KROMA

Random Access Analyser

Service Manual

Section i INTRODUCTION

i.1 Identification Data

This document is the **service manual** of the instrument named KROMA. KROMA is a random access automatic analyser.
This document must be considered a guide for service operations carried out on instrument KROMA by authorized and qualified technical personnel trained by the Producer or by entitled dealer.
Service engineers and maintenance technicians must read carefully every section of this manual before to undertake any operation.
This manual wants to be only a reference aid as technicians need to join training held by authorized personnel.
The producer doesn't take on any responsibility about partial and unauthorized copies of this document.
This manual has been written and produced with the utmost care; however errors cannot be fully excluded.
The producer doesn't take on any responsibility or due about every kind of incidents that may occur from mistakes in the manual.
The service must contact the distributor or the producer in case of doubts or necessity.

i.1.1 Document

- Document code: MNM-10953-01-A
- Document revision: A
- Revision date: June 15, 2009

i.1.2 Instrument

- KROMA: p/n 10750-xx-A (xx=version)

i.1.3 Producer

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i.2 Copyright

i.3 International and European Prescriptions

The KROMA instrument complies the following directive:

- Directive IVD 98/79/CE - In-Vitro Diagnostic Medical Devices

i.4 Purpose of This Document

This document is the service manual of the automatic "random access" analyser KROMA. It is addressed to service engineers and qualified technicians trained by the Producer or by authorized personnel (in the following named as "operator") to carry on service operations on instrument KROMA.

NOTE: information included in this manual allows a correct service of the instrument just in the case the operator has attended a specific training course held by the Producer.

For instrument calibration and service software description refer to LiNEAR SL document code: MNM-10954-01-A, KROMA - KROMA Server SW Manual for Calibration.

i.5 Use of This Manual

The producer recommends the operators to read carefully all sections of this manual taking into particular consideration notes, used for specifying or deepening a concept discussed before, and warnings, used to highlight possible risks or dangers. It is also required a good knowledge of the KROMA User Manual.

Notes and warnings have been written in bold character.

Note: any information regarding Theory of Operation, Functions, Performances, Operating Procedures and User Interface Software Menu Descriptions, refer to the KROMA User Manual – last revision.

i.6 List of Contents

i.7 List of Figures

Section 1 SAFETY

1. Safety Prescriptions

The operator must strictly observe all prescriptions included in the Section 1 – Safety of the KROMA – User Manual when using the instrument and its consumable/ disposable materials and servicing on it. LiNEAR SL is not liable for any Warranty obligations should any modifications (on hardware and software) have been made to the product without LiNEAR SL's express written consent.

1.1. General Instructions

Every note and warning included in this manual, highlighted in bolt and/or underlined characters must be read carefully. During service the qualified technician must follow every precautions referring to *good laboratory practice* (GLP).

1.2. Labelling

Marking of instrument

The following label is placed on the right-rear part of the instrument, close to main-switch, and shows: the producer's name, the instrument type, the instrument part number, the instrument serial number, the supply and consumption specifications, the type of protection fuses and the year of production. Moreover the label informs the operator that the fuses must be replaced by other ones of the same type and value in order to protect the instrument and avoid risk of fire.
The symbol CE indicates the conformity of the instrument, and of the parts where it is applied, to the essential safety requirements according to the corresponding European directives.

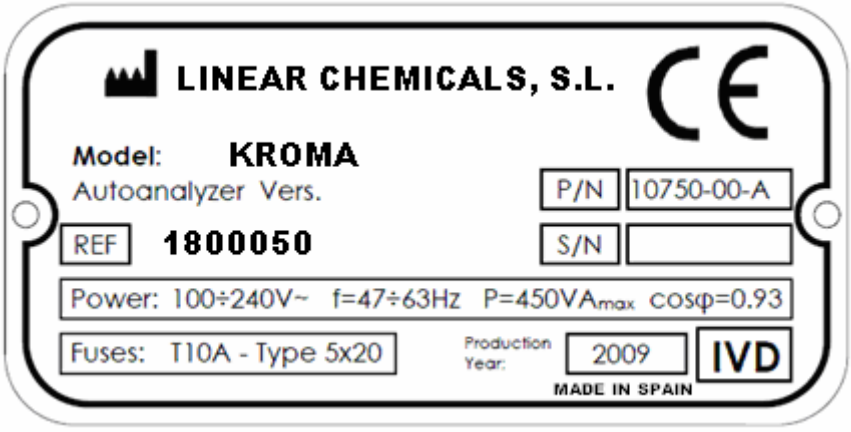


***Figure 1**: Instrument Label*

Electrical Hazard

The following label is placed on the instrument.

a) One of the following label is placed on the instrument on the removable back panel; it informs the user about the potential electrical risk associated with opening the panels and that such operations must be carried out by qualified technician for maintenance.

***Figure 2**: Electrical Risk Label*

b) the following label (icons) are placed inside the instrument, on the AC/DC power supplies area, to inform the qualified technician about the potential electrical risk.

***Figure 3:** Electrical Risk Icons*

Laser Light Hazard

The following labels are placed on the instrument.

a) This label is placed inside the instrument, on the barcode reader, to warn and advise the qualified technician about the laser source characteristics.

***Figure 4:** Laser Light Risk Label*

b) This label (icon) is placed near the sampling ARM of the instrument and informs the user or the qualified technician about the presence of a laser source below, inside the instrument.

***Figure 5:** Laser risk Icon*

Moving Parts Hazard

The label is placed on the front part of the instrument and it informs the user about the risk associated with certain moving parts within the working area of the instrument: sampling probe and washing station.

Figure 6: *Moving Part Risk Label*

Bio-hazard Area

This label is placed on the working area. It informs the user of the potential risk of biological contamination from infected liquids in the area.

Figure 7: *Potentially Infected Area Label*

Bio-hazard liquids

Four of these labels (icons) are placed on the instrument: one is near the waste outlet of the instrument, one near the washing sink pump just behind the front panel, one on the washing station cover and one on the sampling ARM. The label informs the user of the possible contamination from infected liquids or probe.

Figure 8: *Biological Risk Icon*

Generic Hazard

Three similar symbols (icon) are placed on the instrument: one on the ARM protection defence, one on the cover of the washing station and one on the sampling ARM. It informs the user of the potential risk associated with removing the protection and with residual probe movements.

This icon informs that there is a risk associated to the operation, that the user is going to execute and, consequently, it is necessary to carefully follow the proper instructions mentioned in this manual.

Figure 9: *Generic Risk Icon*

Potentially infected tank label

This label is placed on the external waste tank. It informs the user of the possible biological contamination related to the waste tank.

Figure 10: *Potentially Infected Tank Label*

1.3. Safety Precautions

The instrument must be always and permanently grounded; it is provided with a three conductor sheathed cable to be connected to single-phase sockets from 100Vac to 240Vac with frequency range from 47Hz to 63Hz.

WARNING

When possible and applicable maintenance operations must be carried out with the instrument OFF and with the power supply cable disconnect from the socket.

1.3.1. Installation

For installation refer to the next section.

1.3.2. Transport and Storage

To transport the instrument use always the original packing.
For preserving the instrument read carefully the paragraph 10.6 – Storage Environment Requirements of the KROMA User Manual.

1.4. Risks During Use

The producer reminds the operator that the use of the instrument doesn't exclude the exposure to contamination risk, so it must be always considered as potentially infected.
The producer assumes that all precautions and recommendations, normally used in a laboratory, are followed.
NOTE: To avoid risks during operation, don't modify the instrument or any part of the system.

1.4.1. Risks for the Operator

The operator must observe the following prescriptions to avoid risks:

- Don't eat, drink or smoke near the instrument.
- Wear the gown, especially when close to the instrument.
- Wear protection glasses and gloves to handle samples, reagents and potentially contaminated parts of the instrument.

1.4.2. Safety Information for the Operator

The manufacturer declares that all internal parts of the instrument are designed and made so as to prevent all possible risks for the operator, in accordance with established legislation and according to the rule EN 61010-1.
It is essential, for the safety of the operator, to install an emergency switch not beyond than 1m from the instrument.

1.4.3. Information on Liquids and Infected Parts

The use of the instrument doesn't assure the absence of exposures to biological risk. The producer informs the operator that each of the parts of the instrument that can get in touch with blood, serum or other biological liquids, controls and/or reagents included, must be always treated like potentially infected materials.

WARNING
The instrument must be always considered like potentially infected.

1.4.3.1. Treatment

Biological samples (serum, plasma, urine,…) and reagents or controls, if not explicitly declared by their manufacturers, must be always considered potentially infected; consequently, in order to avoid any contact, the operator must treat them wearing the following protections:

- Gown.
- Mono-use Latex Gloves.
- Safety glasses.

The operator must be particularly careful when treating the following parts of the instrument:

- Washing station.
- Sampling probes.
- All needles and the tip of the washing station.
- Waste tank.
- Cuvettes wheel.
- Washing sink for the sampling probes.

These parts are in contact with biological liquids and can be contaminated.
Refer to section 8 of the User Manual for correct disinfection procedure.
Every tool and instrument used for the technical service must be disinfected after use and before packing away.

1.4.3.2. Waste Materials

Every waste material, both liquid and solid, must be disposed off according to the local laws and rules.

WARNING
Every waste material must be always considered potentially infected.

Parts of the instrument that have been replaced must be treated like potentially infected.
Parts of the instrument out of order must be treated like potentially infected.

WARNING
Discharges and replaced instrument's materials, that could be contaminated, must be sterilized, first to go out from the customer laboratory.

The dispose off of the instrument must be executed in conformity with the national rules, with reference to the local environment authority, considering that it is built with materials not dangerous for the environment.

Section 2 INSTALLATION

2. Description of the Instrument

KROMA is a random access auto-analyzer designed to operate in safety mode and with the maximum productivity in accordance with the latest manufacturing standard and in conformity with the actual international normative.

Figure 11: *KROMA*

The KROMA software application must be installed on an external PC, provided of LCD monitor, mouse and keyboard; it allows the complete control of the instrument through a RS-232 serial link.
The instrument working area is protected by a sliding defence. It includes the samples and the reagents tray and the sampling ARM; the reaction cuvettes wheel is on the right. Cuvette wheel temperature is constantly maintained at 37°C. Reagents can be refrigerated at about 12°C ±2°C through a specific refrigeration unit (option). On the left instrument side there are two switches, one for the electronic control of the instrument (green colour) and the other for the refrigeration unit (red colour). The ON/OFF status of the reagent cooler is completely separated and independent from the ON/OFF status of the electronic and from the ON/OFF status of the PC.
A built-in barcode reader, fixed on the sampling ARM, (option) allows the positive identification of reagent bottles and of sample tubes, when barcoded.
The software controls also marginal events in order to operate in safety conditions within the working area.

2.1. Supplied Parts

Refer to the User Manual of the instrument.

2.2. Installation Requirements

To achieve a correct installation of the instrument the operator must observe and respect each of the mechanical and environment constrains listed in the following of this document; only in this case the correct operation of the system is assured.

Mechanical Constrains
KROMA must be exclusively used indoor and not outdoor.
KROMA must be installed on a horizontal flat surface not subject to vibrations (i.e.: centrifuges…). The workbench (min. 120cm long and 80 cm deep) must be stable to avoid unwanted oscillations and auto-vibrations; indeed it must accept 75kg on its surface.

Environment Constrains
The room where the instrument is installed should have air conditioning system to obtain constant temperature and constant relative humidity. Avoid placing the instrument to the direct sunlight.
The operating environment temperature is included in the range +18°C ÷ +32°C. The maximum operating relative humidity is 80% at +31°C with linear fall to 65% at 32°C.
The instrument must be located far away from electromagnetic wave sources (such as big electric motors, lifts, therapeutic equipment, X-Ray machines).
The instrument can be situated next a wall, not closer than 15cm so to have enough free space at back to allow the correct fan cooling operation and the opening of the cover.
In order to allow easy operations around the bench-top version, the operator must provide enough space for the monitor, the keyboard and the mouse and an underlying flat plane for the management PC.
The instrument should be placed to help the handling of 25lt waste tank to the discharge point.
Note: before to unpack the instrument for installation, all of the mechanical and environment constrains must be verified.

2.2.1. Software

The KROMA software is an application developed expressly for this instrument in order to run it under Windows XP® operating system. This application must be used *only* for monitoring and control the KROMA instrument.
A special section of the software is available to the service operator only for service purposes (mechanical calibrations, controls, motion commands, etc.); it can be accessed using a special and "confidential" user ID and password. Those should be never told to the final user and must be carefully saved by the technical personnel belonging on service department.

2.3. Storing the Instrument

The instrument must be stored solely in its original packing box and in a dry environment.

2.4. Unpacking the Instrument

Before proceeding to unpack the instrument, all of the mechanical and environment constrains must be verified.

The instrument KROMA is generally sent closed in a wooden box to give the maximum protection during transportation in normal conditions. In case the instrument must be moved or re-delivered always use the original package. The management PC is packed separately from instrument and together with the KROMA accessories in another wooden box.

2.4.1. Unpacking KROMA

A minimum of two people are required to unpack and to take out the instrument from the box.

- Remove all screws that fix the clips of the box top cover by using a manual or an automatic phillips screwdriver. Remove that clips and save them for re-use.

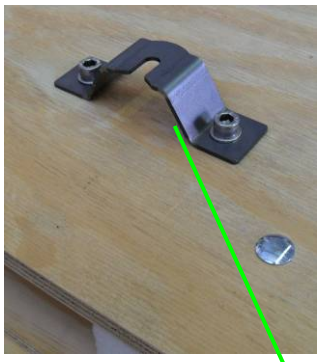
- Remove the box top cover.

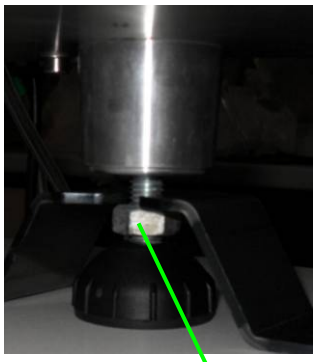
- Unscrew all screws (if any) fixing the clips of the box walls to the box base. Remove the clips and save them for re-use.

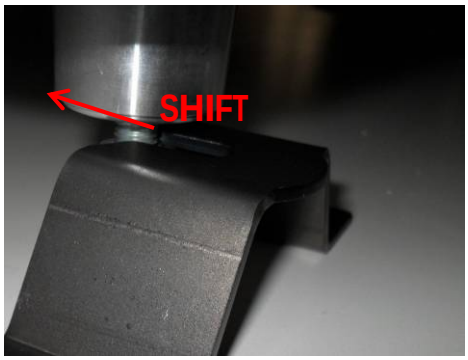
- Carefully lift up and remove the side walls of the box.

- Take out the protective film from the instrument.

- Loosen up the nut locking any instrument feet on each of the four clamps fixed on the wooden base by using one open-end wrench ch=17 (metric); then shift sideways the instrument out of the clamps.







CLAMP

NUT ON
INSTRUMENT'S FOOT

- Lift instrument up and place it on the working bench.

- Place monitor, keyboard and mouse of the PC on the workbench and the CPU close to the instrument.
- Control that all parts listed in the packing list are there.
- Control that the instrument serial number is the same reported "on the packing list"; if different, write a note about the problem.

NOTE: Store the original box in case you want to store or to move the instrument.

2.4.2. Electrical Connections

According to the safety prescriptions listed at the beginning of this manual, in order to reduce the electrical shock risk, the instrument must be grounded. The instrument is provided with a 3-conductor sheated power cable suitable for connection to 110Vac/230Vac supply inlets; selection of the operating voltage or frequency is not requested on the instrument; check only PC voltage selector for the correct setting. Plug one end of the power cable in the inlet placed in the rear side of the instrument, and the other end to 110/230Vac @ 50/60Hz wall socket equipped with ground connection.

NOTE: KROMA cannot manage temporary power supply gaps. Consequently it is recommended to install an UPS, able to supply 1.0kW, to power both the instrument and the personal computer (PC).

2.4.3. Main Steps to Follow During Instrument Installation

After having unpacked the KROMA Instrument and prepared the work bench follow the steps below; some of them have been detailed in the following paragraphs:

1. Place the instrument on the work bench.
2. Remove protections.
3. Unpack the Personal Computer and its accessories; check and eventually **set the PC Power Supply voltage selector** to be compliant to the main line specification (110Vac or 220Vac).
4. Place the LCD monitor, the keyboard and the mouse of the PC on the workbench and the CPU close to the instrument.

5. Connect the PC parts: CPU, monitor, keyboard, mouse and printer.
6. Connect the PC to the KROMA instrument through the RS-232 serial cable.


Serial Cable

7. Fill the Systemic tank, the 20-litres green one, with the Systemic Solution (composed by one 50ml vial of concentrated Systemic solution diluted into 20 litres of distilled water). Connect the tank to the KROMA instrument.
8. Fill the Cleaner tank; the 5-litres blue one, with the Cleaner Solution (5-litres of Multiclean solution not to be diluted). Connect the tank to the KROMA instrument.
9. Empty the Waste tank, the 25-litres red one, and connect it to the KROMA instrument.
10. Install both the PC and the KROMA Instrument to the main line through a 1kVA UPS; check the ground connections and use the power cord supplied with the instrument (it has been tested at factory).

Functional task	Type of connection
Serial Link Instrument/PC (not crossed)	RS-232, SUBD-9pin standard connectors
Instrument power supply	3-poles IEC Socket 2-poles+ground Schuko Plug


Power Cord

11. Power on the KROMA instrument.
12. Power on the Personal Computer and wait for the Operating System running.
13. Run the KROMA software: the instrument will perform a complete hardware reset and then will enter the warming-up time.
14. Wait for the end of the Warming Up (about 30 minutes) and check that the system will pass in the IDLE status waiting for commands.

The following **Check List** describes the actions that the technician must carry on in order to correctly install any KROMA instrument.

The following table can be used as a helping guide during common installation steps.

We suggest printing it in more copies to be filled by the operator; a copy for each instrument installed must be issued and saved by the distributor after any installation.

KROMA **S/N:** _____ **Operator:** _____

Site: _____ **Date:** _____

Action	Status
1- Check instrument and accessories integrity	☐ done
2- Check the proper power supply voltage selection and then switch on the personal computer	☐ 110Vac ☐ 230Vac
3- Disable instrument Warming Up procedure following the instruction given during the training classes	☐ done
4- Power On the instrument and run only the KROMA Server program	☐ done
5- In each ARMx Position Panel verify "Wait", "Empty", "Washing" ARM positions.	☐ done - ☐ modified
6- In each ARMx Position Panel verify "Cuvette Wheel" ARM positions.	☐ done - ☐ modified
7- In each ARMx Position Panel verify samples (16x100, 12x75, sample cup co-ordinates) and reagents ARM positions.	☐ done - ☐ modified
8- In Reading Test panel verify the correct position of cuvette #1 under the optical path (middle)	☐ done - ☐ modified
9- Start a Refill Cycle (from the Cycle Control Panel)	☐ done
10- Verify leaks or bubbles in the hydraulic circuit and the absence of washing station crashes	☐ done - ☐ modified
11- Start a Read Cycle (from the Cycle Control Panel)	☐ done
12- Verify Autozero in the Untitled Window	☐ done - ☐ modified
13- Close KROMA Server program from the Untitled Window	☐ done
14- Restore instrument Warming Up procedure, re-enabling it	☐ done

2.4.4. Electrical Connections and Stabilizer

According to the safety prescriptions listed at the beginning of this manual the instrument must be grounded in order to reduce the electrical shock risk for the operator. Not only, are overall performances of the KROMA System assured only in case of proper ground connection.
The instrument is provided with a 3-conductor sheated power cable suitable for connection to 110Vac/230Vac supply inlets; selection of the operating voltage or frequency is not requested nor necessary on the instrument, it is required only on the PC. Plug one end of the power cable in the inlet placed in the rear side of the instrument, and the other end to 110/230Vac @ 50/60Hz wall socket equipped with safety ground connection.
NOTE: KROMA cannot manage temporary power supply gaps. Consequently it is strongly recommended to install an UPS, able to supply 1.0kVA, to power both the instrument and the personal computer (PC).

2.4.5. External Fuses

Into the power supply block, placed in the left side of the instrument, there are two standard protection fuses 5x20mm, 10A/250V T-type (delayed).
In case of power failure, it is possible to replace them by pulling out the 2-pole fuse-drawer. In that case disconnect first the power cord.

Figure 12: *Power Block and Main Line Protection Fuses*

2.4.6. Fittings and Consumables

The standard accessories of the KROMA instrument are essential parts for a proper operation.
The instrument must be connected to the three provided external tanks:

- 20lt tank: for the systemic solution needed to fill up the hydraulic circuits devoted to cuvettes washing (washing station) and to probe rinsing;
- 5lt tank: for the multi-cleaner solution used from the first needle of the washing station for the washing of cuvettes;
- 25lt tank: for the waste liquids.

The connection between tanks and instrument will be discussed in the following paragraph.
The cuvette tray (for reactions and readings) must be always provided with ***all of the 80 cuvettes*** in optical plastic (Bionex®); no position must be ever left without its own cuvette.

2.4.6.1. Liquid Solutions for KROMA

KROMA systems need the following solution for normal and reliable operation:

- *Systemic Solution:* filled into the 20 litres tank ("green" colour).
- *Multi-Cleaner Solution:* filled into the 5 litres tank ("blue" colour).
- *Rinse solution EW Cvt* filled into 50ml reagent bottle type 1.

(for Cuvette Extra-washing):

- *Rinse solution EW Prb* filled into 20ml reagent bottle type 2.
  (for Probe Extra-washing):

The **Systemic Solution** is supplied as concentrated solution into kits of 6 x 50ml vials each. Each 50ml vial content must be mixed and diluted with 20 litres of distilled water (the dilution ratio is then **1:400**) in order to prepare the new 20 litres Systemic Solution to be poured into the apposite **20 litres tank** (Green connections).
The Systemic Solution must be purchased by LiNEAR SL
Avoid the contact with the skin and with eyes; in case of contact with skin, wash immediately with plenty of water. Handle vials and pour into tanks by using gloves for hand protection and glasses for eyes protection.
Note: refer to Systemic Solution Safety Data Sheet for correct handling and detailed complete information.

The **Cleaner Solution** is supplied into 2 litres or 5 litres containers. It is *ready to be used* and it must be poured into the apposite 5 litres tank (Blue connections).
The Cleaner Solution must be purchased by LiNEAR SL The kit contains *sodium hydroxide at 3,7%***,** it's corrosive, and causes burnings. Use the solution for diagnostic only on KROMA System. Avoid the contact with the skin and with eyes; in case of contact with skin, wash immediately with plenty of water. Handle vials and pour into tanks by using gloves for hand protection and glasses for eyes protection.
Note: refer to Cleaner Solution Safety Data Sheet for correct handling and detailed complete information.

The **Rinse solution EW Cvt** is a special solution supplied into 6x50ml vials kit. It is *ready to be used* and it must be placed on the reagent tray. It is used by the system for the routine cuvette extra washing and, on-line, to avoid contaminations in case methods restrictions have been set.
Avoid the contact with the skin and with eyes; in case of contact with skin, wash immediately with plenty of water. Handle vials and pour into tanks by using gloves for hand protection and glasses for eyes protection.
Note: refer to Rinse solution EW Cvt Safety Data Sheet for correct handling and detailed complete information.

The **Rinse solution EW Prb** is a special solution supplied into 6x20ml vials kit. It is *ready to be used* and it must be placed on the reagent tray. It is used on-line by the system for probe extra washing procedure to avoid contaminations in case **methods restrictions** has been set.
Avoid the contact with the skin and with eyes; in case of contact with skin, wash immediately with plenty of water. Handle vials and pour into tanks by using gloves for hand protection and glasses for eyes protection.

Note: refer to Rinse solution EW Prb Safety Data Sheet for correct handling and detailed complete information.

2.4.6.2. Liquid Tanks

The KROMA needs the charge/waste tanks close to it; it is then possible to put them under the workbench on left side.


20lt Systemic Solution Tank


5 lt Cleaner Solution Tank


25lt Waste Tank

Figure 13: *Charging and Waste Tanks*

The following table shows the electrical connections between instrument and tanks:

Tanks wiring	Instrument
Low level sensor of **20lt Systemic tank**, **green** male floating connector	➔ to be plugged into left **green** panel socket connector (**Systemic**)
Low level sensor of **5lt Cleaner tank**, **blue** male floating connector	➔ to be plugged into centre **blue** panel socket connector (**Cleaner**)
High level sensor of **25lt waste tank**, **red** male floating connector	➔ to be plugged into right **red** panel socket connector (**Waste**)

The following table shows the hydraulic connections between instrument and tanks:

Tanks wiring	Instrument
20lt Systemic solution tank, **green** floating fitting	➔ to be plugged into left panel fitting, (**Systemic**)
5lt Cleaner tank, **blue** floating fitting	➔ to be plugged into centre panel fitting, (**Cleaner**)
25lt Waste tank, **red** floating fitting	➔ to be plugged into right panel fitting, (**Waste**)

Figure 14: *Charging/Waste Tanks Connections*

In the floor-standing version, tanks are accessible by opening the right door.
Each tank is connected with the instrument. Wirings have been marked with different colours to facilitate connections; then, according to the picture above:

- **Red** colour: for Waste tank, electric connector and hydraulic joint;
- **Green** colour: for Systemic solution tank, electric connector and hydraulic joint;
- **Blue** colour: for Cleaner solution tank, electric connector and hydraulic joint.

2.5. Software and Firmware Installation or Upgrade

For any software installation or upgrading and for any firmware upgrading, the operator must follow the instructions given in the last revision of the LiNEAR SL document code RPT-10654-00-x, "KROMA firmware and software upgrade procedure & Software first installation procedure" last revision. In the following sub-paragraphs part of this document, in the **actual** release, has been shown for user convenience.

2.5.1. General Description

KROMA firmware (FW)
KROMA firmware is composed by four different files one for each Controller Board. The upgrade is carried out through a special program called **SwDownload.exe,** included in the directory C:/Program Files/KROMA/Comunication/EXE, after the first User Interface (software) Installation. The producer sends a folder (named WORKAREA) used by the Swdownload.exe program.

KROMA software (SW)
KROMA software upgrade or first installation can be performed through:

- the program **KROMAOne.msi**, that is the complete install package;

or

- the program **KROMAOneUpdateVx.x.x.x.msi,** that is an upgrading patch.

Depending on the particular case, the producer can send one of the above files.

