

To clean the deck trays, proceed as follows:

✓ Segments above the deck tray are removed. Refer to “Removing Segments” [▷ 95].

✓ If deck segments, such as Fluent ID cannot be removed, slide deck trays to an open deck position.

1. Remove the deck trays from the instrument.

2. Empty the trays by removing the liquid according to laboratory handling protocol for that liquid.
3. If the deck trays are damaged or lost, they must be replaced.
4. Wipe surface of the deck trays with the cleaning agent.
5. Place the deck trays back in the instrument.

   Orient the deck trays as depicted below.

   Adjacent deck trays must interlock.

Fig. 41: Incorrect deck tray placement

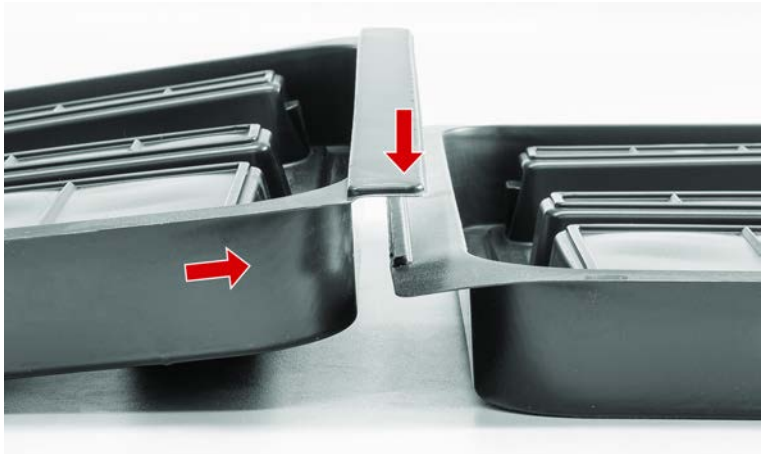


Fig. 42: Interlocking deck trays

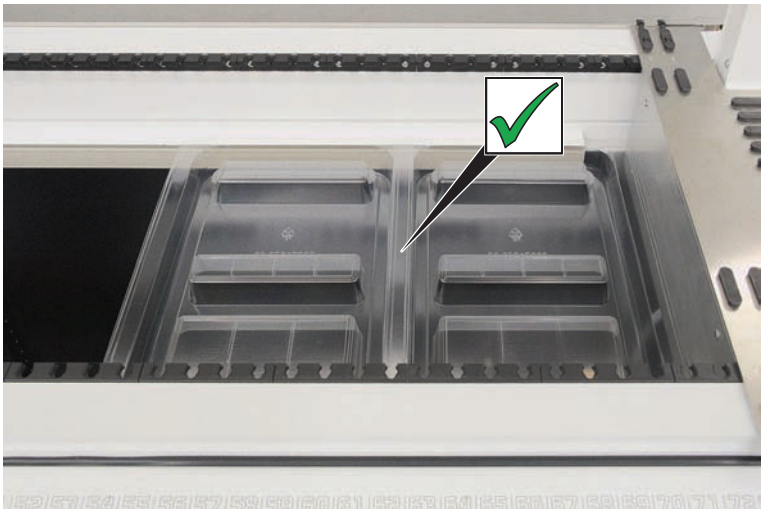


Fig. 43: Correct deck tray placement

7.5.9 Replacing Fluent ID Reflector Foil

✓ Self-adhesive reflector foil

1. Heat up the reflector foil. Use a heat gun.
2. Remove the reflector foil.

3. Remove any residues with alcohol.

4. Apply the new self-adhesive reflector foil on the upper end of the reflector.

7.5.10 Applying Fluent ID Reflector Foil on DiTi Waste Slide

✓ Self-adhesive reflector foil

1. Apply tape on the DiTi waste slide according to the illustration below.

2. Apply the new self-adhesive reflector foil on the DiTi waste slide according to the illustration below.

The laser beam must be in the center of the reflector foil.

3. Remove the tape from the DiTi waste slide.

7.5.11 Cleaning Safety Panels

To clean the safety panels, proceed as follows:

1. Wipe the inner and outer surface of the safety panels with cleaning agent.

7.5.12 Cleaning Disposable Tip Waste and Wash Station Unit

To clean the disposable tip waste and the wash station unit, proceed as follows:

1. Push the quick-release fastener button (B).
2. Slide the wash station backwards.

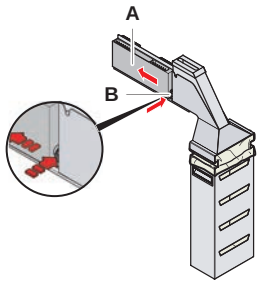


Fig. 44: Fastener for bag housing removal

3. Remove the wash station from the disposable tip waste and the wash station unit.

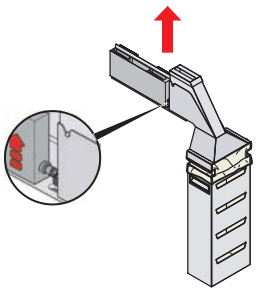


Fig. 45: Remove the wash station

4. Wipe the surface of the wash station with a cleaning agent and remove any spilled reagents.
5. Push the quick-release fastener button (B).
6. Place the wash station (A) in position.
7. Push the wash station forward.

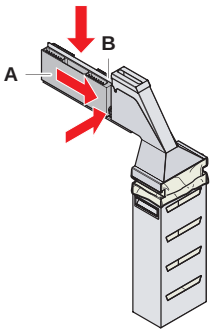


Fig. 46: Refit the wash station

7.5.13 Cleaning Disposable Tip Waste Slide

To clean the disposable tip waste slide, proceed as follows:

✓ Front safety panel is open.

1. Remove the cover (A) from the disposable tip waste slide.

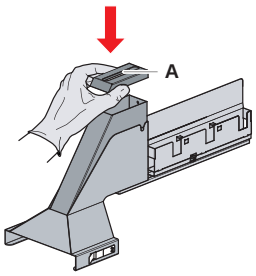


Fig. 47: Removing the cover from disposable tip waste slide

2. Remove the disposable tip waste slide (B) from the holder.

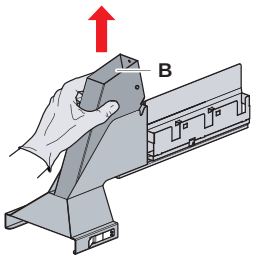


Fig. 48: Removing the disposable tip waste slide

3. Hold a tissue under the disposable tip waste slide bottom opening (C).
   Prevent dripping of contaminated substances.

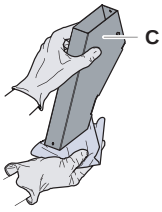


Fig. 49: Handling of disposable tip waste slide

4. Place the disposable tip waste slide and the cover in a basin filled with cleaning agent.
5. Leave to soak for 30 minutes to 4 hours.
6. Take the disposable tip waste slide and cover out of the basin and place them on a clean dry towel.

7. Leave to dry.
8. Reinstall the disposable tip waste slide (B) on the holder.

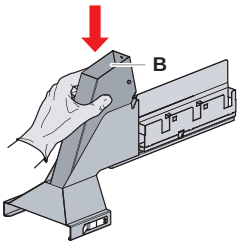


Fig. 50: Reinstall disposable tip waste slide inset

9. Ensure that the positioning pin is correctly inserted in the slot (D).
10. Place the cover (A) on top of the waste slide.

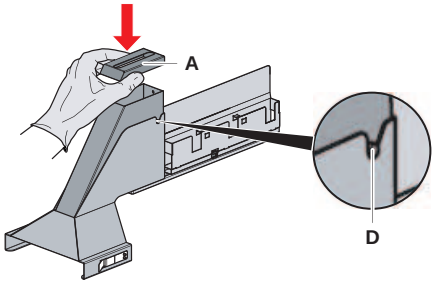


Fig. 51: Positioning pin and cover

7.5.14 Changing Disposable Tip Waste Bag

To change the disposable tip waste bag, proceed as follows:

1. Lift the fastener (A) and slide the bag housing forward.

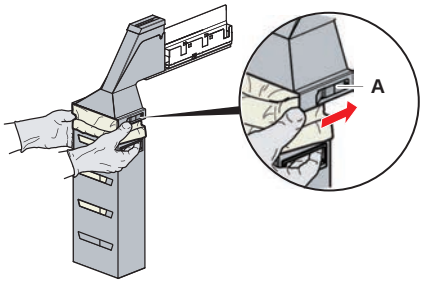


Fig. 52: Fastener for bag housing removal

2. Remove the disposable bag housing (A).
3. Remove the disposable tip waste bag (B).
4. Dispose of the disposable tip waste bag according to your laboratory guidelines.
5. Insert the new disposable waste bag (B) into the empty bag housing (B).

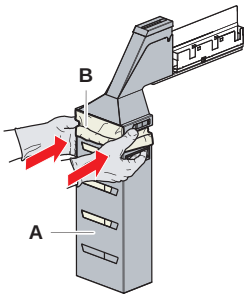


Fig. 53: Bag housing and disposable tip waste bag

Fig. 54: Correct mounting of the waste chute on the worktable

⚠ CAUTION

Incorrectly located waste chute may cause arm to crash and or tips to be ejected incorrectly. Ensure that the waste chutes are correctly located as shown below: insert pictures and Correct/ incorrect as in Waste chute positioning

6. Slide the bag housing into position and close with fastener (A).

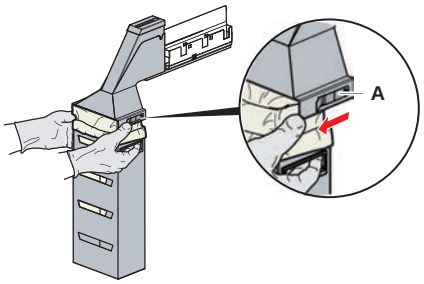


Fig. 55: Closing fastener

7.5.15 Cleaning Liquid Path

- To remove protein residues from the inside of fixed tips, use weak acid followed by a base cleaning agent.
- To remove nucleic acid residues from the inside of fixed tips, use a base cleaning agent.
- Cleaning agents, such as Decon/Contrad can affect the process. Therefore, if such agents are used, carefully validate the process.
- Isopropanol is a highly effective disinfectant. It evaporates quickly, leaving surfaces ready to use.
- Only use allowed cleaning agents. Do not use bleach solutions to flush the entire liquid system.

To clean the liquid path, proceed as follows:

1. Detach the system liquid tubing from the liquid container.
2. Connect the maintenance tube (30043739) to the system tubing.
3. Place the open end of the maintenance tubing in a bottle with cleaning agent.
4. Flush with cleaning agent (20 ml with RapidWash and 10 ml with diluter).
5. Leave to soak for 20 minutes.
6. Place the tubing in a bottle with DI water.
7. Rinse twice with DI water (20 ml with RapidWash and 10 ml with diluter).

⚠ WARNING

Flammable liquids!

Fire hazard caused by flammable liquids or system liquid.

- Avoid the formation and accumulation of flammable vapors.
- Do not operate the system without deck trays.

8. Place the tubing in a bottle with alcohol.
9. Flush with alcohol (20 ml with RapidWash and 10 ml with diluter).
10. Remove the maintenance tubing from the system tubing and connect the system tubing to the system liquid container.

11. Flush twice with DI water (20 ml with RapidWash and 5 times the diluter volume).
12. Check for bubbles in the tubing.
13. Flush again if bubbles are visible.

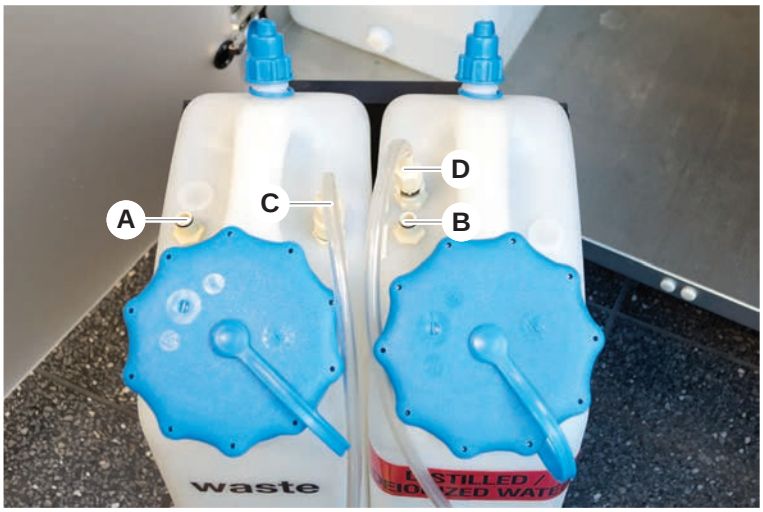
7.5.16 Connecting the System Liquid Container and Waste Container

To prepare the system liquid container and waste container, proceed as follows:

A trouble-free operation is only guaranteed if the original containers with controlling system from Tecan are used.
Prior to first use, the system liquid container must be manually rinsed out thoroughly to remove any solid debris from inside the bottle. Refer to section "Cleaning the System Liquid Container and Waste Container" [150].

