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Tosoh Automated Glycohemoglobin Analyzer

HLC-723GR01

**Laboratory Automation System
Operator's Manual**

Rev. B

REF

0024750 Tosoh Automated Glycohemoglobin Analyzer HLC-723GR01

0024751 Tosoh Automated Glycohemoglobin Analyzer HLC-723GR01LA

TOSOH CORPORATION

BIOSCIENCE DIVISION

Introduction

About this manual

- This Operator's Manual is designed to ensure that you can operate the Tosoh Automated Glycohemoglobin Analyzer HLC-723GR01 (STD model or LA model) safely and correctly when connecting it to and operating it with a Laboratory Automation System (LAS) [beltline, line controller (LC), etc.].
- This manual describes only the settings and operations of the HLC-723GR01 for the purpose of LAS operation, and should be read in conjunction with the HLC-723GR01 Operators' Manual (hereinafter referred to as "GR01 Operator's Manual").
- Keep this manual in an easily accessible location for reference purposes.
- Users must strictly adhere to all safety precautions outlined in this manual.
- Should you notice any discrepancies, errors or omissions in the information provided, you are requested to immediately notify Tosoh local representatives.
- The copyright of this manual belongs to Tosoh Corporation. This manual may not be copied, modified, or disclosed to third parties, in whole or in part. However, this does not apply to copying a part only for personal use other than commercial transactions.
- This manual is subject to change without prior notification.

Contacting us

- To request system inspection, repair, or other services, or if you have any questions about the operating procedures or other matters, please contact Tosoh local representatives.

Readers of this manual

- Facility manager: personnel responsible for the management of clinical laboratories or the HLC-723GR01
- Quality control manager: personnel who perform regular quality control
- Operator: personnel who perform maintenance or daily check, and analysis using the HLC-723GR01.

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- Trademark symbols such as (R) and TM may be omitted from system names and product names in this manual.

Indications in This Manual

Safety notes

The information displayed using “DANGER”, “WARNING”, “CAUTION”, and “NOTICE” signs in this manual are provided for the purposes defined below.



DANGER

Indicates a hazard with a high level of risk which, if not avoided, could result in death or serious injury.



WARNING

Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.



CAUTION

Indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.

NOTICE

Indicates no risk of injury, but a hazard with a medium level of risk which, if not avoided, could result in damage or malfunction to the system or equipment.

Supplementary explanations and references are described as shown below.

Note

- Describes useful things to know when using the analyzer.

Reference

- Describes the items to be referred to.

Use Period, Supply Period, and Warranty

Design-based standard use period of the HLC-723GR01

7 years after installation (self-certification based on in-house data)

- The design-based standard use period means an expected period during which the product can be used safely under the normal conditions (with regular replacement of consumables and regular maintenance), in strict accordance with the Operator's Manual.
- The analyzer may deteriorate over time earlier than the expected standard use period depending on the frequency and operating environment.
- If signs of malfunction appear, immediately shut down the analyzer, and contact Tosoh local representatives even before the standard use period has not passed.

Regular maintenance

Every 20,000 tests or once a year

Supply period of service parts

7 years after the end of sale

Warranty

Any customer modification to the system renders the warranty or service agreement null and void.

For conditions of warranty, contact Tosoh local representatives or refer to your warranty contract partner.

Operating system support

This system is equipped with Windows OS. Although the end-of-support date of the Windows OS is announced by Microsoft Corporation, you can continue to use the system with the installed whitelist-based security software even after the Windows OS is no longer supported. For information about the security software, please contact Tosoh local representatives.

Applicable Instruments

Analyzer

- Tosoh Automated Glycohemoglobin Analyzer HLC-723GR01 (0024750)
(Hereinafter referred to as “STD model”)
- Tosoh Automated Glycohemoglobin Analyzer HLC-723GR01LA (0024751)
(Hereinafter referred to as “LA model”)

Sample Loader

- 90 Sample Loader GR-90SL (0024752)
 - * The sample loader cannot be installed when the GR01 is connected to the SYSMEX transportation system (front-side beltline system).
 - * Sample loaders other than the GR-90SL cannot be used when the GR01 is connected to a beltline system.

You must use the analyzer, sample loader, column, elution buffers, and Hemolysis & Wash solution, filter element, suction filters, optional accessories, consumables and other service parts (Refer to the GR01 Operator’s Manual) dedicated to the HLC-723GR01.

When installing (including connecting to/disconnecting from the LAS), relocating, and disposing of the system, contact Tosoh local representatives.

Tosoh cannot be held liable for any consequences arising from the use of non-specified reagents, components, and accessories or deviations from the descriptions in this manual and the GR01 Operator’s Manual.

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1

Safety Precaution (Transport System)

1.1 Precautions

1.1.1 Installation



WARNING

Connect the power cable to the 2-pin socket with a ground terminal.

- Failure to properly ground the analyzer is a potential source of electric shock.
- Grounding the analyzer helps to prevent system malfunctions due to noise.

Firmly insert the power plug seated in the socket.

Use only a sufficiently rated power cable.

If dust or dirt is attached to the blades or blade mounting part, unplug the power cable, and remove dust or dirt.

Observe the following precautions when handling the power cable:

- Do not stretch the power cable.
- Do not bend the power cable by force.

When unplugging the power cable, be sure to hold the plug.

When using an extension cable, select an extension cable with sufficient capacity and a ground terminal.

- Mishandling may cause fire or electric shock.

Do not install the system in the following locations:

- Locations with rapid temperature changes
- Locations exposed to direct air flow
- Locations with a lot of dust or dirt
- Locations with excessive vibration
- Unstable locations
- Locations with high humidity
- Locations where water may splash
- Near flames
- Narrow spaces with poor ventilation
- Locations where strong magnetic fields or high frequencies may be generated

Do not connect the analyzer ground line to gas pipes, water pipes, lightning rods, or telephone system ground line.

- Gas pipes can ignite fires and cause explosions.
- Water pipes are not effective grounds.
- Lightning rod and telephone lines are potential sources of danger when lightning strikes.

Do not modify the power cable, or do not use a power distribution adapter.

Do not plug or unplug the power cable with wet hands.

- This may cause fire and electric shock.

Design the structure so that users can never access the back of the instrument. (LA model)

- Touching the sampling needle tip may cause injury.
-

NOTICE

Be sure to connect the analyzer to a power supply with a sufficiently high-power rating free of voltage fluctuations.

- Significant fluctuations in voltage may cause fire.

1.2 Precautions for use

1.2.1 Handling of specimens

WARNING

When handling infectious materials such as specimens, be sure to wear the proper protective clothing (goggles, gloves, mask, etc.).

- When handling infectious materials such as specimens, waste liquid, and calibrators, or when replacing the column, filter element or sampling needle, be sure to wear the proper protective clothing (goggles, gloves, mask, etc.) to prevent infection.
- The used columns, filter elements, sampling needles, sample cups, and waste tank are contaminated by blood. When handling them, be sure to wear the proper protective clothing (goggles, gloves, mask, etc.).
- Dispose of them as medical waste in accordance with the relevant laws and regulations to protect the surrounding environment.

1.2.2 General handling

WARNING

Keep the covers and doors closed during operation.

- The interior of the analyzer contains high-speed moving parts, high-temperature components, and high-voltage circuits. Foreign objects or fingers and hands can easily get pinched or caught in the mechanisms, or can cause burns or electric shock, resulting in personal injury.

Do not shut down or start the analyzer by simply unplugging or inserting the power plug.

- This may cause fire and electric shock.
- Always use the main power switch located on the left side of the analyzer.

Do not touch the analyzer with wet hands.

- This may cause electric shock.

Place reagent containers only in designated locations.

- If the reagents are spilled out into the analyzer, it may cause short-circuit or electric shock.

Do not disassemble or modify the analyzer.

- This may cause fire and electric shock.

CAUTION

Be sure to turn off the analyzer before replacing the sampling needle.

- If the analyzer is operated with its main power turned on, it may damage the analyzer or result in injury.

CAUTION

Avoid opening covers and inserting fingers or any foreign object into operating mechanism.

- The interior of the analyzer is comprised of motor-driven components that operate at high-speeds. Foreign objects or fingers and hands can easily get pinched or caught in the mechanisms, resulting in injury.
-

NOTICE

Use only storage media (USB memory stick, etc.) whose safety has been confirmed.

- A virus-infected storage device (USB memory stick, etc.) may result in damage or malfunction to the system or equipment.
-

Connect the storage medium (USB memory stick, etc.) only to a PC whose safety has been confirmed.

- If the storage medium is connected to a virus-infected PC, analysis results stored in the storage medium may be leaked to the internet.
-

Implement security measures against malware.

- When connecting the instrument to an open network, implement sufficient security measures for PCs or server devices used for connection to the internet or other external network.

If no security measures are available, never connect the instrument to an open network. (Open network refers to a network that is directly or indirectly connected to the internet or other external network.)

- Anti-virus software used as a security measure may affect the performance of the controller. Before installing the software, check the details.
-

1.3 Maintenance

For daily maintenance, perform “6.1.1 Daily maintenance (p.46)” before every analysis.
For regular maintenance, contact Tosoh local representatives.

1.4 Electromagnetic waves

This analyzer complies with the EMC standard, IEC61326-2-6:2020 (professional healthcare facility environment). However, this does not guarantee that harmful electromagnetic waves are not generated in any installation environment. It is recommended to evaluate the electromagnetic environment before use of the analyzer.

Electromagnetic interference is generated under certain conditions, such as when the analyzer is not installed or used in accordance with the Operator’s Manual or when a non EMC-compliant device is used, possibly causing malfunction of the analyzer or other peripheral instruments. If the analyzer causes harmful electromagnetic interference to another instrument or is affected by harmful electromagnetic interference caused by another instrument, take the following measures.

- Change the direction or installation location of the analyzer.
- Move the device causing electromagnetic interference away from the analyzer.
- If the analyzer shares its power source with the device causing electromagnetic interference, connect the power cable to a separate power source.

1.5 Batteries

The European Battery Directive requires separate collection of spent batteries to facilitate recycling and protect the environment.

The system contains built-in batteries, which are not intended for the operator to replace or remove. Only a Tosoh representative or a qualified individual may remove the batteries in the system at the end of the life of the analyzer and may dispose of them in accordance with local regulations for separate collection of spent batteries.



WARNING





Improper handling of batteries can cause explosion or fire.

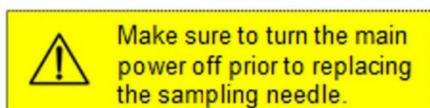
- Do not remove or disassemble batteries.

1.6 Caution labels

Caution labels are applied in locations on the analyzer which require particular attention during operation or handling. Check the contents of the caution labels to use the system safely. If the caution labels become difficult to read due to stain or tears, contact Tosoh local representatives for replacement labels. Replacement labels will be provided.