2.5.2. Procedure for Software First Installation by KROMAInstaller.msi File

In order to install the Software of the instrument KROMA for the **first time** on a new PC, it is necessary to follow the procedure below:

Install the software

1. Start the PC with the KROMA instrument in Power OFF.
2. Disable any ScreenSaver and Power Management on Windows® Desktop Properties.
3. Set a white backgroud color on Windows® Desktop Properties and load the LiNEAR Logo centered on the desktop (file Logo LiNEAR.bmp).
4. Create a new directory called KROMA INSTALLER under **Desktop/My Documents**.
5. Start the CD-ROM (or the USB key) into the PC.
6. Copy the file **KROMA.msi** included in the CD-ROM (or in the USB key).
7. Paste the file **KROMA.msi** in the directory **Desktop/My Documents/KROMA INSTALLER**.
8. Copy the directory **System Parameters** included in the CD-ROM (or in the USB key).
9. Paste the directory **System Parameters** in the directory **Desktop/My Documents/KROMA INSTALLER**.
10. Start the **KROMA.msi** and follow the instructions on the screen to install it up to the end.
11. At the end of installation, click with the right mouse button on **START** and select **Explore**.
12. Check if CD contains KROMA software upgrades called **KROMAUpdateVx.x.x.x.msi**. Copy them in the same folder of base installer, then begin to run the file with older version. Run all files one by one following the version order.
13. Restart the pc.

Start the software.

1. Power On the KROMA instrument.
2. Start the KROMA software by double-clicking the KROMA icon on the desktop.

3. If the system resets jump to step #4 otherwise goes in the **System Config** menu, set the correct serial COM port and click on **Save Parameters,** click on **Shutdown** in the Main Menu and close the system un-selecting **Do final wash** flag.
4. Start again the KROMA software by double-clicking the KROMA icon on the desktop; the system performs the reset of the instrument and enters WarmingUp.
5. The system is then ready for operation when entering Idle status.

Note: the system is ready for parameters calibration after having carried out calibration backup system parameters files.

2.5.3. Back-Up of Instrument Calibration

After having carried out calibration on the instrument follow the procedure below to backup system parameters files.

1. Click with the right mouse button on **START** and select **Explore**.
2. Select the directory **c:/Program Files/KROMA/Comunication/EXE**.
3. In order to backup the characteristic instrument files, select the following files by clicking with the left mouse button while pressing Ctrl Keyboard key:
   - arm1Config.dat
   - mConfig.dat
   - odMatrix.dat
   - rwConfig.dat
4. Click with the right mouse button on the selection and select **Copy** in the pop-up menu.
5. Select the directory **Desktop/My Documents/KROMA INSTALLER/System Parameters**.
6. Click with the right mouse button on the directory and select **Paste** in the pop-up menu. Overwrite the old files by confirming **Yes to All**.
7. Select the directory **c:/Program Files/KROMA/Comunication/config**.
8. In order to backup the characteristic instrument mechanical calibration files, select the following files by clicking with the left mouse button while pressing Ctrl Keyboard key:
   - KROMAFlashParams.xml
9. Click with the right mouse button on the selection and select **Copy** in the pop-up menu.
10. Select the directory **Desktop/My Documents/KROMA INSTALLER/System Parameters**.
11. Click with the right mouse button on the directory and select **Paste** in the pop-up menu. Overwrite the old files by confirming **Yes to All**.

2.5.4. Recover of Instrument Calibration

In case the instrument has been already calibrated and a copy of the system parameters files is available, follow the procedure below to install the characteristic system parameters files.

1. In the CD-ROM supplied with the system, copy the **System Parameters** directory and paste it the directory **Desktop/My Documents/KROMA INSTALLER:** overwrite any existing previous one**.**
2. Select the new directory **Desktop/ My Documents/KROMA INSTALLER/System Parameters**.
3. Select the following files by clicking with the left mouse button while pressing Ctrl Keyboard key:
   - arm1Config.dat
   - mConfig.dat
   - odMatrix.dat
   - rwConfig.dat.
4. Click with the right mouse button on the selection and select **Copy** in the pop-up menu.
5. Select the directory **c:/Program Files/KROMA/Comunication/EXE**.

6. Click with the right mouse button on the directory and select **Paste** in the pop-up menu. Overwrite the old files by confirming **Yes to All**.
7. Select the new directory **Desktop/ My Documents/KROMA INSTALLER/System Parameters**.
8. Select the following files by clicking with the left mouse button while pressing Ctrl Keyboard key:
   - KROMAFlashParams.xml
9. Click with the right mouse button on the selection and select **Copy** in the pop-up menu.
10. Select the directory **c:/Program Files/KROMA/Comunication/config**.
11. Click with the right mouse button on the directory and select **Paste** in the pop-up menu. Overwrite the old files by confirming **Yes to All**.

Note: the directory Desktop/KROMA INSTALLER is a backUp directory to be used in case of necessity, problems or software reinstallation. Its sub-directory Desktop/KROMA INSTALLER/System Parameters contains the files with parameters of that particular instrument.

2.5.5. Procedure for Automatic Software Upgrade by Patch (KROMAUpdate.msi File)

In order to upgrade the Software of the instrument KROMA with a patch, it is necessary to follow the procedure below:

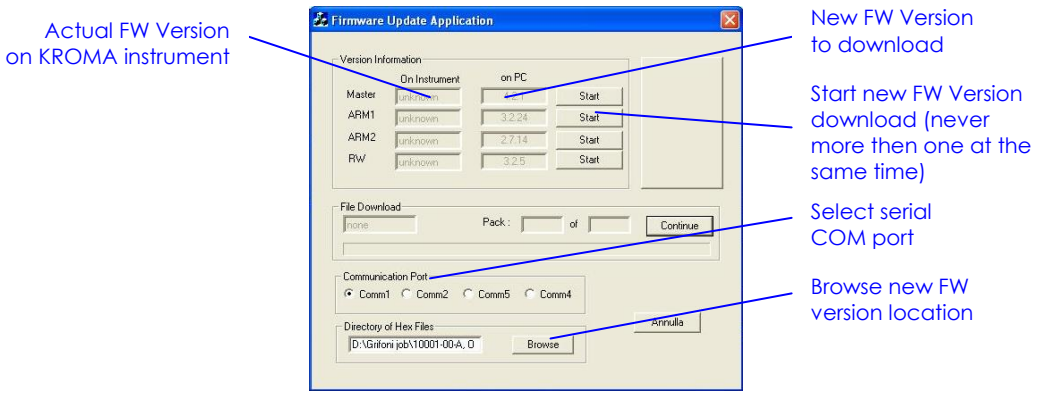
1. Close all KROMA software.
2. Start the CD-ROM (or the USB key) into the PC.
3. Copy the file **KROMAUpdateVxx.xx.xx.xxx.msi** included in the CD-ROM (or in the USB key).
4. Paste the new file **KROMAUpdateVxx.xx.xx.xxx.msi** in the directory **Desktop/My Documents/KROMA INSTALLER**.
5. Start the **KROMAUpdateVxx.xx.xx.xxx.msi** and follow the instructions on the screen to install it.
6. Restart the pc.
7. Run **KROMA** program from desktop shortcut.
8. Go in the **System Config** menu.
9. Select the correct serial COM port and click on **Save Parameters**.
10. Click on **Shutdown** in the Main Menu and close the system un-selecting **Do final wash** flag.
11. Then the system can be restarted.

2.5.6. Procedure for Firmware Upgrading

In order to upgrade the Firmware of the instrument KROMA with new versions, it is necessary to follow the procedure below:

Firmware download

1. Close KROMA software, if running (or restart the PC).
2. Power OFF the KROMA instrument, wait for ten seconds and then Power it ON again.
3. Insert the CD-ROM containing the upgrades (or the USB key) into the PC.
4. Click with the right mouse button on **START** and select **Explore**.
5. Select the directory **c:/Program Files/KROMA/Comunication/EXE**.
6. Select and start the program **SwDownload.exe** included in that directory. The program shows following window that visualizes the firmware versions for each of the four Controller boards.



7. Select the correct serial COM port and the actual firmware versions on the instrument will be shown in the column "**On Instrument**".
8. After the actual versions are visualized, click on **Browse** button and select the location of the upgrades (CD-ROM or USB key) in the window.
9. Open the **Workarea** directory and be sure that the following sub-directories are visible: arm1, arm2, master, rw. Click on **Select** button. The new firmware versions on the CD-ROM (or USB key) must be shown in the column "**on PC**".
10. Verify the old versions (Opportunity) and the new versions (on PC) in order to identify which one must be upgraded: when a release number of a "new version" is greater then the release number of the correspondent "old version", it must be upgraded.
11. Click on the **Start** button, near the first version to be upgraded, to begin download and wait for the end of the operation; the end is reached when the progress bar is full and when the release number in the column "**On Instrument**" has changed to the same number shown in the column "**on PC**".
12. Repeat step 11 for all versions to be upgraded.
13. When over with upgrading, click on the red cross in the upper right side to close the program.
14. Power OFF the instrument, wait for ten seconds and Power it ON again. The instrument is ready to operate.
15. Start the KROMA software by double-clicking the KROMA icon on the desktop (if already installed or upgraded, otherwise install or upgrade it before running).

2.6. 4-channel ISE Module (option)

The ISE Module, when included in configuration as option, requires some operations for the proper start-up and initialization. It can be supplied with different configuration depending on the number of electrodes installed (from 1 to 4). The 4-channel ISE Module is assembled at factory and it is located on the front right side of the instrument, behind the front panel.
It is composed by:

- in its full configuration the ISE Module includes 4 measurement electrodes (Li+, Na+, K+, and Cl-), one reference electrode, one bubble detector and the conditioning electronics (if some electrodes hasn't been requested in its position must be used a special "Spacer electrode" to maintain the sample flow path);
- the ISE Module pump assembly with 3 peristaltic stepper pumps (Cal A, Cal B and Waste);
- the ISE Module electrical wiring (flat cable from ISE Module to pumps assembly, reagent pack connector and mother-board);
- the ISE Module reagent pack (containing Calibrant A, Calibrant B and Waste);
- the ISE Module reagent pack connector;
- ISE Module hydraulic tubing and fittings.

Electrodes must be installed before powering the instrument on and before to use the ISE Module. If some electrodes have not been requested, replace the position with a special dummy electrode called ***"spacer electrode"***.

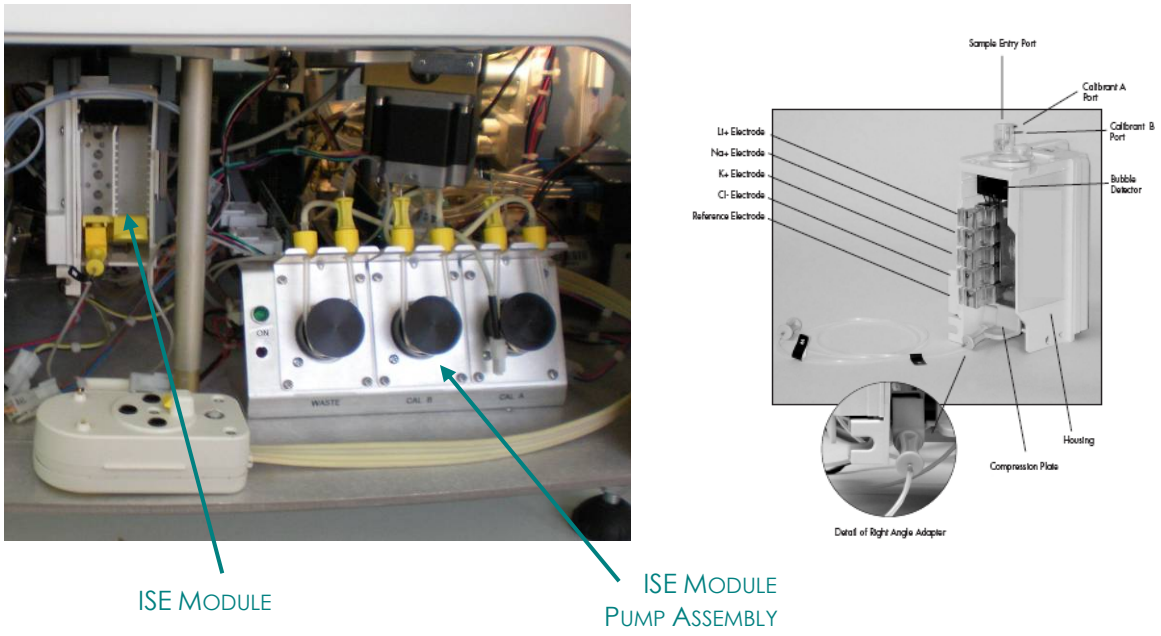


Figure 15: *ISE Module, location into the instrument (behind the front panel)*

Electrodes, Reagent pack (Cal A + Cal B + Waste), Cleaning Solution and Urine Diluent are not included in the standard shipping; they are consumables to be order apart.

2.6.1. ISE Module Installation

The ISE Module has been previously installed into the instrument at factory by the producer. The user must only install the electrodes before installation and use. After having installed electrodes, they can be enabled or disabled by software (*ISE Module Config* menu).

2.6.1.1. Connections

Following the picture below, the user has only to connect the Reagent Pack Connector on the Reagent Pack itself: press the yellow button and at the same time place it on the Reagent Pack, then release the yellow button.
The instrument doesn't require the user to carry out any electrical connections, just check that the internal side walls of the peristaltic pump tubings are not glued together to obstruct the flow.
Hydraulic connections have been installed into the instrument by the Producer at factory. The user doesn't need to install any additional tubing.

Figure 16: *ISE Module, Reagent Pack connection*

NOTE: the user must properly connect and fix the Reagent Pack Connector on the Reagent Pack taking particular care in not bending tubes.

2.6.2. ISE Module Solutions and Consumables

The ISE Module proper operation requires the following solutions:

1. ***Reagent Pack***, containing:
   - **Calibrant A.** It is used in both the two-point and single-point calibrations **for sample analysis**. It is contained into the Reagent Pack together with Calibrant B and Waste.
   - **Calibrant B.** It is used in two-point and single-point calibrations **for urine sample analysis**. It is contained into the Reagent Pack together with Calibrant A and Waste.

   No preparation is required. Store reagent pack at 4°C÷25°C until expiration date on labels. When install new reagent pack: record the exact date.

WARNING

Biohazard Waste: waste material must be always considered potentially infected. Dispose off according to local laws and rules.

2. ***Cleaning solution.*** It is used once a day **to prevent protein build-up**. It must be used more frequently if the ISE Module performs greater than 50 samples per day. It is composed by mixing the Pepsin powder and by the Cleaner Diluent. Pepsin/HCl cleaning solution must be prepared once per week and stored at 4°C. When ISE Module is in use, cleaning solution must be dropped into a 20ml reagent vial and placed in the proper position of the instrument reagent tray; that position is chosen by the User in the *Reagents* menu.
   Store unprepared components at 18÷25°C until expiration date on labels.
   Preparation
   - Add daily cleaner diluent into top of pepsin bottle and shake well.
   - Record date.
   - Spill the solution into a clean 20ml vial and place on the proper reagent tray position.
   - Refrigerate at 2÷8°C when not in use.
   - Discard 4 weeks after mixing.

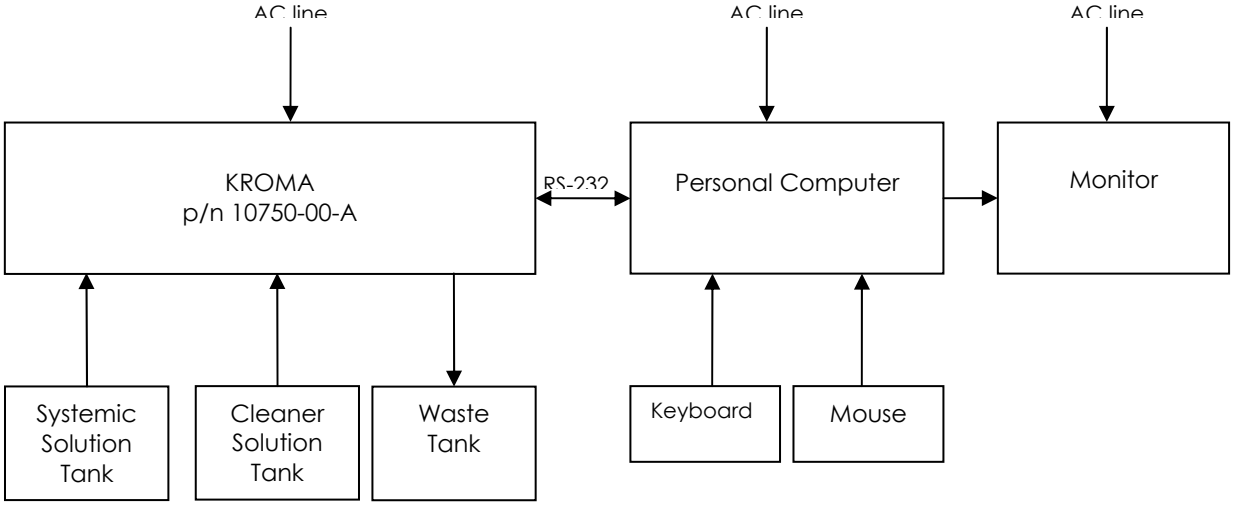
   WARNING
   IRRITANT! This solution is irritating to eyes and skin.
   Avoid contact with skin and eyes. In case of contact with eyes, rinse immediately with plenty of water and seek medical advise. Contains ammonium bifluoride.

3. ***Urine Diluent***. Urine samples are diluted to perform urine measurement: 1 part urine sample to 9 parts urine diluent. When the ISE Module is in use, the user has to fill with urine diluent a 20ml reagent vial and must place it in the proper position of the instrument reagent tray; that position is chosen by the User in the *Reagents* menu.
   No preparation is required. Store at 5°C÷25°C until expiration date marked on labels.

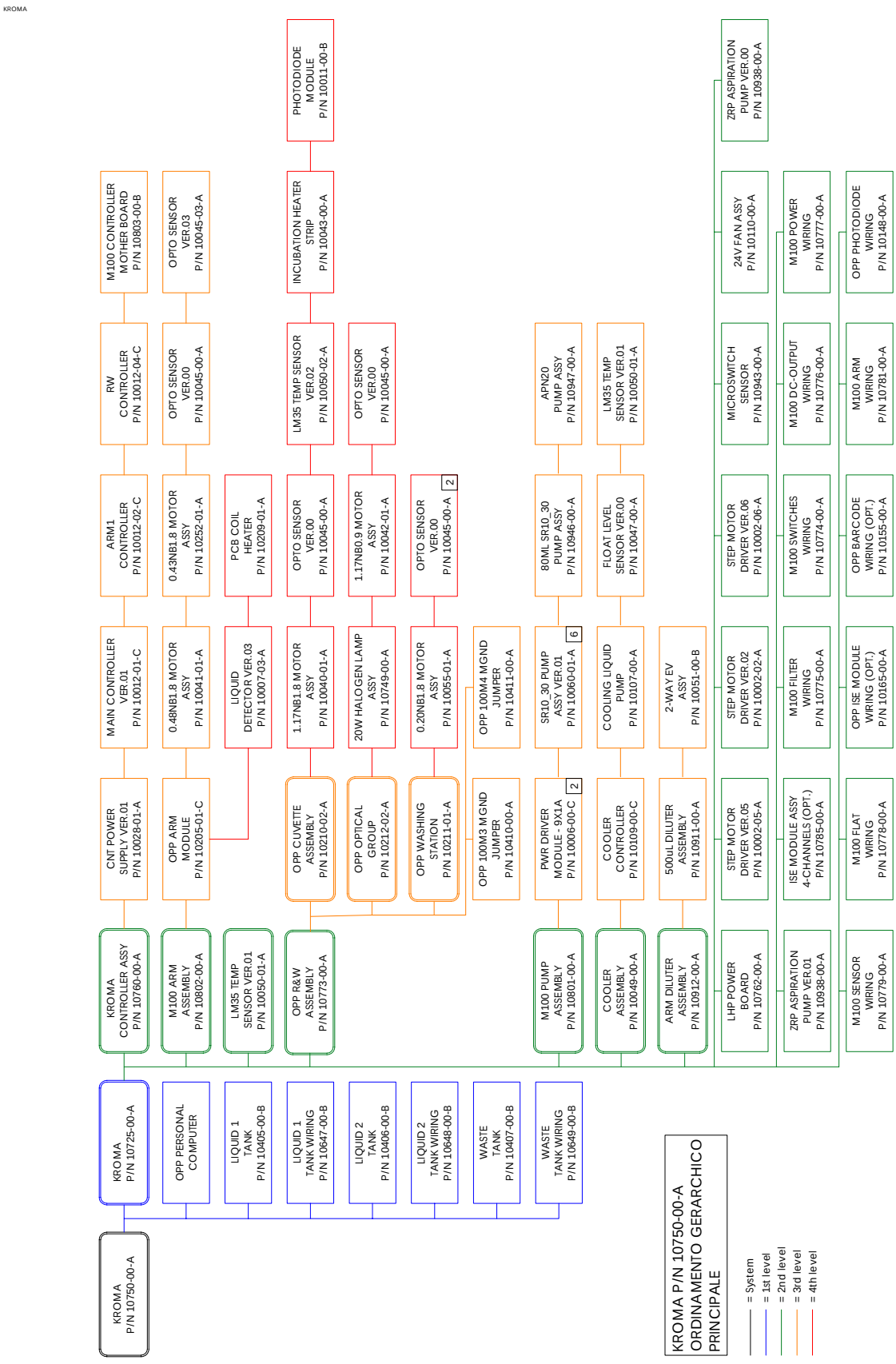
Section 3 ELECTRICAL DRAWINGS AND PART LISTS

3. The KROMA System

The system KROMA, in its base configuration, is composed: by the *instrument* itself - KROMA Unit, by the external Personal Computer managing the instrument, by the external tanks and by the mutual electrical and hydraulical connections.



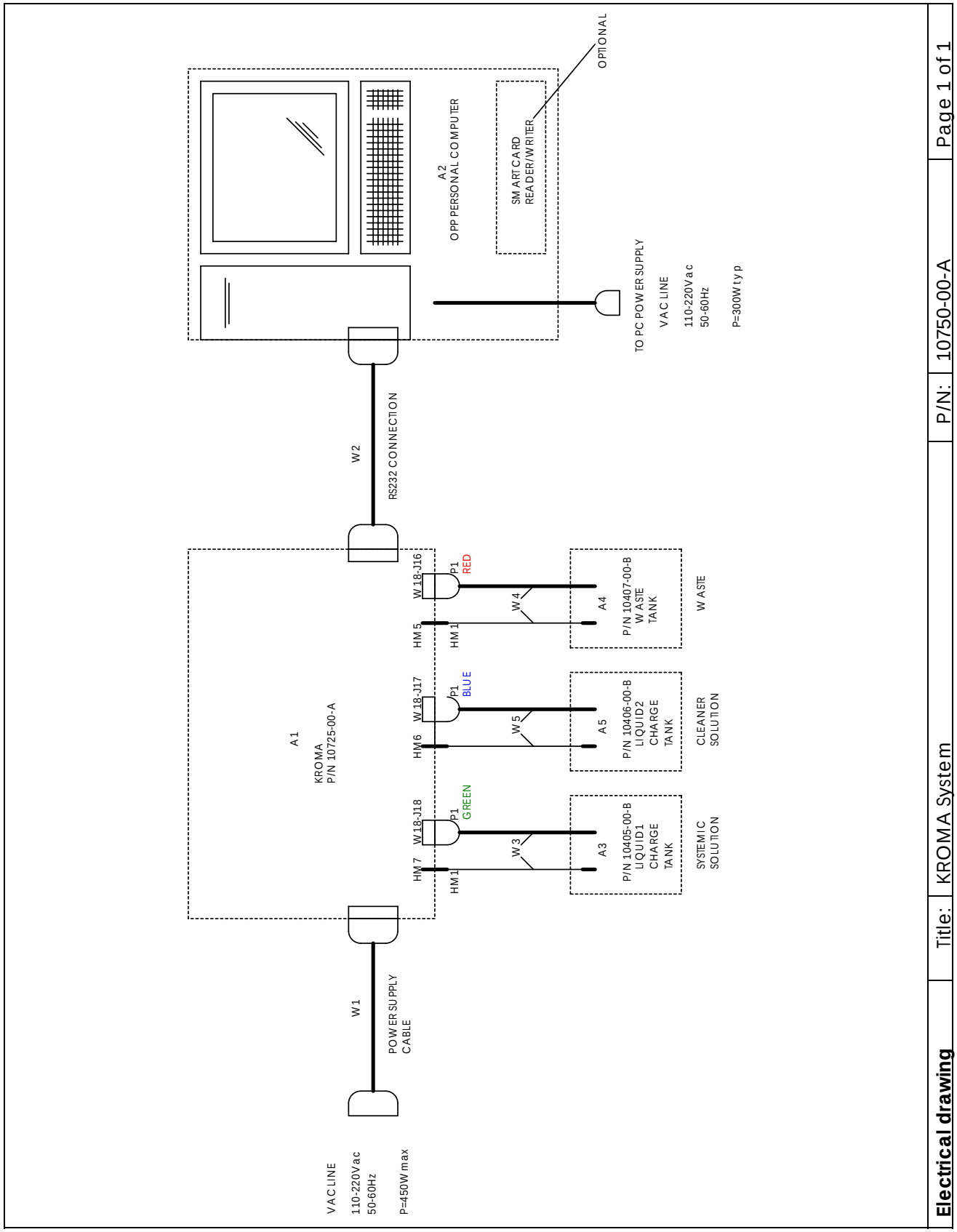
The **hierarchical assembly** diagram is given in the following picture.