✓ Tecan container with a capacity of more than 20 liters

1. Ensure that the liquid detection system (A, B) is connected correctly.
2. Ensure that the tubes (C, D) are connected correctly.



7.5.17 Cleaning the System Liquid Container and Waste Container

To clean the liquid container and the waste container, proceed as follows:

1. Empty the wash liquid container manually.
2. Clean the liquid container in a basin with the cleaning agent and rinse.
3. Disinfect the liquid container with alcohol.
4. Connect the system liquid and the waste container, refer to section "Connecting the System Liquid Container and Waste Container" [150].

7.5.18 Checking Tightness of Syringes

To check the correct tightness of the syringes proceed as follows:

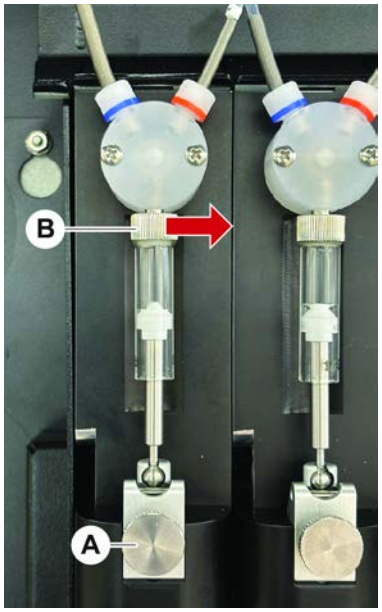


Fig. 56: Checking tightness

A Plunger lock screw **B** Syringe screw

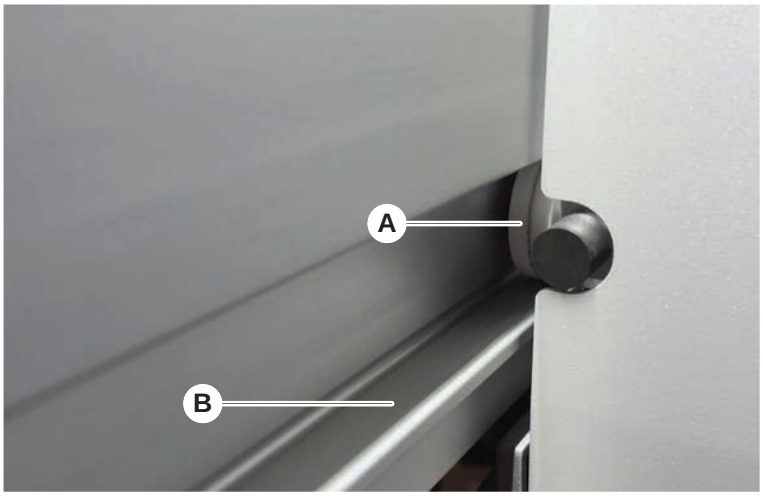
1. Move the plungers to the center of the syringes using a maintenance script that aspirates air.
   Note: The maintenance script must be provided by the laboratory's FluentControl administrator.
2. Tighten the syringe screw (B).
   I.e., turn it right.
3. Turn the plunger lock screw (A) clockwise to tighten it.

7.5.19 Cleaning Arm Guide

To clean the arm guide, proceed as follows:

1. Clean the arm guide roller (A) on the arm guide with a cotton swab or a lint-free cloth on a screwdriver.
2. Clean the arm rails (B) with a lint-free cloth.

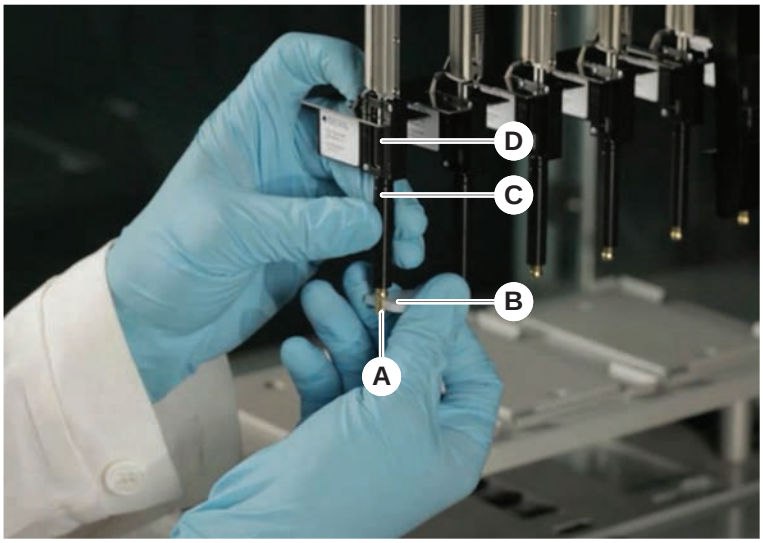
3. Where present, clean the upper surface of the guide rail on the MCA arm guide with a lint-free cloth.



7.5.20 Tightening a DiTi Cone

To tighten the FCA DiTi Cone, proceed as follows:

1. Hold the tip adapter (D) and tip ejector tube (C).
2. Tighten the DiTi cone (A) using the DiTi cone wrench (B).



3. Run the **FCA Routine Maintenance** method.

7.5.21 Frida Reader

Insert

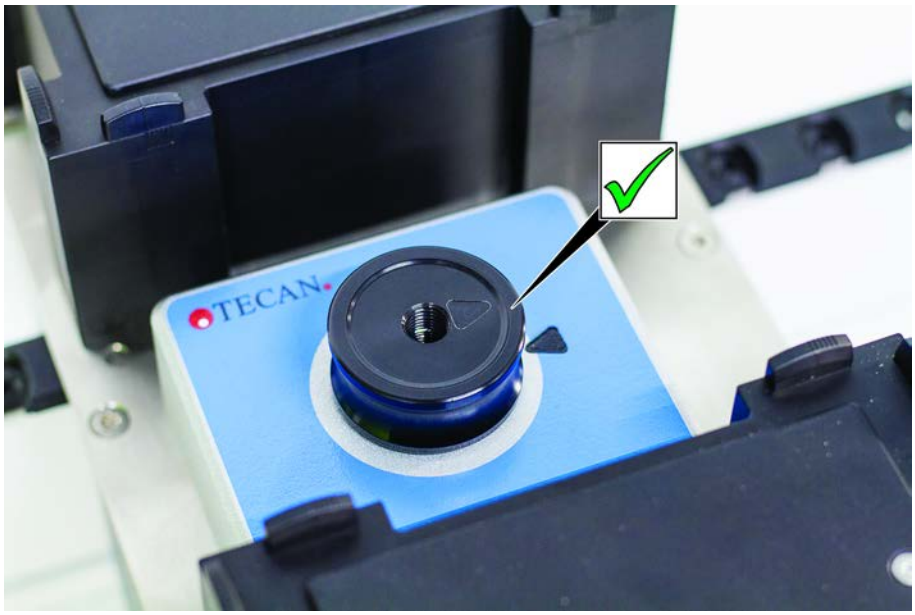


Fig. 57: Frida Reader insert

For installation fit the insert into the Frida Reader and align the markings.

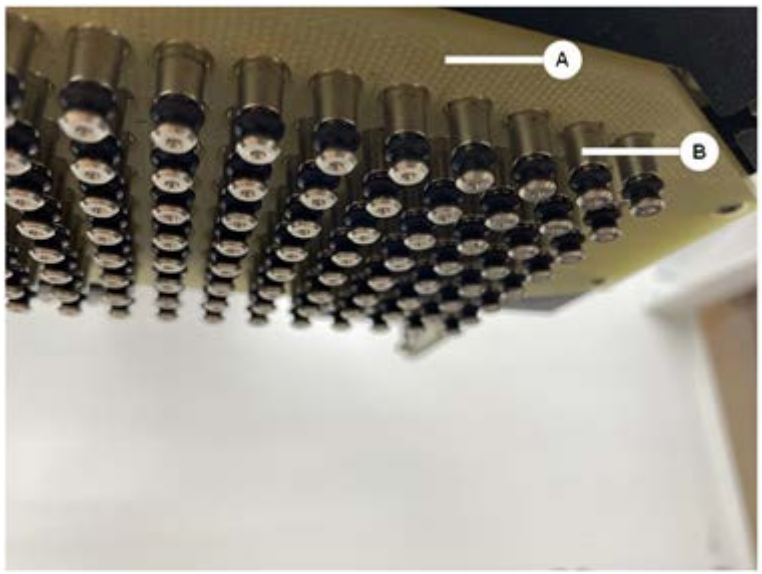
Blind Plug

Fig. 58: Frida Reader blind plug

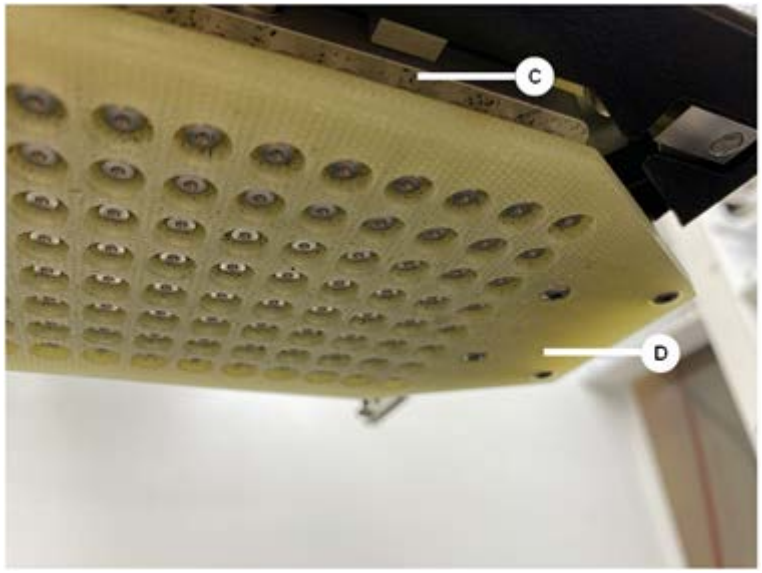
The blind plug protects the Frida Reader when the insert is removed. For installation fit the blind plug into the Frida Reader.

7.5.22 Cleaning MCH 96

Inspect the ejection plate (A) for any visible damage. Spillage of certain process liquids (such as DMSO or acetonitrile) or cleaning agents (such as bleach) could lead to damage of the plate. If this is the case, please contact your local service organization for a replacement.



1. Use the Move Tool to drive the ejection axis to the bottom. 2. . 3.
2. Use oil-free compressed air to clean the top surface of the ejection plate (C), the cone plate and the cones (B)
3. Use a lint free cloth and alcohol to clean the bottom surface of the ejection plate (D).



The left picture below shows the ejecton plate before cleaning and the right picture shows the ejecton plate after cleaning.

8 Troubleshooting

Consult this chapter for help on resuming operation after a problem has occurred with the Fluent. For further information or, in the event of problems not covered in this manual, or in insufficient detail, please consult section “Customer Support” [▷ 200].

8.1 Safety Instructions for This Chapter

⚠ CAUTION

Cross contamination due to damaged tips after crash!

Bent tips or damaged tip coating cause pipetting inaccuracy and liquid detection errors.

- Check the fixed tips after a crash. Refer to section “Checking Fixed Tips” [▷ 176].

8.2 Troubleshooting Tables

The troubleshooting tables list possible problems, causes, and corrective measures. For further information or, in the event of problems not covered in this manual, or in insufficient detail, please consult section “Customer Support” [▷ 200].

8.2.1 Instrument Troubleshooting

Tab. 42: Instrument troubleshooting table

Problem/Error	Possible Cause	Corrective Measure
System liquid leak	Tubing and/or tubing connections are not tight. Syringe is leaking.	Please consult section “Customer Support” [▷ 200].
Communication error	Power is not ON. Power or communication is interrupted. No communication.	Switch off the instrument. Wait until the instrument status lamp and power supply lamp switch off. Switch off the PC. Check cable and plugs. Switch on the instrument and the PC.
	X-, Y- or Z-drive blocked.	Check for obstacles. **NOTICE! Ensure that the arms can move freely.**

Problem/Error	Possible Cause	Corrective Measure
Initialization error	Arms cannot be initialized.	Check for obstacles. **NOTICE! Ensure that the arms can move freely.**
	Hardware problem.	Please consult section “Customer Support” [▶ 200].
Front safety panel door sensor and door lock are damaged	Mechanical failure of the door locks.	Switch off the instrument. Please consult section “Customer Support” [▶ 200].
Safety panel missing or damaged	Safety cannot be guaranteed.	Switch off the instrument. Please consult section “Customer Support” [▶ 200].
Liquid detection (cLLD) fault	Dirty contact surface. Inadequate contact between labware and segment.	Prepare deck. Refer to section Check before Starting a Method. Clean the contact surface. Refer to section “Cleaning Runners and Segments” [▶ 140].
	System Liquid has a conductivity > 10 µS/cm for cLLD compatibility.	Contact the key operator.