 WARNING	
Biohazard label	Description
	<p>Biohazard label (column oven, line filter, sampling needle, waste port, waste tank)</p> <ul style="list-style-type: none"> • Take the utmost care to prevent exposure to biohazard materials. • Improper handling may cause infection. • The column, the line filter and the sampling needle, the waste port and the waste tank can be contaminated by samples. Do not touch the column, line filter, sampling needle and waste tank with unprotected hands. Wear the proper protective clothing (gloves). • Empty the waste container regularly to avoid spill-over.

 CAUTION	
Caution label	Description
	<p>Caution label (sampling needle)</p> <ul style="list-style-type: none"> • Take the utmost care to prevent general hazards • Be sure to turn off the main power switch when replacing the sampling needle. • If the auto sampler operates during sampling needle replacement, it may cause damage to the analyzer or may cause injury.
	<p>Caution for high temperature (inside printer)</p> <ul style="list-style-type: none"> • Take the utmost care when touching inside the printer • Do not touch the thermal head of the internal printer when changing the roll paper of the internal printer.
	<p>Caution label for hazard to sharp objects (sampling needle): LA model only</p> <ul style="list-style-type: none"> • Touching the tip of the needle may cause injury. • Do not put your hand in the gap between the beltline and the analyzer.



Caution label (sampling needle)

- Take the utmost care to prevent general hazards.
- Be sure to turn off the main power switch when replacing the sampling needle.
- If the auto sampler operates during sampling needle replacement, it may cause damage to the analyzer or may cause injury.

1.7 What to do in case of an emergency

1.7.1 If a failure occurs

WARNING

Immediately shutdown the analyzer, and unplug the power plug when the problem (such as burning smell, malfunction, or severe degradation of the analyzer) occurs.

- Continuing to operate the analyzer that is still malfunctioning may cause electric shock or fire.

Contact Tosoh local representatives.

If eluent leaks, stop the operation, and unplug the power plug.

- Wear the proper protective clothing (goggles, gloves, mask, etc.), wipe off the eluent, and stop the leakage after making sure of no leakage in tube connections.
- Contact Tosoh local representatives when the leakage cannot be stopped.
- Elution buffer or Hemolysis & Wash solution leakage may cause fire, electric shock or corrosion.

1.7.2 If an earthquake, a power outage, or a fire occurs

WARNING

Immediately shutdown the analyzer, and unplug the power plug.

- Before restarting the analyzer, check for exterior damage, connect the power plug to the appropriate power source, and turn on the analyzer.

1.7.3 If a serious incident occurs and incident reporting

Any serious incident that has occurred in relation to the analyzer should be reported to the manufacturer and the regulatory authority (e.g. EU competent authorities) in the country where the user and/or patient is established.

WARNING

Immediately shutdown the analyzer, and unplug the power plug.

Contact Tosoh local representatives and the regulatory authority.

1.8 Relocation of the analyzer

WARNING

Contact Tosoh local representatives.

- This product uses human-derived specimens, so it may have been contaminated by infectious substances.

1.9 Disposal of the analyzer

WARNING

Contact Tosoh local representatives.

- This product uses human-derived specimens, so it may have been contaminated by infectious substances.

2

Overview

2.1 Inspecting parts

The HLC-723GR01 (LA model) comes with the following accessories. Check that all the items are included. Refer to the GR01 Operator's Manual for the accessories provided with the STD model and sample loader.

2.1.1 Main unit (LA model)

<input type="checkbox"/> Specimen Transport System Operator's Manual (CD-R)	1
<input type="checkbox"/> Operator's Manual (CD-R)	1
<input type="checkbox"/> Power cable for the main unit (2 m)	1
<input type="checkbox"/> Waste tank (10 L).....	1
<input type="checkbox"/> Waste tube (silicone, 9 mm ×1.6 m).....	1
<input type="checkbox"/> Cable tie CV-150.....	5
<input type="checkbox"/> Cross slot screwdriver (100 mm).....	1
<input type="checkbox"/> Sample Cup	20
<input type="checkbox"/> Printer paper roll	1 roll
<input type="checkbox"/> System USB memory stick	1
<input type="checkbox"/> Elution buffer holder.....	1
<input type="checkbox"/> Bottle cap (4 L).....	1
<input type="checkbox"/> Barcode label for controls.....	6 sheets (2 sheets x 3 levels)
<input type="checkbox"/> Adapter for controls	6
<input type="checkbox"/> Accessory box.....	1
<input type="checkbox"/> Security software End User License Agreement (EULA).....	1
(included in the packaging box only when the software has already been installed at the shipment)	

NOTICE

All the provided items can be used only for HLC-723GR01. Do not use them items for other instruments.

- If not, the system may not operate properly, or may be damaged.
-

2.1.2 Consumables and optional accessories (sold separately)

- Column, reagents
- Consumables

Refer to the GR01 Operator's Manual.

- Optional accessories

Part No.	Product Name	Description
0016320	Waste tank	10 L
0023274	SYSMEX sample rack (without adapter)	1
0018433	Adapter for SYSMEX sample rack (13 mm)	10
0018496	Adapter for SYSMEX sample rack (12 mm)	10
0018497	Adapter for SYSMEX sample rack (14 mm)	10
0024848	Adapter for control	2
0024847	Handheld barcode scanner (USB)	1
0024846	Laser BCR with attachment	1
0023932	LED signal tower kit for G11	1 set
0024772	Buffer Switching Unit for GR	1 set
0024337	Printer	1 set
0023295	Tosoh Data Management Program 501RP+	1 set
0024852	Handheld barcode scanner holder	1
0019594	Barcode Reader for LAS	1
0024858	Front panel for beltline*1	1
0024860	Fixing plates for beltline*2	1 set

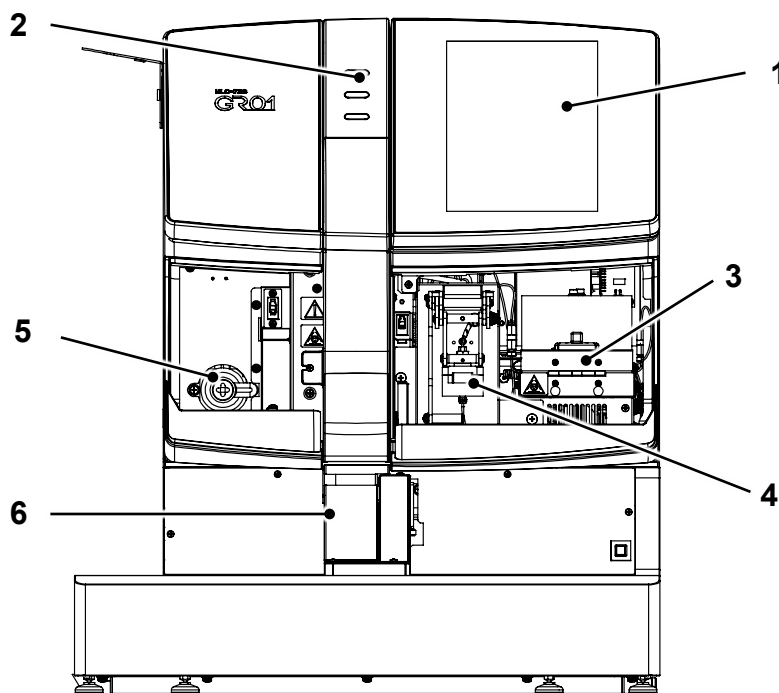
Note

- Some optional accessories are not available or some of their specifications may be different depending on the countries and areas.
 - *1 The front panel for beltline is required when the GR01 is operated with the SYSMEX transportation system (front beltline).
 - *2 The Fixed plates for beltline cannot be used with some LAS or bench. In such cases, please prepare separately.

2.2 Units and functions

Front view (STD model / LA model)

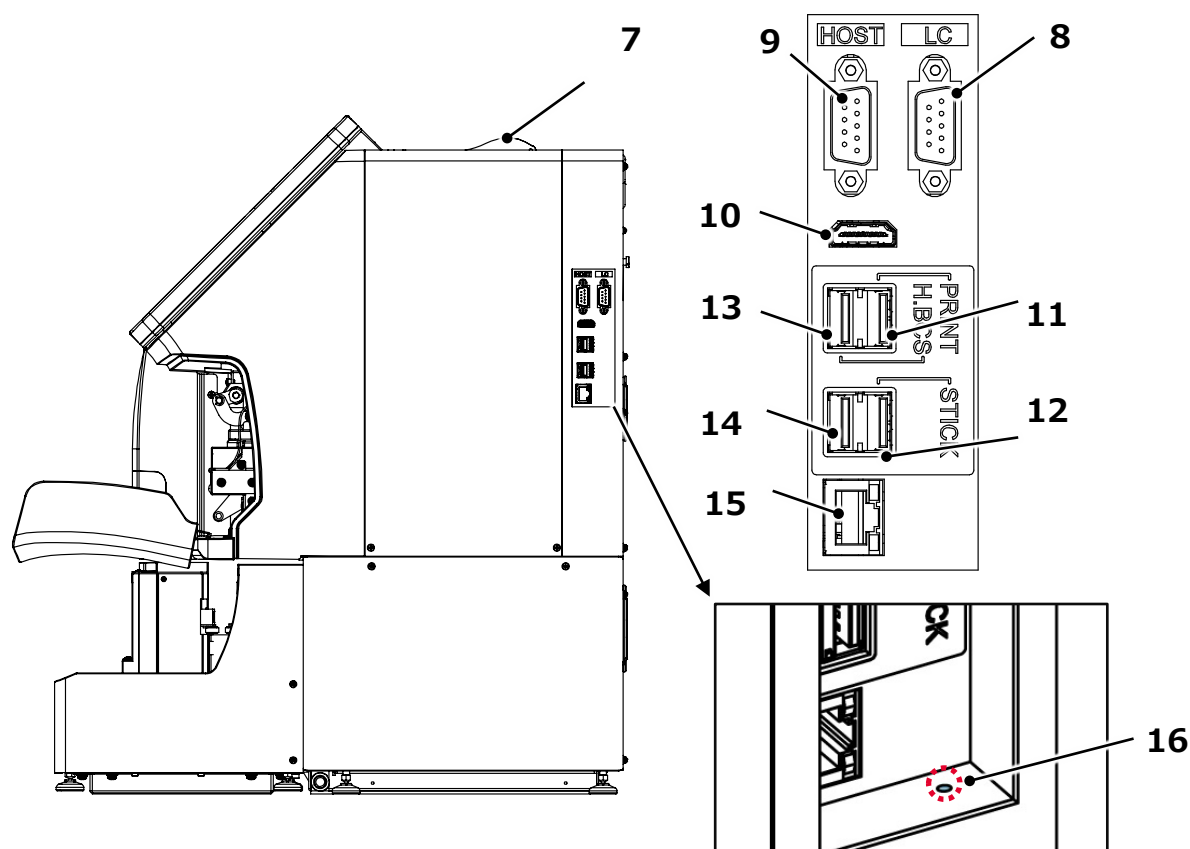
*The illustration shows the STD model with GR-90SL.