KROMA
KROMA P/N 10750-00-A
KROMA P/N 10725-00-A
OPP PERSONAL COMPUTER
LIQUID 1 TANK P/N 10405-00-B
LIQUID 1 TANK WIRING P/N 10647-00-B
LIQUID 2 TANK P/N 10406-00-B
LIQUID 2 TANK WIRING P/N 10648-00-B
WASTE TANK P/N 10407-00-B
WASTE TANK WIRING P/N 10649-00-B
KROMA CONTROLLER ASSY P/N 10760-00-A
M100 ARM ASSEMBLY P/N 10802-00-A
LM35 TEMP SENSOR VER.01 P/N 10050-01-A
OPP R&W ASSEMBLY P/N 10773-00-A
M100 PUMP ASSEMBLY P/N 10801-00-A
COOLER ASSEMBLY P/N 10049-00-A
ARM DILUTER ASSEMBLY P/N 10912-00-A
LHP POWER BOARD P/N 10762-00-A
ZRP ASPIRATION PUMP VER.01 P/N 10938-00-A
M100 SENSOR WIRING P/N 10779-00-A
CNT POWER SUPPLY VER.01 P/N 10028-01-A
OPP ARM MODULE P/N 10205-01-C
OPP CUVETTE ASSEMBLY P/N 10210-02-A
OPP OPTICAL GROUP P/N 10212-02-A
OPP WASHING STATION P/N 10211-01-A
OPP 100M3 M GND JUMPER P/N 10410-00-A
PWR DRIVER MODULE - 9X1A P/N 10006-00-C 2
COOLER CONTROLLER P/N 10109-00-C
500uL DILUTER ASSEMBLY P/N 10911-00-A
STEP MOTOR DRIVER VER.05 P/N 10002-05-A
ISE MODULE ASSY 4-CHANNELS (OPT.) P/N 10785-00-A
M100 FLAT WIRING P/N 10778-00-A
MAIN CONTROLLER VER.01 P/N 10012-01-C
0.48NB1.8 MOTOR ASSY P/N 10041-01-A
LIQUID DETECTOR VER.03 P/N 10007-03-A
1.17NB1.8 MOTOR ASSY P/N 10040-01-A
20W HALOGEN LAMP ASSY P/N 10749-00-A
0.20NB1.8 MOTOR ASSY P/N 10055-01-A
OPP 100M4 MGND JUMPER P/N 10411-00-A
SR10_30 PUMP ASSY VER.01 P/N 10060-01-A 6
COOLING LIQUID PUMP P/N 10107-00-A
2-WAY EV ASSY P/N 10051-00-B
STEP MOTOR DRIVER VER.02 P/N 10002-02-A
M100 FILTER WIRING P/N 10775-00-A
OPP ISE MODULE WIRING (OPT.) P/N 10165-00-A
ARM1 CONTROLLER P/N 10012-02-C
0.43NB1.8 MOTOR ASSY P/N 10252-01-A
PCB COIL HEATER P/N 10209-01-A
OPTO SENSOR VER.00 P/N 10045-00-A 2
1.17NB0.9 MOTOR ASSY P/N 10042-01-A
OPTO SENSOR VER.00 P/N 10045-00-A
80ML SR10_30 PUMP ASSY P/N 10946-00-A
FLOAT LEVEL SENSOR VER.00 P/N 10047-00-A
STEP MOTOR DRIVER VER.06 P/N 10002-06-A
M100 SWITCHES WIRING P/N 10774-00-A
OPP BARCODE WIRING (OPT.) P/N 10155-00-A
RW CONTROLLER P/N 10012-04-C
OPTO SENSOR VER.00 P/N 10045-00-A
LM35 TEMP SENSOR VER.02 P/N 10050-02-A
OPTO SENSOR VER.00 P/N 10045-00-A
APN20 PUMP ASSY P/N 10947-00-A
LM35 TEMP SENSOR VER.01 P/N 10050-01-A
MICROSWITCH SENSOR P/N 10943-00-A
M100 DC-OUTPUT WIRING P/N 10776-00-A
M100 ARM WIRING P/N 10781-00-A
M100 CONTROLLER MOTHER BOARD P/N 10803-00-B
OPTO SENSOR VER.03 P/N 10045-03-A
INCUBATION HEATER STRIP P/N 10043-00-A
PHOTODIODE MODULE P/N 10011-00-B
24V FAN ASSY P/N 10110-00-A
M100 POWER WIRING P/N 10777-00-A
OPP PHOTODIODE WIRING P/N 10148-00-A
ZRP ASPIRATION PUMP VER.00 P/N 10938-00-A
KROMA P/N 10750-00-A ORDINAMENTO GERARCHICO PRINCIPALE
= System
= 1st level
= 2nd level
= 3rd level
= 4th level

Schematics and part lists of the main assemblies of the instrument are given in this section into hierarchical format.

Part List Title: KROMA P/N: 10750-00-A

Pos.	Ref. Designator	Q.ty	UdM	Description	Value	Rating	Toler.	P/N
1	A1	1	PZ	KROMA UNIT				10725-00-A
2	A2	1	PZ	OPP PERSONAL COMPUTER, COMPLETE WITH KEYBOARD, MONITOR, MOUSE AND PRINTER WITH USB CABLE				P3140000097
3	A3	1	PZ	LIQUID 1 TANK (SYSTEMIC SOLUTION)				10405-00-B
4	A4	1	PZ	WASTE TANK				10407-00-B
5	A5	1	PZ	LIQUID 2 TANK (CLEANER SOLUTION)				10406-00-B
6	W1	1	PZ	INSTRUMENT POWER CABLE, SCHUKO PLUG, IEC SOCKET, PVC EN60320 3X1mmq, 10A@250Vac, LENGHT=2m				GJ033020
7	W2	1	PZ	RS-232C STANDARD SERIAL CABLE, SUBD-9PIN F, SUBD-9PIN M, RX/TX E RTS/CTS NOT CROSSED, LENGHT=1,8m				EG003330
8	W3	1	PZ	LIQUID 1 TANK WIRING (SYSTEMIC SOLUTION)				10647-00-B
9	W4	1	PZ	WASTE TANK WIRING				10649-00-B
10	W5	1	PZ	LIQUID 2 TANK WIRING (CLEANER SOLUTION)				10648-00-B
11		1	PZ	CUVETTE'S EXTRACTION TOOL				M2ASA
12		1	PZ	KROMA OPERATING PROGRAM SOFTWARE ON CD-ROM				TBD-07_03_22-10
13		1	KIT	REAGENT BOTTLE 20ml, KIT 30 PCS				P3140000020
14		1	KIT	REAGENT BOTTLE 50ml, KIT 50 PCS				P3140000019
15		1	KIT	READING CUVETTES, KIT 5 PCS				P3140000002
16		1	KIT	SYSTEMIC SOLUTION, KIT 6x50ml				P3140000102
17		2	KIT	LEANER SOLUTION (MULTICLEAN), KIT 2X 2LT				P3140000114
18		1	KIT	RINSE EWCVT SOLUTION, KIT 6X50ml				P3140000113
19		1	KIT	RINSE EWPRB SOLUTION, KIT 6X20ml				P3140000115
20		1	KIT	CAPS FOR REAGENT BOTTLES, KIT 80 PCS				P3140000079
21		1	PZ	USER MANUAL – KROMA (LAST REVISION)				MNU-10751-00-__
22		1	PZ	QUICK START GUIDE – KROMA (LAST REVISION)				GRS-10752-00-__
23		1	KIT	PRIMARY TUBES 12mm, KIT 1000 PCS				P3140000100
24		1	KIT	SAMPLE CUPS 3ml, KIT 1000 PCS				P3140000001
25		1	PZ	FUNNEL, FOR SYSTEMIC TANK REFILLING				166K


OPTIONAL
A2
OPP PERSONAL COMPUTER
SMART CARD
READER/WRITER
TO PC POWER SUPPLY
VAC LINE
110-220Vac
50-60Hz
P=300W typ
W2
RS232 CONNECTION
A1
KROMA
P/N 10725-00-A
W18-J16
W18-J17
W18-J18
HM5
HM6
HM7
HM1
P1
RED
BLUE
GREEN
W4
W5
W3
A4
A5
A3
P/N 10407-00-B
WASTE
TANK
P/N 10406-00-B
LIQUID2
CHARGE
TANK
P/N 10405-00-B
LIQUID1
CHARGE
TANK
WASTE
CLEANER
SOLUTION
SYSTEMIC
SOLUTION
W1
POWER SUPPLY
CABLE
VAC LINE
110-220Vac
50-60Hz
P=450W max
Electrical drawing
Title:
KROMA System
P/N:
10750-00-A
Page 1 of 1

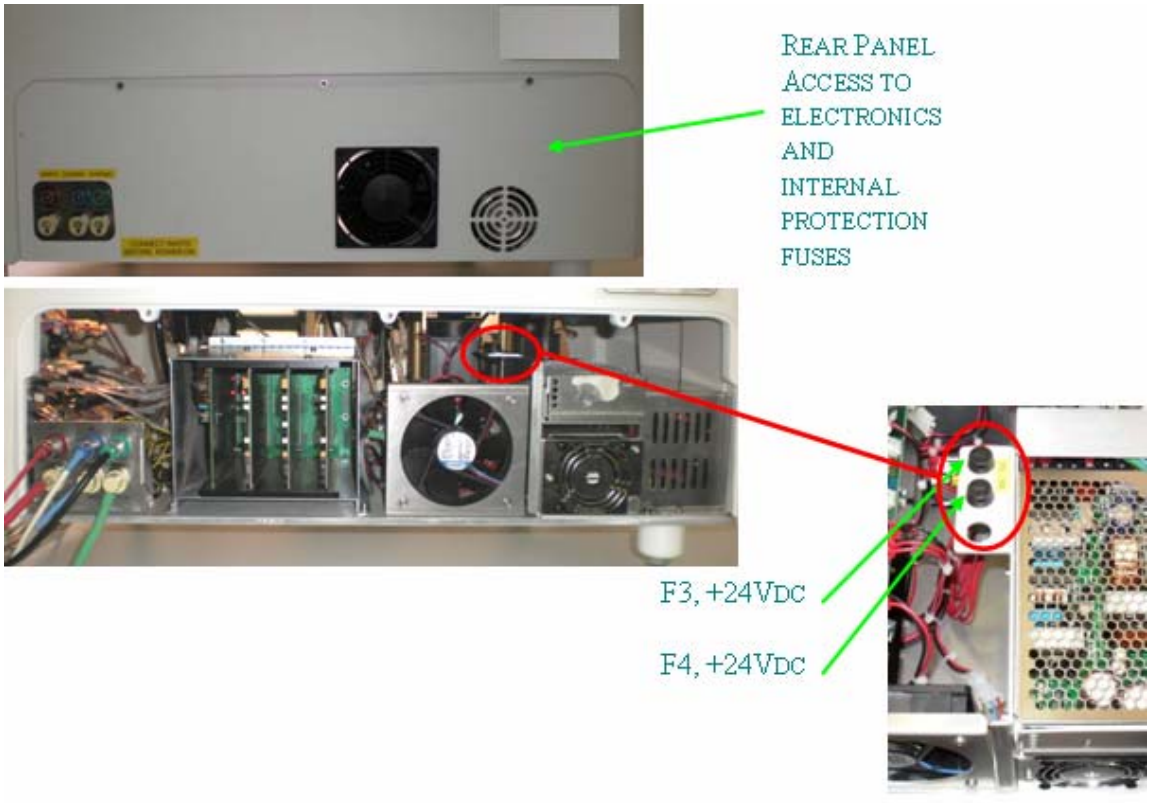
KROMA Unit P/N 10725-00-A

This paragraph shows electrical drawings and part list of ***KROMA Unit*** P/N 10725-00-A.
Part list shows only components/parts available for servicing.

Two DC voltages are generated by the power supply units; they can be switched ON/OFF independently from each other:

- +24Vdc for electronic operation (with the exception of the reagents' cooler assembly); enabled by the front green switch.
- +12Vdc for reagents' cooler assembly and its electronic only; enabled by the front blue switch.

This two DC lines are linked to the terminal blocs (TB) through the ***KROMA DC Output Wiring*** P/N 10776-00-A.
The internal +24Vdc line split into 2 lines by the ***KROMA Power Wiring***, each one is protected by a specific fuse placed inside of the instrument, on a support behind the right side panel and near the power supplies. Any of these 2 lines groups 3 sub-lines each.
The internal +12Vdc line is linked directly to the ***LHP Power Board*** P/N 10762-00-A through the ***KROMA DC Output Wiring*** P/N 10776-00-A (over-current and over-voltage protections provided by the +12Vdc
power



supply).

Figure 17: *Rear Panel and Internal Fuses*

The internal fuse panel includes the following 2 fuses:

- Fuse 3: case 5mmX20mm, 8A/250Vac, T-Type (delayed).
  It protects the following lines:
  +24VDC-CONTR: it supplies the KROMA Controller Assembly A5 (it includes the rack with the Controller Boards).

+24VDC-1: it supplies the Stepping Motor Driver A8 for Cuvette and ARM Diluter motors.
+24VDC-2: it supplies the Stepping Motor Driver A6 for Washing Station and Filter Wheel motors.

- Fuse F4: case 5mmX20mm, 8A/250Vac, T-Type (delayed).
  It protects the following lines:
  +24VDC-3: it supplies the Stepping Motor Driver A7 for ARM1-X and ARM1-Y motors.
  +24VDC-4: it supplies KROMA Pump Assembly (drivers and loads).
  +24VDC-5: it supplies the LHP Power Board A13 for halogen lamp and incubation heater strip powering section.

Power supplies of the unit are universal main AC/DC type. They can be powered with alternate stable supply in the range from 100Vac up to 240Vac; the acceptable frequency ranges from 47Hz to 63Hz. Semi-operative voltage selections on the instrument are **not required**. The main switch block is placed on the left side of the unit and it includes:

- Two switches.
- Two line protection fuses.
- One line filter.
- The supply cable inlet.

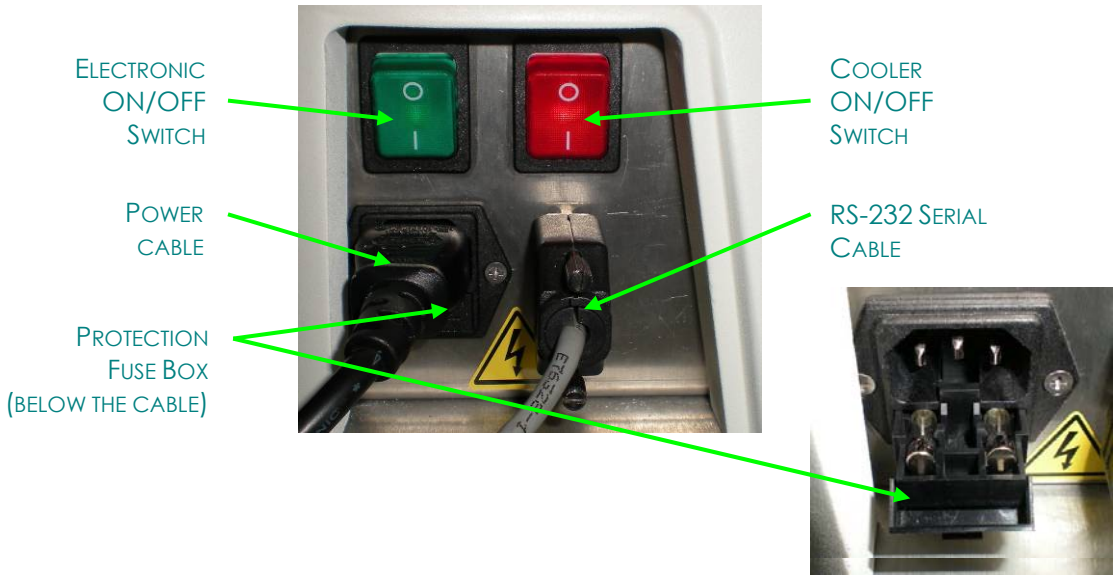


Figure 18: *Main Switch Block*

External main fuses on the main switch block:

- Fuse F1 and F2: case 5mmX20mm, 10A/250Vac, T-type (delayed).

WARNING

When replacing or controlling main fuses the instrument must be powered off and the power cable must be disconnected from the instrument.

RFI Filter suppressor is placed under the Power Supplies cover.

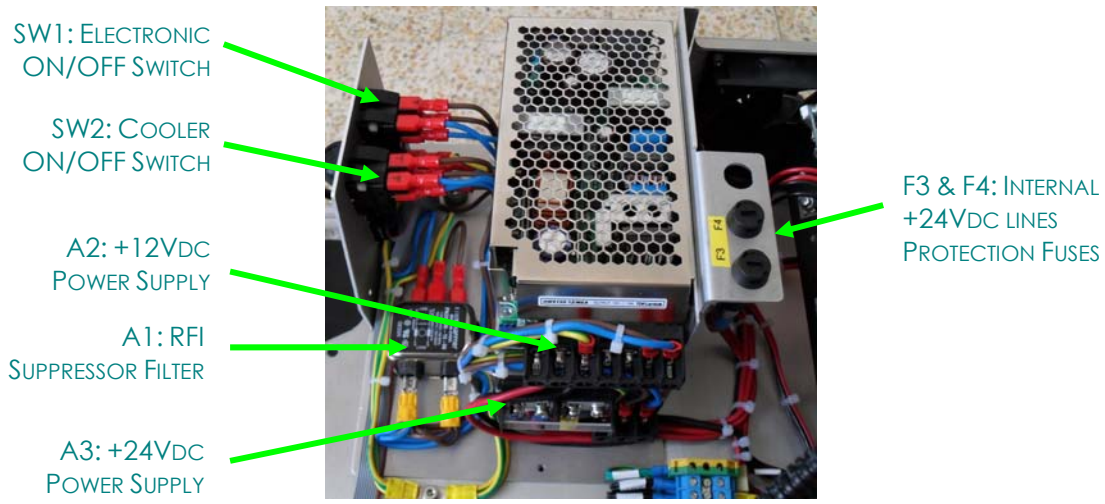


Figure 19: *Power Supplies without protection covers*

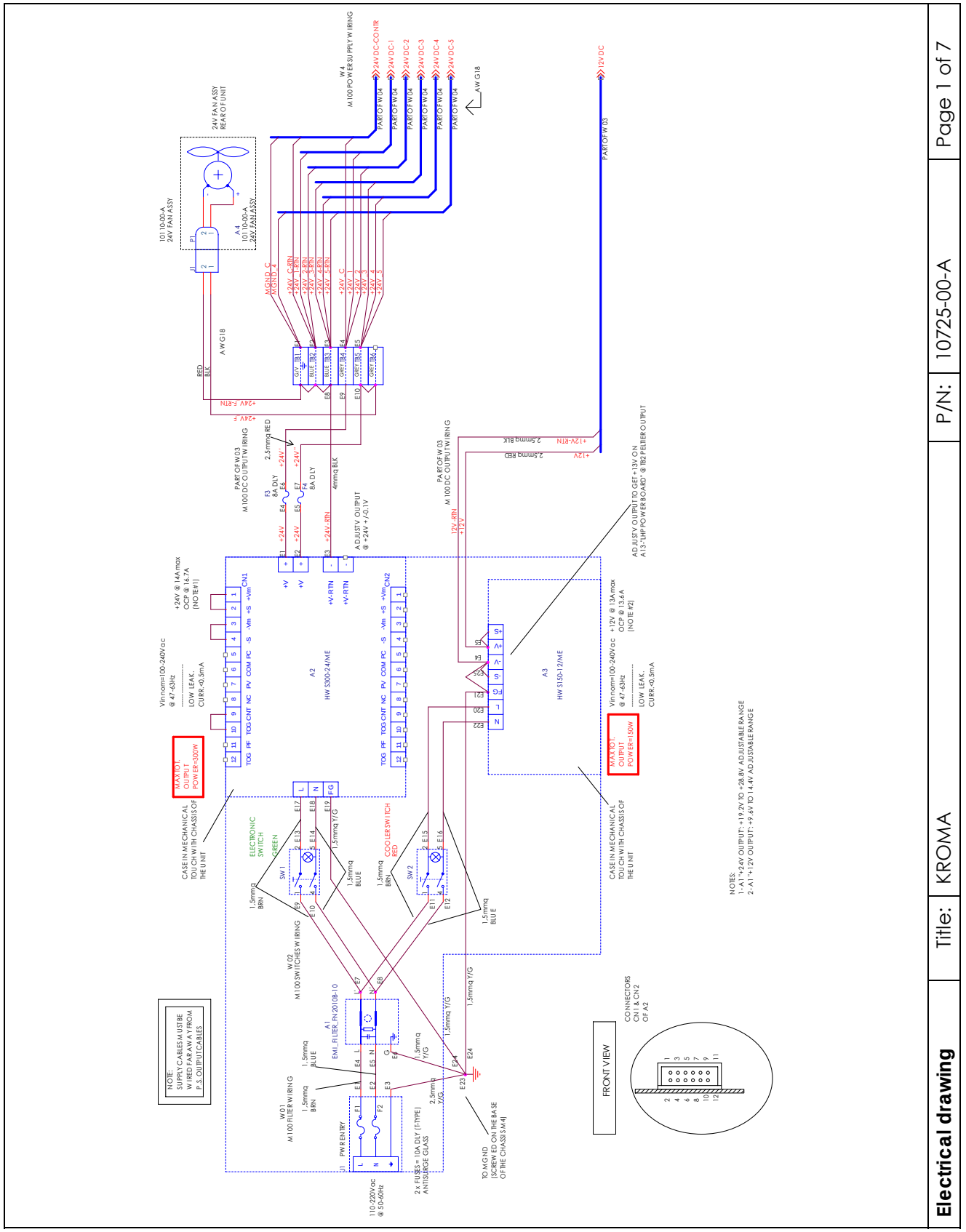
To replace one of the power supplies, power OFF the instrument, disconnect power cord and remove the instrument cabinet. Unfasten the screws fixing the power supplies cover and remove them. Unfasten the screws fixing the Power Supply on the bracket and disconnect the wiring; then replace the Power Supply only with the same model.
The temperature of reagents is monitored by a potted temperature sensor (***LM35 Temp Sensor Ver.01*** P/N 10050-01-A) screwed on the bottom side of the reagent tray; this sensor is controlled by the **LHP Power Board** P/N 10762-00-A in order to control the refrigeration temperature of reagents when cooling is ON.
The bottom base of samples and reagent trays has been grounded for correct liquid level detector operation into sample tubes and cups and into reagent bottles.

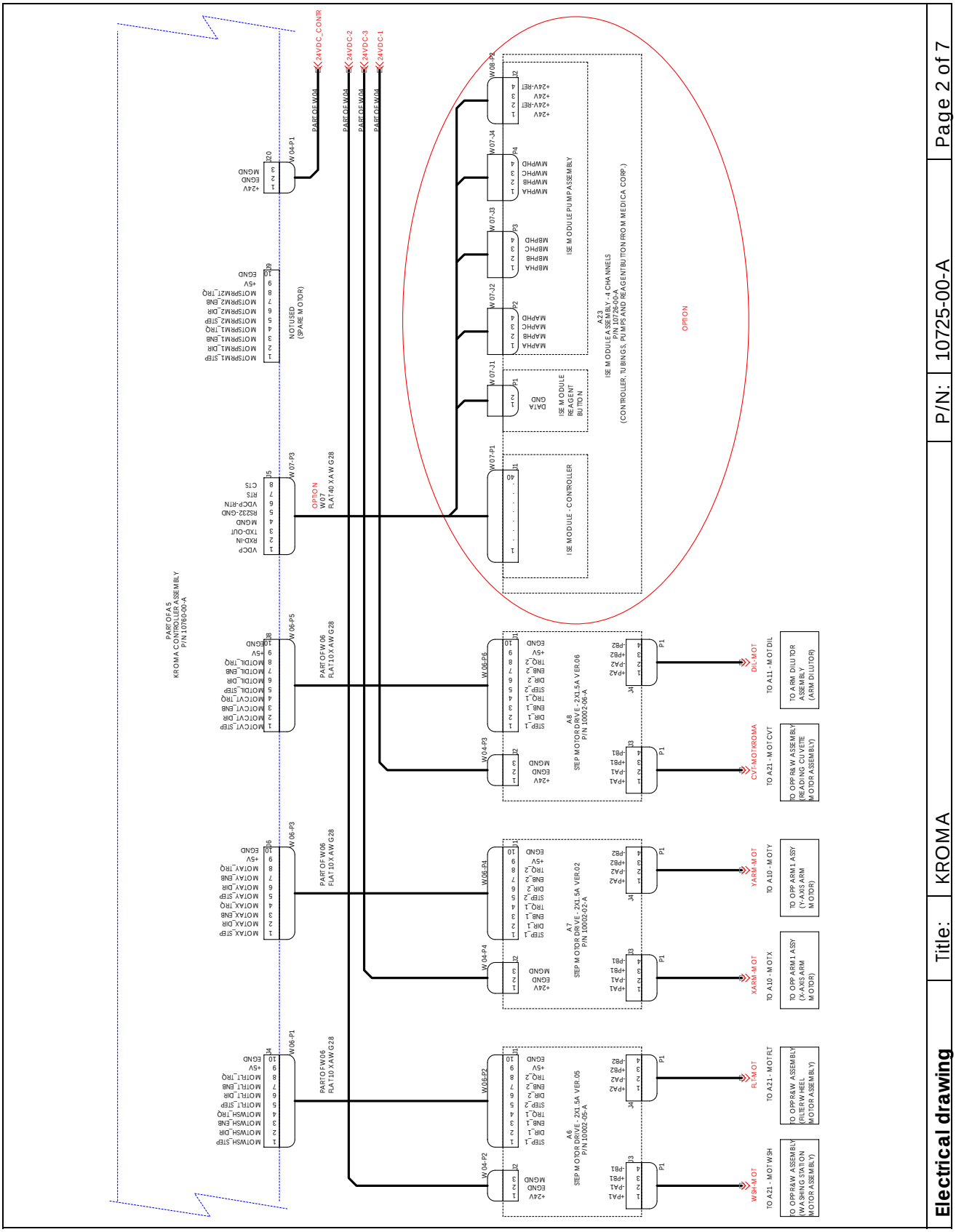
Part List Title: KROMA Unit P/N: 10725-00-A