8.2.2 Flexible Channel Arm (FCA) Troubleshooting

Tab. 43: Flexible Channel Arm troubleshooting table

Problem/Error	Possible Cause	Corrective Measure
Loose DiTi cone **CAUTION! Inaccurate pipetting volumes!**	Insufficiently tightened DiTi cone.	Tighten the DiTi cone.
Disposable tip not fetched	Insufficiently tightened DiTi cone.	Tighten the DiTi cone.
Disposable tip not discarded	Insufficiently tightened DiTi cone.	Tighten the DiTi cone.
	Reused DiTis	Ensure tips are new. DiTis are not recommended for reuse. Disposable tips not ejected in waste chute/ Waste chute is not located correctly

Problem/Error	Possible Cause	Corrective Measure
Disposable tips not ejected in waste chute	Waste chute is not located correctly	Ensure the waste chutes are correctly located. Refer to section “Cleaning Disposable Tip Waste Slide” [145]
Tips not aligned with labware on a single carrier	Carrier in wrong position. Segment not locked in place. Labware not positioned correctly.	Ensure correct carrier position. Refer to section “Loading Standard Runners” [96]. Lock segment in place. Refer to section “Checking Segment” [193].
Tips not aligned with labware on several carriers	Defective arm alignment caused by a collision.	Please consult section “Customer Support” [200].
Tip collides with bottom of labware	Wrong labware. Labware not positioned correctly.	Ensure that the labware on the deck corresponds to the method deck layout.
DiTi drips	Dirty DiTi cone causing leak.	Clean the DiTi cone.
	Reused DiTis	Ensure tips are new. DiTis are not recommended for reuse.
Error message: **Pressure out of range (Air FCA)**	Wet inline filter after aspiration with wrong DiTi size.	Ensure that the size of the DiTi on the deck corresponds to that defined in the method. Ensure that the DiTi cones are tightened correctly Check the inline filter. Refer to section “Checking Inline Filter (Air FCA)” [169].
Error messages: **DiTi not fetched** **DiTi not dropped**	Magnetic field interfering with DiTi-presence sensor.	–
Liquid detection: Tip does not detect liquid	DiTi cone loose	Tighten DiTi cone (refer to “Tightening a DiTi Cone” [152]).
O-rings worn	MultiSense tip adapters	Replace O-rings and X-ring on MultiSense tip adapters.

8.2.3 Mix and Pierce

Tab. 44: Troubleshooting

Symptom	Possible Cause	Corrective Measures
Piercing tip cannot be retracted with software commands	Stuck piercing tip	Refer to section “Retracting Stuck Piercing Tips” [▶ 187].
Damaged piercing tip	Bent piercing tip Damaged tip	Replace the piercing tip. Refer to sections “Removing Piercing Tips” [▶ 180] and “Installing Piercing Tips” [▶ 183].
Piercing errors	Piercing tip too dry	Lubricating with water (wash station)
	Damaged tip	Replace the piercing tip. Refer to sections “Removing Piercing Tips” [▶ 180] and “Installing Piercing Tips” [▶ 183].
	Bent piercing tip	
	Wrong piercing parameter	Contact the key operator.
	Wrong movement type used	Contact the key operator.
	Wrong tubes used	Use supported tubes. Refer to section “Tube Rotator Runners” [▶ 74].
	Arm has reached its lifetime	Please consult section “Customer Support” [▶ 200].
Liquid handling problems	Clogged piercing tips	Flush piercing tips. Check washing procedure in general.
	Damaged tip	Replace the piercing tip. Refer to sections “Removing Piercing Tips” [▶ 180] and “Installing Piercing Tips” [▶ 183].
	Syringes not properly mounted	Check tightness of syringes. Refer to section “Checking Tightness of Syringes” [▶ 150].
	Bubbles in Liquid System	Flush. Please consult section “Customer Support” [▶ 200].

Symptom	Possible Cause	Corrective Measures
Hemolysis problems	Sample dilution	Higher excess volume or partitioning volume
		Saline 0.9% as partitioning volume
		Lower pipetting speeds
	Damaged tip	Replace the piercing tip. Refer to sections “Removing Piercing Tips” [▷ 180] and “Installing Piercing Tips” [▷ 183].
	Mixing parameters	Make sure that the used rotation / oscillation parameters of the tube rotator do not lead to hemolysis

Symptom	Possible Cause	Corrective Measures
Sample in syringe	Any	Clean system. Refer to section "Cleaning Liquid Path" [149].
	Wrong air gap	Validate wash procedure.
	Syringes not properly mounted	Check tightness of syringes. Refer to section "Checking Tightness of Syringes" [150].
		Run the **FCA Leakage Method**.
		Bigger leading air gap.
		Slower aspiration speeds.
	Incorrect sample preparation for liquid handling. Sample source tubes contain solid particles like clots, cell debris, etc.	Ensure proper sample preparation to allow pipetting of sample liquid.
		Make sure that sample source tubes do not contain solid particles like clots, cell debris, etc.
	Incorrect sample preparation for liquid handling. Tubes are not properly filled and still contain partial vacuum that reduces the leading air gap during piercing.	Make sure that the sample source tubes are properly filled with the tube's target volume.
		Make sure that sample source tubes do not contain vacuum.
		Increase the leading air gap to compensate for possible remaining vacuum.
Piercing tip bends during wash procedure	Piercing tip is not centered in wash station cleaner holes.	Create a copy of the wash station and teach the pipetting positions.

Symptom	Possible Cause	Corrective Measures
Incorrect liquid level detection: only on specific channels	Bent piercing tip: Piercing Tip is bent and therefore touches the tube wall during piercing	Replace the piercing tip. Refer to sections “Removing Piercing Tips” [▷ 180] and “Installing Piercing Tips” [▷ 183].
	Piercing position is incorrect and therefore the piercing tip touches the tube wall during piercing.	Use Tecan manufacutred labware. Refer to section “Tube Rotator Runners” [▷ 74].
		Teach/adjust labware pipetting position
	Orientation of piercing tip is incorrect.	Mount piercing tip with opening facing to the front of the instrument. Refer to section “Installing Piercing Tips” [▷ 183].
Incorrect liquid level detection: constant deviation of expected liquid level and detected liquid level	Manufacturing tolerances of the arm, Tube Rotator and/or instrument in combination with piercing force can lead to noticeable Z-offset during liquid level detection.	Teach/adjust the custom attribute "PiercingDetectionHeightCompensation" in the tube labware definition

Symptom	Possible Cause	Corrective Measures
Wash station overflow	Clogged sample in wash station, central waste, front or back cleaners	Remove wash station and clean as described. Refer to section "Cleaning the Tube Rotator Wash Station" [▶ 138].
		Implement more rigorous cleaning procedure as part of end of day maintenance. Refer to sections "End of Day" [▶ 125] and "Mix and Pierce" [▶ 159] (Step 6).
	Clogged waste connectors	Clean connectors with bottle brush or exchange connectors. Refer to section "Cleaning the Tube Rotator Wash Station" [▶ 138].
		Regular exchange of wash station connectors is recommended. Refer to section "Safety Instructions for This Chapter" [▶ 90] (whole blood applications)
		Implement more rigorous cleaning procedure as part of end of day maintenance. Refer to sections "End of Day" [▶ 125] and "Mix and Pierce" [▶ 159] (Step 6).

8.2.4 Multiple Channel Arm (MCA) Troubleshooting

Tab. 45: Multiple Channel Arm troubleshooting table

Problem/Error	Possible Cause	Corrective Measure
Tips are not aligned with the carriers	Mechanical fault	Please consult section "Customer Support" [▶ 200].
	Arm crash	
Microplate and pipetting head not 100% parallel	Crash	Contact the key operator to check the parallelism of the pipetting head and the deck.
During pipetting, the pipetting head stops generating an error	Aspiration and dispensing acceleration is too fast compared to speed.	Acceleration must be in a reasonable relation to aspirating and dispensing speed.
	Aspiration and dispensing deceleration is too fast compared to speed.	Deceleration must be in a reasonable relation to aspirating and dispensing speed.
		Problem cannot be solved. Please consult section "Customer Support" [▶ 200].

Problem/Error	Possible Cause	Corrective Measure
Several or all pipetting channels leaking	Wrong disposable tips or tip cone seals	Always use disposable tips or tip cone seals supplied by Tecan. Contact the key operator to check the system for leaks.
	Tip cone seals are old or defective.	Please consult section “Customer Support” [▷ 200]. Contact the key operator to check the system for leaks.
	Pipetting head is faulty.	Please consult section “Customer Support” [▷ 200].
Single channel leaking	Tip cone seal or other seals in the pipetting head are defective.	Contact the key operator to check the system for leaks. Please consult section “Customer Support” [▷ 200].
Single disposable tip not picked up correctly	Individual disposable tip is defective. Tip cone seal on this disposable tip position is defective.	Replace disposable tips. Problem cannot be solved. Please consult section “Customer Support” [▷ 200].
Single disposable tip not dropped	Individual disposable tip is defective. Tip cone seal on this disposable tip position is defective.	Problem cannot be solved. Please consult section “Customer Support” [▷ 200].
	Wrong humidity	Ensure the humidity is within operating humidity limits. Refer to section “Environmental Conditions” [▷ 42].
Several or all disposable tips not dropped	Wrong disposable tips used.	Always use disposable tips supplied by Tecan. Problem cannot be solved. Please consult section “Customer Support” [▷ 200].

Problem/Error	Possible Cause	Corrective Measure
Disposable tip box is lifted up with disposable tips when picking up disposable tips	Carrier is not adjusted correctly. X- and/or Y-offset are specified incorrectly.	Adjust all carriers (mechanical) precisely. Replace the disposable tip carrier. Problem cannot be solved. Please consult section “Customer Support” [▷ 200].
	Disposable tip box does not meet specifications.	Always use disposable tip boxes that comply with the Society of Biomolecular Screening standards. Problem cannot be solved. Please consult section “Customer Support” [▷ 200].
	Disposable tip carrier is defective (malfunction on disposable tip box retainers).	Always use disposable tip boxes that comply with the Society of Biomolecular Screening standards. Problem cannot be solved. Please consult section “Customer Support” [▷ 200].
Inaccurate pipetting results	Disposable tips are not picked up properly. Liquid handling parameters are incorrect. Carriers are not correctly adjusted. Pipetting head is faulty.	Contact the key operator to check the application script and the carriers. Contact the key operator to check the environment parameters and the dispensing height.

8.2.5 Robotic Gripper Arm (RGA) Troubleshooting

Tab. 46: Robotic Gripper Arm troubleshooting table

Problem/Error	Possible Cause	Corrective Measure
Microplate not picked up	No microplates on carrier. Gripper fingers cannot pick up the microplate.	Place microplate on carrier. Set gripper position. Clean RGA gripper fingers.
Unusual noise during arm movement	Parts are damaged or worn.	Please consult section “Customer Support” [▷ 200].
Eccentric Gripper Fingers misaligned	Spare fingers crash. Finger screws not tight enough.	Align the Eccentric Gripper Fingers. Refer to section “Checking Gripper Finger Alignment” [▷ 188]. Use a torque screw driver to tighten the screws to 3 Nm, as described in section “Basic Gripper Fingers Alignment for FES Gripper Fingers” [▷ 189].

8.2.5.1 Robotic Gripper Arm with long Z-axis (RGA-Z) Troubleshooting

Tab. 47: Robotic Gripper Arm with long Z-axis troubleshooting table

Problem/Error	Possible Cause	Corrective Measure
Microplate not picked up	No microplates on carrier. Gripper fingers cannot pick up the microplate.	Place microplate on carrier. Set gripper position. Clean RGA gripper fingers.
	Gripper fingers are slippery.	Clean RGA gripper fingers.
Unusual noise during arm movement	Parts are damaged or worn.	Please consult section “Customer Support” [▷ 200].

8.2.6 Wash System Troubleshooting

Tab. 48: Wash system troubleshooting table

Problem/Error	Possible Cause	Corrective Measure
Wash station overflow	Disposable tips or algae block the wash station.	Clean the wash station. Refer to section “Cleaning the System Liquid Container and Waste Container” [▷ 150].
	Waste tubing is kinked.	Check tubing for kinks. Refer to section “Checking the Tubing on System Liquid Container and Waste Container” [▷ 101].
	Waste tubings are clogged or damaged.	Check waste tubing. Replace the waste pump if necessary. Please consult section “Customer Support” [▷ 200].