No.	Name	Function
1	Operation panel	The operation panel is a color LCD with touch keys. The angle of the operation panel can be adjusted.
2	LED panel	The LED panel shows the analyzer status with 3 colors of LEDs. POWER (green): lights up when the instrument is turned on. RUN (blue): lights up when analysis is in progress. ERROR (red): lights up when an error occurs; goes off when the error is reset.
3	Column oven	The column oven contains the column, an essential component for analysis. The column oven is controlled at about 25°C.
4	Line filter	The line filter contains the filter element.
5	Drain valve	In case where air bubbles enter the pump, open the drain valve to expel the bubbles.
6	STAT port	The STAT port cannot be used when a beltline system is connected to the GR01.

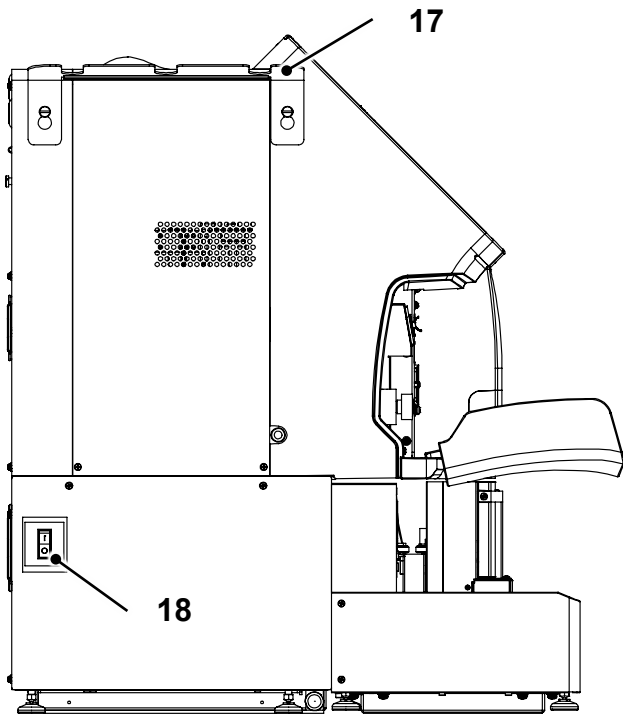
Right side view (STD model / LA model)

* The illustration shows the STD model.

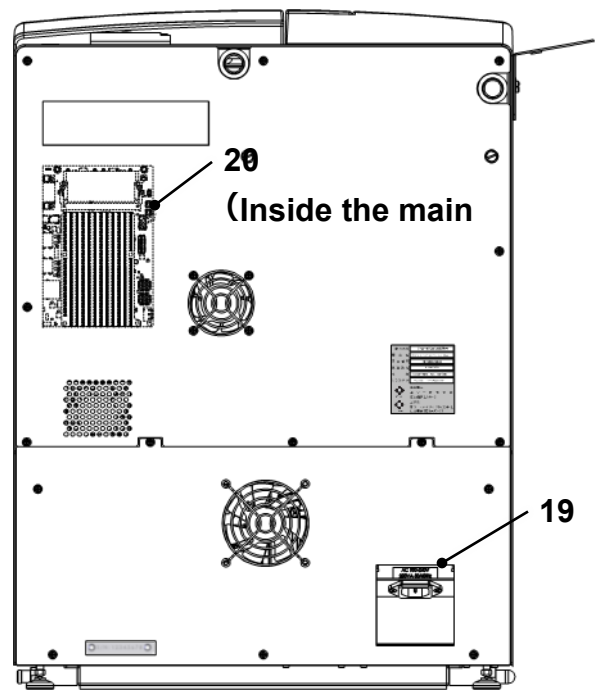


No.	Name	Function
7	Printer	This is a thermal printer, used to print analysis results, etc.
8	LC port	This port is used to connect the GR01 to the SYSMEX transportation system. Do not connect any communication cables other than the SYSMEX system.
9	HOST port	This port is used to connect a data communication cable.
10	HDMI port	Not used.
11	USB printer port (PRINT)	This port is used to connect the external printer.
12	USB memory stick port (STICK)	This port is used to connect the system USB memory stick or a USB memory stick for storing analysis results. An encrypted USB memory stick or a password-protected USB memory stick cannot be used with this instrument. An exFAT-format USB memory stick is recommended to store analysis results.
13	Handheld barcode scanner port (H.B.C.S)	This port is used to connect the handheld barcode scanner.
14	USB port	Not used.
15	LAN port	Not used.
16	Reset switch	This button is used to reset the PC unit. Push the button with a sharp object such as a ballpoint pen (only for use in an emergency).

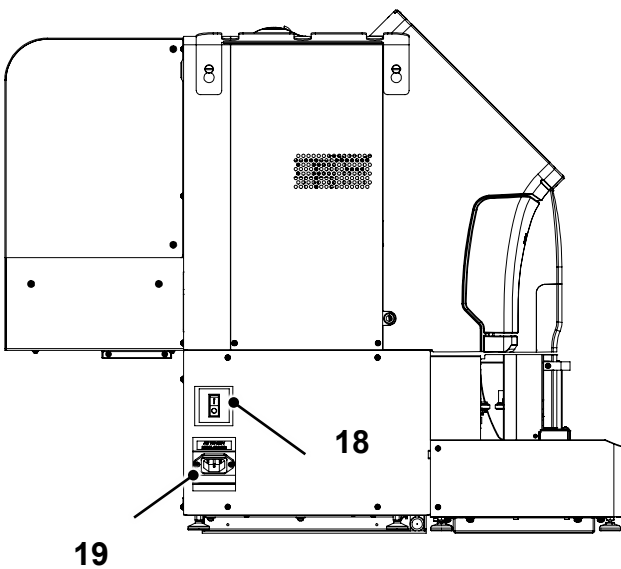
Left side view (STD model)



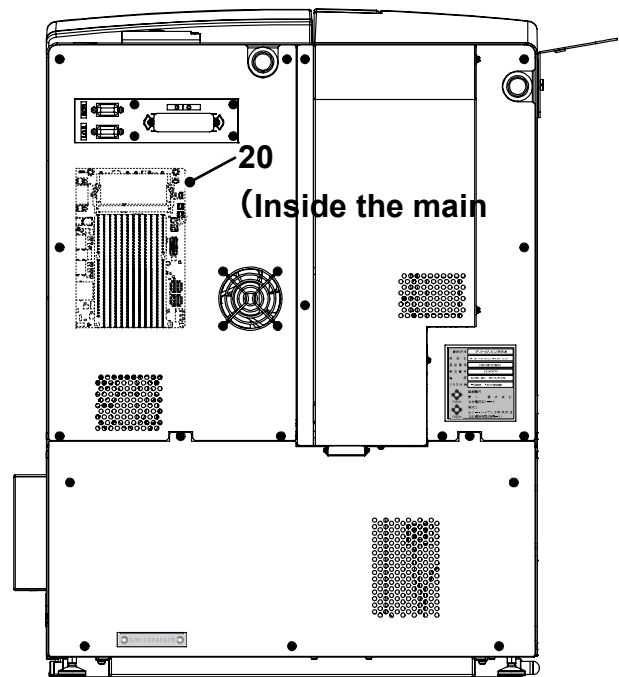
Rear view (STD model)



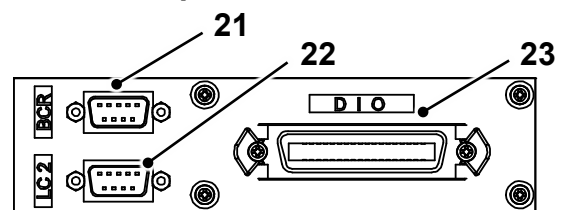
Left side view (LA model)



Rear view (LA model)



Connector panel



No.	Name	Function
17	Elution buffer holder	This holder is used to hang elution buffer aluminum bags. It can be attached also to the back of the instrument.
18	Main power switch	This main power switch serves as a breaker for overcurrent protection.
19	AC inlet	This inlet is used to connect the provided power cable.
20	PC unit	A Windows PC is built in the instrument. The PC is equipped with an uninterruptible power supply (UPS) system for data protection.
21	BCR port (connector panel)	This port is used to connect the optional Barcode Reader for a LAS to a beltline.
22	LC2 port (connector panel)	This port is used to connect a line controller.
23	DIO port (connector panel)	This port is used to connect a LAS.

3

Installation and Management

3.1 Installation

3.1.1 Installation

Only a Tosoh service engineer or personnel who have received maintenance training will install, deliver the instrument, and connect to/disconnect from the laboratory automation system (LAS) [beltline, line controller (LC), etc.].

3.1.2 Installation environment

Install the instrument on the flat table in an environment free from harmful gas, dust, and vibration, and not exposed to water, direct sunlight, or wind.

Operate the instrument under the conditions indicated below:

Operating environment

Temperature	15 to 30°C
Humidity	30 to 80% (No condensation)
Overvoltage category	Category II
Pollution degree	Level 2
Dust	Ordinary office level
Altitude	2,000 m or less
Other	Indoor use

Power supply

Voltage	AC100 to 240 V ($\pm 10\%$)
Frequency	50/60 Hz
Max. current	3.6 A



CAUTION

Use the power cable with sufficient capacity.

- The power consumption of the HLC-723GR01 (STD / LA model) is 250 VA.

NOTICE

Do not use the instrument in an environment subject to rapid temperature changes.

- Rapid temperature changes may result in condensation, causing electrical leakage or operation failure of the instrument.

3.1.3 Storage and transportation environment

Store or transport the instrument under the conditions indicated below.

Storage and transportation environment

Temperature	0 to 50°C
Humidity	80% or less (No condensation)
Other	Keep dry. Store indoors.

3.1.4 Installation space

Do not block the fans on the right (only for LA model) and back of the instrument.

Ensure the operation space for turning off the main power switch or disconnecting the power cable.

3.2 Connection

3.2.1 Waste tube/waste tank

Adjust (or cut) the waste tube to an appropriate length (5 m or less), and insert the waste tube fully into the waste tank so that it will not be bent.

Do not place any objects on the waste tube.

Place the waste tank at a position equal to or lower than the installation surface of the instrument.

CAUTION

Place the waste tank on a flat and stable surface.

- If the waste tank falls over, the waste liquid may spill out.
- Use a container such as a liquid receiving tray together with the waste tank.