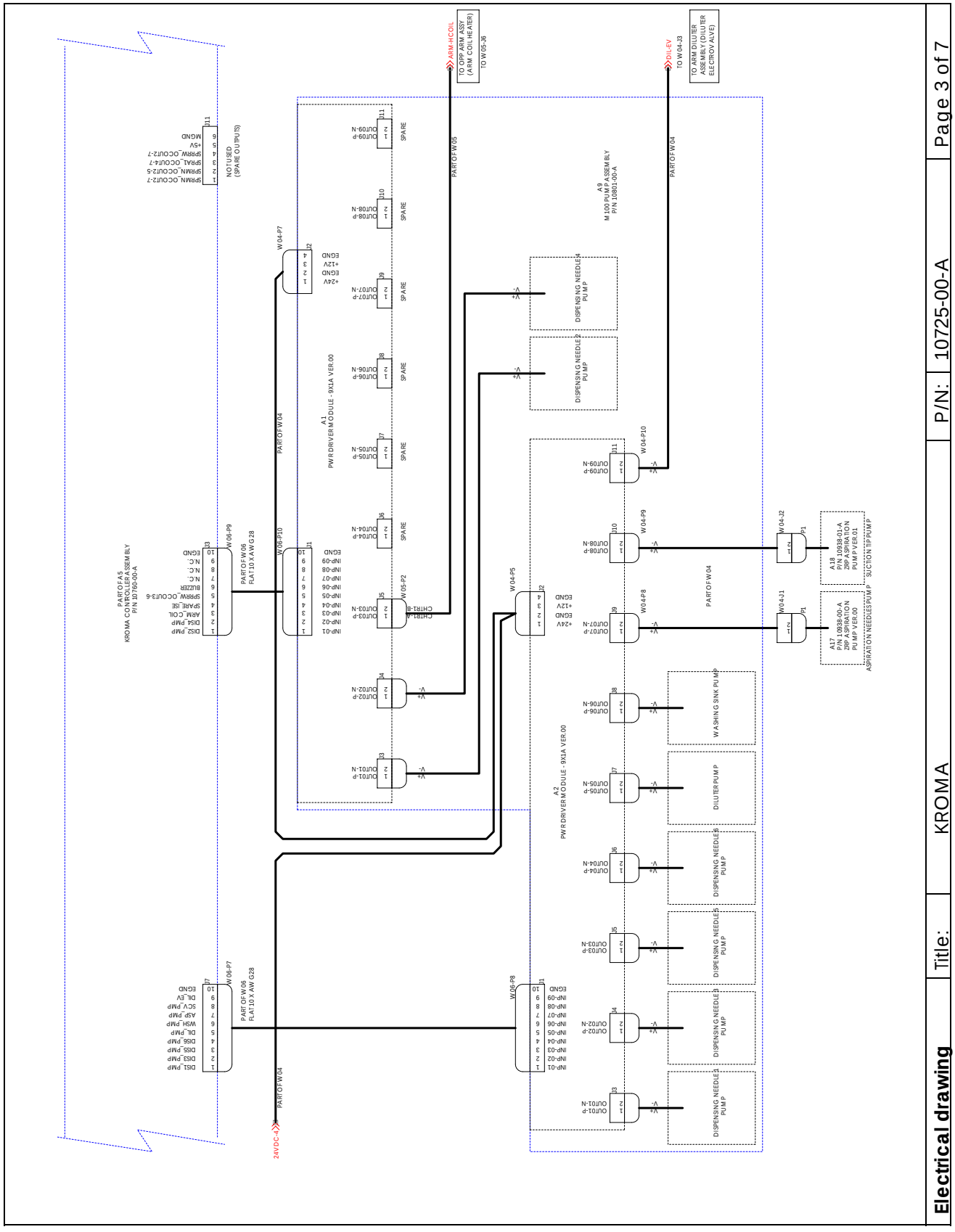
Pos.	Ref. Designator	Q.ty	UoM	Description	Value	Rating	Toler.	P/N
1	A1	1	PZ	EMC FILTER, MONO-PHASE, SINGLE STAGE, FAST-ON CONNECTION, 250Vac/50-60Hz/10A, MEDICAL TYPE, L=0.8mH, Cx=0.1uF, R=1MOhm	250Vac	10A		FN2010B-10/06
2	A2	1	PZ	POWER SUPPLY, AC/DC SWITCHING, SINGLE OUTPUT, 300W, 85-265Vac@47-63Hz INP, +24Vdc@14Amax (Vout = 19.2-28.8V), LOW LEAKAGE CURRENT=<0.5mA@60Hz, INTERNAL COOLING FAN (FW), SCREW TERMINAL, EN606010-1 COMPLIANT, MEDICAL, HWS300 SERIES	+24V	300W		HWS 300-24/ME
3	A3	1	PZ	POWER SUPPLY, AC/DC SWITCHING, SINGLE OUTPUT, 150W, 85-265Vac@47-63Hz INP, +12Vdc@13Amax (Vout = 9.6-14.4V), LOW LEAKAGE CURRENT =<0.5mA@60Hz, REMOTE SENSING, SCREW TERMINAL, EN606010-1 COMPLIANT, MEDICAL, HWS150 SERIES	+12V	150W		HWS 150-12/ME A
4	A4	1	PZ	24V FAN ASSY				10110-00-A
5	A5	1	PZ	KROMA CONTROLLER ASSEMBLY				10760-00-A
6	A6	1	PZ	STEP MOTOR DRIVE - 2X1.5A VER.05				10002-05-A
7	A7	1	PZ	STEP MOTOR DRIVE - 2X1.5A VER.02				10002-02-A
8	A8	1	PZ	STEP MOTOR DRIVE - 2X1.5A VER.06				10002-06-A
9	A9	1	PZ	KROMA PUMP ASSEMBLY				10801-00-A
10	A10	1	PZ	KROMA ARM ASSEMBLY				10802-00-A
11	A11	1	PZ	DILUTER ASSEMBLY				10912-00-A
12	A12	1	PZ	MICROSWITCH SENSOR				10943-00-A
13	A13	1	PZ	LHP POWER BOARD				10762-00-A
14	A14	1	PZ	LM35 TEMP SENSOR VER.01				10050-01-A
15	A15-A16	2	PZ	THERMO-ELECTRIC MODULE, PELTIER CELL, Qmax=38,5W, Imax=8,5A, Vmax=8,6V, DTmax=65°C, 30x30x3,3mm, LAPPED TYPE (FLAT CERAMIC SURFACE), WITH RTV SEALING, AWG18 CONDUCTORS				CP1.4-71-045L-RTV
16	A17	1	PZ	ZRP ASPIRATION PUMP VER.00 (FOR ASPIRAT. NEEDLES)				10938-00-A

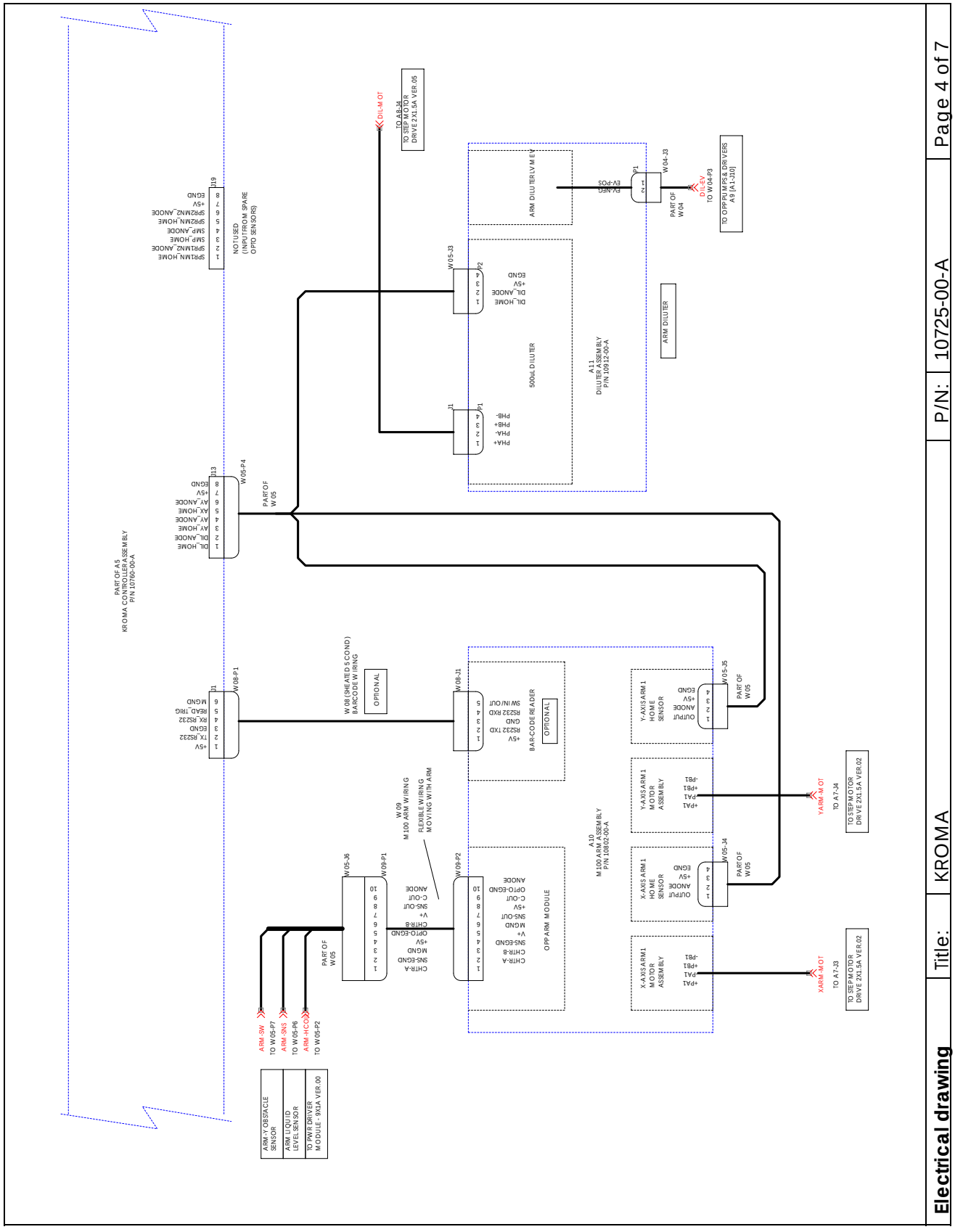
Part List Title: KROMA Unit P/N: 10725-00-A

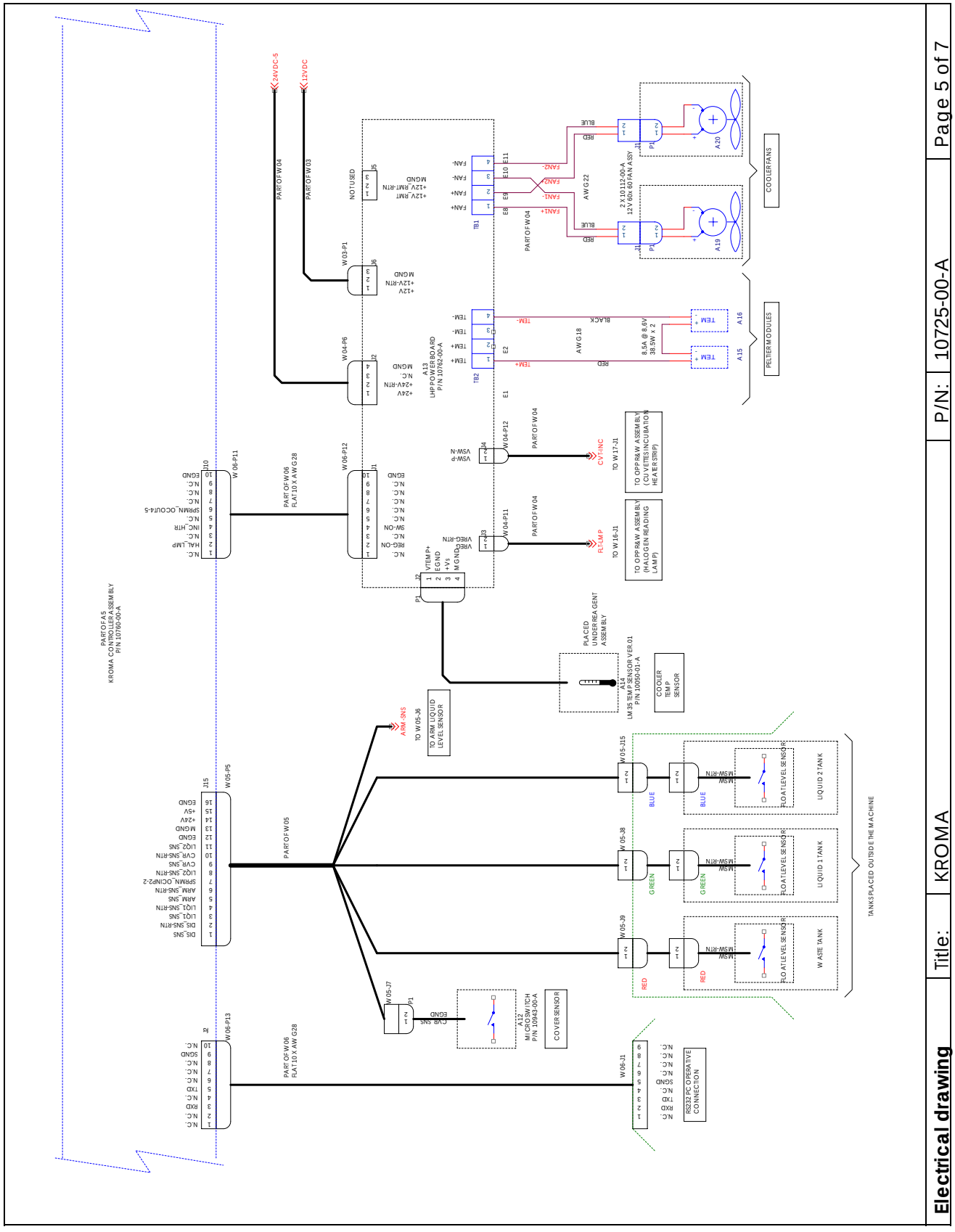
Pos.	Ref. Designator	Q.ty	UoM	Description	Value	Rating	Toler.	P/N
17	A18	1	PZ	ZRP ASPIRATION PUMP VER.01 (FOR TIP)				10938-01-A
18	A19, A20	2	PZ	12V 60x60 FAN ASSY				10112-00-A
19		2	PZ	HEATSINK, HIGH EFFICIENCY, 60x60mm BASE, 30mm HEIGTH, PARALLEL FINS				W60-30W
20	A21	1	PZ	KROMA R&W ASSEMBLY VER.00				10773-00-A
21	A23	0	PZ	ISE MODULE ASSEMBLY - 4 CHANNELS				10726-00-A
22	F1, F2	2	PZ	FUSE, 5x20mm, GLASS, TIPO T (RITARDATO)	10A	250Vac		CT520310
23	F3, F4	2	PZ	FUSE, 5x20mm, GLASS, TIPO T (RITARDATO)	8A	250Vac		0234 008P
24	J1	1	PZ	POWER INLET BLOCK, IEC/EN60320-1, WITH 2-POLES PROTECTING 5x20mm FUSES, 2-SCREWS PANEL FIXING, 250Vac/10A, FOR IEC PLUG, FAST-ON 6,35mm CONNECTIONS				PF0030/63
25	SW1	1	PZ	SWITCH, PANEL, BASCULANT, DPST, GREEN LIGHT, 250Vac/16A, FAST-ON 6.3x0.8mm CONNECTIONS	250Vac	16A		C6053ALNAM
26	SW2	1	PZ	SWITCH, PANEL, BASCULANT, DPST, RED LIGHT, 250Vac/16A, FAST-ON 6.3x0.8mm CONNECTIONS	250Vac	16A		C6053ALNAE
27	W01	1	PZ	KROMA FILTER WIRING				10775-00-A
28	W02	1	PZ	KROMA SWITCHES WIRING				10774-00-A
29	W03	1	PZ	KROMA DC OUTPUT WIRING				10776-00-A
30	W04	1	PZ	KROMA POWER WIRING				10777-00-A
31	W05	1	PZ	KROMA SENSORS WIRING				10779-00-A
32	W06	1	PZ	KROMA FLAT WIRING				10778-00-A
33	W07	0	PZ	OPP ISE MODULE WIRING				10165-00-A
34	W08	0	PZ	BARCODE WIRING				10155-00-A
35	W09	1	PZ	KROMA ARM WIRING				10781-00-A
36	W10	1	PZ	OPP PHOTODIODE WIRING				10148-00-A
37	HM1	1	PZ	SAMPLING PROBE, SWAGGED, DRYFILM INT. E EXT., TEFLON EXT., OURTER DIAM.=1,2mm, INNER DIAM.=0,8mm/0,6mm				10558-00-A
38	HM4	2	PZ	COUPLING FOR PLASTIC TUBING, QUICK, FEMALE, PANEL MOUNTING, POLYPROPYLENE, O-RING EPDM SEAL, WITH LOCK, 1/2-24UNS THREAD, FOR 1/8" ID (3.2mm ID) TUBING, FINNED, WITH VALVE, PMC12 SERIES				PMCD160212
39	HM5	1	PZ	COUPLING FOR PLASTIC TUBING, QUICK, FEMALE, PANEL MOUNTING, POLYPROPYLENE, GUARNIZIONE O-RING EPDM, O-RING EPDM SEAL, WITH LOCK, 1/2-24UNS THREAD, FOR 1/8" ID (3.2mm ID) TUBING, FINNED, WITHOUT VALVE, PMC12 SERIES				PMC160212
40	HM8-HM21	13	PZ	FINGERTIGHT FITTINGS NUT, PVC, 1/4-28UNF THREAD, FOR FERULE, FOR PTFE TUBING OUTER DIAM.=1/8"				20281-00-A
41		13	PZ	FERULE, FOR 1/8" PTFE TUBING, FLANGELESS, FOR FLAT-BOTTOM PORTS, ETFE, YELLOW				P-300x
42		1	PZ	FITTING, Y, BARBED, POLIPROPILENE, FOR FLEXIBLE TUBING ID=1/8"				Y230-6
43	HT1-HT9, HT17	5,5	M	FLEXIBLE TUBING, TYGON, INNER DIAM.=1/8" (3,17mm), OUTER DIAM.=1/4" (6,35mm), WALL=1/16" (1,58mm), TYPE TYGON R3603				AAC00007
44	HT10-HT16	3,2	M	FLEXIBLE TUBING, PTFE (TEFLON), INNER DIAM.=1,6mm, OUTER DIAM.=3,2mm, WALL=0,8mm				562-3019-X2
45		1	PZ	SMART CARD READER ATHENA MOD. ASE DRIVE IIIe USB (OPTION)				ASE IIIe DRIVE USB

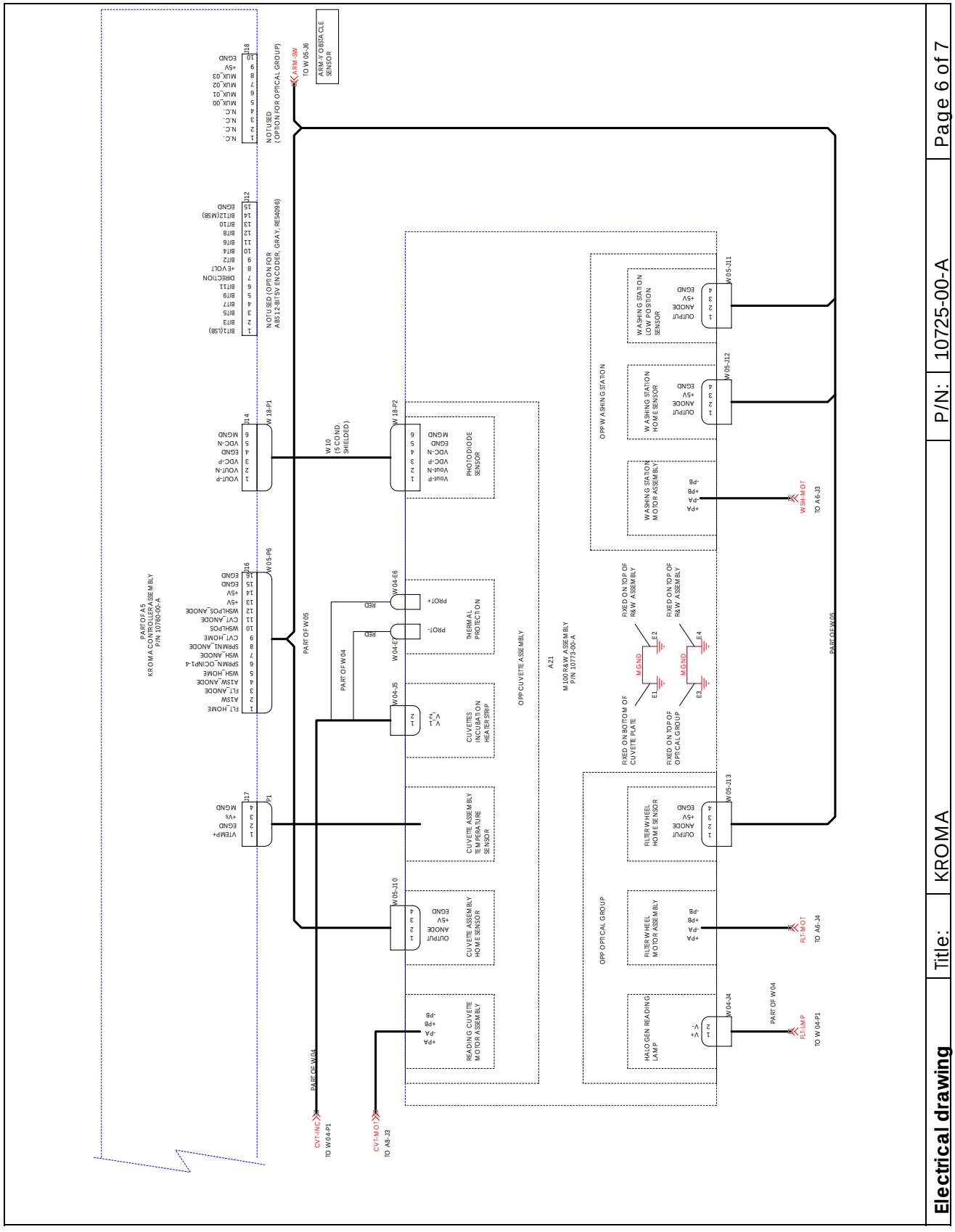

Electrical drawing
Title: KROMA
P/N: 10725-00-A
Page 1 of 7
NOTE:
SUPPLY CABLES MUST BE WIRED FAR AWAY FROM P.S. OUTPUT CABLES
NOTES:
1- A1: +24V OUTPUT: +19.2V TO +28.8V ADJUSTABLE RANGE
2- A1: +12V OUTPUT: +9.6V TO 14.4V ADJUSTABLE RANGE
FRONT VIEW
CONNECTORS CN1 & CN2 OF A2
CASE IN MECHANICAL TOUCH WITH CHASSIS OF THE UNIT
TO MGND (SCREWED ON THE BASE OF THE CHASSIS M4)
2 x FUSES = 10A DLY (T-TYPE) ANTISURGE GLASS
110-220Vac @ 50-60Hz
Vin nom=100-240Vac @ 47-63Hz
LOW LEAK. CURR.<0.5mA
+24V @ 14A max OCP @ 16.7A (NOTE#1)
+12V @ 13A max OCP @ 13.6A (NOTE #2)
MAX TOT. OUTPUT POWER<300W
MAX TOT. OUTPUT POWER<150W
ELECTRONIC SWITCH GREEN
ELECTRONIC SWITCH RED
A1 EMI_FILTER_PN 20108-10
A2 HW S300-24/ME
A3 HW S150-12/ME
W01 M100 FILTER WIRING
W02 M100 SWITCHES WIRING
W4 M100 POWER SUPPLY WIRING
M100 DC OUTPUT WIRING
PART OF W03
PART OF W04
24V FAN ASSY REAR OF UNIT
10110-00-A 24V FAN ASSY
A4 10110-00-A 24V FAN ASSY
ADJUSTV OUTPUT @ +24V +/-0.1V
ADJUSTV OUTPUT TO GET +13V ON A13-"UHP POWER BOARD" @ TB2 PELTIER OUTPUT
+24V DC-CONTR
+24V DC-1
+24V DC-2
+24V DC-3
+24V DC-4
+24V DC-5
+12V DC
A WG 18
2.5mmq RED
2.5mmq BLK
4mmq BLK
1.5mmq BRN
1.5mmq BLUE
1.5mmq Y/G
2.5mmq Y/G
F3 8A DLY
F4 8A DLY

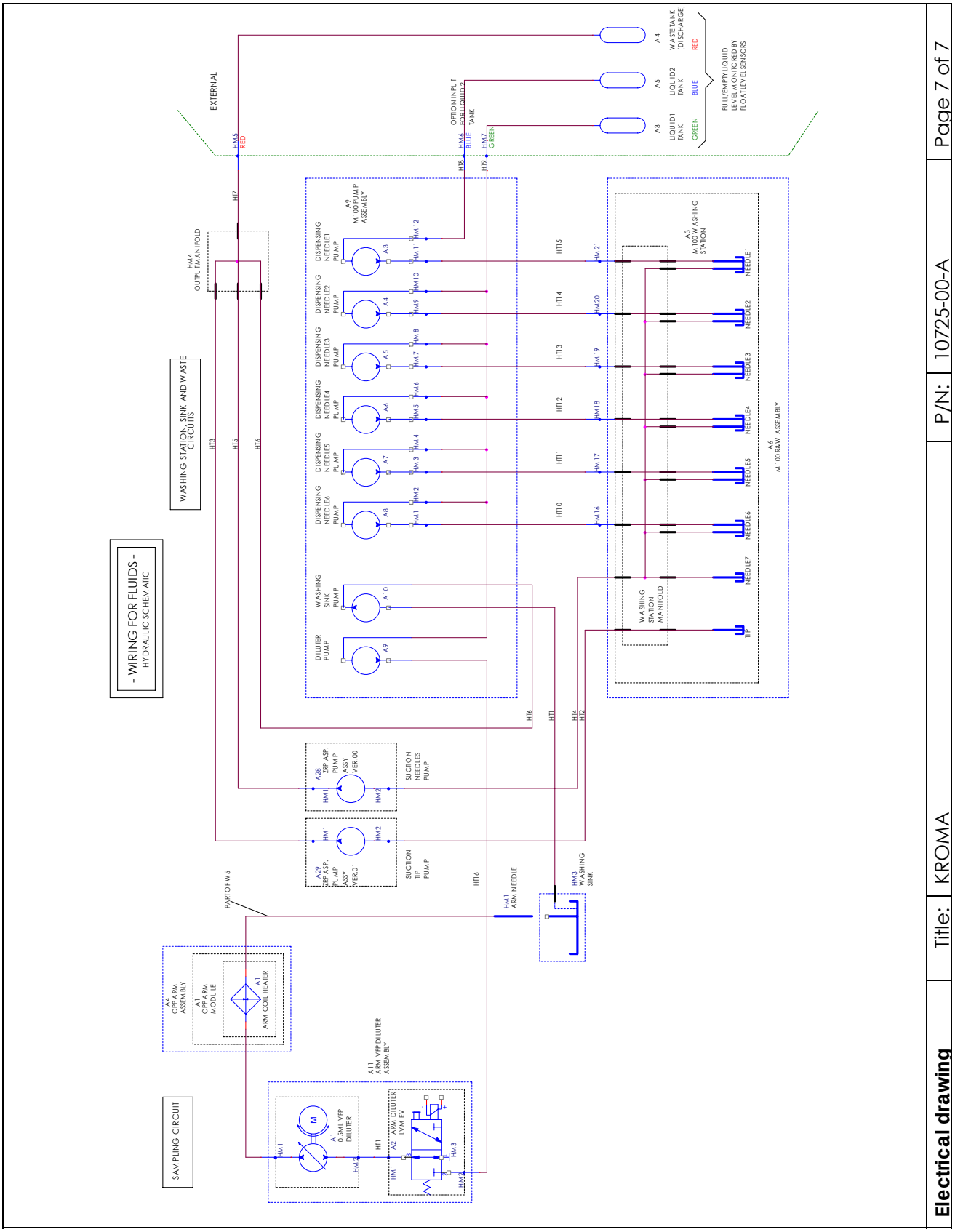

Electrical drawing
Title: KROMA
P/N: 10725-00-A
Page 2 of 7
ISE MODULE - CONTROLLER
ISE MODULE REAGENT BUTTON
ISE MODULE PUMP ASSEMBLY
A23 ISE MODULE ASSEMBLY - 4 CHANNELS P/N 10726-00-A (CONTROLLER, TUBINGS, PUMPS AND REAGENT BUTTON FROM MEDICA CORP.)
OPTION
PART OF A5 KROMA CONTROLLER ASSEMBLY P/N 10760-00-A
A6 STEP MOTOR DRIVE - 2X1.5A VER.05 P/N 10002-05-A
A7 STEP MOTOR DRIVE - 2X1.5A VER.02 P/N 10002-02-A
A8 STEP MOTOR DRIVE - 2X1.5A VER.06 P/N 10002-06-A
W 04-P1
W 04-P2
W 04-P3
W 06-P1
W 06-P2
W 06-P3
W 06-P4
W 06-P5
W 07-P1
W 07-P3
W 07-J1
W 07-J2
W 07-J3
W 07-J4
W 08-P2
24VDC_CONTR
24VDC-2
24VDC-3
24VDC-1
+24V
EGND
MGND
DATA
GND
VDCP
RXD-IN
TXD-OUT
MGND
RS232-GND
VDCP-RTN
RTS
CTS
NOTUSED (SPARE MOTOR)
WSH-MOT
RLM-MOT
XARM-MOT
YARM-MOT
CVT-MOTKROMA
DIL-MOT
TO A21 - MOT WSH
TO A21 - MOT RLT
TO A10 - MOT X
TO A10 - MOT Y
TO A21 - MOT CVT
TO A11 - MOT DIL
TO OPR R&W ASSEMBLY (WASHING STATION MOTOR ASSEMBLY)
TO OPR R&W ASSEMBLY (RELEASE AGENT MOTOR ASSEMBLY)
TO OPR ARM 1 ASSY (X AXIS ARM MOTOR)
TO OPR ARM 1 ASSY (Y AXIS ARM MOTOR)
TO OPR R&W ASSEMBLY (REAGENT AGITATE MOTOR ASSEMBLY)
TO ARM DILUTOR ASSEMBLY (ARM DILUTOR)