For troubleshooting of Mix and Pierce systems and wash stations, please refer to “Mix and Pierce” [▷ 159].

8.2.7 Fluent ID Troubleshooting

Tab. 49: Fluent ID troubleshooting table

Problem/Error	Possible Cause	Corrective Measure
Barcode not read	Barcode label not facing the scanner.	Unload the tube runner, turn the tubes so that the barcode labels face left. Reload the tube runner on the Fluent.
	Runner loaded too fast.	Unload the tube runner and load it again slowly.
	Poor label quality.	Enter the barcode manually or report the problem to the key operator.
	Scanner window is dirty.	Clean the scanner window. Refer to section Every Week.
	Reflector is dirty.	Clean the reflector. Refer to section Every Week.
	Barcode type or barcode length not pre-defined for the method.	Report the problem to the key operator.
Tube presence not detected	Barcode label position too low on the tube.	Report the problem to the key operator.

8.2.8 Software Troubleshooting

Tab. 50: Software troubleshooting table

Problem/Error	Possible Cause	Corrective Measure
User login screen not displayed when envisaged.	User management has not been activated in FluentControl.	Contact the key operator to activate user management.
User cannot log in.	Password is incorrect or account is locked.	Contact the key operator to reset the password or account.
Not all service actions completed. Warning appears at each FluentControl startup.	Not all envisaged service actions are marked as complete in the instrument configuration.	Please consult section “Customer Support” [▶ 200].
Touchscreen does not react to touch.	Software driver not installed.	Contact computer administrator for installation of the drivers on the installation CD and configuration of the touchscreen.
	Touchscreen interface incorrectly configured.	Open the touchscreen driver settings and ensure that the touchscreen is correctly mapped.

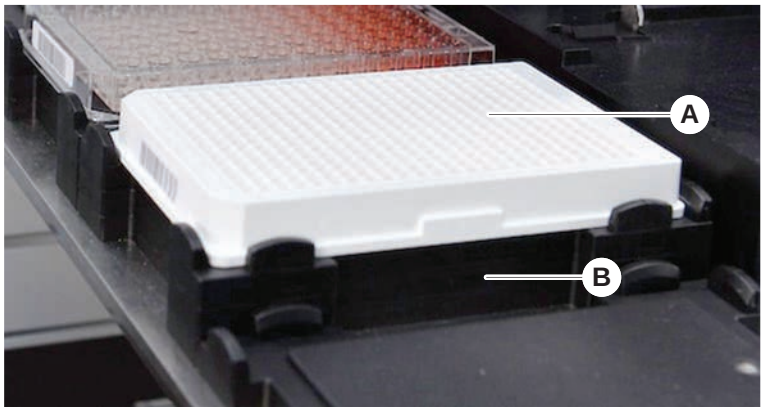
Problem/Error	Possible Cause	Corrective Measure
Touch interface is not displayed on touchscreen.	Touchscreen was not on when the software was started.	Turn on the instrument and restart the software or check the Touch Tool settings in the FluentControl configuration system.
Error on FluentControl startup.	FluentControl (SystemSW.exe) is already running in the background (Task Manager).	Open the Task Manager, process `SystemSW.exe` and restart FluentControl. Or restart the computer.
FluentControl does not communicate with connected hardware devices.	FluentControl is not properly configured for communication with hardware devices.	Contact the person responsible for configuring the system to activate the I/O state of the hardware devices.

8.3 Troubleshooting Activities

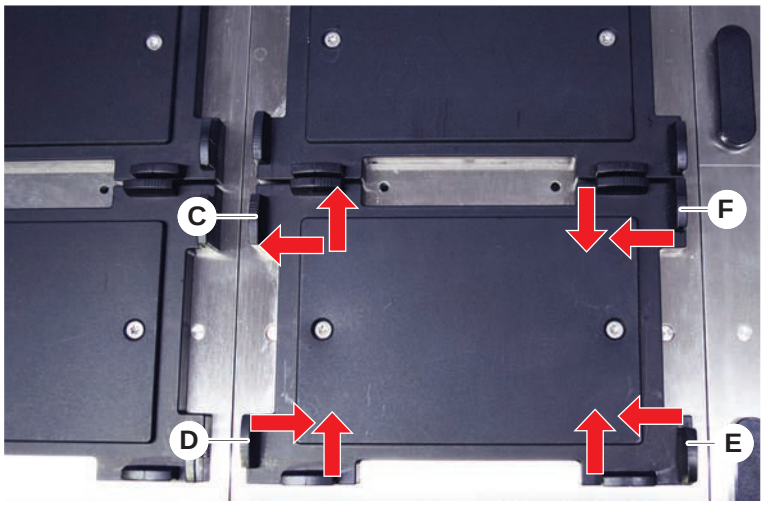
8.3.1 Position Labware

To ensure that labware is positioned correctly in the nest for precise arm access, proceed as follows:

1. Place the labware (A) on the nest (B).



2. Push the labware gently against the static positioner (C).



3. Slide the diagonal sliding positioner (E) towards or away from the labware to precisely fit the labware.
4. Slide the vertical and horizontal sliding positioners (D, F) towards or away from the labware to fix the labware.
5. Lift the labware from the nest.

   Ensure that there is no friction when placing or removing the plate.

8.3.2 Checking Inline Filter (Air FCA)

A control system is installed on each channel to protect Air FCA pipetting channels against over-aspiration of liquid.

✓ The **Air FCA Routine Maintenance** method includes an inline filter check, which detects wet, damaged or mispositioned filters as well as missing filters.

1. Run the **Air FCA Routine Maintenance** method to check the inline filter inside the DiTi cone of an Air FCA pipetting channel.

   In the event of an error, the inline filter must be changed. Refer to section "Changing Inline Filter (Air FCA)" [▸ 170].

8.3.3 Changing Inline Filter (Air FCA)

To change the inline filter, proceed as follows:

✓ Decontaminated disposable tip cone.

✓ DiTi cone removed from the channel. Refer to section "Removing DiTi Cone (Air FCA)" [▸ 171].

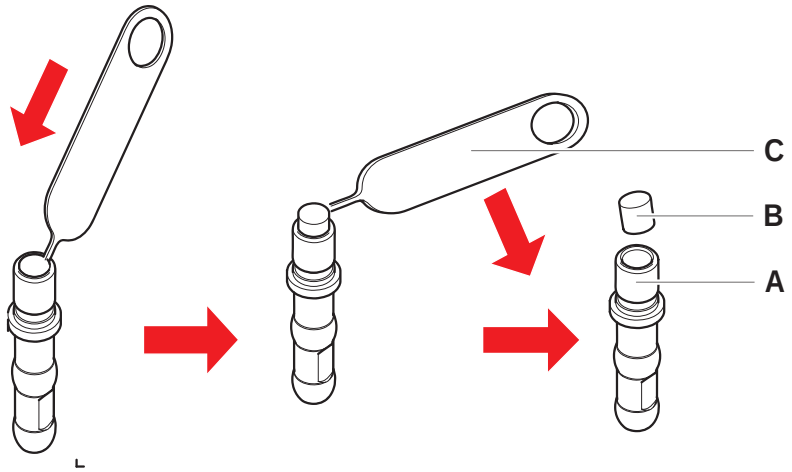
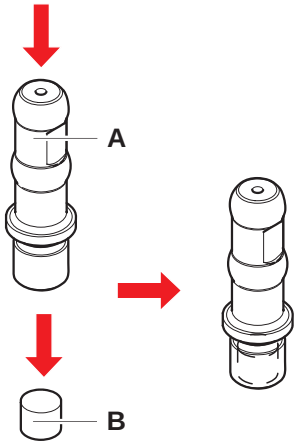


Fig. 59: Removing inline filter

A	DiTi cone	**B**	Inline filter
C	Filter removal tool		

1. Pierce the inline filter (B) sideways with the filter removal tool (C).
2. Pry out the inline filter with the filter removal tool. Note that the filter may be contaminated with process liquids.

3. Dispose of the inline filter.



4. Clean the DiTi cone (A) with alcohol.
   DiTi cone must be dry before refitting.
5. Place the new inline filter on a clean and flat surface.
6. Press the inline filter into the DiTi cone.
   The inline filter must not protrude from the DiTi cone.
7. Check the inline filter according to the method defined by your key operator.

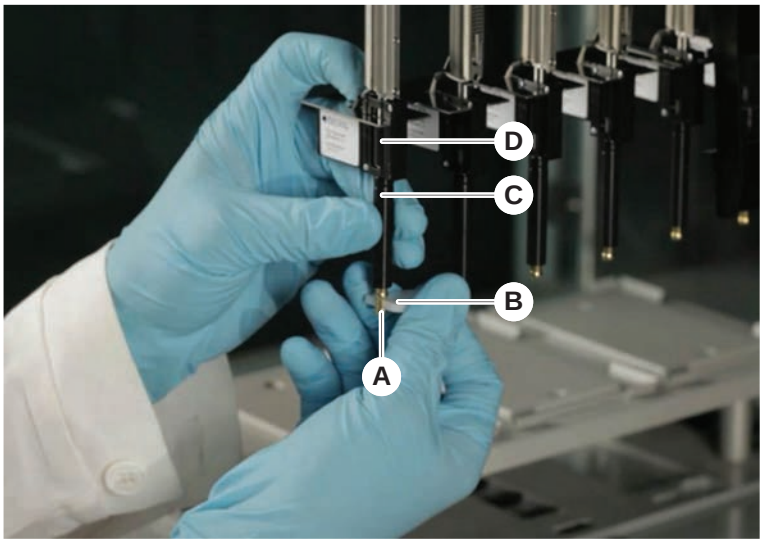
8.3.4 Removing DiTi Cone (Air FCA)

To remove the DiTi Cone (Air FCA), proceed as follows:

✓ DiTi cone wrench available.

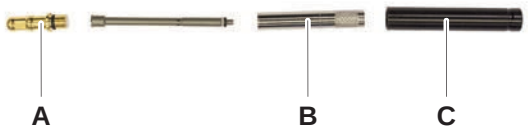
1. Switch off the instrument.
2. Open front safety panel.
3. Manually raise all the Z-rods to their uppermost position.
4. Move all the Z-rods towards the front of the instrument.
5. Spread the Z-rods as wide as possible.
6. Hold the tip adapter (D) and tip ejector tube (C).

7. Unscrew the DiTi cone (A) using the DiTi cone wrench (B).



8. Pull down the DiTi cone carefully.

   In some cases the tip ejector tube (C) or the adapter cylinder (B) may still be attached to the DiTi cone (A). Refer to section "Assembling DiTi Ejector Tube (Air FCA)" [▸ 172].

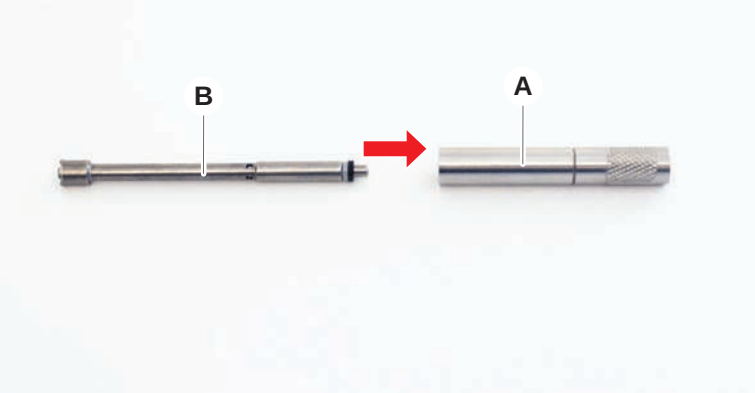


8.3.5 Assembling DiTi Ejector Tube (Air FCA)

To assemble the DiTi ejector tube (Air FCA), proceed as follows:

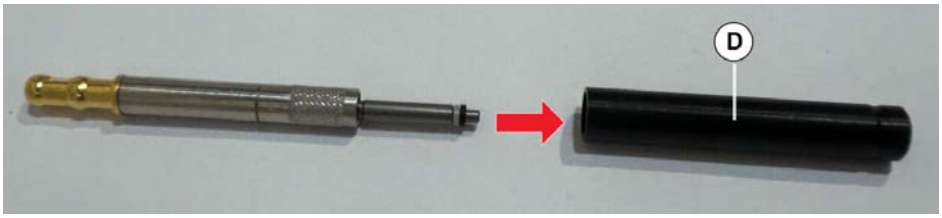
✓ The DiTi ejector tube has been removed, according to the instructions.
✓ DiTi cone wrench available.

1. Insert the sealing sleeve (B) in the adapter cylinder (A).



2. Screw the DiTi cone (C) to the assembled cylinder. Please make sure that the black O-ring is not visible as shown in the very below picture.