Note

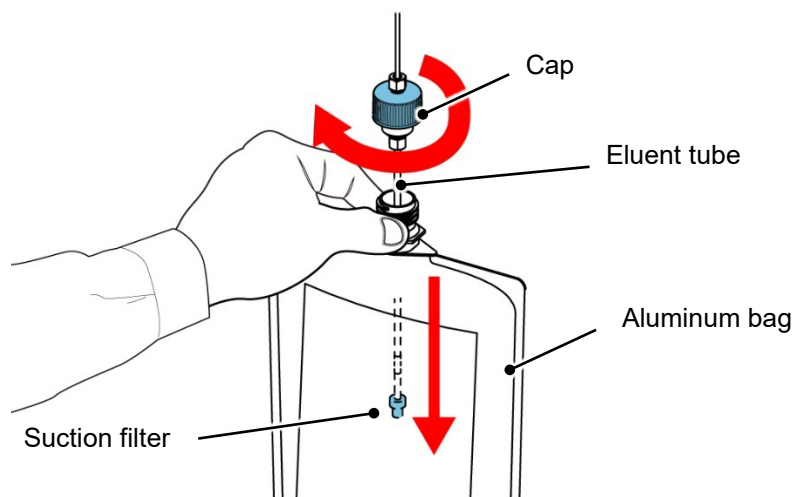
- If the waste tube is bent, the waste liquid may not drain out smoothly. If the waste tube is lifted, it may trigger the waste liquid sensor, which will stop the analysis.
- The waste liquid is forced to be drained out by the pump, possibly causing bubbles in the waste liquid.

3.2.2 Eluent tube

While matching the color of the cap (with the eluent tube) with the label color of the Elution Buffer No. 1, 2, or 3 for GR01, insert each eluent tube into the aluminum bag of the corresponding elution buffer, and tightly close the cap. A suction filter is connected to the end of each eluent tube to prevent foreign matter from entering the instrument flow path.

When opening/closing the bottle cap, hold the plastic part as shown below.

Elution Buffer No. 1	Light green
Elution Buffer No. 2	Pink
Elution Buffer No. 3	Orange

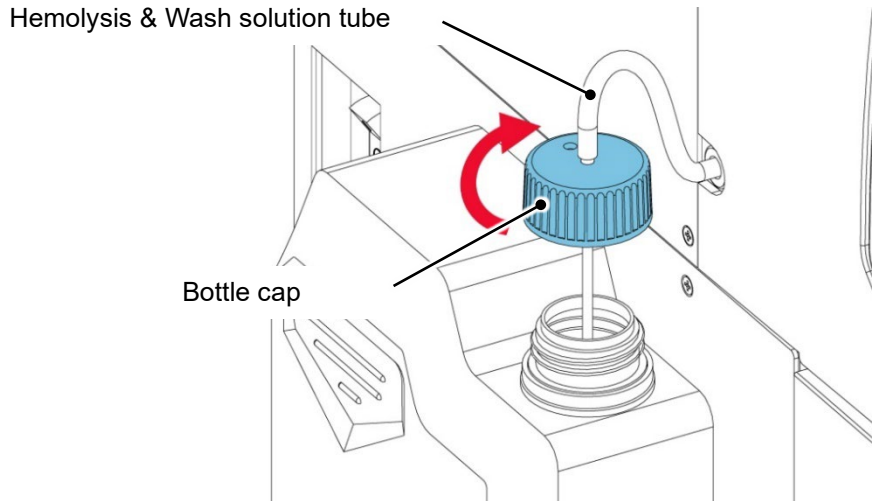


Note

- If the tube is bent, the tube end may not reach the bottom of the aluminum bag. Be sure to connect the tube after straightening any bends with hands.
- Before closing the cap, squeeze the aluminum bag to remove as much air as possible from the upper part of the aluminum bag.
- If the bottle cap is not firmly closed, the eluent may be degraded. It will be difficult to visually recognize the remaining volume of eluent because the aluminum bag will not deflate as the eluent decreases.

3.2.3 Hemolysis & Wash solution tube

Open the bottle cap of the Hemolysis & Wash solution bottle, insert the Hemolysis & Wash solution tube (with the anchor and the bottle cap) coming from the left side of the instrument, and then close the bottle cap. Check that the anchor reaches the bottom of the bottle. When using the Hemolysis & Wash Solution (LL), also change the bottle to the provided bottle cap for 4 L bottle, and change the H/W bottle setting on the analysis settings screen.



Note

- When changing the size of the Hemolysis & Wash solution bottle, also change the bottle cap.

3.2.4 Power supply

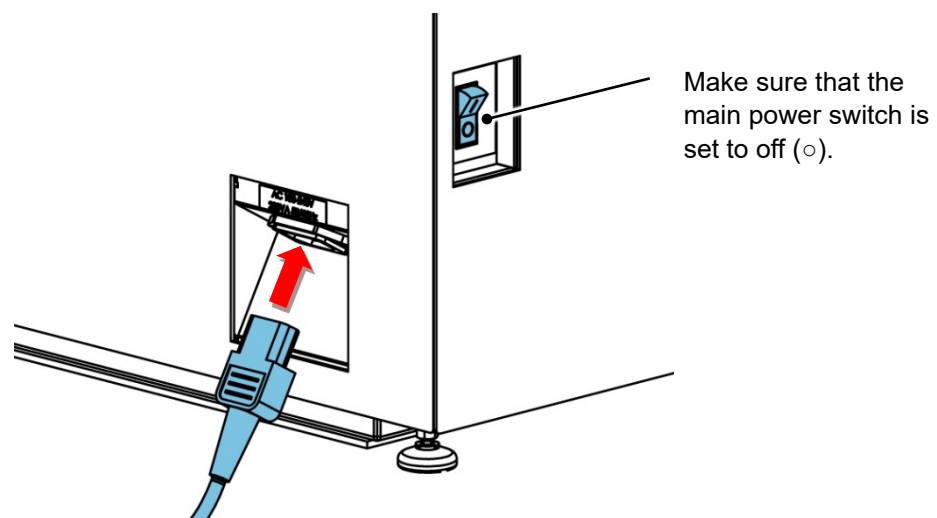
Connect the provided power cable securely to the AC inlet of the main unit.

Make sure that the main power switch is set to off (○), and then connect the power plug into the socket.

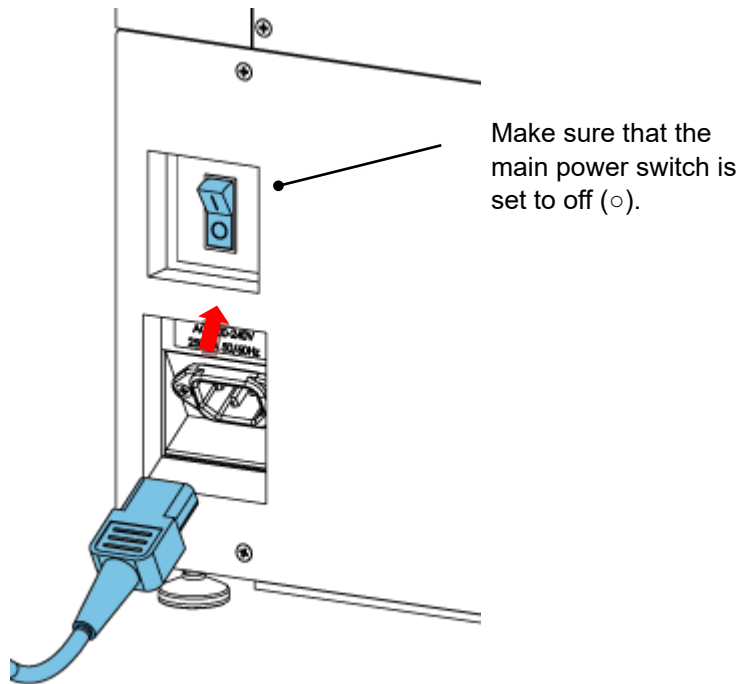
Note that the main power switch position is different between the STD and LA models.

A power source requires the capacity over 10 A and 2-pin socket with a grounding terminal.

STD model

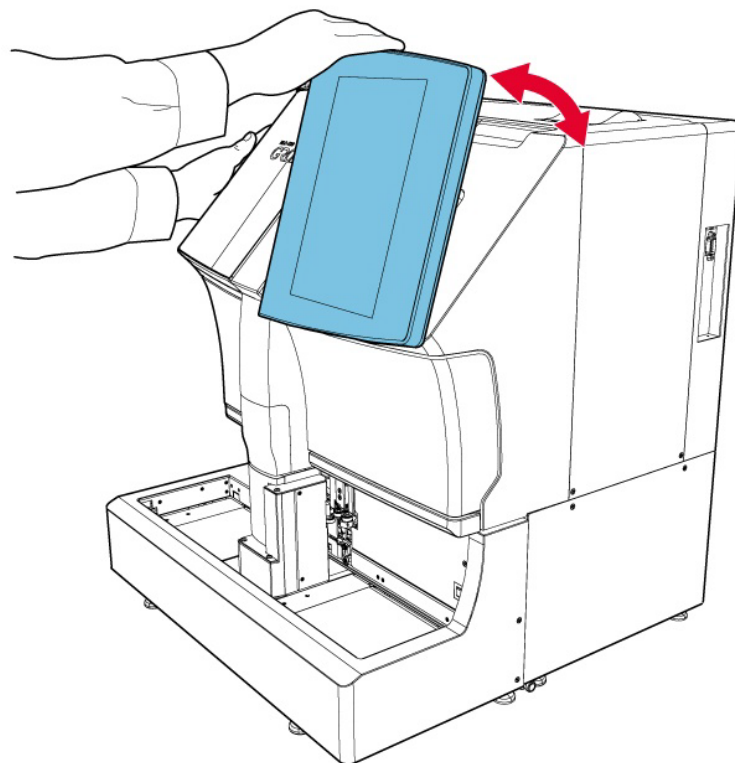


LA model



3.3 Adjusting the Angle of the Operation Panel

The angle of the operation panel can be adjusted to an easily viewable angle as necessary. To adjust the angle, hold the instrument with your left hand, grab the upper part of the operation panel with your right hand, and then move the operation panel slowly.



3.4 Column

To replace the column, refer to “6.4.4 Replacing the column” in the GR01 Operator’s Manual.

Note

- The column oven is controlled at about 25°C so that the potential fluctuating room temperature does not affect analysis results. The temperature of the column oven is always controlled unless the main power switch is turned off, making it possible to start analysis without waiting for the column to reach the right temperature.