Electrical drawing
Title: KROMA
P/N: 10725-00-A
Page 3 of 7
ARM-HCOIL
TO OPP ARM ASSY (ARM COIL HEATER)
TO W 05-J6
DILEV
TO W 04-J3
TO ARM DILUTER ASSEMBLY (DILUTER ELECTROVALVE)
PART OF W05
PART OF W04
A3 M 100 PUMP ASSEMBLY P/N 10801-00-A
A1 PWR DRIVER MODULE - 9X1A VER.00
A2 PWR DRIVER MODULE - 9X1A VER.00
PART OF A5 KROMA CONTROLLER ASSEMBLY P/N 10760-00-A
NOT USED (SPARE OUTPUTS)
SPARE
DISPENSING NEEDLE 4 PUMP
DISPENSING NEEDLE 2 PUMP
DISPENSING NEEDLE 1 PUMP
DISPENSING NEEDLE 3 PUMP
DISPENSING NEEDLE 5 PUMP
DILUTER PUMP
WASHING SINK PUMP
A18 P/N 10938-00-A ZRP ASPIRATION PUMP VER.01 SUCTION TIP PUMP
A17 P/N 10938-00-A ZRP ASPIRATION PUMP VER.00 ASPIRATION NEEDLES PUMP
24VDC


Electrical drawing
Title: KROMA
P/N: 10725-00-A
Page 4 of 7
PART OF A5
KROMA CONTROLLER ASSEMBLY
P/N 10760-00-A
ARM DILUTER LVM EV
ARM DILUTER
500uL DILUTER
A11
DILUTER ASSEMBLY
P/N 10912-00-A
A10
M100 ARM ASSEMBLY
P/N 10902-00-A
OPP ARM MODULE
Y-AXIS ARM 1
MOTOR
ASSEMBLY
HOME
SENSOR
X-AXIS ARM 1
BAR-CODE READER
OPTIONAL
FLEXIBLE WIRING
MOVING WITH ARM
TO STEP MOTOR
DRIVE 2X1.5A VER.02
TO OPPU M/PS & DRIVERS
A9 [A1-J10]
NOT USED
(INPUT FROM SPARE
OPTO SENSORS)
ARM-Y OBSTACLE
SENSOR
ARM LIQUID
LEVEL SENSOR
TO PWR DRIVER
MODULE - 9X1A VER.00


Electrical drawing
Title: KROMA
P/N: 10725-00-A
Page 5 of 7
COOLER FANS
PELTIER MODULES
LIQUID 2 TANK
LIQUID 1 TANK
WASTE TANK
TANKS PLACED OUTSIDE THE MACHINE
COVER SENSOR
COOLER TEMP. SENSOR
RS232 PC OPERATIVE CONNECTION
TO ARM LIQUID LEVEL SENSOR
TO OPP R&W ASSEMBLY (CUVETTES INCUBATION HEATER STRIP)
TO OPP R&W ASSEMBLY (HALOGEN READING LAMP)
PART OF A5 KROMA CONTROL BOARD ASSEMBLY P/N 10760-00-A
LHP POWER BOARD P/N 10762-00-A
A12 MICROSWITCH P/N 10943-00-A
A14 LM 35 TEMP SENSOR VER.01 P/N 10060-04-A
2 X 10112-00-A 12V 60x 60 FAN ASSY
8.5A @ 8.6V 38.5W x 2
FLOAT LEVEL SENSOR
PLACED UNDER REAGENT ASSEMBLY


Electrical drawing
Title: KROMA
P/N: 10725-00-A
Page 6 of 7
ARM-Y OBSTACLE SENSOR
ARM-SW
TO W 05-J6
NOT USED (OPTION FOR OPTICAL GROUP)
NOT USED (OPTION FOR ABS12-BIT/5V ENCODER, GRAY, RES4096)
W 18-P1
W 18-P2
W 10 (5 COND. SHIELDED)
PHOTODIODE SENSOR
THERMAL PROJECTION
CUVETTES INCUBATION HEATER STRIP
CUVETTE ASSEMBLY TEMPERATURE SENSOR
CUVETTE ASSEMBLY HOME SENSOR
READING CUVETTE MOTOR ASSEMBLY
PART OF W 05
PART OF W 04
PART OF W05
OPP CUVETTE ASSEMBLY
A21
M100 R&W ASSEMBLY
P/N 10773-00-A
OPP WASHING STATION
WASHING STATION HOME SENSOR
WASHING STATION MOTOR ASSEMBLY
WASHING STATION HOME POSITION SENSOR
W SH-MOT
TO A6-J3
FIXED ON TOP OF R&W ASSEMBLY
FIXED ON BOTTOM OF CUVETTE PLATE
FIXED ON TOP OF OPTICAL GROUP
M GND
OPP OPTICAL GROUP
FILTER WHEEL HOME SENSOR
FILTER WHEEL MOTOR ASSEMBLY
HALOGEN READING LAMP
FLT-MOT
TO A6-J4
FLT-LMP
TO W 04-P1
PART OF W 04
CVT-INC
TO W 04-P1
CVT-MOT
TO A8-J3
PART OF A5 KROMA CONTROL ASSEMBLY P/N 10760-00-A



Electrical drawing | Title: KROMA | P/N: 10725-00-A | Page 7 of 7

3.2. Schematics and Part Lists for KROMA Unit Sub-assemblies and Wirings

This paragraph and its sub-paragraphs include electrical drawings and part lists for KROMA Unit for the main instrument sub-assemblies including wirings. Part lists show only components available for servicing.

3.2.1. KROMA Controller Assembly P/N 10760-00-A

This assembly includes a local DC/DC converter power supply, three controller boards and the mother board A1 (***KROMA Controller Mother Board*** P/N 10803-00-B). This assembly is contained into a rack and collects all small signals to/from sensors and driver boards.
The DC/DC power supply A5 (***CNT Power Supply*** P/N 10028-01-A) converts the +24VDC into the DC low voltages used by the digital and analog circuits.
The controller boards are three:

- A2 – ***R&W Controller*** P/N 10012-04-C, manages Read and Wash Assembly.
- A3 – ***MAIN Controller*** Ver.01 P/N 10012-01-C, manages the Unit and Sample and Reagent Assembly.
- A4 – ***ARM1 Controller*** P/N 10012-02-C, manages ARM Assembly.

Those four boards are not interchangeable with each other and anyone has its own position.

Figure 20: *KROMA Controller Assembly*

The controller boards are intra-connected through two busses: one for data and macro-command (Rx/Tx bus) the other for synchronisms (SPI bus). The Rx/Tx bus is accessed also by the Personal Computer through the Main Controller board that provides the adapter.

When the Unit is equipped with the ISE Module, the ARM1 controller board manages the communication with it too.

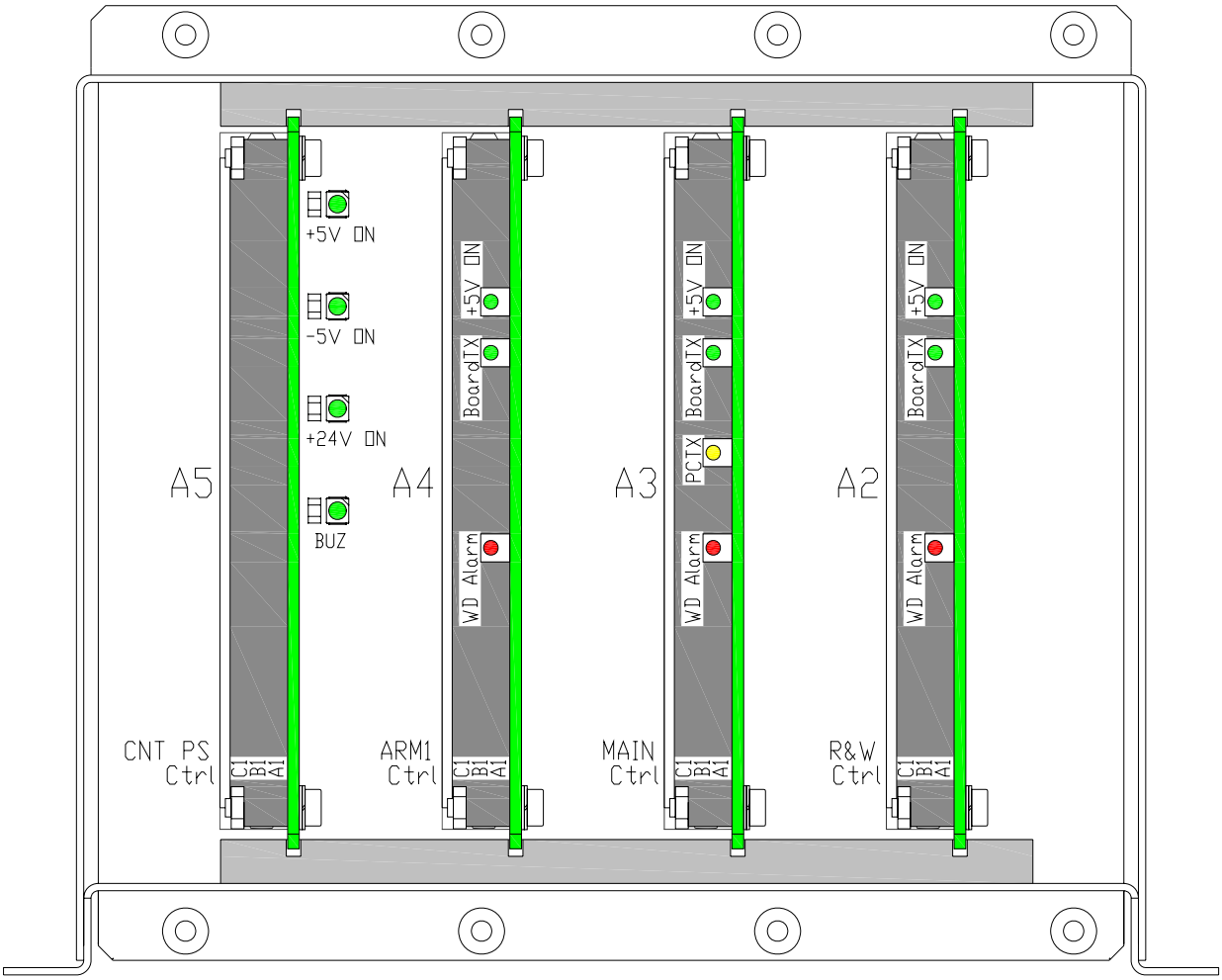


Figure 21: *KROMA Controller Assembly - Front View*

If needed, it is possible to extract each of these four boards by sliding them away: pay attention not to touch on-board electronic components as they can be ESD sensitive and not to bend components (i.e.: LEDs) or damage boards. Use a standard hook extractor for Eurocards 100x160mm.

If needed, the Mother Board can be disassembled after having disconnected the wirings and dismounted the rack from the mechanics. Screw away four upper screws and four lower screws. During replacing with a new one, take care about the alignments to allow correct boards insertion.

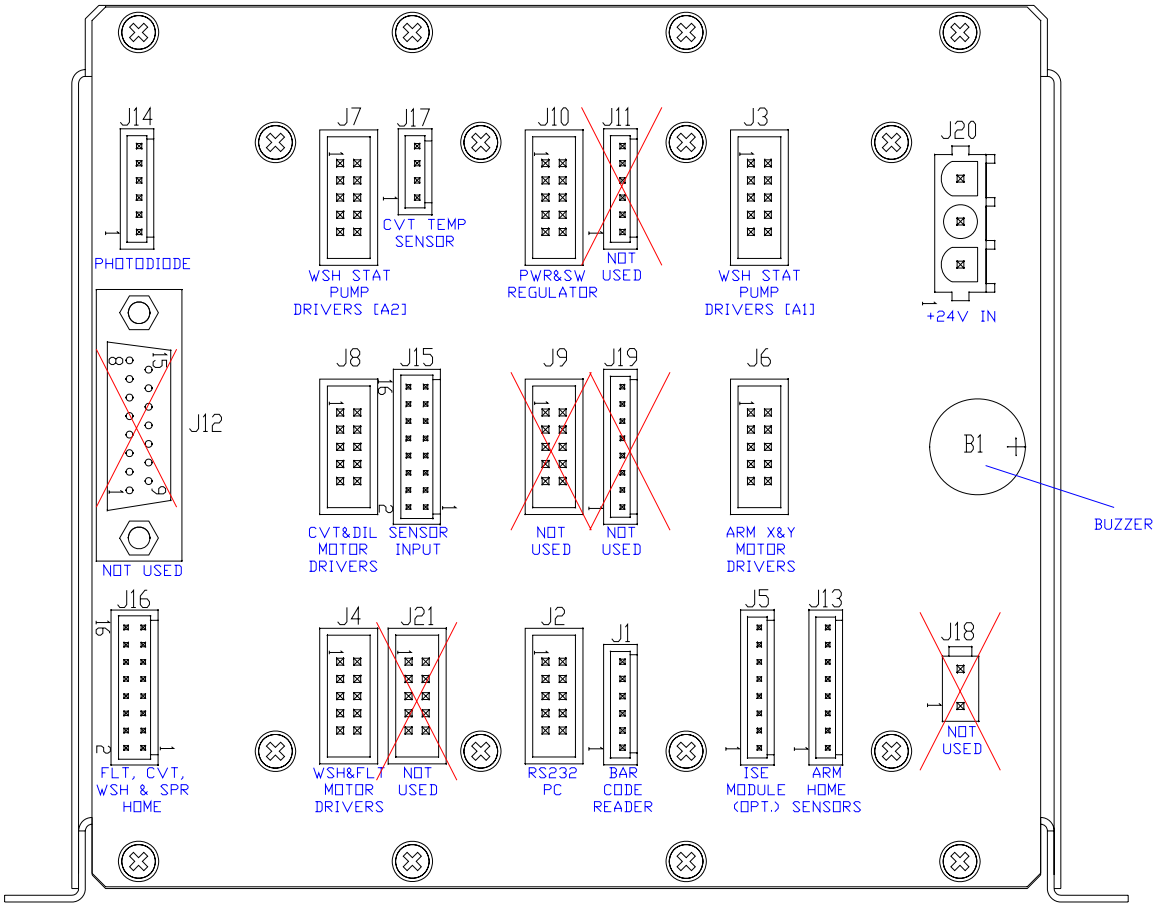
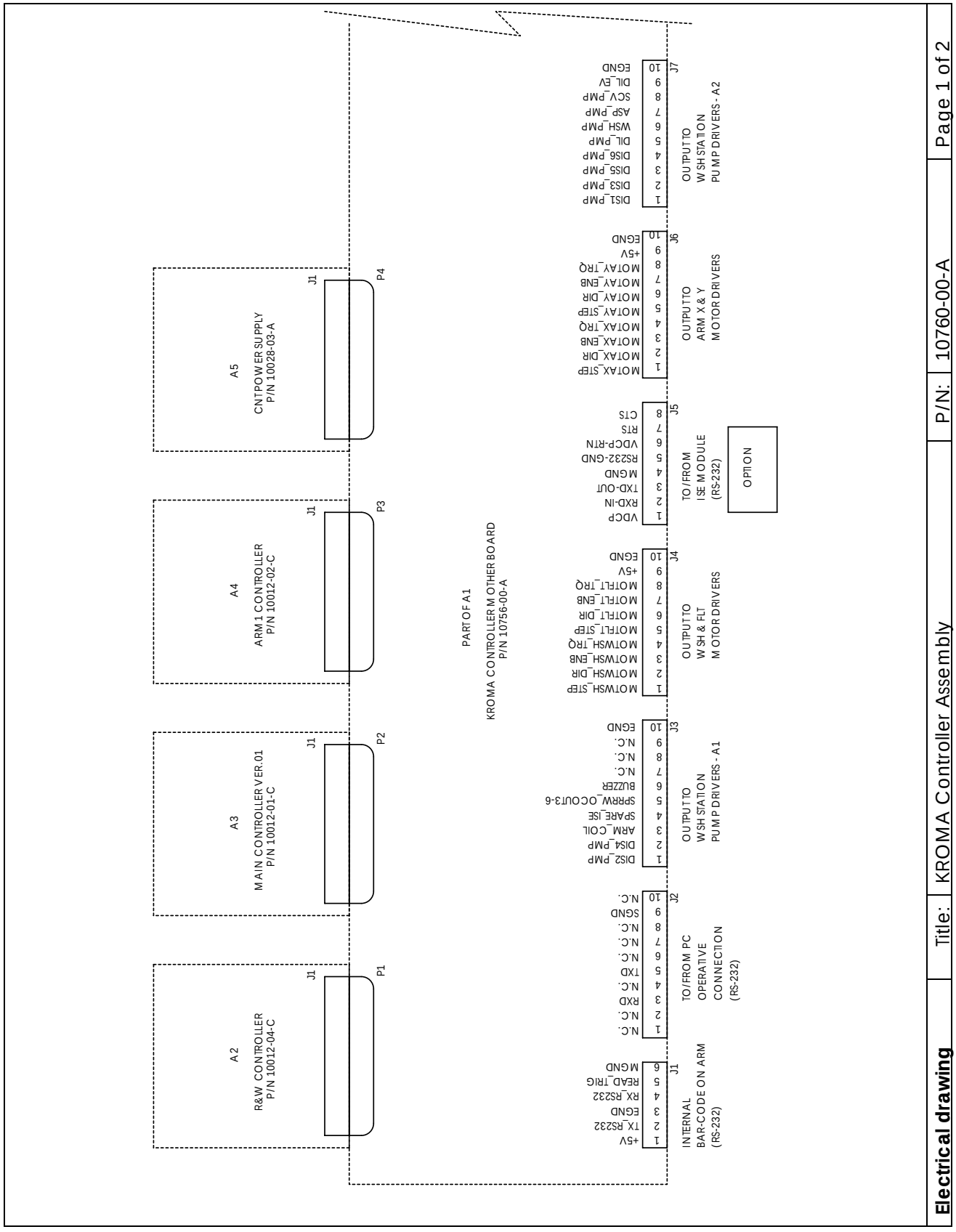
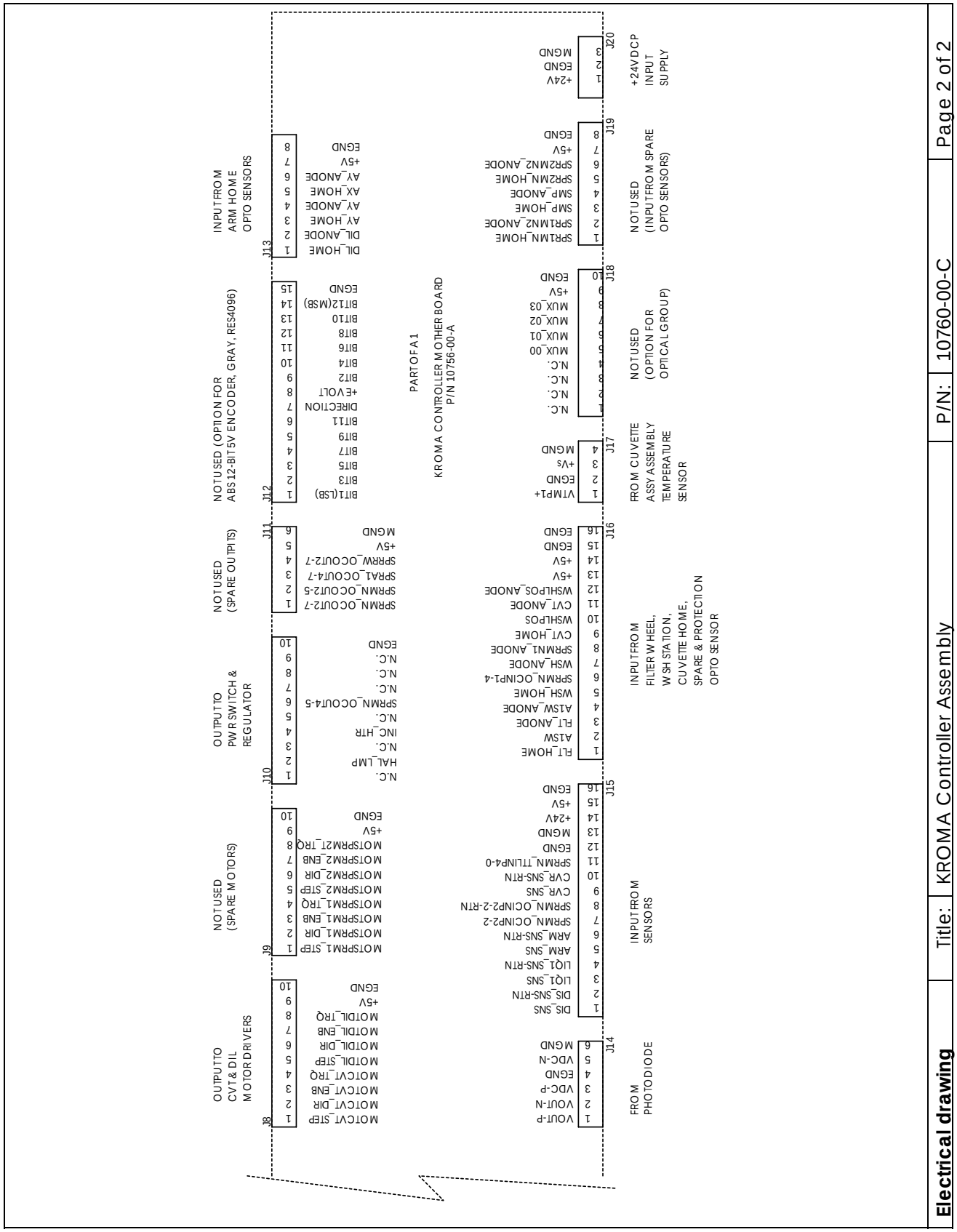


Figure 22: *KROMA Controller Assembly - Back View, Connectors to Unit Wirings*

Part List Title: KROMA Controller Assembly P/N: 10760-00-A

Pos.	Ref. Designator	Q.ty	UoM	Description	Value	Rating	Toler.	P/N
1	A1	1	PZ	KROMA CONTROLLER MOTHER BOARD				10803-00-B
2	A2	1	PZ	R&W CONTROLLER				10012-04-C
3	A3	1	PZ	MAIN CONTROLLER VER.01				10012-01-C
4	A4	1	PZ	ARM1 CONTROLLER				10012-02-C
5	A5	1	PZ	CNT POWER SUPPLY				10028-01-A
6		1	PZ	BOARDS RACK				20480-00-0


A5
CNTPOWER SUPPLY
P/N 10028-03-A
A4
ARM1 CONTROLLER
P/N 10012-02-C
A3
MAIN CONTROLLER VER.01
P/N 10012-01-C
A2
R&W CONTROLLER
P/N 10012-04-C
J1
P4
P3
P2
P1
PART OF A1
KROMA CONTROLLER MOTHER BOARD
P/N 10756-00-A
J7
OUTPUT TO
WSH STATION
PUMP DRIVERS - A2
J6
OUTPUT TO
ARM X & Y
MOTOR DRIVERS
J5
TO/FROM
ISE MODULE
(RS-232)
OPTION
J4
OUTPUT TO
WSH & FLT
MOTOR DRIVERS
J3
OUTPUT TO
WSH STATION
PUMP DRIVERS - A1
J2
TO/FROM PC
OPERATIVE
CONNECTION
(RS-232)
J1
INTERNAL
BAR-CODE ON ARM
(RS-232)
Electrical drawing
Title: KROMA Controller Assembly
P/N: 10760-00-A
Page 1 of 2


Electrical drawing
Title: KROMA Controller Assembly
P/N: 10760-00-C
Page 2 of 2
KROMA CONTROLLER MOTHER BOARD
P/N 10756-00-A
PART OF A1
OUTPUT TO CVT & DIL MOTOR DRIVERS
NOT USED (SPARE MOTORS)
OUTPUT TO PWR SWITCH & REGULATOR
NOT USED (SPARE OUTPUTS)
NOT USED (OPTION FOR ABS 12-BIT 5V ENCODER, GRAY, RES4096)
INPUT FROM ARM HOME OPTO SENSORS
INPUT FROM PHOTODIODE
INPUT FROM SENSORS
INPUT FROM FILTER WHEEL, WSH STATION, CUVETTE HOME, SPARE & PROTECTION OPTO SENSOR
FROM CUVETTE ASSY ASSEMBLY TEMPERATURE SENSOR
NOT USED (OPTION FOR OPTICAL GROUP)
NOT USED (INPUT FROM SPARE OPTO SENSORS)
+24V DCP INPUT SUPPLY

3.2.1.1. KROMA Controller Mother Board P/N 10803-00-B

This board is the Mother Board of the KROMA Controller Assembly; it acts as a backplane interconnecting the Controller Boards each other. It collects signals from remote sensors and distributes signals to the drivers and peripherals through wirings.
Four green LEDs are placed on this board for monitoring of DC voltages:

- +5V
- -5V
- +24V
- +BUZ (ON when the buzzer is beeping)

When light is ON, voltage/signal is active.