3. Insert the tip ejector tube (D) with the non-notch side to the assembled cylinder as shown below.



8.3.6 Installing DiTi Cone (Air FCA)

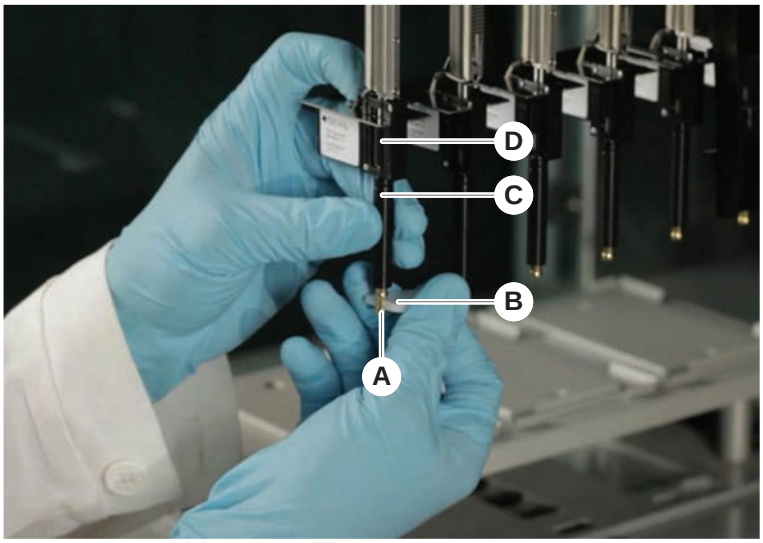
To install the Air FCA DiTi Cone, proceed as follows:

✓ DiTi cone is fully assembled: Refer to section “Assembling DiTi Ejector Tube (Air FCA)” [▷ 172].

✓ DiTi cone wrench available.

1. Slide the adapter cylinder into the tip ejector tube (C).
2. Hold the tip adapter (D) and tip ejector tube (C).

3. Screw in the DiTi cone (A) using the DiTi cone wrench (B).



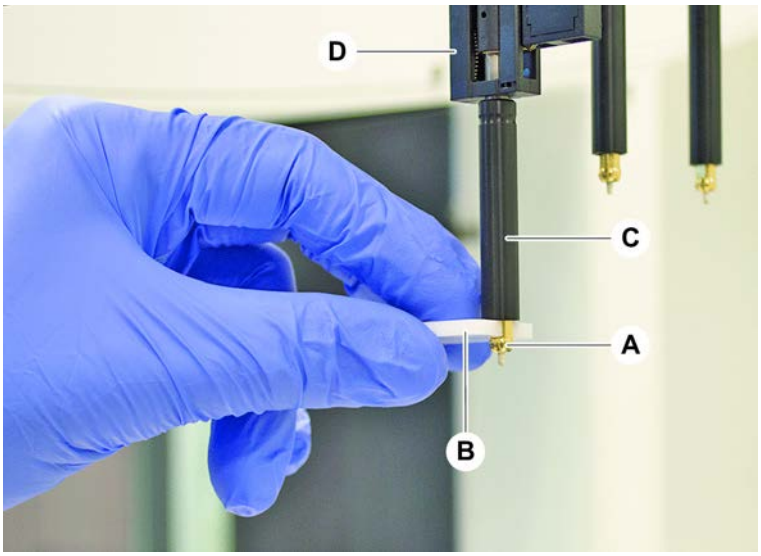
4. Run the **Air FCA Routine Maintenance** method.

8.3.7 Removing the DiTi Option (FCA)

To remove the DiTi option, proceed as follows:

✓ DiTi cone wrench

1. Switch off the instrument.
2. Open the front safety panel.
3. Manually raise all the Z-rods to their uppermost position.
4. Move all the Z-rods towards the front of the instrument.
5. Spread the Z-rods as wide as possible.
6. Hold the tip adapter (D) and tip ejector tube (C).
7. Unscrew the DiTi cone (A) with the DiTi cone wrench (B).

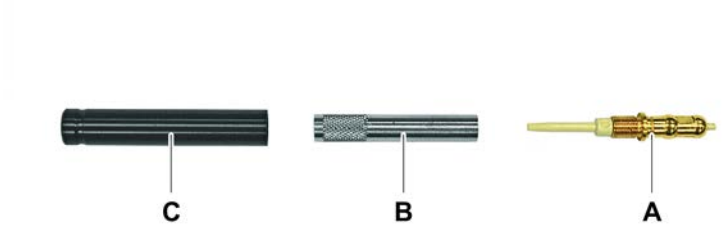


8. Pull down the DiTi cone carefully.

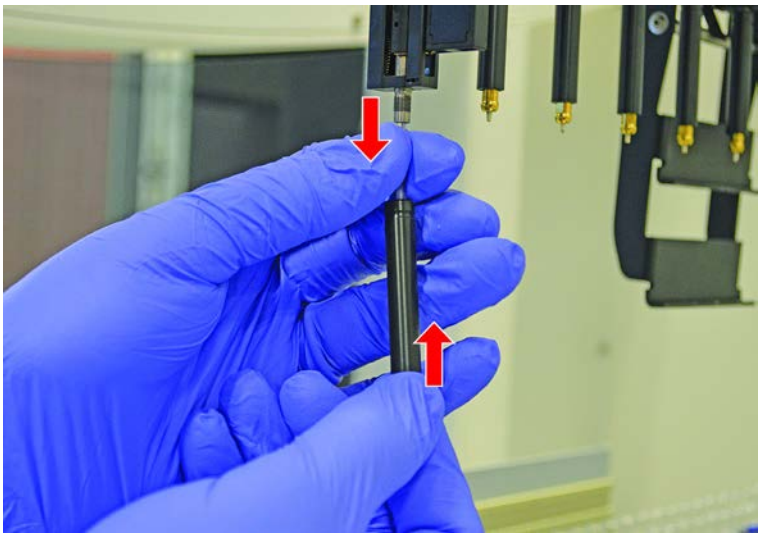
8.3.8 Installing the DiTi Option (FCA)

To install the DiTi option, proceed as follows:

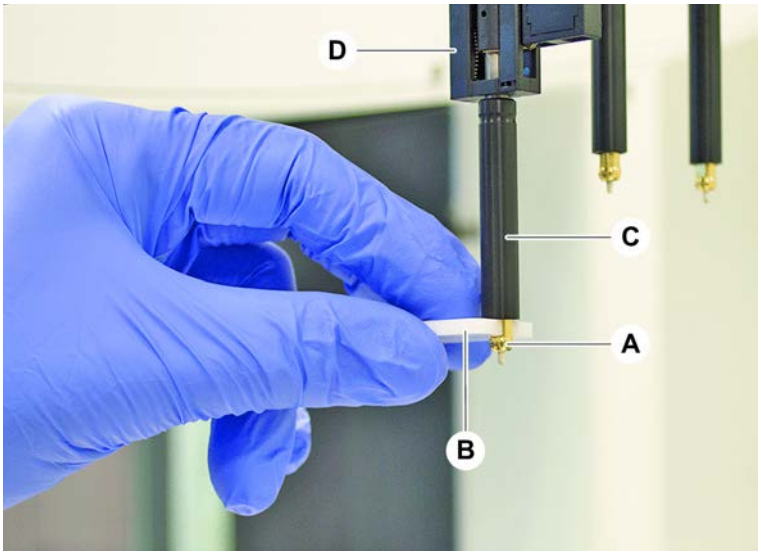
1. Screw the adapter cylinder (B) in the tip ejector tube (C).
2. Screw the DiTi cone (A) to the adapter cylinder. Use the DiTi cone wrench.



3. Push the tubing onto the plastic needle until the tubing attaches firmly to the DiTi option.



4. Hold the tip adapter (D) and tip ejector tube (C).
5. Screw in the DiTi cone (A) using the DiTi cone wrench (B).



8.3.9 Checking Fixed Tips

To check the fixed tips, proceed as follows:

NOTICE

Pipetting inaccuracy and liquid detection errors!

Bent or damaged tip coating causes pipetting inaccuracy and liquid detection errors.

- Never work with damaged or bent tips.

1. Switch off the instrument.
2. Open front safety panel.
3. Inspect the fixed tips.
4. Inspect the fixed tip coating with a mirror.

   Ensure that the fixed tips are not bent. If the fixed tip coating is damaged or the fixed tip is bent, it must be replaced. Refer to section "Removing Fixed Tips" [▷ 177].

8.3.10 Removing Fixed Tips

To remove fixed tips, proceed as follows:

✓ Fixed tips have been cleaned. Refer to section "System Care Tables" [▷ 123].
✓ Fixed tips have been checked. Refer to section "Checking Fixed Tips" [▷ 176].

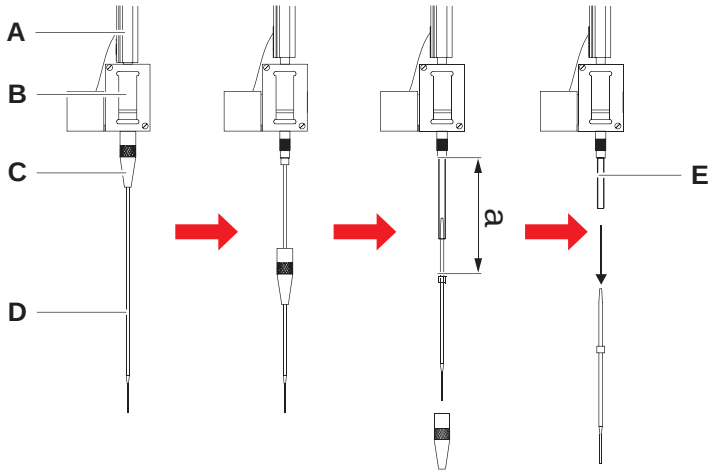


Fig. 60: Standard tip removal

A	Z-rod	**B**	Tip adapter
C	Lock nut	**D**	Tip
E	Pipetting tubing		

1. Switch off the instrument.
2. Open front safety panel.
3. Manually raise all the Z-rods (A) to their uppermost position.
4. Spread the Z-rods as wide as possible.
5. If an adjustable fixed tip is installed, loosen the four tip adjustment screws.
6. Unscrew lock nut (C) while holding the fixed tip immediately below the lock nut with the other hand.
7. Remove the lock nut (C), sliding it along the tip axis.

   Avoid contact between the lock nut and the tip coating.
8. If the tip (D) is adjustable, turn the lock nut (C) upside down on a clean surface, and remove the O-ring and the washer.

9. If the channel is equipped with the low volume option, unscrew the flange on top of the solenoid valve to free the pipetting tubing (E) running through the Z-rod (A).
10. Extract the pipetting tubing (E) a certain distance (a) out of the tip adapter (B) by pulling on the tip (D).

    Use a dry emery cloth for improved grip on the pipetting tubing—not on the tip.

8.3.11 Installing Fixed Tips

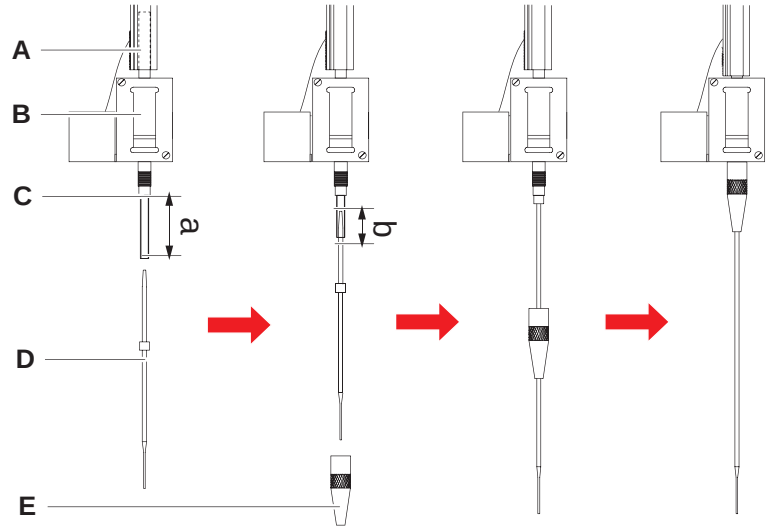


Fig. 61: Standard tip installation

A	Z-rod	**B**	Tip adapter
C	Pipetting tubing	**D**	Tip
E	Lock nut		

To install fixed tips, proceed as follows:

1. Carefully pull the pipetting tubing approx. 25 mm (1 in.) (a) out of the tip adapter.

   Use a small piece of emery cloth to grip the tubing near the end to ensure a better grip.

   If a tip has been installed before, cut approx. 5 mm (0.2 in.) (b) from the pipetting tubing, using a sharp knife to obtain a straight cut.