3.4.1 Precautions for use of the column

- Read the Instruction For Use (IFU) of the column carefully before use.
- If the column is stored in a refrigerator, be sure to let it return to room temperature before use.
- Always use the TSKgel GR01 in combination with the GR01 Elution Buffers of the identical lot number. The column lot number is indicated by a single uppercase alphabetical character (A, B, etc.) on the label of the column packaging box. The Elution Buffer label displays an alphabetic character corresponding to the column lot number as shown below.



3.5 Beltline setting

NOTICE

The connection to a LAS must be set up by Tosoh service engineer or personnel who have received maintenance training.

If any of the following situations occur, or if you wish to change the setting parameters, contact Tosoh local representatives.

- When changing the laboratory automation system or specifications of the laboratory automation system
- When changing the sample container for calibrators on the beltline
- When changing the sample container for controls on the beltline
- When changing the sample container on the beltline for normal operation (e.g., from the host-dependent setting to the test tube setting)
- When changing the specimen type on the beltline for normal operation (e.g., from the host-dependent setting to the whole blood setting)
- When changing the setting of whether or not to send a query to the host computer for specimens on the beltline

There are two main beltline settings with the GR01, for the STD line settings and SYSYMEX line settings.

When using a SYSMEX transportation system, refer to “For SYSYMEX line”.

When using a LAS system of another manufacturer, refer to “For STD line”.

However, special settings may be required depending on the specifications of the LAS.

3.6 Communication with the line controller

NOTICE

The connection to the line controller must be set up by Tosoh service engineer or personnel who have received maintenance training.

3.6.1 Communication specifications

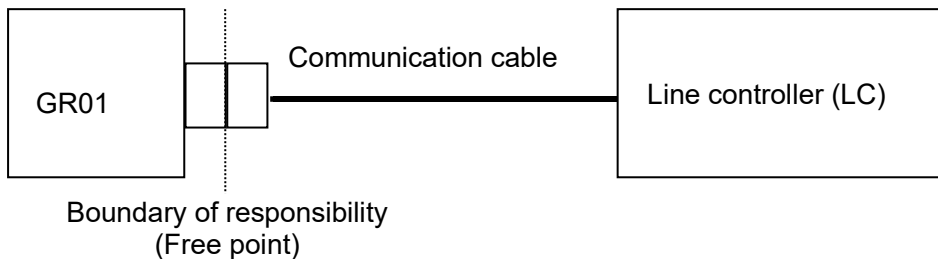
For STD line

Item	Specifications
Transmission method	RS-232C, asynchronous
Transmission rate	4800 bps
Transmission code	ASCII
Data length	7 bit
Parity	Even
Stop bit	1 bit

For SYSMEX line

Item	Specifications
Transmission method	RS-232C, asynchronous
Transmission rate	1200 bps
Transmission code	ASCII
Data length	7 bit
Parity	Even
Stop bit	2 bit

3.6.2 Connection



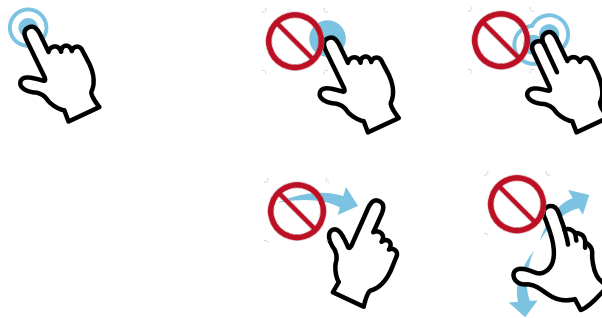
4

Operation Screen (LAS)

The screens may change depending on the analysis mode of the GR01. In this manual, the screens in standard analysis mode are used.

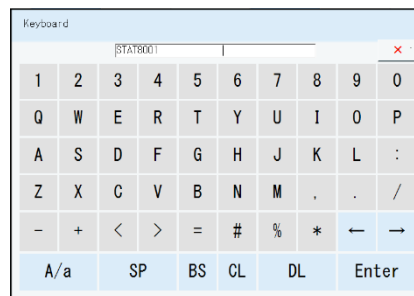
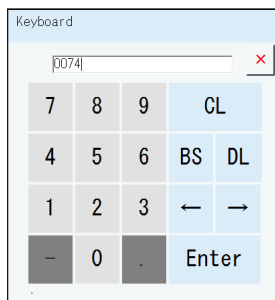
4.1 Operating the screen

To operate the screen of the operation panel, touch (single-tap) the screen with your finger. Double-tapping, swiping, long-tapping, multi-tapping, and pinching are not supported. It can be operated with vinyl-gloved hands; however, it may not be operated properly depending on the material or thickness of the gloves.



4.2 Entering characters and numbers

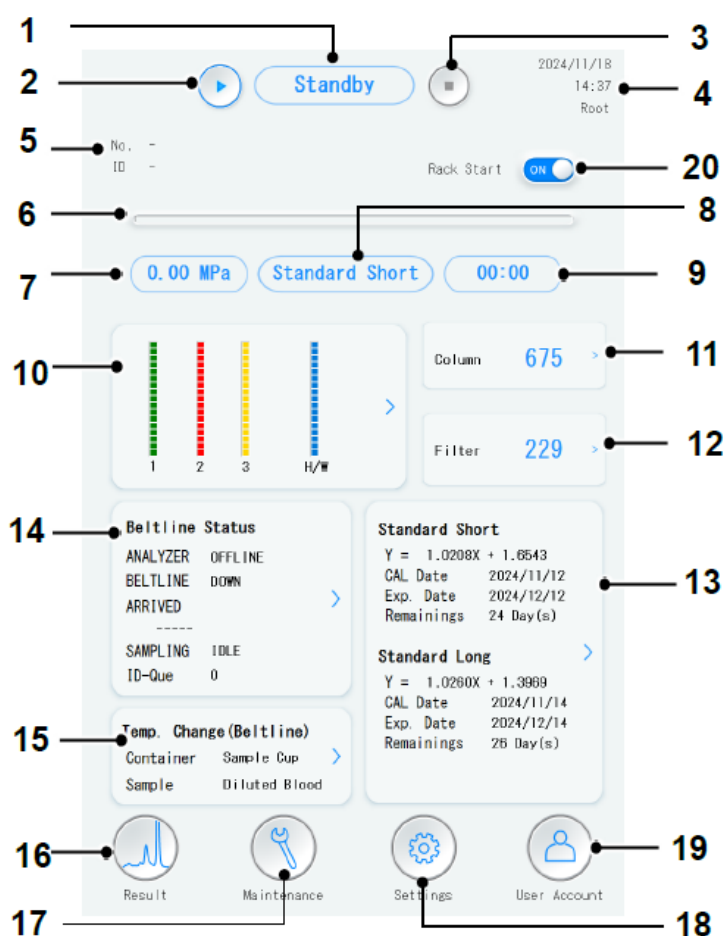
To enter a characters and numbers, use a screen keyboard. The screen keyboard appears automatically when necessary. There are 2 types of screen keyboards:







Button	Description	Button	Description
CL	Clears the content of the field.	BS	Deletes one character before the cursor.
DL	Deletes one character after the cursor.	←/→	Moves the cursor back and forth.
A/a	Switches between uppercase and lower case.	SP	Inserts a space (blank).
Enter	Fixes the entered text.		Closes the screen keyboard. The entered text is not confirmed.






4.3 Main screen (for LAS connection)

When a LAS is connected, the main screen for LAS connection appears first after the instrument is turned on and then a user is logged on.



No.	Button/Display	Description
1	Analyzer status	Shows the analyzer status. For details of the analyzer status, refer to “4.4 Analyzer status (p.32)”.
2	Sample loader analysis start button 	Tap to start the analysis of specimens on the sample loader. This button is not displayed when the SYSMEX transportation system is connected. Specimens on the sample loader are given priority for analysis over samples on the beltline.
3	Analysis stop button 	Tap to stop the analysis immediately, or to stop warming up and wash. When the analysis is stopped, the analysis results of the sample for which sampling or suction is in progress cannot be obtained.
4	Date and time/logon user	Shows date at the top row, time at the middle row, and logon user name at the bottom row. When no user is logged on, “No User” is displayed.

No.	Button/Display	Description
5	Sample information	Shows the information of the sample for which analysis is in progress. "No." indicates the analysis No. (sample No.), and "ID" indicates the sample tube barcode information or the sample rack and sample position information.
6	Progress bar	Shows the progress of operation or analysis. The progress bar is reset each time an analysis is completed.
7	Pressure	Shows the current system pressure.
8	Analysis mode	Shows the specified analysis mode (in the standby state) or current analysis mode (during analysis).
9	Remaining time	Shows the remaining time until the operation such as warming up or current analysis is completed.
10	Remaining reagent volume information/ Reagent replace button	Shows the remaining volumes of elution buffers and Hemolysis & Wash solution. When the button is tapped, the reagent replacement screen appears.
11	Column count/ Column replace button	Shows the usage count of the column that is currently in use. When the button is tapped, the column replacement screen appears. When the column count exceeds the specified count, the  mark appears.
12	Filter element count/ Filter element replace button	Shows the usage count of the filter element that is currently in use. When the button is tapped, the filter element replacement screen appears. When the filter element count exceeds the specified count, the  mark appears.
13	Calibration information/ Calibration reserve button	Shows the current calibration information. When the button is tapped, the calibration reservation screen appears.
14	Beltline connection status information/ Beltline connection status settings button	Shows the information on the GR01 status [ANALYZER], beltline connection status [BELTLINE], sample ID at the sampling position [ARRIVED], sampling status [SAMPLING], and the number of pending samplings (notified) [ID-QUE]. For details, refer to "4.5.1 Beltline connection status display (p.33)". When the button is tapped, the belt line connection status settings screen appears. For details, refer to "4.5.2 Beltline connection status screen (p.34)".

No.	Button/Display	Description
15	Temporary information/ Temporary setting button	Shows the information when a sample container or sample type is temporarily specified for a sample on the beltline. When the button is tapped, the temporary setting screen appears. For details, refer to "4.6 Temporary setting screen (p.35)".
16	Result button 	Tap to move to the result screen. When a flag is attached to the analysis result, or when the QC data is out of the control range, the  mark appears.
17	Maintenance button 	Tap to move to the maintenance screen.
18	Settings button 	Tap to move to the settings screen.
19	User Account button 	Tap to move to the user account screen.
20	Rack Start switch	Select whether to enable/disable automatic rack start. With the [Rack Start] switch set to [ON], when a sample rack is loaded at the front right of the sample loader, the sample rack is detected and then analysis is started automatically. (This button is not displayed when the GR01 is connected to SYSMEX transportation system or when the [Rack Rotation] switch is set to [ON].)

Note

When a transfer system is connected, the STAT button is not displayed and STAT measurement cannot be performed.