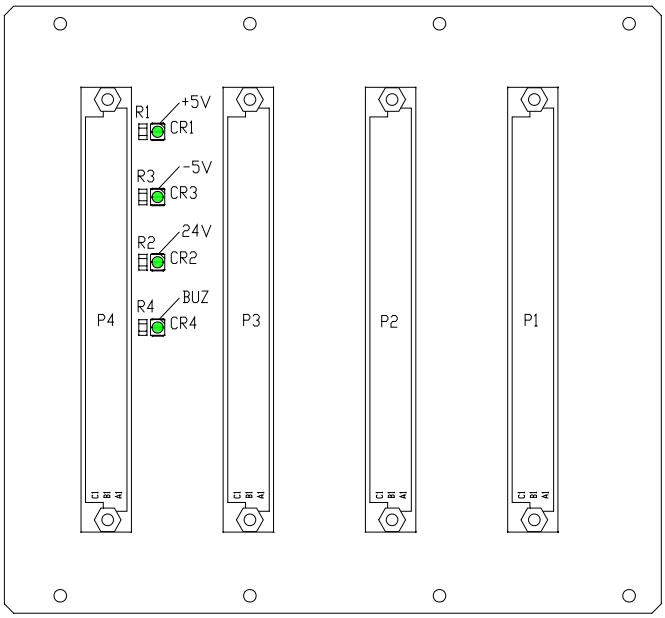


Figure 23: *KROMA Controller Mother Board - Front View*

Note: No maintenance operations are foreseen at board level. Ask Producer for spare part.

3.2.1.2. CNT Power Supply P/N 10028-01-A Ver.01

This board is a DC/DC converter power supply for the controller boards of the unit. It is located into the KROMA Controller assembly P/N 10760-00-A, inserted in the connector P5.
It generates two filtered voltages +5VDC and -5VDC.
The DC channels are protected against input over-current by an F (fast) type 5mmx20mm 4.0A/250Vac standard glass fuse.

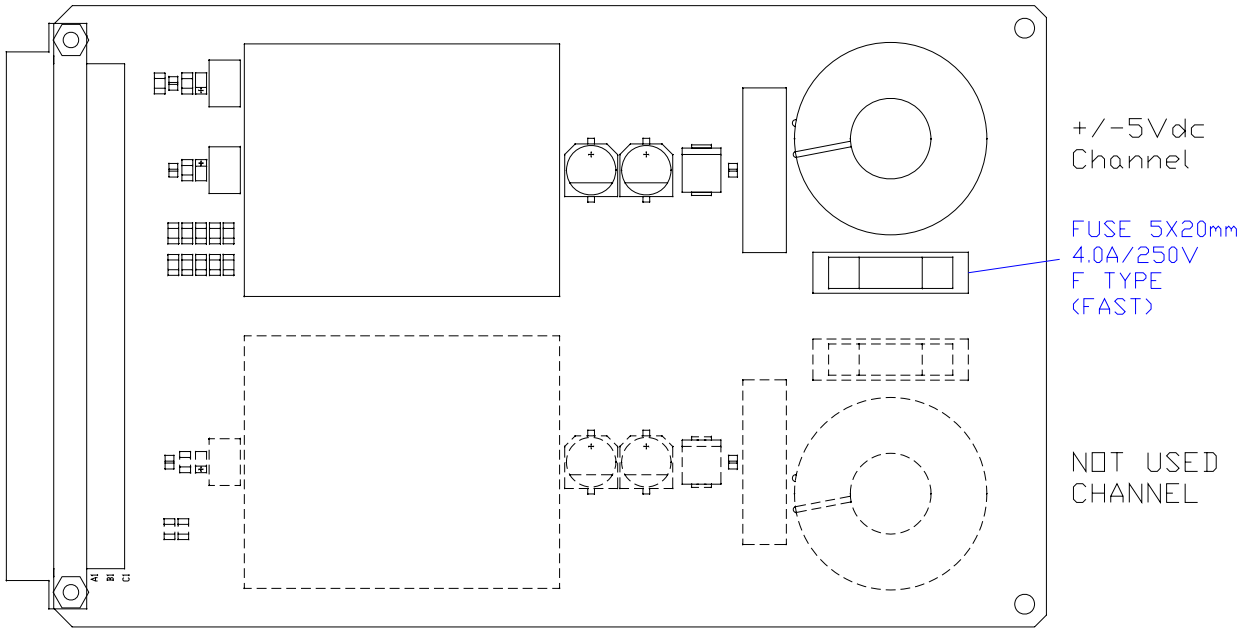


Figure 24: *CNT Power Supply*

Note: No maintenance operations are foreseen at board level. Ask Producer for spare part.

3.2.1.3. MAIN Controller Ver.01 P/N 10012-01-C

This board is the Main Controller (Master) of the Unit. It is located into the KROMA Controller assembly P/N 10760-00-A, inserted in the connector P2.
It manages the data handshake with the external PC, and controls: liquid levels of the tanks, the protection defence of the instrument, the buzzer, the Communication with the other controllers and the SPI Synchro Bus (as master).
It is equipped with a flash code memory micro-controller (U1). The firmware upgrade is achieved by using a special Software Download program only and it is performed through the RS232 serial link from the Personal Computer of the system; no hardware intervention is required.
This electronic board is provided with an external flash memory (U3 - on socket) for storing some sensible data of all unit. This chip must follow the unit in case of board breakdown and replacing with a new one.
This board provides measurement of the cuvette incubation temperature and of the internal electronic operating temperature. Two potentiometers have been tuned at factory:

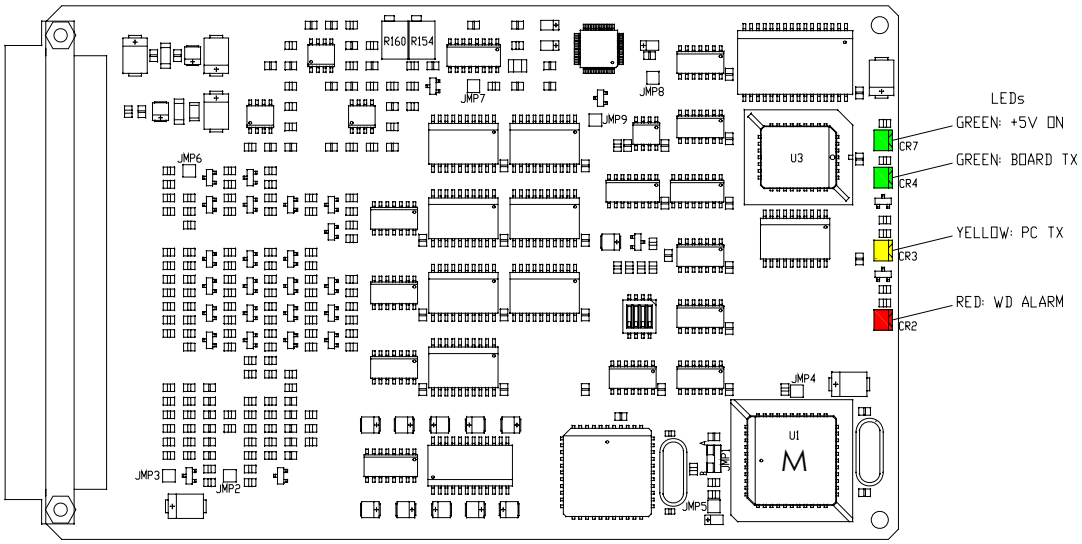
- Potentiometer R154, devoted to incubator cuvette temperature fine tuning and off-set nulling.
- Potentiometer R160 is not actually used.

On the rear edge of the board are four LEDs that give the monitor status of this module:

- CR7 (green): +5V ON, if ON the board is powered.
- CR4 (green): BOARD TX, when ON the board is transmitting data.
- CR3 (yellow): PC TX, when ON the Personal Computer is transmitting data.
- CR2 (red): WD ALARM, if ON the board is out of order (watch dog) and must be replaced.

In particular, this board controls the following signals and functions:

Name	Desciption	Type of Signal
CVR_OPT	Protection Defence Sensor	INPUT
LIQ1_SNS	Systemic Solution Tank Level Sensor	INPUT
LIQ2_SNS	Cleaner Solution Tank Level Sensor	INPUT
DIS_SNS	Waste Tank Level Sensor	INPUT
BUZZER	Buzzer (internal beeper)	OUTPUT
INC_HTR	Incubation Heater Strip	OUTPUT
SPI	SPI Synchro Bus	INPUT/OUTPUT
Rx/Tx Data	Rx/Tx Controller Boards Data	INPUT/OUTPUT
RS232 PC Rx/Tx	Rx/Tx Personal Computer Data	INPUT/OUTPUT
RS232 BC Rx/Tx	Rx/Tx BarCode Reader Data	INPUT/OUTPUT



JUMPER CONFIGURATION (C=CLOSED, O=OPEN):

JMP1	JMP2	JMP3	JMP4	JMP5	JMP6	JMP7	JMP8	JMP9
C==>B	O	O	O	C	C	O	C	C

Figure 25: *MAIN Controller*

Note: No maintenance operations are foreseen at board level. Ask Producer for spare part.

3.2.1.4. RW Controller P/N 10012-04-C

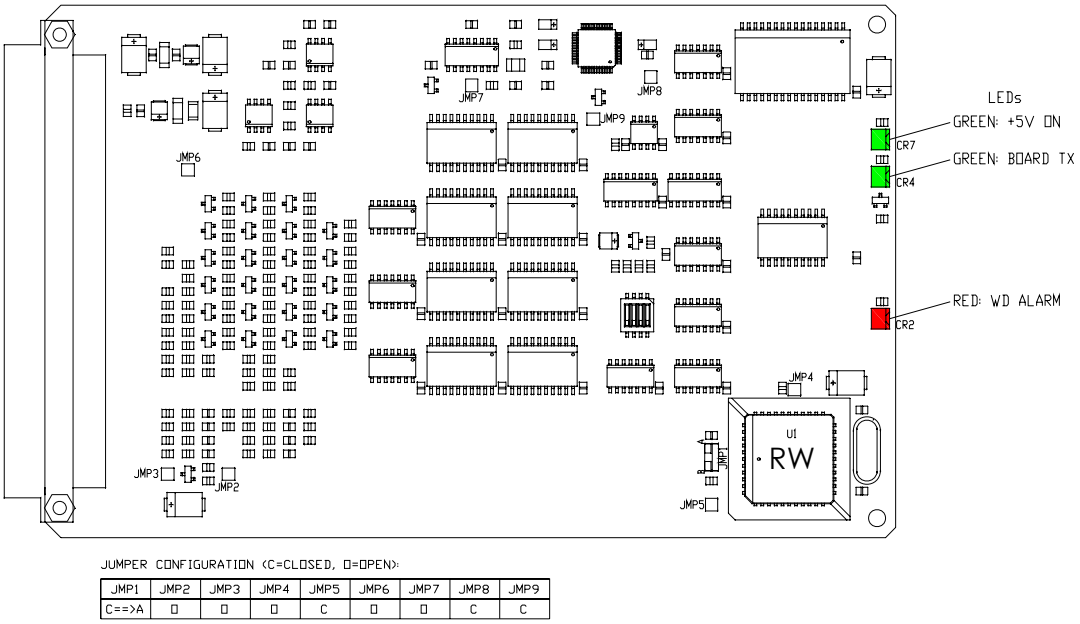
This board is the Read&Wash Controller of the Unit. It is located into the KROMA Controller assembly P/N 10760-00-A, inserted in the connector P1.
It manages the Read & Wash Assembly. It controls the Cuvette wheel motor, the Filter wheel motor, the Washing Station motor, the Halogen Lamp, the Washing Station into cuvettes, the Washing station dispensing pumps, the Washing Station aspirating pumps, the tip aspirating pump (for drying), the cuvette encoder, the Communication with the other controllers and the SPI Synchro Bus (as slave).
It is equipped with a flash code memory micro-controller (U1). The firmware upgrade is achieved by using a special Software Download program only and it is performed through the RS232 serial link from the Personal Computer of the system; no hardware intervention is required.
No characteristic calibration parameters of the R&W Assembly are stored in this board so it can be replaced with a new one without saving any memory.
This board manages the optical group and provides the optical measurement of the reaction's OD by acquisition and conditioning of the photodiode analog signal. Analog-to digital conversion is reached by a 16-bit AtoD Converter working in parallel mode.
Each wavelength filter works with its own gain. Automatic gain calibration is provided through a digital potentiometer. Off-set is automatically nulled.
On the rear edge of the board are three LEDs that give the monitor status of this module:

- CR7 (green): +5V ON, if ON the board is powered.
- CR4 (green): BOARD TX, when ON the board is transmitting data.
- CR2 (red): WD ALARM, if ON the board is out of order (watch dog) and must be replaced.

In particular, this board controls the following signals and functions:

Name	Desciption	Type of Signal
MOTCVT_STEP	Cuvette Motor, Step	OUTPUT
MOTCVT_DIR	Cuvette Motor, Direction	OUTPUT
MOTCVT_ENB	Cuvette Motor, Enable	OUTPUT
MOTCVT_TRQ	Cuvette Motor, 60% TORQUE	OUTPUT
CVT_HOME	Cuvette Motor, Home Sensor	INPUT
MOTWSH_STEP	Washing Station Motor, Step	OUTPUT
MOTWSH_DIR	Washing Station Motor, Direction	OUTPUT
MOTWSH_ENB	Washing Station Motor, Enable	OUTPUT
MOTWSH_TRQ	Washing Station Motor, 60% TORQUE	OUTPUT
WSH_HOME	Washing Station Motor, Home Sensor	INPUT
MOTFLT_STEP	Filter Wheel Motor, Step	OUTPUT
MOTFLT_DIR	Filter Wheel Motor, Direction	OUTPUT
MOTFLT_ENB	Filter Wheel Motor, Enable	OUTPUT
MOTFLT_TRQ	Filter Wheel Motor, 60% TORQUE	OUTPUT
FLT_HOME	Filter Wheel Motor, Home Sensor	INPUT
HAL_LMP	Halogen Lamp (Photometer)	OUTPUT
WSHLPOS	Washing Station Low Position Sensor	INPUT
DIS1_PMP	Needle 1 Dispensing Pump (DIS1 - Position1)	OUTPUT
DIS2_PMP	Needle 2 Dispensing Pump (DIS2 – Position2)	OUTPUT
DIS3_PMP	Needle 3 Dispensing Pump (DIS3 – Position3)	OUTPUT
DIS4_PMP	Needle 4 Dispensing Pump (DIS4 – Position4)	OUTPUT
DIS5_PMP	Needle 5 Dispensing Pump (DIS5 – Position5)	OUTPUT

Name	Desciption	Type of Signal
DIS6_PMP	Needle 6 Dispensing Pump (DIS6 – Position6)	OUTPUT
ASP1-7_PMP	Needle 1-5 and 7, Aspiration Pump (ASP1-5, ASP7, Positions 1-5, 7)	OUTPUT
SCV_PMP	Tip Aspiration Pump (TIP – Position 8)	OUTPUT
SPI	SPI Synchro Bus	INPUT/OUTPUT
Rx/Tx Data	Rx/Tx Controller Boards Data	INPUT/OUTPUT



JUMPER CONFIGURATION (C=CLOSED, O=OPEN):

JMP1	JMP2	JMP3	JMP4	JMP5	JMP6	JMP7	JMP8	JMP9
C==>A	O	O	O	C	O	O	C	C

Figure 26: *Read&Wash Controller*

Note: No maintenance operations are foreseen at board level. Ask Producer for spare part.

3.2.1.5. ARM1 Controller P/N 10012-02-C

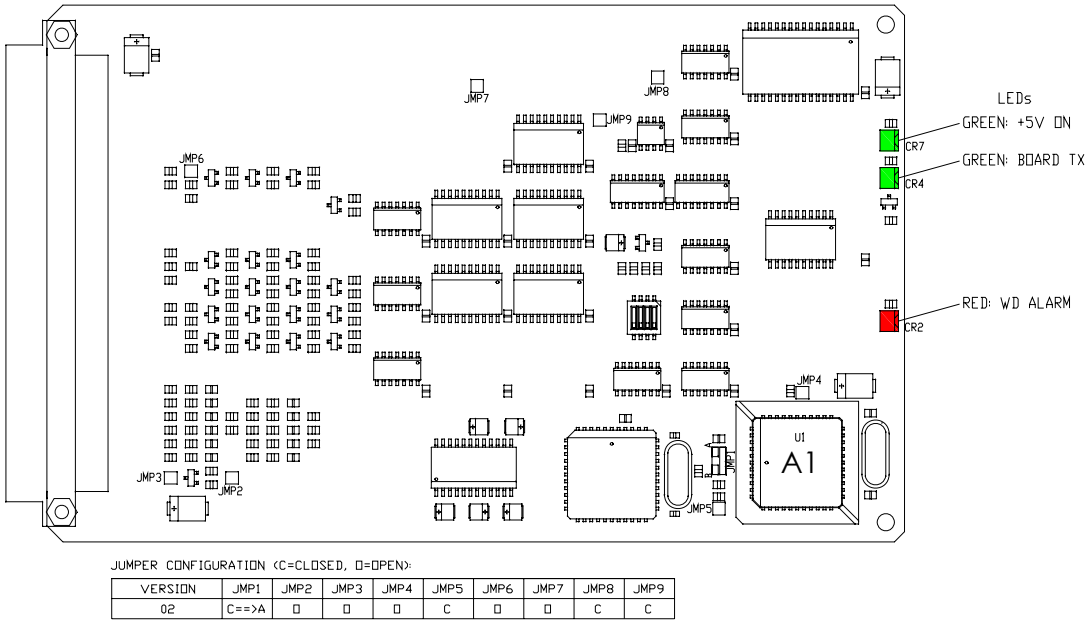
This board is the ARM Controller of the Unit. It manages the ARM Assembly. It is located into the KROMA Controller assembly P/N 10760-00-A, inserted in the connector P3.
It controls the ARM X-axis motor (rotation), the ARM Y-axis motor (elevation), the Diluter motor, the Washing pump, the Electrovalve, the Liquid level detector, the Obstacle sensor, the Heater coil, the Washing sink pump, the Communication with the other controllers and the SPI Synchro Bus (as slave).
It is equipped with a flash code memory micro-controller (U1). The firmware upgrade is achieved by using a special Software Download program only and it is performed through the RS232 serial link from the Personal Computer of the system; no hardware intervention is required.
No characteristic calibration parameters of the ARM1 Assembly are stored in this board so it can be replaced with a new one without saving any memory.
This board manages the ARM X-axis and Y-axis motions and the ARM Diluter metering pump.
During probe washing in the sink, the electrovalve is open, the washing pump and the washing sink empty pump are enabled.
During sampling, the electrovalve is closed and the washing pump is disabled.
When probe is descending the firmware monitors the obstacle sensor in order to detect eventual crashes.
When probe is descending into samples or reagents, the firmware monitors the liquid level detector in order to control the depth of the probe into the liquid (reagents and/or sample).
The washing sink pump is devoted to empty the washing sink from waste. The heater coil is for liquid warming and probe temperature conditioning.
If provided, this board manages the handshake of data and the commands to the ISE Module through a RS232 serial link.
If provided, this board manages the handshake of data and the commands with the barcode reader through a RS232 serial link.
On the rear edge of the board are three LEDs that give the monitor status of this module:

- CR7 (green): +5V ON, if ON the board is powered.
- CR4 (green): BOARD TX, when ON the board is transmitting data.
- CR2 (red): WD ALARM, if ON the board is out of order (watch dog) and must be replaced.

In particular, this board controls the following signals and functions:

Name	Desciption	Type of Signal
MOTA1X_STEP	ARM1 X-Axis Motor, Step	OUTPUT
MOTA1X_DIR	ARM1 X-Axis Motor, Direction	OUTPUT
MOTA1X_ENB	ARM1 X-Axis Motor, Enable	OUTPUT
MOTA1X_TRQ	ARM1 X-Axis Motor, 60% TORQUE	OUTPUT
A1X_HOME	ARM1 X-Axis Motor, Home Sensor	INPUT
MOTA1Y_STEP	ARM1 Y-Axis Motor, Step	OUTPUT
MOTA1Y_DIR	ARM1 Y-Axis Motor, Direction	OUTPUT
MOTA1Y_ENB	ARM1 Y-Axis Motor, Enable	OUTPUT
MOTA1Y_TRQ	ARM1 Y-Axis Motor, 60% TORQUE	OUTPUT
A1Y_HOME	ARM1 Y-Axis Motor, Home Sensor	INPUT
MOTDIL1_STEP	ARM1 Diluter Motor, Step	OUTPUT
MOTDIL1_DIR	ARM1 Diluter Motor, Direction	OUTPUT
MOTDIL1_ENB	ARM1 Diluter Motor, Enable	OUTPUT
MOTDIL1_TRQ	ARM1 Diluter Motor, 60% TORQUE	OUTPUT
DIL1_HOME	ARM1 Diluter Motor, Home Sensor	INPUT

Name	Desciption	Type of Signal
DIL1_EV	ARM1 Electrovalve	OUTPUT
DIL1_PMP	ARM1 Probe Washing Pump	OUTPUT
ARM1_SNS	ARM1 Liquid Level Detector	OUTPUT
A1SW	ARM1 Y-Axis Obstacle Sensor (Crash sensor)	INPUT
ARM1_COIL	ARM1 Heater Coil	OUTPUT
WSH_PMP	Washing Sink Empty Pump	OUTPUT
SPI	SPI Synchro Bus	INPUT/OUTPUT
Rx/Tx Data	Rx/Tx Controller Boards Data	INPUT/OUTPUT
RS232 ISE Rx/Tx	Rx/Tx ISE Module Data	INPUT/OUTPUT



VERSION	JMP1	JMP2	JMP3	JMP4	JMP5	JMP6	JMP7	JMP8	JMP9
02	C==>A	O	O	O	C	O	O	C	C

Figure 27: *ARM1 Controller*

Note: No maintenance operations are foreseen at board level. Ask Producer for spare part.

3.2.2. Step Motor Driver – 2X1.5A, All Versions, P/N 10002-__-A

This module is used as Stepping Motor Driver for all motor of the units. Each board is divided into two sections and then it can drive one or two motors (one per every section).
It includes several versions depending on the motor sizes:

- Ver.02 – P/N 10002-02-A
- Ver.03 – P/N 10002-05-A
- Ver.04 – P/N 10002-06-A.

The board is provided with two LEDs for each section (Section1: CR1, CR2 - Section2: CR3, CR4):

- CR1 and CR3, green: when OFF, full motor torque is selected;
  when ON, 75% motor torque is selected.
- CR2 and CR4, red: when OFF, motor is disabled;
  when ON, motor is enabled.

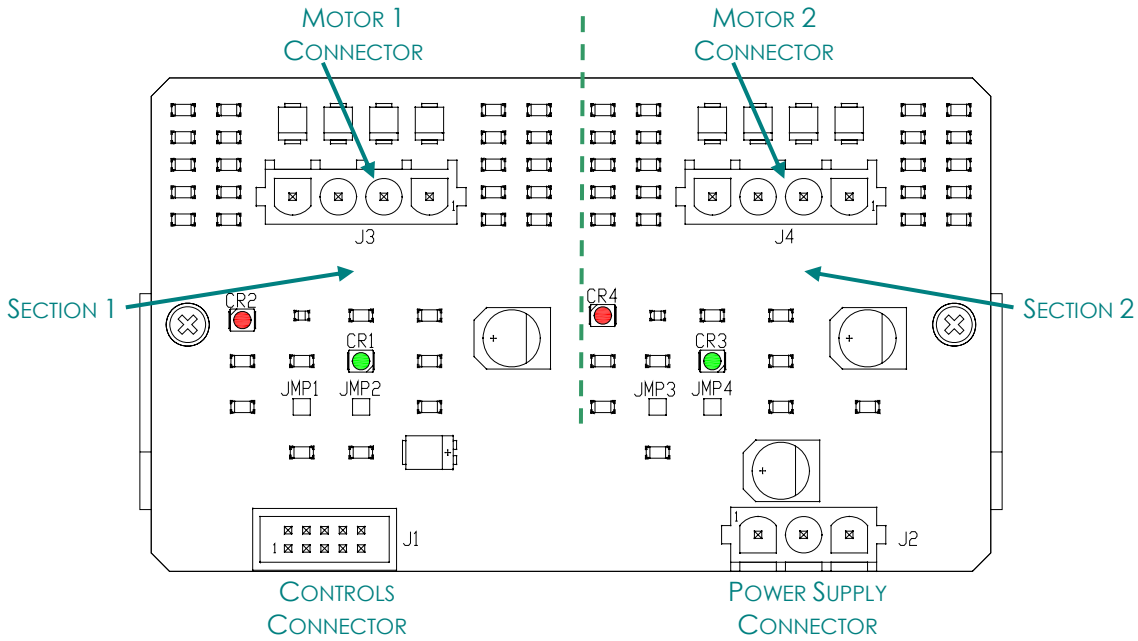


Figure 28: *Step Motor Driver*

Note: No maintenance operations are foreseen at board level. Ask Producer for spare part.

Three of these boards are used in KROMA. They drive 6 motors: 5 for motions and 1 for a micro metering pump (Diluter). These three boards are located next the motors to drive.
To replace a board, unfasten the two screws that fix it on the two supports paying attention not to confuse them with ones fixing the integrated circuit on the heat sink; unplug connectors and rise up the board. Repeat on the other way round the former instructions for assembling the new board.
Replace board only with the same model (they must have the same P/N) as **boards are not interchangeable** with each other.

Don't disconnect motors with power on as drivers and motor themselves can be damaged.

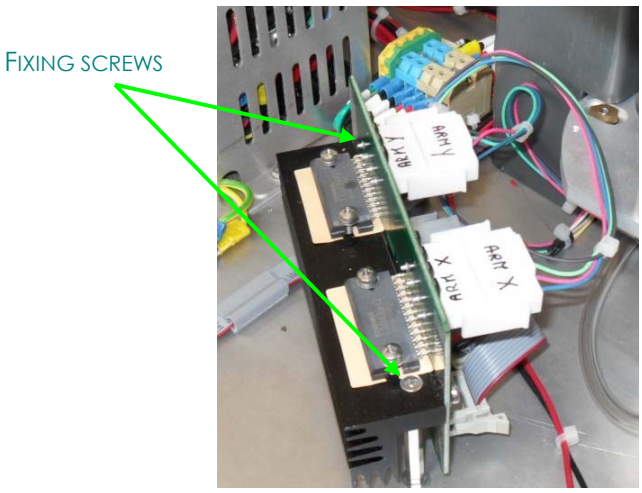


Figure 29: *Step Motor Drivers, Fixing Points*

The configuration and destination of each driver version is given in the following table "Step Motor Drivers' Configurations".