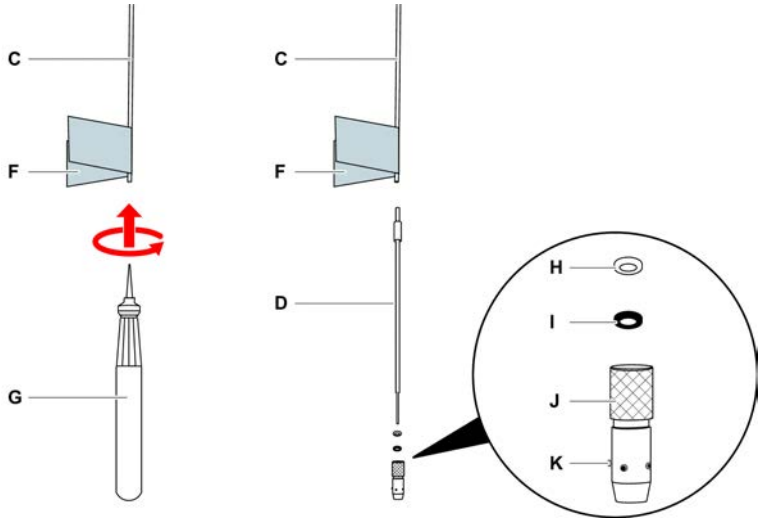


Fig. 62: Te-PS tubing widener

C	Pipetting tubing	**D**	Te-PS tip
F	Emery cloth	**G**	Te-PS tubing widener
H	Washer, white (FEP)	**I**	O-ring, black
J	Adjustable lock nut	**K**	Tip adjustment screw

2. In case of Te-PS tips or low-volume tips:

   Use the Te-PS tubing widener (G) to widen the tubing end by pushing the Te-PS tubing widener up to the hilt into the tubing while turning the tool.

   While the tubing is still wide, push the Te-PS tip into the tubing end by approx. 4 mm (0.16 in.).

3. Slide the lock nut onto the tip.

   If the tip is adjustable (e.g., Te-PS), slide the lock nut over the washer (H) and the O-ring (I).

   NOTICE! Avoid contact with the delicate end of the tip and its coating.

4. Insert the tip and the pipetting tubing in the tip adapter.
5. Screw the lock nut onto the tip adapter and tighten.

   If the tip is adjustable (e.g., Te-PS), tighten the lock nut so that the four tip adjustment screws (K) are at a 45° angle to the deck's X/Y coordinate system.

6. Clean the fixed tips. Refer to section End of Day.
7. Run a pipetting precision test as defined by the key operator.

8.3.12 Removing Piercing Tips

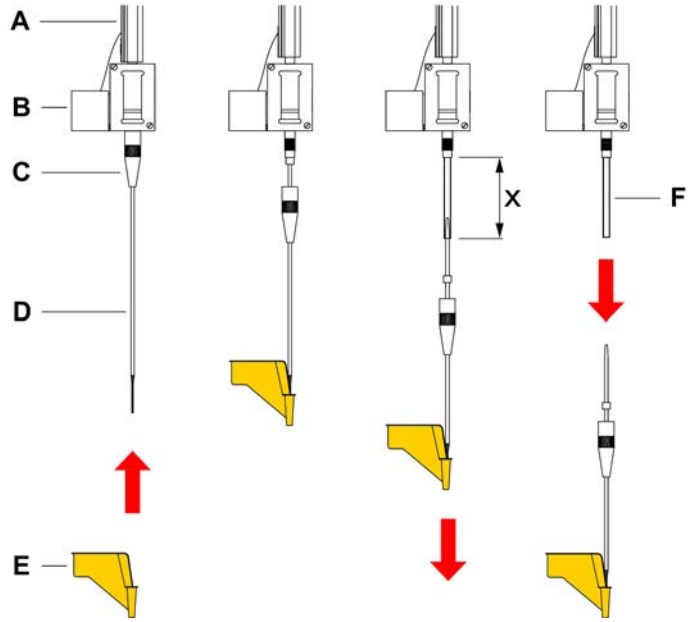


Fig. 63: Piercing tip removal

A	Z-rod	**B**	Tip adapter
C	Lock nut	**D**	Piercing tip
E	Piercing tip protection	**F**	Pipetting tubing
x	25 mm (1 in.)		

To remove piercing tip, proceed as follows:

✓ The instrument is switched off.

1. Open the front safety panel.
2. Manually raise all the Z-rods to their uppermost position.
3. Move all the Z-rods towards the front of the instrument.
4. Spread the Z-rods as wide as possible.

5. Cover the piercing tips with piercing tip protections. Start with the rearmost piercing tip.

6. Unscrew the lock nut, holding the piercing tip immediately below the lock nut with the other hand.

7. Pull the pipetting tubing approx. 25 mm out of the tip adapter by pulling on the tip. Hold the piercing tip at its upper end when pulling.

8. Pull the piercing tip off the tubing, withholding the tubing with the other hand.
9. Do not remove the piercing tip protection. Discard it with the piercing tip into the biological waste container.

8.3.13 Installing Piercing Tips

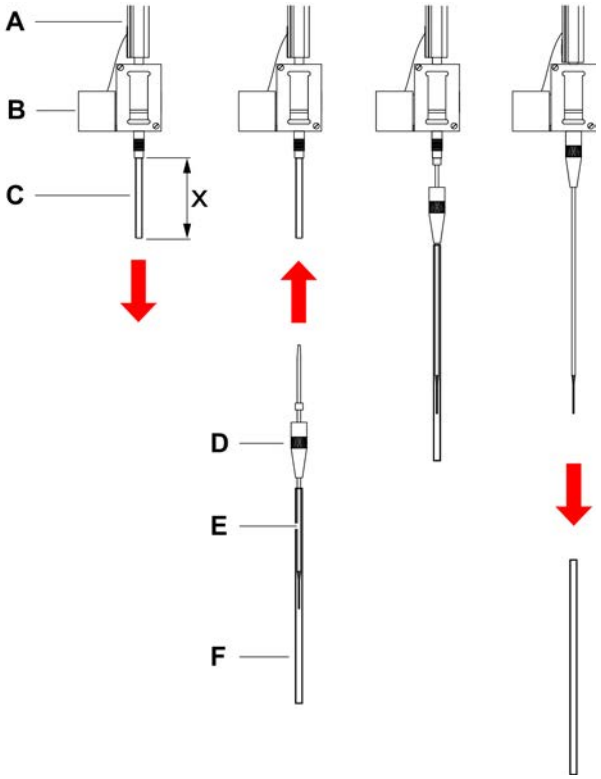


Fig. 64: Piercing tip installation

A	Z-rod	**B**	Tip adapter
C	Pipetting tubing	**D**	Lock nut
E	Piercing tip	**F**	Tip protection
x	25 mm (1 in.)		

To install piercing tips, proceed as follows:

✓ The instrument is switched off.
✓ A key operator is available.

1. Open the front safety panel.
2. Manually raise all the Z-rods to their uppermost position.
3. Move all the Z-rods towards the front of the instrument.
4. Spread the Z-rods as wide as possible.

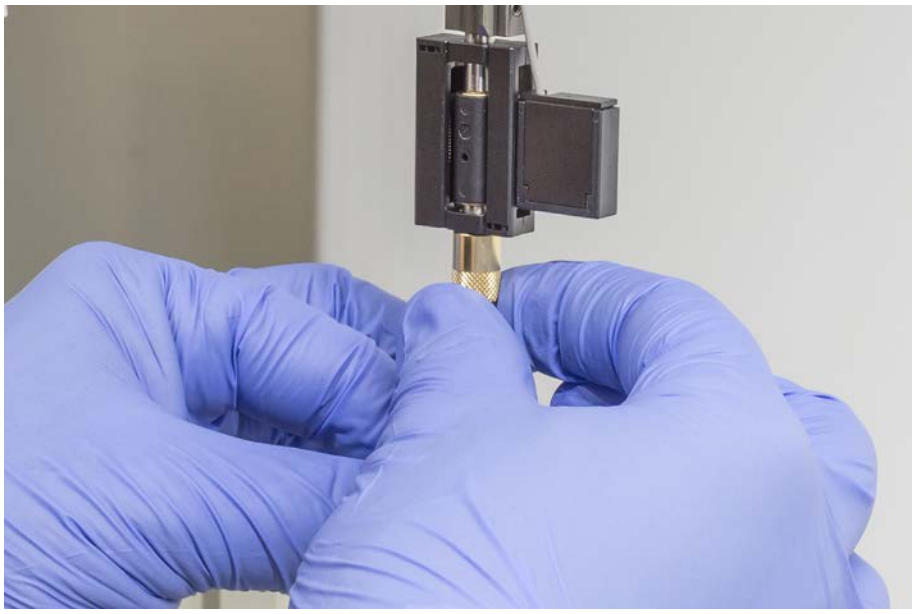
5. Open the piercing tip packaging.
   Do not remove the tip protection (F).

Installation order of the piercing tips: from back to front

6. Carefully pull the pipetting tubing approx. 25 mm out of the tip adapter.
7. Push the blank, conical end of the piercing tip into the tubing end.

8. Insert the piercing tip and the pipetting tubing in the tip adapter.

9. Screw the lock nut onto the tip adapter and tighten it by hand.



10. Open the lock nut slightly. Move the tip protection slightly down in order to access the piercing tip shaft. Do not completely remove the tip protection yet.
11. Turn the piercing tip until the tip opening faces the front side of the instrument. Keep the piercing tip in this orientation with one hand and tighten the lock nut with the other hand.
12. Check that all tip openings face the front side of the instrument.

13. After installing all piercing tips remove all tip protection. Start with the rearmost piercing tip.

14. Contact a key operator for resetting the counter in FluentControl.
15. Contact a key operator for performing a QC kit test. Refer to Reference Documents.
16. Run the **Piercing FCA Leakage** method.
17. Run a pipetting precision test (recommendation: use QC kit) as defined by the key operator.

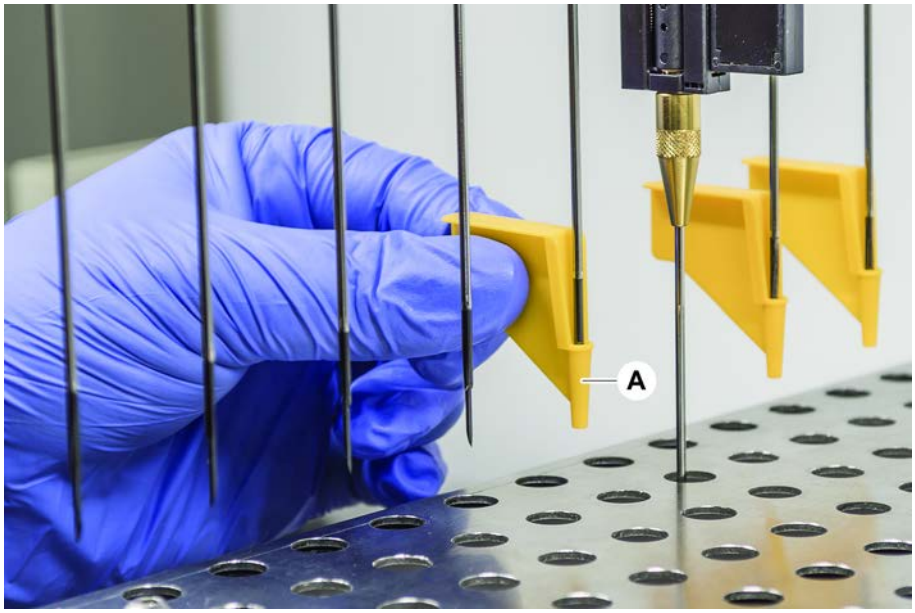
8.3.14 Retracting Stuck Piercing Tips

In case a piercing tip gets stuck so that it cannot be retracted with software commands, it has to be removed manually.

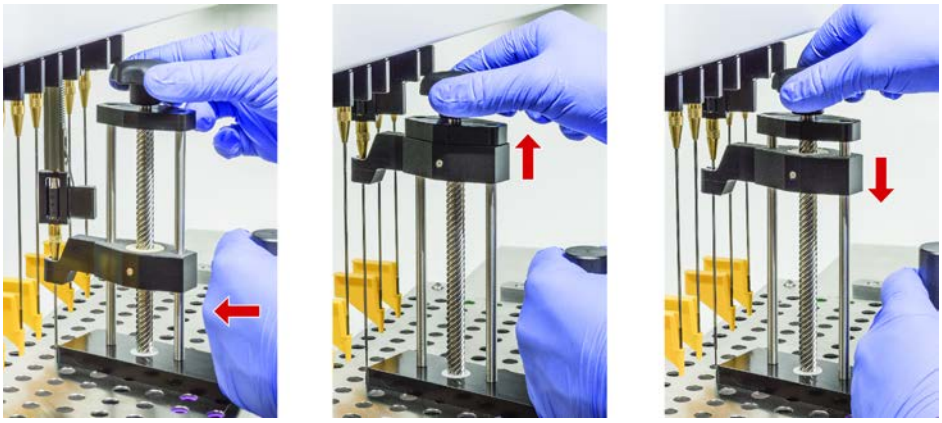
To retract stuck piercing tips, proceed as follows:

✓ The instrument is switched off.