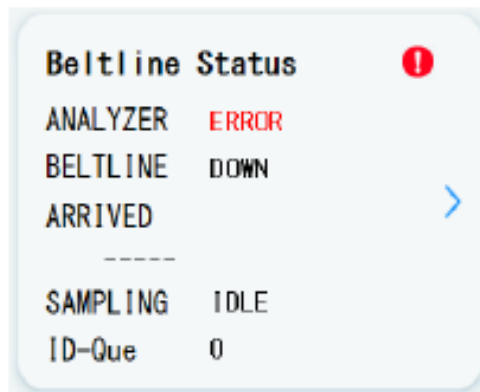
4.4 Analyzer status

The analyzer status is displayed. Some operations such as checking the analysis results and changing settings are not available when the analyzer status is other than "Standby".

Status display	Description
Warming up	Appears when the instrument is turned on. Initialization (warming up) is performed.
Standby	Appears when the instrument is ready for any operations including analysis.
Analysis	Appears when analysis is in progress or when the instrument is preparing for analysis.
Wash	Appears during wash operation after analysis is completed.
Priming	Appears during priming operation.
Air Removal	Appears during air removal operation.
Line Wash	Appears during line wash.

4.5 Beltline connection status information

4.5.1 Beltline connection status display

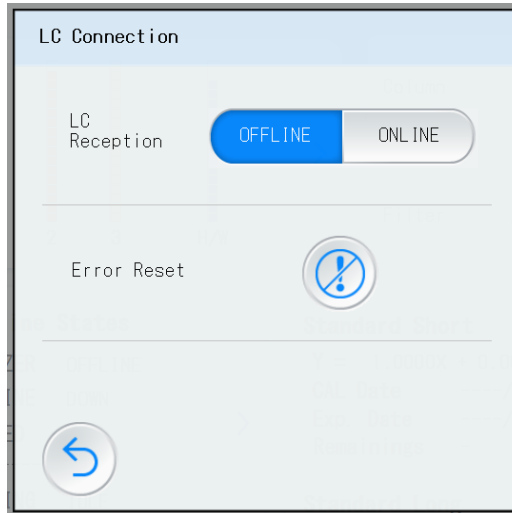



Item	Description
ANALYZER	Shows the GR01 status for the LAS. ONLINE: Ready to accept specimens on the beltline OFFLINE: Unable to accept specimens on the beltline ERROR: Error on the GR01 (Unable to accept specimens on the beltline)
BELT LINE	Shows the LAS status for the GR01 CONNECT: Connection with the LAS established (Ready to accept specimens on the beltline) DOWN: No response or no connection signal from the LAS (Unable to accept specimens on the beltline) ERROR: Error on the LAS (Unable to accept specimens on the beltline)
ARRIVED	Shows the latest sample ID of the specimen arriving at the sampling position on the beltline.
SAMPLING	Shows the sampling status on the GR01 IDLE: State of waiting for a specimen on the beltline for sampling REQUEST: State of requesting sampling for a specimen on the beltline EXECUTE: Sampling is in progress for a specimen on the beltline. PASS: Sampling has been skipped for a specimen on the beltline. COMPLETE: Sampling is completed for a specimen on the beltline. ERROR: A sampling error has occurred for a specimen on the beltline.
ID-Que	Shows the number of pending samplings (notified).

4.5.2 Beltline connection status screen

To switch the connection status of the GR01 for the LAS and to reset an error on the GR01, perform the LC connection settings.

Tap the beltline connection status button on the main screen, and then the LC Connection screen appears.

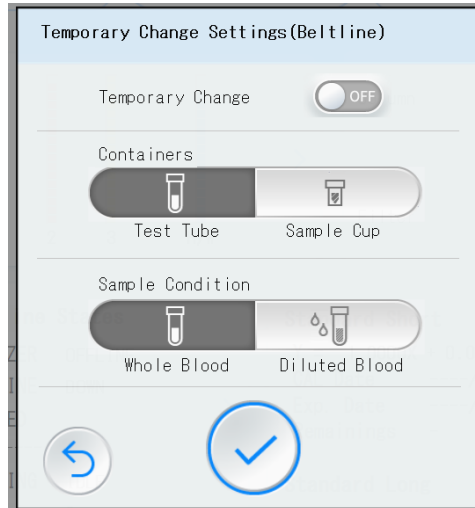


Button/Display	Description
[LC Reception] buttons	Select whether to accept specimens on the GR01 from the LAS. ONLINE: Set to accept specimens on the beltline. OFFLINE: Set to NOT accept specimens on the beltline.
[Error Reset] button	Tap to reset the error on the GR01 and to clear the ERROR indication for beltline connection. When an error occurs, always tap this button after removing the cause of the error. See “5.4 Communication connection with the LAS” for details. Note that this button is different from the confirmation button  on the error history screen.

4.6 Temporary setting screen

Set to temporarily specify (fix) the sample container or sample type for specimens on the beltline.

Tap the temporary setting button on the main screen, and then the temporary setting screen appears.



Button/Display	Description
[Temporary Change] switch	Set the switch to [ON] to temporarily specify the sample container or specimen type.
[Sample Container] buttons	Tube: Tap to select the test tube. Cup: Tap to select the sample cup.
[Sample Condition] buttons	Select [Whole Blood] or [Diluted Blood].

CAUTION

Do not analyze sample cup specimens when [Tube] is selected for [Sample Container]. To return to the normal operation, set the [Temporary Change] switch to [OFF].

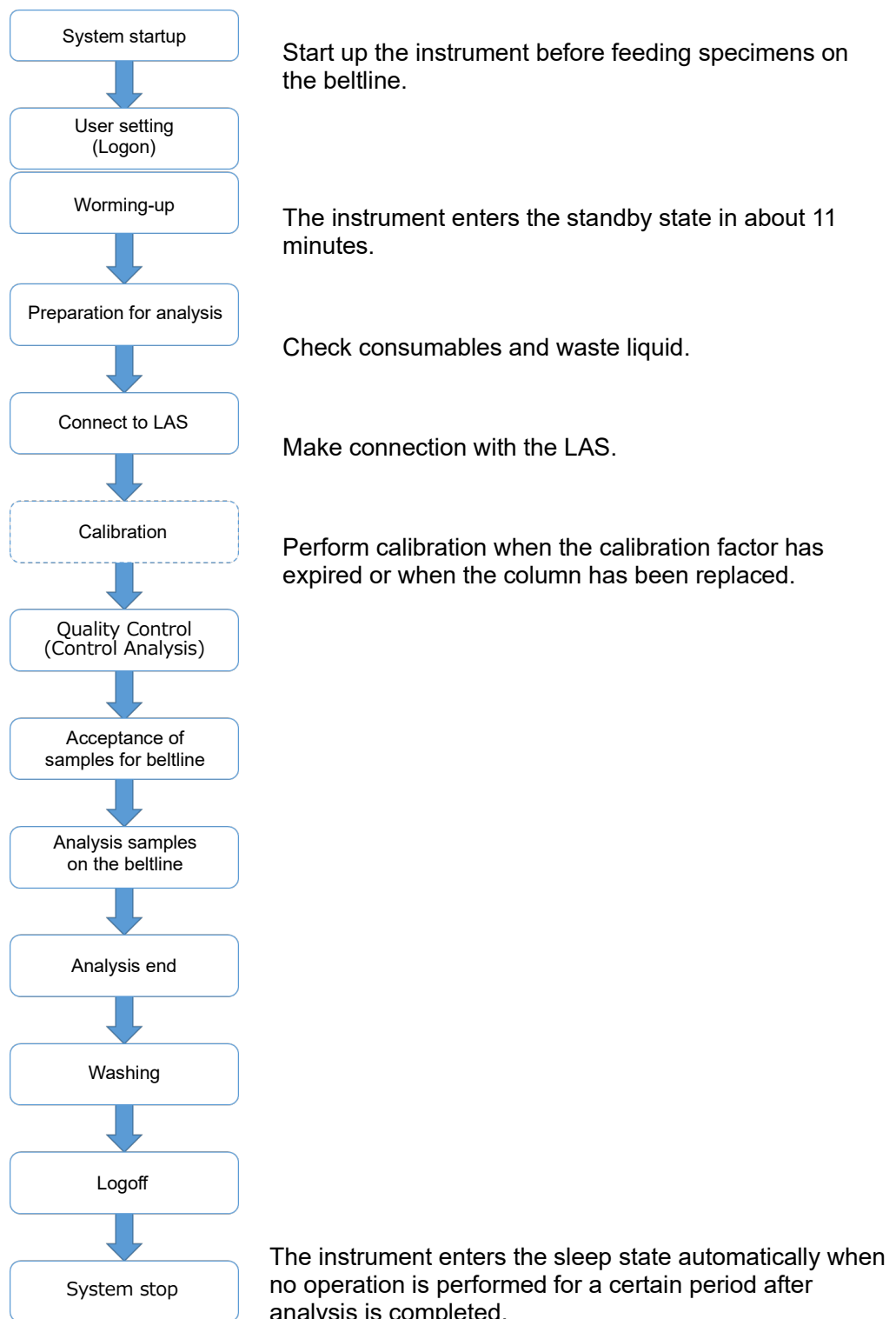
- The needle does not move down to the suction position, which may result in malfunction of the needle, instrument, or beltline.
- The needle may penetrate the sample cup, and then the specimen may be spilled out.

5

Analysis operation

5.1 Analysis flow (connected with LAS)

The following chart shows the standard analysis flow when the GR01 is connected to the LAS.



5.2 System startup

NOTICE

Do not turn off the main power switch of the instrument during startup except in case of emergency.

- The screen may not be started properly. If no display appears on the screen after the main power switch is turned on, refer to “9. Troubleshooting” in the GR01 Operator’s Manual.

5.2.1 System startup procedure

1 Prepare for system startup.

Before turning on the main power switch, make sure that the system USB memory stick is not inserted to the USB memory stick port. A USB memory stick for storing analysis results can be connected.



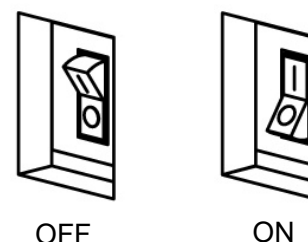
Note

- If the system USB memory stick is inserted to the USB memory stick port, the instrument automatically loads the system program, and the information stored in the internal memory of the instrument is overwritten with the loaded system program.

2 Turn on the main power switch.

The main power switch is located on the left back of the instrument, viewed from the front.

When the “|” side is pushed in, the main power switch is turned on. When the “o” side is pushed in, the main power switch is turned off.



Note

- This main power switch serves as a breaker for overcurrent protection. If the main power switch is turned off immediately after turned on, there may be current leakage.