Step Motor Driver Configurations						
Version	**Size of Motor per Section**		**Operat. Current**	**Jumpers**		**Destination (Motor)**
	Sect.	**Size**		**Configuration**	**Mode**	
10002-02-A	#1	1.40A/ph, 0.48Nm, Bipolar, 1.8°	1.00A/ph	JMP1=Open JMP2=Closed	½ Step	ARM X-Axis
	#2	0.85A/ph, 0.33Nm, Bipolar, 1.8°	0.80A/ph	JMP3=Open JMP4=Closed	½ Step	ARM Y-Axis
10002-05-A	#1	0.28A/ph, 0.20Nm, Bipolar, 1.8°	0.25A/ph	JMP1=Closed JMP2=Open	¼ Step	Washing Station (WASH)
	#2	1.40A/ph, 1.17Nm, Bipolar, 0.9°	1.00A/ph	JMP3=Open JMP4=Closed	½ Step	Filter Wheel (FLT)
10002-06-A	#1	1.40A/ph, 1.17Nm, Bipolar, 1.8°	1.14A/ph	JMP1=Closed JMP2=Open	¼ Step	Reading Cuvette (CVT)
	#2	0.57A/ph, Bipolar, 1.8°	0.48A/ph	JMP3=Open JMP4=Closed	½ Step	ARM Diluter (DIL)

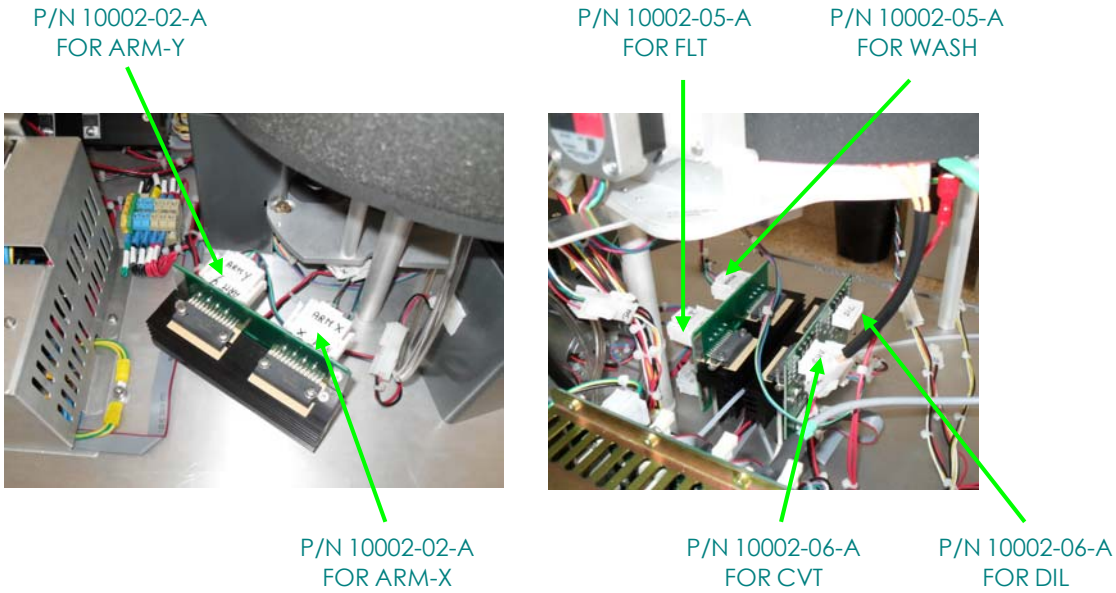


Figure 30: *Step Motor Driver Boards*

3.2.3. LHP Power Board, P/N 10762-00-A

This module is used to drive the **photometer Halogen Lamp**, the **Incubation Heater Strip** and to control the **cooling temperature** of the reagent tray (Peltier cell circuit).
It includes three sections: one section is the SMPS for halogen lamp supply (out➔J3), the second section is the driver for incubation heater strip switching and controlling at constant temperature (out➔J4), the third section enables the Peltier cell circuit (out➔TB2) and its fans (out➔TB1)of the reagent tray cooler.
The **lamp driver** consists in a switching mode power supply (SMPS) generating a DC voltage @ +12V; the LED CR5 (green) is ON when lamp is enabled. The firmware enables the lamp at *instrument* power on. The voltage has been fine tuned to +12.00V at factory under load conditions (lamp on). In case of voltage modification, tune to +12.00V +/- 0,01V by trimming R2 potentiometer. It's status is controlled by the R&W Controller's firmware.
The **heater strip driver** doesn't need any calibration; it is enabled when LED CR6 (green) is ON. Its status is controlled by the MAIN Controller's firmware.
The **cooler section** regulates reagent refrigeration temperature. It includes the potentiometer R16, tuned at factory, that allows the control of reagent tray temperature; it modifies the threshold. Temperature is measured on the bottom of the bulk reagent tray. When measured temperature is above the threshold Peltier are enabled; when it is below, Peltier are disabled. The range of the threshold goes from about +9.5°C up to about +12.3°C, that means from +10°C to +14°C on reagents. Turning potentiometer R2 CW (clockwise) temperature decreases, turn completely CCW (counter-clockwise) to get about 13°C. The cooler doesn't assure more than 14°C below the ambient temperature.

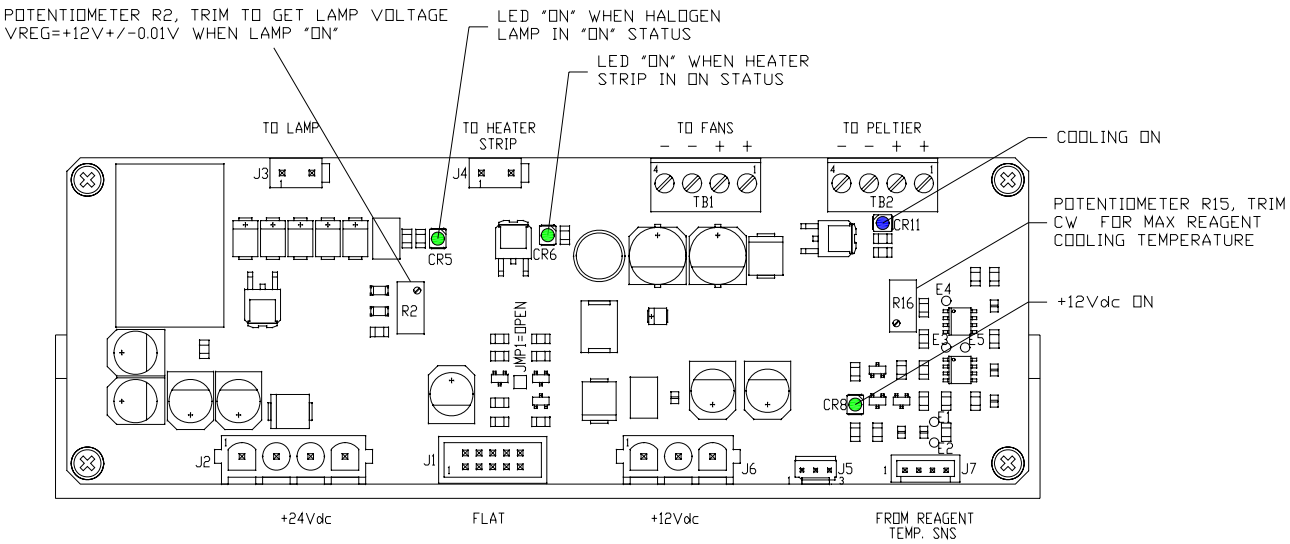


Figure 31: *LPH Power board*

Note: No maintenance operations are foreseen at board level. Ask Producer for spare part.

The board is placed near a +24Vdc cooler fan for optimum operation when lamp, heater and cooler are on.
To access the board, open the rear panel of the unit, it is placed just aside the internal fuse-holders' bracket.
To replace a board, unfasten the screw that fix it on the supports; unplug connectors and rise it up.
Replace board only with the same model.

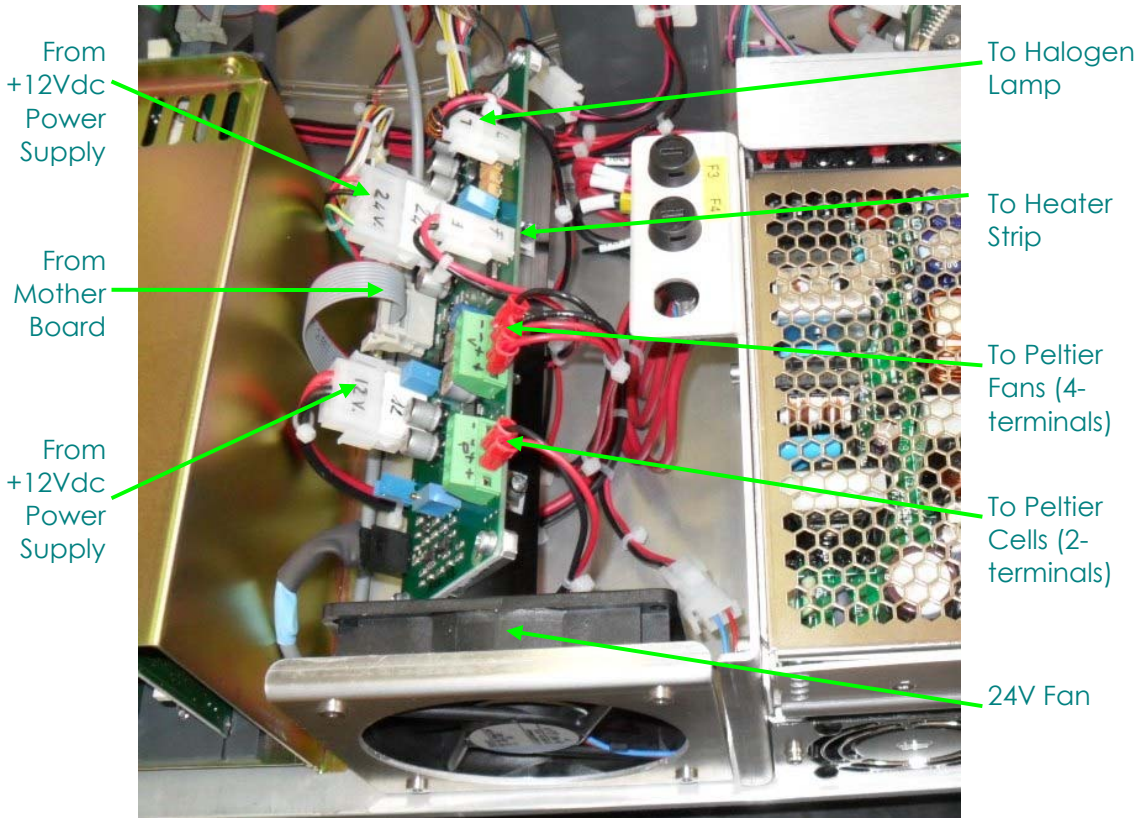


Figure 32: *LHP Power Board*

Note: No maintenance operations are foreseen at board level. Ask Producer for spare part.

As already said the Cooler sectionis powered by the +12Vdc only; it is independent from the Controller boards and manages the cooling of reagents tray. It can be powered independently from the rest of the electronics: this allows the operator to leave cooling ON overnight without the need of the PC controlling. This refrigeration unity preserves reagents at constant temperature of about 12°C ± 2°C (anyway not less than a maximum of 14°C below the ambient temperature).
The command for turning ON/OFF the refrigeration unit is separate and independent from that dedicated to the power ON/OFF of the electronics; in this way, with the ***main breaker*** of the instrument in ON position, it is possible to turn ON or OFF the refrigeration unity independently from the rest of the instrument.

The Cooler section is composed by the following main parts:

- two **Peltier Cells** for cooling**,** placed under the reagent tray;
- one temperature sensors (**LM35 Temp Sensor Ver.01**, P/N 10050-01-A), for reagent tray temperature control;
- two +12Vdc small fans, for the two heatsinks ventilation.

3.2.4. LM35 Temp Sensor Ver.01, P/N 10050-01-A

This is the temperature sensor used for monitoring the reagent tray cooling temperature.

Reagent tray temperature sensor is placed on the back instrument side, below the Reagent tray plate. To access it remove the cabinet; the sensor is fixed by one screw together with the grounding jumper giving MGND ground connection to the mechanical parts. The sensor is connected to the LHP Power Board (cooling section) through a connector.

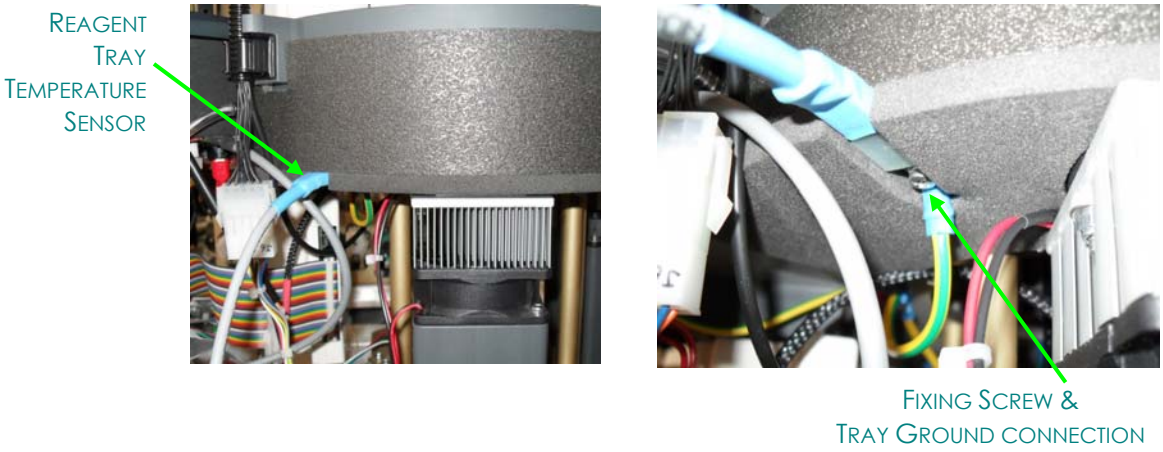


Figure 33: *Reagent Tray Temperature Sensor*

Part List Title: LM35 Temp Sensor Ver.01 P/N: 10050-01-A

Pos.	Ref. Designator	Q.ty	UoM	Description	Value	Rating	Toler.	P/N
1	A1	1	PZ	LM35 FILTER MODULE VER01				10121-01-A
2	P1	1	PZ	CONNECTOR, RECEPTACLE, FEMALE, STRAIGHT, CRIMP CONTACT, SINGLE ROW 1x4PIN, POLARIZATION, LOCK, AMPMODU SERIES, PITCH 2,54mm, UL94-V1				280359-0
3		3	PZ	CONTACT, CRIMP, FEMALE, 22-26AWG, FOR TYCO-AMP MODU				181270-2
4		0,33	M	MULTI-CONDUCTOR CABLE, SHIELDED ULTRA-FLEX, CONDUCTOR PCV 2x0,14mmq (AWG26), (CONDUCTORS: WHITHE/BROWN), POLIURETAN SHEAT, FLAME RETARDANT, TIN PLATED COPPER SHIELD, NOM. DIAM.=3,9mm, FROM -40°C TO +70°C, TYPE LAPP UNITRONIC-FD CP PLUS, 0,25A, 70°C, 250Vac				0028 880
5		0,05	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, UL1007, AWG24 (11/0,16), Tmax=+80°C, Vmax=300V, BLACK				CAV1007/24NE
6		2	ML	SILICON ADHESIVE, PROTECTION, RTV744				744

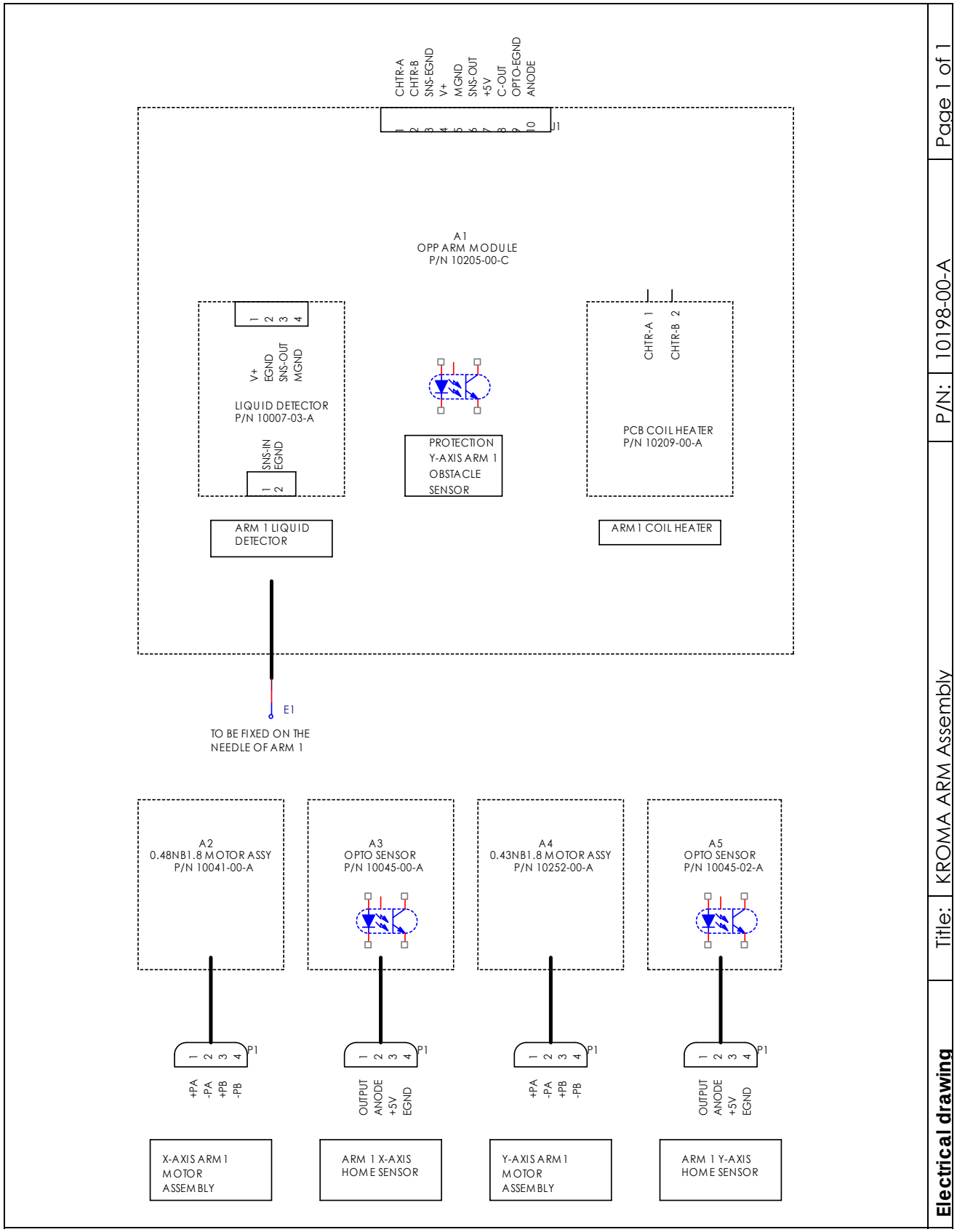
3.2.5. KROMA ARM Assembly, P/N 10802-00-A

This assembly is controlled by the ARM Controller P/N 10012-02-C. It includes the X-axis stepping motor (***0.48NM1.8 Motor Assy*** P/N 10041-01-A) for ARM rotation, the Y-axis stepping motor (***0.43NM1.8 Motor Assy*** P/N 10252-01-A) for vertical motion and the Diluter stepping motor (integrated into the Diluter itself) as metering pump.
Two home sensors controls respectively the X-axis (***Opto Sensor Ver.00*** P/N 10045-00-A) and the Y-axis (***Opto Sensor Ver.03*** P/N 10045-03-A). The Diluter home sensor is integrated in the Diluter itself.
On top of the ARM is placed the board ***OPP ARM Module*** P/N 10205-01-C; it includes the Liquid Detector sensor, the Obstacle sensor and the Heater Coil and it is connected through a flexible wiring to the electronics.
An optional barcode reader is fixed on the ARM and it allows the positive identification of barcoded reagent bottles and sample tubes when rotating.

Figure 34: *KROMA ARM Assembly*

Part List Title: KROMA ARM Assembly P/N: 10802-00-A

Pos.	Ref. Designator	Q.ty	UoM	Description	Value	Rating	Toler.	P/N
1	A1	1	PZ	KROMA ARM MODULE				10205-01-C
2	A2	1	PZ	0.48NM1.8 MOTOR ASSY VER.01				10041-01-A
3	A3	1	PZ	OPTO SENSOR VER.00				10045-00-A
4	A4	1	PZ	0.43NM1.8 MOTOR ASSY VER.01				10252-01-A
5	A5	1	PZ	OPTO SENSOR VER.03				10045-03-A
6	A6	1	PZ	LETTORE DI CODICE A BARRE, DECODER INTEGRATO, HOUSING CON CONNETTORE M-12 CIRCOLARE				BCL 8 SM102



Page 1 of 1 | P/N: 10198-00-A | Title: KROMA ARM Assembly | **Electrical drawing**

3.2.5.1. 0.48NM 1.8 Motor Assy P/N 10041-01-A

This is the stepping motor assembly used for ARM X-axis (rotation).

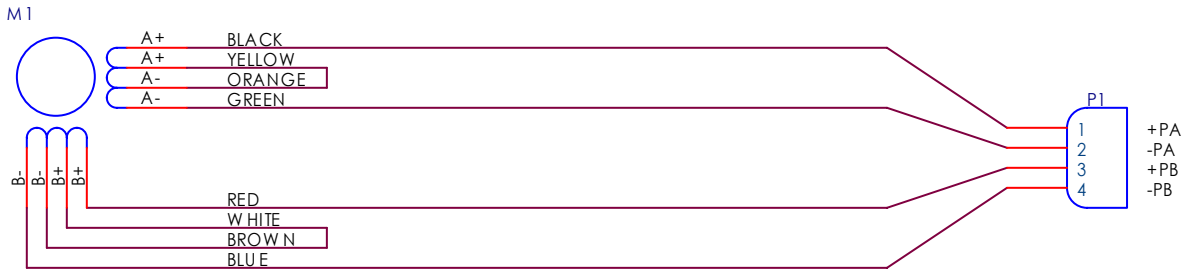


Figure 35: *0.48NM 1.8 Motor Assy*

To access motors, disassemble the cabinet.
ARM X-axis motor is placed in the centre of the sample/reagent tray. It is fixed on a plate and it allows arm rotation through a belt.

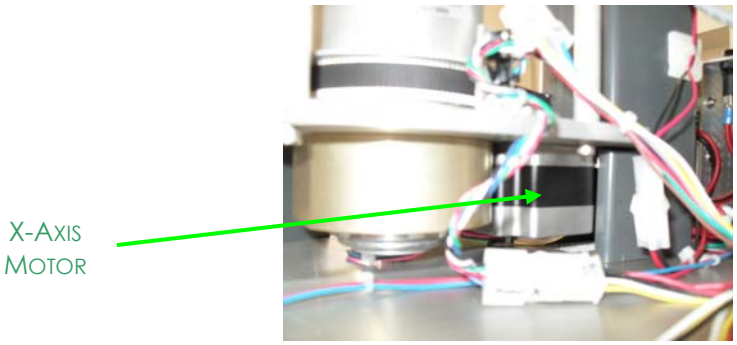


Figure 36: *KROMA ARM X-axis Motor Assy*

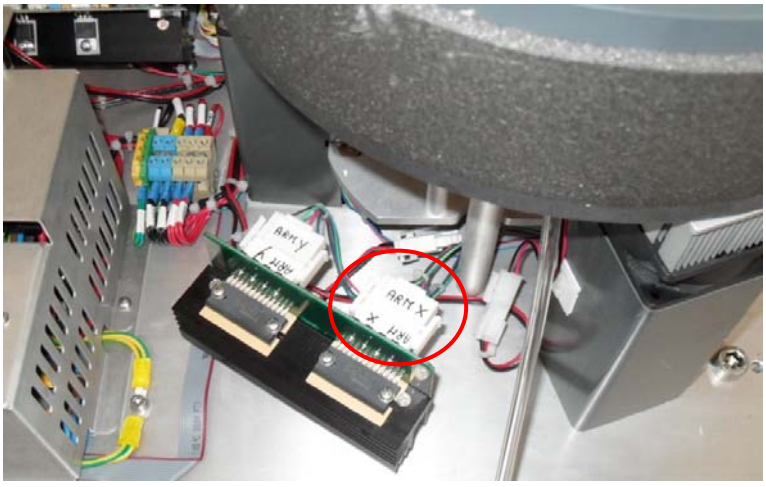


Figure 37: *ARM X-axis Motor Driver*

3.2.5.2. 0.43NM 1.8 Motor Assy P/N 10252-01-A

This is the stepping motor assembly used for ARM Y-axis (elevation).

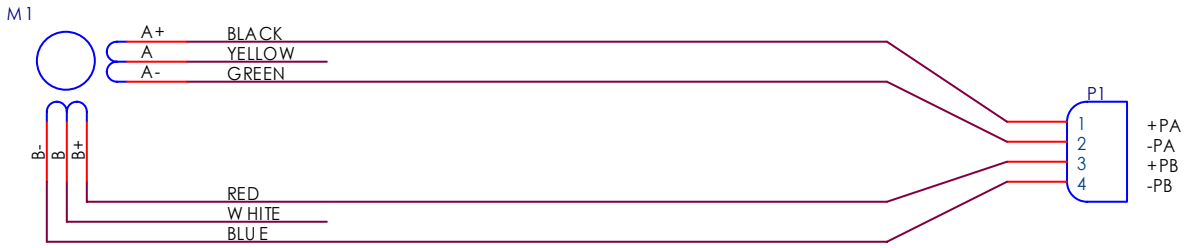


Figure 38: *0.48NM 1.8 Motor Assy*

To access motors, disassemble the cabinet.
ARM Y-axis motor is placed in the centre of the sample/reagent tray. It is fixed on the bottom of the arm, into a protection, and it allows arm vertical movement through an internal long screw.
Keep arm shaft oiled with pure Vaseline grease to allow correct up and down sliding.