1. Open the front safety panel.
2. Manually raise all retracted Z-rods to their uppermost position.
3. Cover all retracted piercing tips with piercing tip protections (A). Start with the rearmost piercing tip.



4. Place the piercing tip removal tool next to the stuck tip on a robust and stable surface and fit it under the lock nut.



5. Turn the knob of the piercing tip removal tool until the tip is completely retracted.
6. Turn the knob in the opposite direction and lower the retractor about 1 cm.
7. Remove the piercing tip removal tool.

   The stuck piercing tip is now retracted.
8. Clean the piercing tip removal tool with alcohol.
9. Check the piercing tip for any damage (e.g., bent piercing tip, damaged tip).
10. Replace the piercing tip if it is damaged. Refer to section “Removing Piercing Tips” [▶ 180] and section “Installing Piercing Tips” [▶ 183].
11. Remove all piercing tip protections by holding the lock nut with one hand and removing the tip protections with the other hand. Start with the rearmost piercing tip.
12. Clean the piercing tip removal tool with alcohol.

8.3.15 Checking Gripper Finger Alignment

Realignment of gripper fingers may be needed after a crash or when implementing spare Gripper Fingers. This applies to all arms using Grippers with Gripper Fingers.

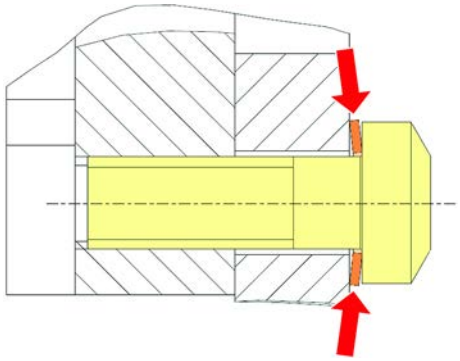
Misalignment after a crash:

- Analyze the situation.
- Evaluate potential causes of the crash or cause of the finger misalignment such as misaligned drawer of a reader, washer, incorrectly taught/positioned hotel or another segment.
- Select a procedure below on the basis of precision requirements.

1. If Gripper Fingers do not need to satisfy above-average precision, perform a basic alignment. Refer to section “Basic Gripper Fingers Alignment for FES Gripper Fingers” [▶ 189], or to section “Basic Gripper Fingers Alignment for Fixed Gripper Fingers” [▶ 190].
2. If Gripper Fingers must satisfy advanced requirements (Z-deviation < ±0.2 mm), perform the Advanced Gripper Finger alignment procedure. Refer to section “Advanced Gripper Fingers Alignment for FES Gripper Fingers” [▶ 191] or “Advanced Gripper Fingers Alignment for Fixed Gripper Fingers” [▶ 191].

3. The Gripper fingers can be mounted with two different screws:
a) Torx screw M4x12, tightened with a torque of 3 Nm.

b) Allen screw M4x12 in combination with a tension washer (observe position according to the illustration below), tightened with a torque of 3.5 Nm.



If no torque screwdriver is available, tighten screw until the washer is pressed flat and resistance increases. Then tighten $^{1}/_{12}$ rotation further. This corresponds to approx. 3.5 Nm.

8.3.16 Basic Gripper Fingers Alignment for FES Gripper Fingers

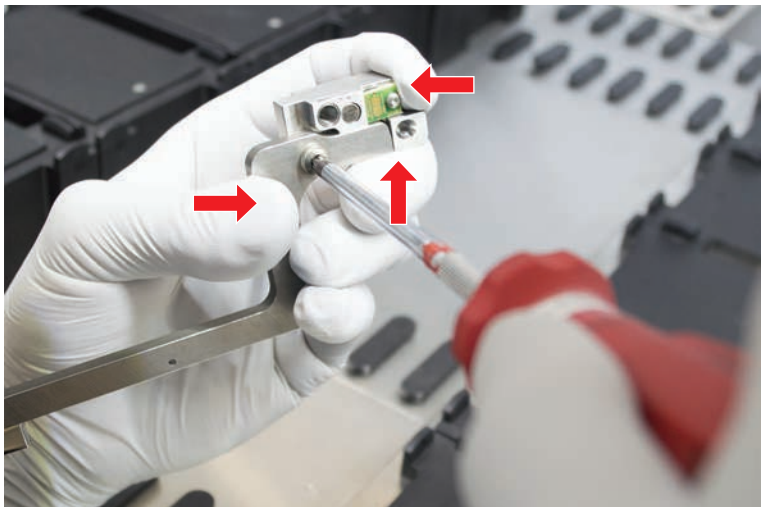
This applies to all arms using Grippers with Gripper Fingers.

For a basic alignment, proceed as follows:

- ✓ Misalignment is clearly visible.
- ✓ No above-average precision is required.
- ✓ Torque screwdriver available (with a 3 or a 3.5 Nm option).
If no torque screwdriver is available:
Torx screw: tighten the screws firmly but do not use excess force.
Allen screw: refer to “Checking Gripper Finger Alignment” [▶ 188].

1. Remove Gripper Finger from the gripper head.
2. Loosen the screw between Gripper Finger and FES finger adapter.

3. Press the Gripper Finger against the upper and the rear stop of the adapter as shown in the illustration below and tighten the screw with a torque screwdriver (3 or 3.5 Nm).

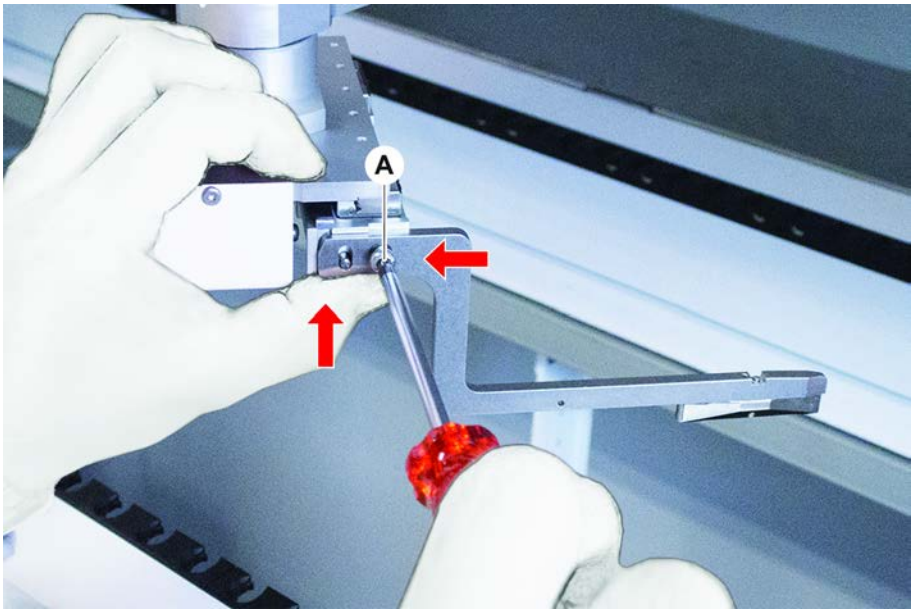


8.3.17 Basic Gripper Fingers Alignment for Fixed Gripper Fingers

For a basic alignment, proceed as follows:

- ✓ Misalignment is clearly visible.
- ✓ No above-average precision is required.
- ✓ Torque screwdriver available (with a 3 or 3.5 Nm option).

1. Loosen the fixing screw (A).



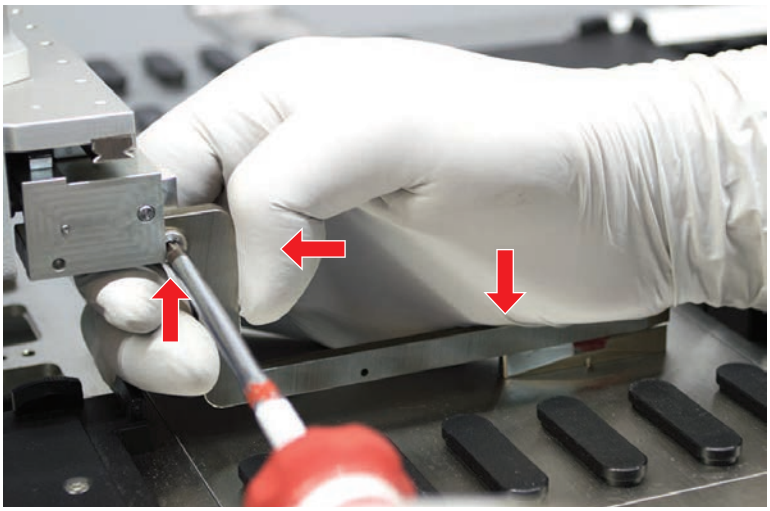
2. Press the Gripper Finger against the upper and the rear stop of the Gripper Head Mount and tighten the screw with a torque screw driver (3 or 3.5 Nm).

8.3.18 Advanced Gripper Fingers Alignment for FES Gripper Fingers

This applies to all arms using Grippers with Gripper Fingers.

✓ Torque screwdriver available (with a 3 or 3.5 Nm option).
If no torque screwdriver is available:
Torx screw: tighten the screws firmly but do not use excess force.
Allen screw: refer to “Checking Gripper Finger Alignment” [188].

1. Use the Move Tool to move the Z-height to a height of about 3 mm above the worktable.
2. Loosen the screw between the Gripper Finger and the FES finger adapter.



3. Ensure that the FES finger adapter is firmly connected to the gripper head.
   The finger adapters are held in place in one direction by a magnet.
4. Use the Move Tool to move the Z-height to a height of 0 mm above the worktable.
   Move slowly for the last tenth of a millimeter.
   Note: If you do not know how to access or operate the Move Tool, contact your key operator.
5. Press the Gripper Finger against the gripper head and the reference surface as shown in the illustration and tighten the screw with a torque of 3 or 3.5 Nm.
6. Check the adjustment by rotating the head to 90°, 180°, 270°, by hand. A misalignment at the different positions indicates a misalignment of the head or the arm. In this case, an FSE needs to check the alignment.

8.3.19 Advanced Gripper Fingers Alignment for Fixed Gripper Fingers

✓ Torque screwdriver available (with a 3 or 3.5 Nm option).

1. Use the Move Tool to move the Z-height to a height of about 3 mm.
2. Loosen the screw between the Gripper Finger and the gripper head.

3. Use the Move Tool to move the Z-height to a height of 0 mm.
   Move slowly for the last tenth of a millimeter.
   Note: If you do not know how to access or operate the Move Tool, contact your key operator.
4. Press the Gripper Finger against the gripper head and the reference surface and tighten screw with a torque of 3 or 3.5 Nm.
5. Check the adjustment by rotating the head to 90°, 180°, 270°, by hand. A misalignment at the different positions indicates a misalignment of the head or the arm. In this case an FSE needs to check the alignment.

8.3.20 Checking Segment

Check that segment is closed.