3 Start the application.

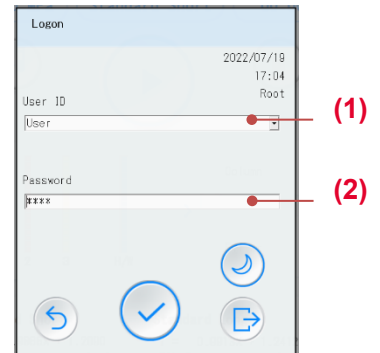
When the main power switch is turned on, the application is started up automatically.

Note

- If no display appears on the screen, the screen is not updated, or an error occurs during startup, an internal failure may have occurred on the instrument. Turn off the main power switch once, and start from the **Step 1** again.



- 4** Log on to the application, and start warming up.
A logon screen appears.
The instrument starts warming up (analyzer status: Warming up).
Select a logon user name (1), enter the password (2), and tap the log on button .



Reference

- To add or edit a user, or change the password, refer to “7.4 User account settings” in the GR01 Operator’s Manual. A logon is necessary.
- The logon using the handheld barcode scanner is possible. For more details, refer to “5.2.2 Logon using the handheld barcode scanner” in the GR01 Operator’s Manual.

- 5** The analyzer enters the “Standby” state.
After warming up is completed, the analyzer status is changed to “Standby”, and is ready for analysis.
The analyzer enters the sleep state automatically when no operation is performed for a certain period (2 hours in the initial setting).

5.3 Preparation for analysis

Before starting analysis, check consumables and waste liquid.

Refer to the “5.3 Preparation for analysis” in the GR01 Operator’s Manual.

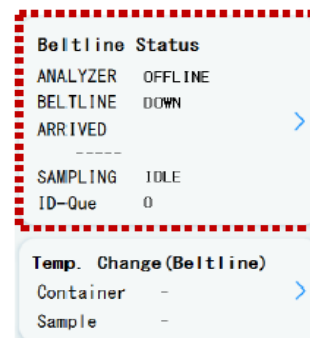
Note

- In daily check, check necessary items for each facility in addition to check items in this section.

5.4 Communication connection with the LAS

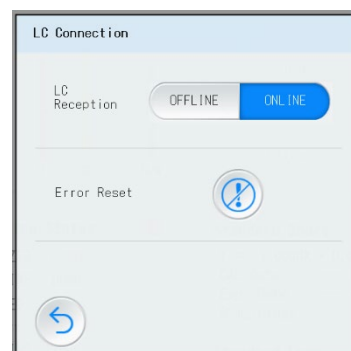
- 1 Tap the beltline connection status settings button on the main screen (for LAS connection).

- Note**
- If the main screen is not for the LAS, the LAS connection has not been set up.
 - Contact Tosoh local representatives.



- 2 Select [ONLINE] for [LC Reception].
Tap the return button to return to the main screen.

- Note**
- [OFFLINE] is automatically selected for [LC reception] when the main power switch of instrument is turned on. When the instrument is returned from the sleep mode, the previously selected mode is maintained.




- 3 Make sure that [ONLINE] is displayed for [ANALYZER] and that [CONNECTED] is displayed for [BELT LINE] in the [Beltline States] section.

If [ERROR] is displayed for [ANALYZER], or [DOWN] or [ERROR] is displayed for [BELT LINE], remove the error cause, and tap the Error Reset button on the beltline connection status settings screen to clear the ERROR display.



NOTICE

- After an error occurs on the GR01 or the LAS, the analyzer will not be ready for acceptance unless the error is reset, even when [ONLINE] is displayed for [ANALYZER]. After removing the error cause, be sure to tap the Error Reset button to clear the ERROR display.
- Tapping the confirmation button  on the error history screen will not clear the error status of the beltline connection.

5.5 Calibration

When the GR01 is connected to a LAS, there are two calibration methods

1. Calibration using the sample loader
2. Calibration using the beltline

However, the calibration using the sample loader is not possible when the GR01 is connected to the SYSMEX transportation system (front-side beltline system).

NOTICE

The sample volume required for calibration is as follows.

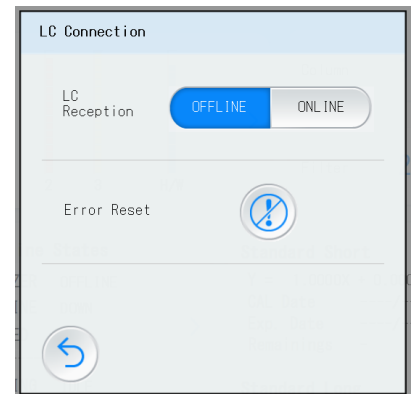
- STD model (SYSMEX LINE): 500 μ L or more
- LA model: 700 μ L or more

5.5.1 Calibration using the sample loader

1 Check that the analyzer status is a mode other than "Analysis".

2 If not processing specimens on the beltline until calibration is completed, disconnect the LAS connection.

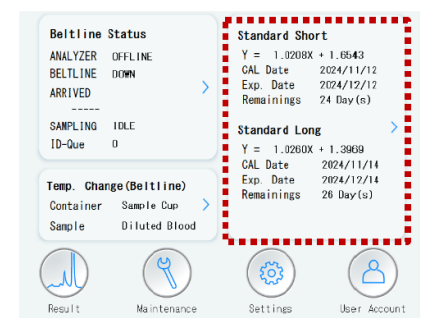
Select [OFFLINE] for [LC Reception] to disconnect the LAS connection.



3 Tap the calibration reserve button on the main screen.

Reference

- For details of the calibration settings, refer to "5.4.4 Calibration Procedure" **2** to **8** in the GR01 Operator's Manual.



4 Set the sample rack with the calibrators on the sample loader, and tap the analysis start button.

5.5.2 Calibration using the beltline

NOTICE

- Calibration using the beltline is performed with the sample container specified in the beltline settings.
To change the sample container setting for calibrators, contact Tosoh local representatives.

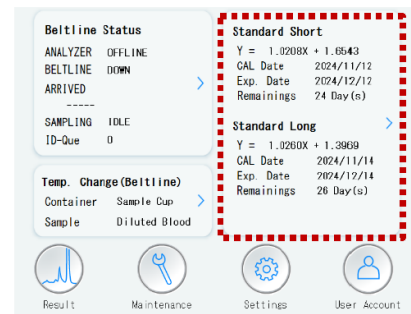
Calibration procedure using the beltline

1 Make sure that “OFFLINE” is displayed for “ANALYZER” in the [Beltline status] section.

2 Tap the calibration reserve button on the main screen.
Enter the calibrator information, and reserve calibration.

Reference

- For details on of the calibration settings, refer to “5.4.4 Calibration Procedure” **2** to **8** in the GR01 Operator’s Manual.
- Note that the calibrator layout on the beltline differs from that shown on the GR01 screen.



3 Set the [ANALYZER] status to [ONLINE].

If [ERROR] is displayed for [ANALYZER], tap the Error Reset button on the connection status setting screen to clear the ERROR display.



4 Feed the calibrators on the beltline in the order of Lv.1 and Lv.2 sequentially.

The calibrator Lv.1 is used three times and the Lv.2 twice for a single sample container.

For calibration in the Standard Short + Standard Long mode, feed the calibrators in the order of Lv.1, Lv.2, Lv.1, and Lv.2 sequentially.

Operation with calibrator ID

The ID of calibrator Lv.1 (first sample) can be registered in advance as the calibrator ID. If the calibrator ID is registered, the calibration reservation operation described in step **2** above can be omitted.

If the first sample ID read after the start of analysis matches the calibrator ID registered in advance, calibration is performed according to the assigned values for calibrator specified in advance.

Three types of calibrator IDs can be registered for Standard Short, Standard Long, and Standard Short + Standard Long modes.

NOTICE

- Calibration cannot be performed during analysis even if the calibrator ID has been set. Even a calibrator is analyzed as a normal sample.
- For calibration reservation, the calibration reservation settings are used in priority.
- To register a calibrator ID or to change the registered calibrator ID, contact Tosoh local representatives.

5.6 QC (Quality Control)

When the GR01 is connected to a LAS, there are two methods to analyze QC materials (controls).

1. analyzing a QC material on the sample loader
2. analyzing a QC material on the beltline

However, the analysis of QC materials on the sample loader is not possible when the GR01 is connected to the SYSMEX transportation system (front-side beltline system).

5.6.1 Assaying QC materials on the sample loader

The operation procedure is the same as the HLC-723GR01 STD model. Refer to “5.5.3 Analyzing QC materials” in the GR01 Operator’s Manual.

5.6.2 Assaying QC materials on the beltline

- 1 Attach a barcode label with the same information as the pre-registered CTL ID to the sample container of the QC material.
- 2 Feed the QC material on the beltline in the same way as a normal sample.
- 3 The GR01 automatically recognizes samples with a barcode label that matches the CTL ID as QC samples.

Reference

- For details of registering a CTL ID, refer to “5.5.2 Registering QC materials” in the GR01 Operator’s Manual.

NOTICE

- To analyze a QC material using the beltline, use the sample container specified in the beltline settings.
- To change the sample container setting for QC materials, contact Tosoh local representatives.

5.7 Analyzing a sample

5.7.1 Sample containers

For sample containers on the beltline, check the specifications of the LAS.

Note

- The GR01 can analyze even a sample in a sample tube capped with a rubber cap.
- Both sample tubes and sample cups can be set only when the query method is used for specimen identification.
- The bottom height position of each sample tube and sample cup must be the same.

When analyzing a sample from a sample rack on the sample loader, the type of sample containers that can be analyzed are the same as the standard model.

- Sample tube

Diameter: 12 mm to 15 mm

Height: 75 mm or 100 mm

- Sample cup

Tosoh-dedicated sample cup (with adapter)

5.7.2 Specimen identification

The sample ID (the barcode attached to the sample tube) is read on the beltline, and then it is transmitted to the GR01 each time.

Depending on the beltline settings, it is possible to check sample IDs before sampling.

5.7.3 Specimen sampling method

There are two sampling methods: Query method or Non-query method.

When using the SYSMEX transportation system, only the non-query method can be specified.

Query method

Sampling is performed according to orders from the host computer, including whether to be analyzed or not, sample condition (whole blood or diluted), and sample container type (sample tube or sample cup).

However, sample condition and sample container type can be specified (fixed) on the GR01.

Non-query method

The GR01 analyzes all samples arriving at the sampling position on the beltline, according to the settings specified on the GR01, including the sample condition (whole blood or diluted), and sample container type (sample tube or sample cup). Only one of the container types or sample conditions is selected for each analysis.

When using the SYSMEX transportation system, only the non-query method can be specified.

5.8 Analyzing a STAT sample

Notice

When the GR01 is connected to a beltline, analysis using the STAT port of the sample loader is not available.

For LA model

Set a STAT sample at the sample rack on the sample loader. Samples set on the sample loader are analyzed in priority, earlier than samples on the beltline.

For STD model (the SYSMEX transportation system)

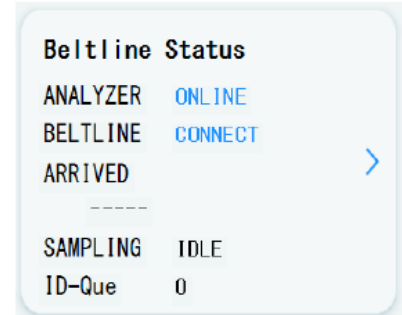
Add a STAT sample on the beltline.

5.9 Disconnecting communication from the LAS

Disconnect communication between the GR01 and the LAS in the following situations:

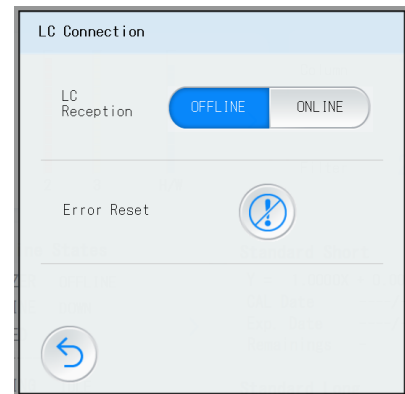
- when turning off the main power of the analyzer
- When changing the settings of the GR01 or the LAS
- When replacing consumable parts with new ones.

1 Tap the [Beltline States] button on the main screen (for LAS connection).

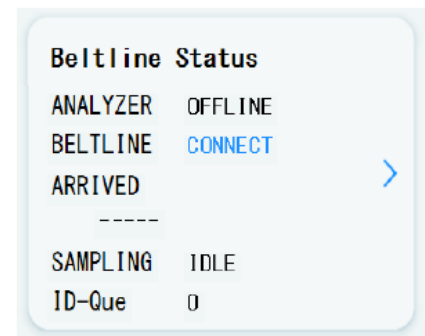


2 Select [OFFLINE] for [LC Reception]

Tap the return button to return to the main screen.



3 Make sure that [OFFLINE] is displayed for [ANALYZER] in the [Beltline States] section.



6

Maintenance

6.1 About maintenance

Consumables and service life-limited parts are used with the analyzer.

Daily maintenance, regular replacement of consumables, and regular maintenance must be performed to maintain the stable performance and to obtain correct analysis results. Early replacement is required for safety to use the analyzer for a long time in particular.

Also refer to the GR01 Operator's Manual.

6.1.1 Daily maintenance

Item to check	Frequency	Reference (GR01 Operator's Manual)
Cleaning of the analyzer	When dirt is noticeable When necessary	"6.2.1 Cleaning of the analyzer"
Preparation for analysis	Before every analysis	"5.3 Example of user account barcode Preparation for analysis"
Manual eluent feeding	When checking the pressure	"6.2.2 Manual eluent feeding"
Line wash	Analysis results are unstable. When a Total Area value is too high.	"6.2.3 Line wash"
Eluent priming	Analysis results are unstable.	"6.2.4 Eluent priming"
Sample rack rotation	When checking operation	"6.2.5 Sample rack rotation"
Sampler reset	When checking operation	"6.2.6 Sampler reset"
Air removal from the pump	When the pressure does not rise during eluent feeding	"6.2.7 Air removal from the pump"

6.1.2 Regular replacement of consumables (replacement by the customer)

Item to check	Frequency	Reference (GR01 Operator's Manual)
Printer paper roll	When remaining paper is insufficient or has run out	"6.4.1 Replacing a paper roll"
Hemolysis & Wash solution	When remaining volume is insufficient	"6.4.2 Replacing elution buffers and Hemolysis & Wash solution"
Eluent	When remaining volume is insufficient	"6.4.2 Replacing elution buffers and Hemolysis & Wash solution"
Filter element	When the warning mark appears.	"6.4.3 Replacing the filter element"
Column	When the warning mark appears.	"6.4.4 Replacing the column"
Suction filters	Every 6 months	"6.4.5 Replacing the suction filters"
Sampling needle*	When the needle is clogged or bent	"6.4.6 Replacing the sampling needle"

* Only personnel who have received the training can replace the sampling needle.

6.1.3 Regular maintenance (replacement by the service engineer)

Item to check	Frequency
Check the barcode scanner.	Every 20000 tests or once a year
Check the end marker sensor.	
Check the sample rack holder and the sample holder.	
Check the sample sensor.	
Check the needle descent position.	
Check the dilution port and wash block.	
Check the actuator of the sampling unit.	
Check the column oven temperature.	
Check the operation of the solenoid valves (4 locations).	
Check the operation of the vacuum pump.	
Check the operation of the waste pump.	
Replace the rotor seal of the injection valve.	
Replace the rotor seal of the rotary valve.	
Replace the sample loop.	
Wash or replace the pump check valve.	

Item to check	Frequency
Replace the plunger seal.	
Replace the needle O-ring.	
Replace or clean the waste filter.	
Replace the valve stator face.	When it is dirty or worn
Replace the syringe L-tip.	When it is worn
Replace the syringe (0.1 mL)	When it is worn
Replace the drain valve O-ring	When it is worn

Note

- For replacement of consumables or regular maintenance, contact Tosoh local representatives.

6.2 Daily maintenance

6.2.1 Cleaning of the analyzer

CAUTION

Be sure to turn off the main power of the analyzer before cleaning.

- Users might catch their fingers in the moving part.
- A foreign object, including clothes, might get caught in the moving part, causing damage to the analyzer.

Never clean the inner parts of the analyzer by removing a cover using a tool.

- When dirt inside the analyzer, such as the waste port, is noticeable, contact Tosoh local representatives.

When blood or eluent adheres to the analyzer, immediately wipe it off with a wipe. Otherwise, it may stick and cause corrosion.

If liquid leakage may have spread widely, contact Tosoh local representatives.

For dirt attached to the analyzer cover, wipe it off with a tightly wrung wipe moistened with a neutral detergent.

NOTICE

Wipe off the plastic covers with a tightly wrung wipe moistened with sodium hypochlorite.

- If cleaned using organic solvent such as ethanol, the covers might be discolored.

For dirt attached to the metal parts, wipe it off with a tightly wrung wipe moistened with a neutral detergent.




If the dirt is noticeable, wipe it off with a wipe moistened with ethanol or isopropyl alcohol (with a concentration of 70% or more).

Moisture left on the surface may cause corrosion.

For dirt attached to the belt of the sample loader or the display, wipe it off with a wipe moistened with ethanol or isopropyl alcohol (with a concentration of 70% or more).

6.3 When the analyzer is not used for a long time

When the analyzer is not used for more than 1 weeks, it is necessary to replace eluent in the analyzer lines with pure water.

- 1 Make sure that the analyzer status is “Standby”.
- 2 Remove the column. Securely attach the end fittings at the both ends of the column, and store the column in a cool place (2 to 15°C).
- 3 Connect an old column. (It is not necessary to perform the column replacement procedure.)
- 4 Insert the ends of the tubes for all elution buffers and Hemolysis & Wash solution into a container containing a 500 mL of pure water. (They can be inserted in a separate container for each type of tubes.)
- 5 Open the maintenance screen, and tap the manual operation button .
- 6 Select all the reagents (elution buffers and Hemolysis & Wash solution (H/M)) to be used for priming.
Tap the priming button  to start priming.
- 7 Tap the line wash button .
- 8 Turn off the main power of the analyzer.



NOTICE

When not using the analyzer for a long time, replace the lines with pure water instead of eluent.

- Never replace the lines with Hemolysis & Wash solution or organic solvents.

When starting to use the analyzer again, prepare new elution buffers and Hemolysis & Wash solution.

- There will be a large discrepancy between the displayed volume and the actual volume.

When starting to use the analyzer again, first perform analysis of controls or known samples to confirm that there are no problems on the chromatogram and analysis values before sample analysis.

7

Appendix

7.1 Specifications of the HLC-723GR01 (LA model)

For specifications of the analysis modes, refer to the GR01 Operator's Manual.

Applicable samples	Whole blood and diluted samples	
Assay principle	Ion exchange high-performance liquid chromatography	
Calibration	2-point calibration by calibrators	
Detection method	2-wavelength absorbance (Detection wavelength: 415 nm / 500 nm)	
Sampling volume	3 μ L for whole blood samples, 150 μ L for diluted samples	
Sample feed	Supply from the beltline: in accordance with the LAS specifications Sample loader: using the sample rack (excluding the front-side beltline system)	
Sample suction	Nozzle	
Sample injection	Sample loop (5 μ L)	
Sample dilution	Automatic dilution with Hemolysis & Wash solution in the dilution port	
Sample container	<ul style="list-style-type: none"> • For beltline In accordance with the LAS specifications • For sample loader (using the SYSMEX racks) Sample tubes (12 to 15 mm in diameter \times 75 or 100 mm in length) Dedicated sample cup (with adapter)	
Sample barcode	Barcode with a maximum of 20 digits Barcode standards: 4 types of barcodes can be selected at a time from the following: NW-7 (Codabar), CODE39, ITF, CODE128, JAN (UPC/EAN), Industrial 2 of 5, COOP 2 of 5 (CODE39 is available only with the optional laser barcode reader.)	
Dimensions	Main unit	480 (W) \times 658 (D) \times 615 (H) mm (excluding protrusions)
	Main unit and GR-90SL	530 (W) \times 725 (D) \times 615 (H) mm (excluding protrusions)
Weight	Main unit	Approx. 36 kg
	Sample loader (GR-90SL)	Approx. 9 kg
Display	10.1-inch color LCD	
Input	Capacitive touch panel	
Printer	Internal printer: Thermal printer (paper width: 58 mm) External printer: A4 monochrome laser printer (optional)	

External output		Serial communication (RS-232C) Parallel communication (DIO)
Quality control		Trend management function (Max. 31 days)
Eluent feeding		Single plunger pump (Maximum feeding pressure: 18 MPa)
Temperature control (column)		Approx. 25°C
Applicable sample rack		SYSMEX rack (with plastic bottom)
Data processing unit		OS: Windows 10 IoT Enterprise LTSC
Power	Power supply	AC100 to 240 V (±10%), 50 / 60 Hz
	Power consumption	250 VA
Operating environment	Temperature	15 to 30°C
	Humidity	30 to 80% (No condensation)
	Over voltage category	II
	Pollution degree	2
	Dust	Ordinary office level
	Altitude	2000 m or less
	Other	Indoor use
Standard conformity	EMC standard	IEC61326-2-6: 2020
	Barcode reader	IEC60825-1: 2014, Class 1 LED Product
	Handheld barcode scanner (optional)	IEC62471: 2006, exempt group
	Laser barcode scanner (optional)	EN60825-1: 2014, Class 1 Laser Product



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