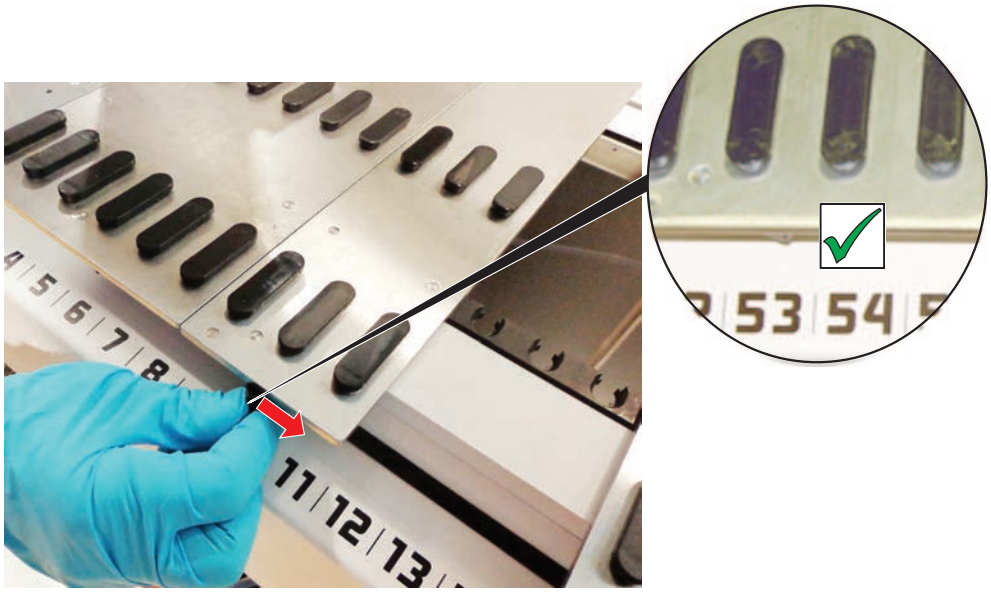


Fig. 65: Segment closed

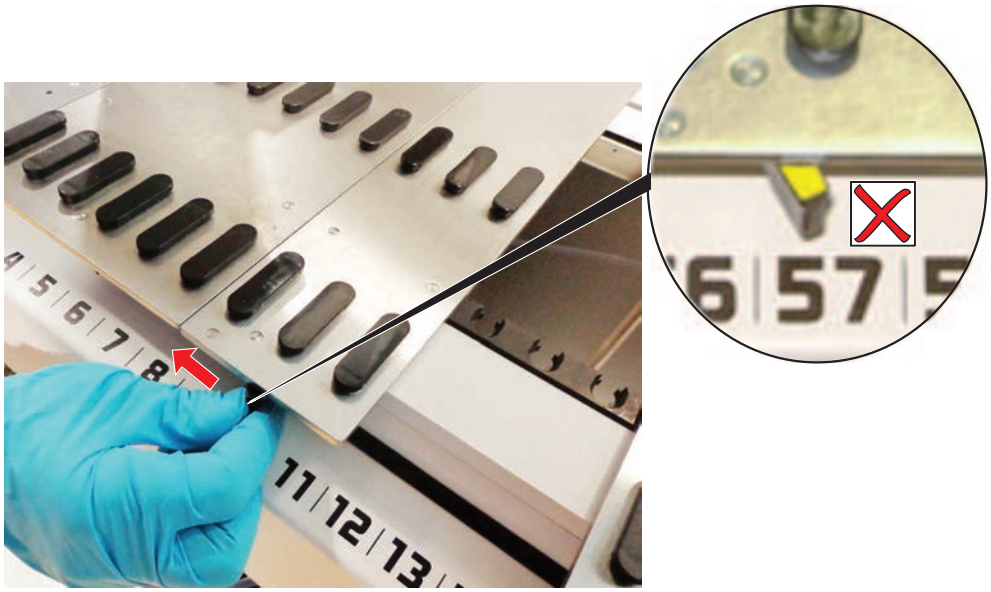


Fig. 66: Segment open

8.3.21 Removing Positioning Pins

To remove positioning pins, proceed as follows:

NOTICE

Crash or process error!

Crash and other process error can be a result of inaccurate positioning of elements on a deck segment due to loose positioning pins.

- Do not operate the Fluent when positioning pins are missing.

✓ Positioning pins are broken.

1. Slide the pin remover over positioning pin.

2. Lift the pin remover handle and pull the pin out of the deck segment.

8.3.22 Replacing Lock Pins and Positioning Pins

NOTICE

Crash or process error!

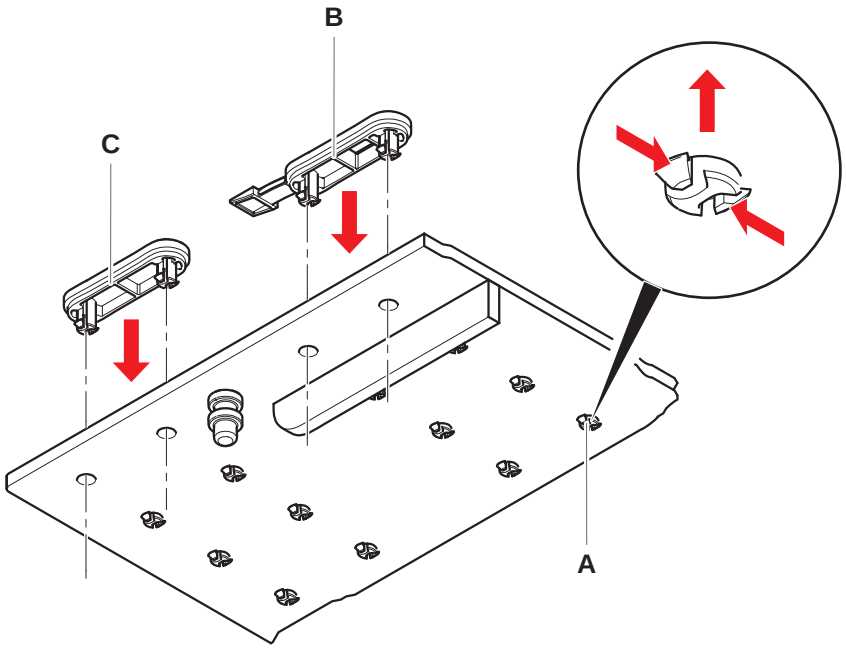
Crash and other process error can be a result of inaccurate positioning of elements on a deck segment due to loose positioning pins.

- Do not operate the Fluent when positioning pins are missing.

✓ Positioning pins indicated in the system care table are available.

1. Remove segment from the deck:
   Refer to section Remove Segment.
2. Press the new lock pin (B) in the hole (A).

3. Press the new positioning pin (C) in the hole (A).



4. Place segment on the deck:
   Refer to section Place Segments.

9 Packing, Unpacking, Transport, Storage and Disposal

This chapter includes regulatory information about recycling and packaging labels that must be followed.

NOTICE

Prevent damage by unqualified and unauthorized personnel!

Packing, unpacking, transport and storage may only be performed by Tecan personnel or personnel authorized by Tecan!

- Please consult the “Customer Support” [▷ 200].

For information about moving the instrument, refer to section “Moving the Instrument on a Cabinet within the Laboratory” [▷ 132].

9.1 Packaging Labels

Correct and complete marking of packaging helps to prevent incorrect handling, accidents, incorrect delivery, loss of weight and damage during storage.

Tab. 51: Packaging symbols

Symbol	Meaning	Description
	Recycle	The packaging material can be recycled. Do not dispose of as domestic waste. Information on the material used for this packaging is provided beneath the symbol.
	This side up	Ensure that the package is transported and stored with the top side, indicated by the arrows, uppermost. Do not topple over.
	Keep dry	Ensure that the package does not get wet during transport and storage.
	Fragile	Handle the package with care. There are fragile goods inside.
	Keep away from sunlight	Ensure that the package will not be exposed to heat during transport and storage. Protect against strong sunlight.
	Do not stack	Do not stack packages. The package is not designed to carry extra weight.

9.2 Disposal

This section includes regulatory information about recycling that must be followed.

NOTICE

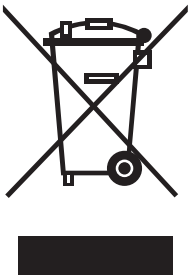
Recycling in accordance with applicable legal regulations!

Observe the laws applicable in your country for recycling.

9.2.1 Local Requirements European Union

The European Commission has released the Directive on Waste Electrical and Electronic Equipment (WEEE; 2012/19/EU).

Since August 2005, producers have been responsible for taking back and recycling electrical and electronic equipment.

Marking	Explanation
	Negative environmental impacts associated with the treatment of waste. • Do not treat electrical and electronic equipment as unsorted municipal waste. • Collect waste electrical and electronic equipment separately.

9.2.2 Local Requirements People's Republic of China

Marking for the Restriction of the Use of Hazardous Substances in Electronic and Electrical Products

The People's Republic of China Electronic Industry Standard SJ/T11364-2014 **Marking for the Restriction of the Use of Hazardous Substances in Electronic and Electrical Products** requires the marking for the restriction of the use of hazardous substances in electronic and electrical products.

In accordance with the requirements specified in SJ/T11364-2014, all electronic and electrical Tecan products sold in the People's Republic of China are labeled with a marking for the restriction of the use of hazardous substances.

Marking	Explanation
	This marking indicates that this electronic product contains certain hazardous substances and can be safely used during the environment-friendly use period, but it shall enter the recycling system after the environment-friendly use period.

9.2.3 Other Requirements

Marking	Explanation
	This lamp contains mercury • Recycle or dispose of as required by applicable local laws.

10 Customer Support

This chapter explains which files and information Tecan requires to perform a first assessment of an issue.

10.1 Contacts

Please contact your local distributor or importer or one of the addresses below.

Also see our homepage on the web: www.tecan.com

Tab. 52: Customer Support contacts

Country/Region	Address	Telephone/Telefax/E-mail	
Australia New Zealand Pacific Islands	Tecan Australia Pty Ltd Unit 2, 475 Blackburn Road Mount Waverly VIC 3149 Australia	Phone Phone Fax E-mail	Toll Free: 1300 808 403 +61 3 9647 4100 +61 3 9647 4199 helpdesk-aus@tecan.com
Austria	Tecan Sales Austria GmbH Untersbergstrasse 1a 5082 Grödig Austria	Phone Fax E-mail	+43 6246 8933 256 +43 6246 72770 helpdesk-at@tecan.com
Belgium	Tecan Benelux B.V.B.A. Mechelen Campus Schaliënhoevedreef 20A 2800 Mechelen Belgium	Phone Fax E-mail	+32 15 42 13 19 +32 15 42 16 12 tecan-be@tecan.com
Denmark	Tecan Denmark, Filial af Tecan Nordic AB, Sverige Lejrvej 29 3500 Værløse Denmark	Phone E-mail	+46 8 7503940 info-dk@tecan.com
France	Tecan France S.A.S.U Tour Swiss Life 1 bd Marius Vivier Merle F- 69 003 Lyon France	Phone Fax E-mail	+33 4 72 76 04 80 +33 4 72 76 04 99 helpdesk-fr@tecan.com
Germany	Tecan Deutschland GmbH Werner-von-Siemens-Straße 23 74564 Crailsheim Germany	Phone Fax E-mail	+49 1805 8322 633 or +49 1805 TECAN DE +49 7951 9417 92 helpdesk-de@tecan.com

Country/Region	Address	Telephone/Telefax/E-mail	
Italy	Tecan Italia, S.r.l. Via Brescia, 39 20063 Cernusco Sul Naviglio (MI) Italy	Phone Fax E-mail	+39 800 11 22 91 +39 (02) 92 72 90 47 helpdesk-it@tecan.com
Netherlands	Tecan Benelux B.V.B.A. Industrieweg 30 NL-4283 GZ Giessen Netherlands	Phone Fax E-mail	+31 20 708 4773 +31 183 44 80 67 helpdesk.benelux @tecan.com
Scandinavia	Tecan Nordic AB Sveavägen 159, 1tr SE-113 46 Stockholm Sweden	Phone Fax E-mail	+46 8 750 39 40 +46 8 750 39 56 info@tecan.se
Spain Portugal	Tecan Ibérica Instrumentación S.L. C/ Lepanto 151 Bajos E-08013 Barcelona Spain	Phone E-mail	+34 93 595 25 31 helpdesk-sp@tecan.com
Switzerland	Tecan Schweiz AG Seestrasse 103 8708 Männedorf Switzerland	Phone Fax E-mail	+41 44 922 82 82 +41 44 922 89 23 helpdesk-ch@tecan.com
United Kingdom	Tecan UK Ltd. Theale Court 11-13 High Street Theale, Reading, RG7 5AH United Kingdom	Phone Fax E-mail	+44 118 930 0300 +44 118 930 5671 helpdesk-uk@tecan.com

Abbreviations

ADT
Air Displacement Technology

Air FCA
Flexible Channel Arm with air system

ASM
Application Software Manual

CE
Conformité Européenne

cLLD
Capacitive Liquid Level Detection

CNS
Common Notification System

DiTi
Disposable Tip

EMC
Electromagnetic Compatibility

EN
European Norm

FCA
Flexible Channel Arm

FES
Finger Exchange System

FSE
Field Service Engineer

GLP
Good Laboratory Practice

HEPA
High-Efficiency Particulate Arrestance

IEC
International Electrotechnical Commission

IQ
Installation Qualification

ISO
International Organization for Standardization

LED
Light Emitting Diode

Liquid FCA
Flexible Channel Arm with liquid system

MCA
Multiple Channel Arm

MCA
Multiple Channel Arm

MCH
Multiple Channel Head

MET
Registered mark of Eurofins EE as a Nationally Recognized Testing Laboratory

MIO
Monitored Incubators Option

MP
Microplate

NRTL
Nationally Recognized Test Laboratory

OM
Operating Manual

OQ
Operating Qualification

PC
Personal Computer

PP
Polypropylene

rcf
relative centrifugal force

RF
Radio Frequency

RGA
Robotic Gripper Arm

RGA long Z
Robotic Gripper Arm long height

RGA standard Z
Robotic Gripper Arm standard height

RUO
Research Use Only

RWP
RapidWash Pump

SN
Serial Number

Te-Shake
Tecan Shaker

Te-VacS
Tecan Vacuum Separator

USB
Universal Serial Bus

WEEE
Waste Electrical and Electronic Equipment