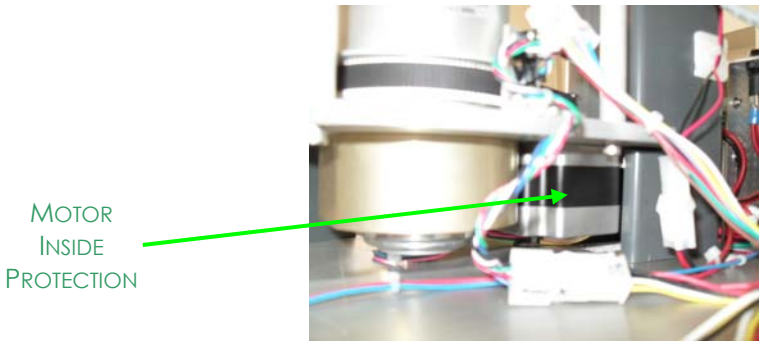


Figure 39: *KROMA ARM Y-axis Motor Assy*

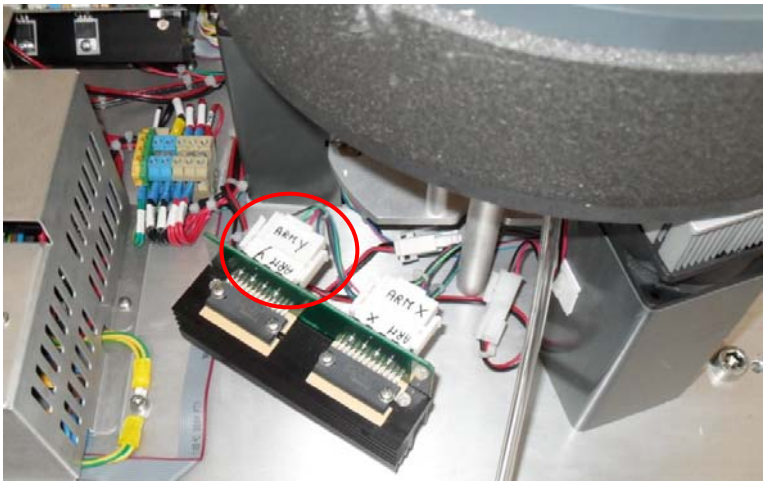


Figure 40: *ARM Y-axis Motor Driver*

3.2.5.3. Opto Sensor, All Versions P/N 10045-__-A

This is the home sensor of the ARM1 stepping motor assemblies.
There are several versions that refer to the same electrical drawing, two of them have been used in this instrument and they differ for length and for external wiring protection:

- Version 00 (P/N 10045-00-A) is used for ARM X-axis home.
- Version 03 (P/N 10045-03-A) is used for ARM Y-axis home.

To access opto sensors, disassemble the cabinet; they are fixed by two screws and holed cable ties.

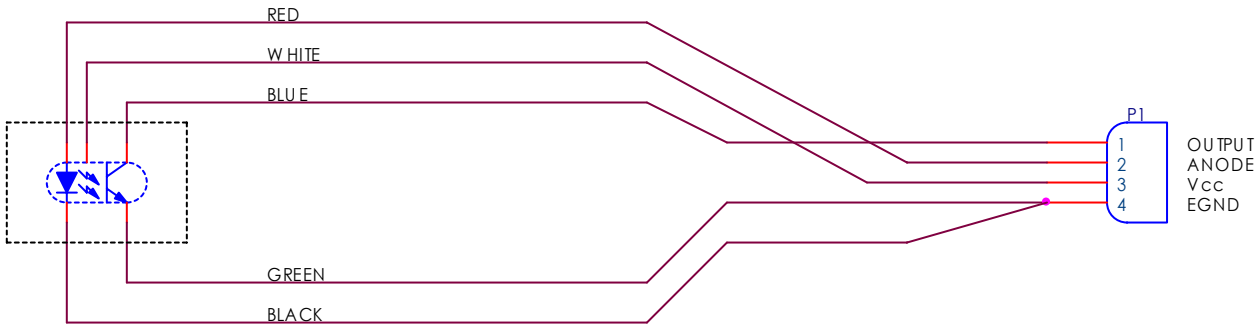


Figure 41: *Opto Sensor*

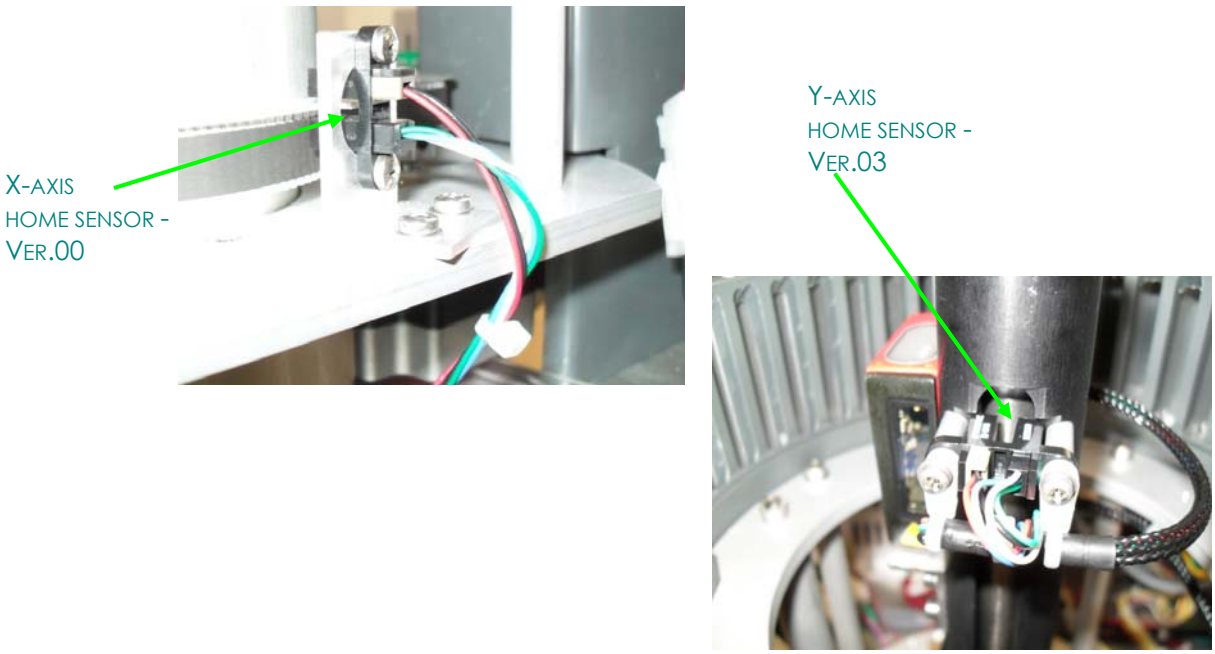


Figure 42: *KROMA ARM Home Sensors*

3.2.5.4. KROMA ARM Module P/N 10205-01-C

This board, located on top of the ARM under a protection cover, includes the Liquid Level capacitive sensor for detection of fluid's level, the Obstacle sensor (to detect crashes along Y-axis travelling) and the Heater Coil. The Liquid Level sensor includes two LEDs:

- one green LED, it lights ON whent instrument is in power on and the board is powered,
- one red LED, it lights ON when the probe touches a fluid giving a capacitance variation.

The Liquid Level sensor is in contact with the probe through a jumper soldered on the board.
The Obstacle sensor detects when the probe crashes on its way down: a flag, fixed on the probe, enters the optocoupler on the board and activates the alarm.
The Heater Coil connects the probe with the Diluter through a Teflon tubing. One end is plugged on the very top of the probe; the other end is fitted onto the top acrylic head of the Diluter.
It can warm the fluid flowing into the probe, it can be equipped with a heating element as a cartridge resistor controlled by the ARM1 Controller in PWM mode and driven by the Pumps & Driver Assembly. It is possible to replace the Heater Coil, after having disconnected tubing from probe and Diluter, by removing it from the clamps. If during instrument power on the green led is OFF or flashes/blinks, replace the board. It is possible to replace this board by removing the screws that fix the wiring clamp and the board itself.

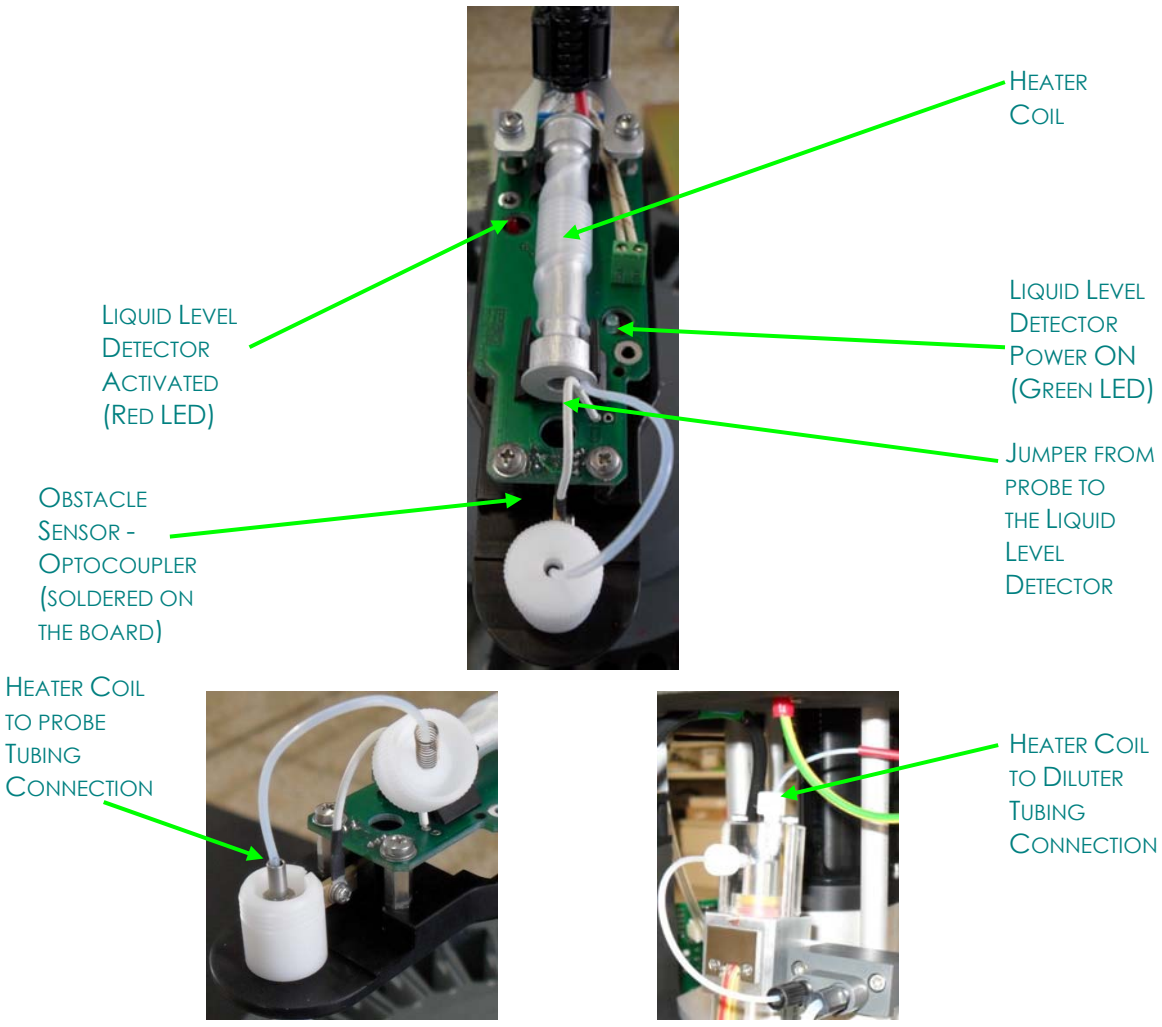


Figure 43: *KROMA ARM Module*

3.2.5.5. BarCode Reader

The barcode reader is placed in the centre of the reagent tray, under the cover. To access it, take out the cover of the tray. It is fixed on the arm support through its own bracket by two screws on the bottom that allow mechanical calibration. In case of misalignment, unfasten the screws and align it. To replace it, loosen the connector.

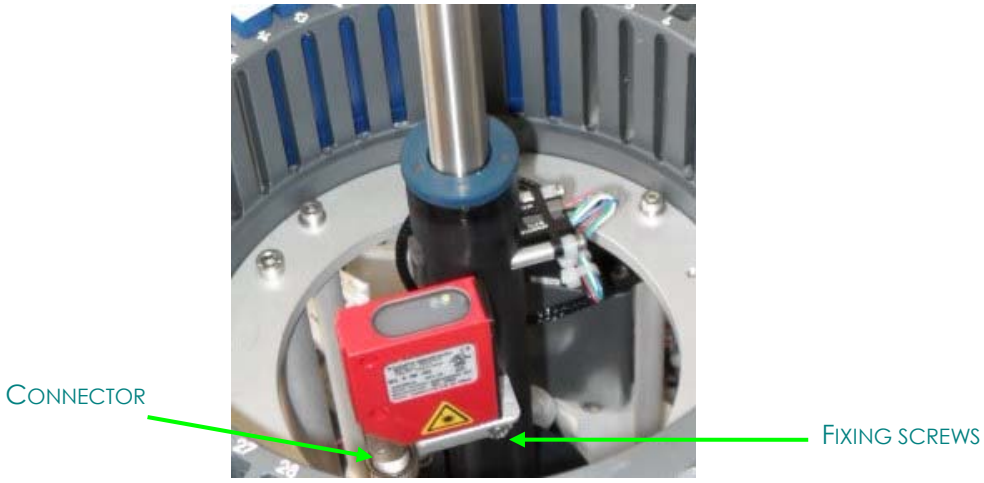
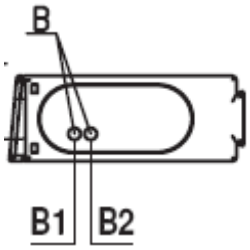


Figure 44: *BarCode Reader*



B: Indicators LEDs B1= status LED
B2= decode LED

Figure 45: *BarCode Reader LEDs, Top View*

After power on, the BCL 8 performs an automatic "Power On" function test. Then, the green status LED on the top side of the BCL 8 lights up (if not, check and tight interface connector).
Two 3-colour LEDs at the top of the case show the device and reading status:

LED	Color	meaning
Status LED	Green flashing	initialisation phase
	Green continuous	ready for operation
	Red flashing (200ms)	warning
	Red continuous	error, no function
	Orange flashing (200ms)	service operation
Decode LED	Green (200ms on)	reading successful
	Red (200ms off)	no reading result
	Orange continuous	reading gate active

3.2.6. KROMA R&W Assembly Ver. 00, P/N 10773-00-A

This assembly is controlled by the Read&Wash Controller P/N 10012-04-C. It includes the cuvette wheel, the Filter wheel and the Washing Station, each of them moved by a stepping motor and controlled through a home sensor. It is composed by the following sub-assemblies:

- OPP Cuvette Assemblies Ver.02, P/N 10210-02-A;
- OPP Optical Group Ver.02, P/N 10212-02-A;
- OPP Washing Station, P/N 10211-00-A.

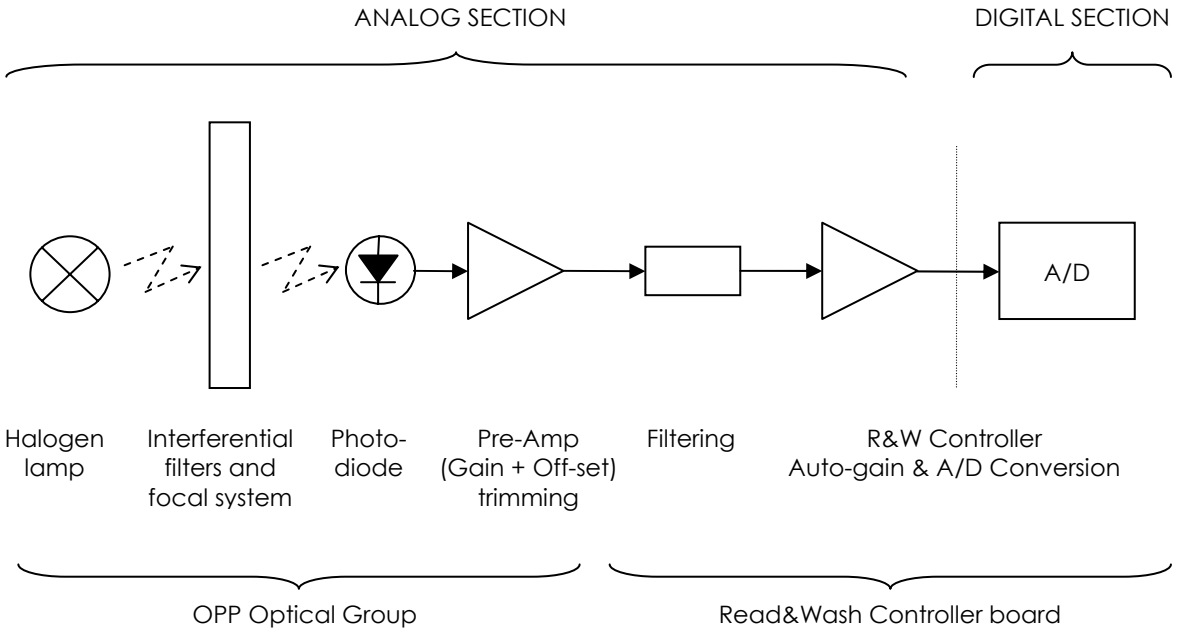


***Figure 46:** Optical Measurement Functional Diagram*

The OPP Cuvette Assemblies includes the reading cuvette tray and the photodiode module for photometric readings. The photodiode board is connected trough a wiring to the mother board.
The OPP Optical Group includes the halogen lamp light source, the optical lenses and the filter wheel.
The OPP Washing Station is devoted to cuvettes washing and includes needles and tip for aspiration/dispensing and a manifold for fluid distribution.

Part List Title: KROMA R&W Assembly Ver.01 P/N: 10773-00-A

Pos.	Ref. Designator	Q.ty	UoM	Description	Value	Rating	Toler.	P/N
1	A1	1	PZ	OPP CUVETTE ASSEMBLY VER.0				10210-01-A
2	A2	1	PZ	OPP OPTICAL GROUP VER.01				10212-01-A
3	A3	1	PZ	0PP WASHING STATION				10211-00-A
4	W1	1	PZ	OPP 100M3 MGND JUMPER				10410-00-A
5	W2	1	PZ	OPP 100M4 MGND JUMPER				10411-00-A

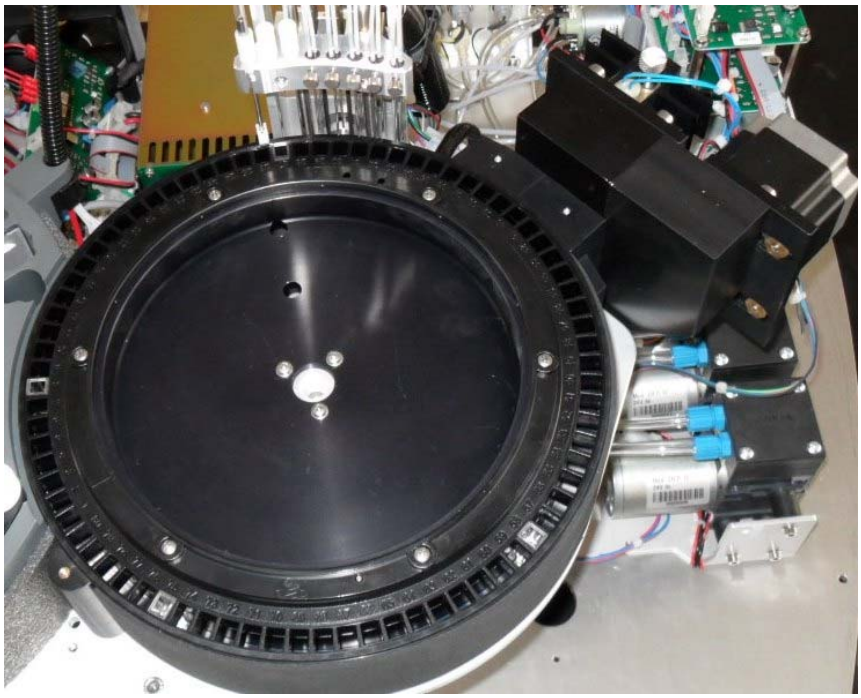
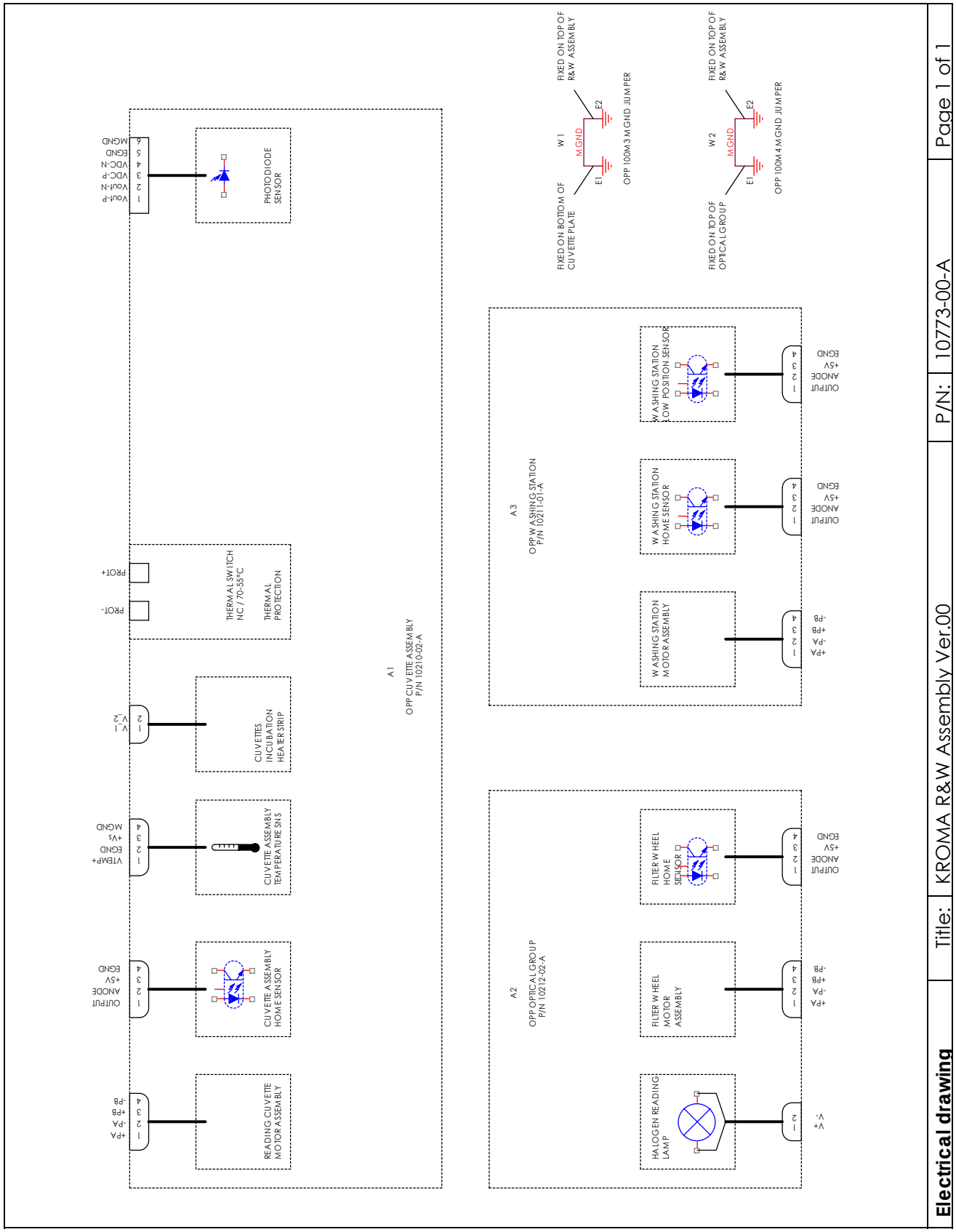


Figure 47: *KROMA R&W Assembly, shown w/o cuvettes*


Electrical drawing
Title: KROMA R&W Assembly Ver.00
P/N: 10773-00-A
Page 1 of 1
A1
OPP CUVETTE ASSEMBLY
P/N 10210-02-A
PHOTODIODE SENSOR
Vout-P
Vout-N
VDC-P
VDC-N
EGND
MGND
THERMAL SWITCH
NC / 70-55ºC
THERMAL PROTECTION
PROT+
PROT-
CUVETTES INCUBATION HEATER STRIP
V_1
V_2
CUVETTE ASSEMBLY TEMPERATURE SNS
VTEMP+
EGND
+Vs
MGND
CUVETTE ASSEMBLY HOME SENSOR
OUTPUT
ANODE
+5V
EGND
READING CUVETTE MOTOR ASSEMBLY
+PA
-PA
+PB
-PB
A2
OPP OPTICAL GROUP
P/N 10212-02-A
HALOGEN READING LAMP
V+
V-
FILTER WHEEL MOTOR ASSEMBLY
FILTER WHEEL HOME SENSOR
A3
OPP WASHING STATION
P/N 10211-01-A
WASHING STATION MOTOR ASSEMBLY
WASHING STATION HOME SENSOR
WASHING STATION LOW POSITION SENSOR
FIXED ON BOTTOM OF CUVETTE PLATE
W1
M.GND
E1
E2
OPP 100M3 M.GND JUMPER
FIXED ON TOP OF R&W ASSEMBLY
FIXED ON TOP OF OPTICAL GROUP
W2
OPP 100M4 M.GND JUMPER

3.2.6.1. OPP Cuvette Assembly, P/N 10210-02-A

This sub-assembly, controlled by the Read&Wash Controller P/N 10012-04-C, includes the cuvette wheel that is moved by a stepping motor assembly (**1.17NM1.8 Motor Assy** P/N 10040-01-A), and controlled through the related home sensor (***Opto Sensor Ver.00*** P/N 10045-00-A. The OPP Cuvette Assembly includes 80 semi-disposable cuvettes and:

- the Incubation Eater Strip, P/N 10043-00-A;
- the LM35 Temperature Sensor, P/N 10050-02-A;
- the Photodiode module, P/N 10011-00-B.

The Incubation Heater Strip is controlled by the Read&Wash Controller and driven by the LHP Power Board P/N 10762-00-A; it allows the heating of the aluminium bulk structure above and, consequently, the incubation at constant temperature of the reaction fluids into the cuvettes.
The LM35 Temperature Sensor returns to the controller the temperature of the assembly to be regulated; on the base of the temperature measurement the heater strip is turned ON and OFF to regulate incubation temperature.
The photodiode module is placed under the cuvette tray and allows the photometric measurement of the incident light crossing cuvettes. It is located into a special enclosure and includes two potentiometers: one for photodiode pre-amplifier Gain calibration, the other for Off-set nulling.

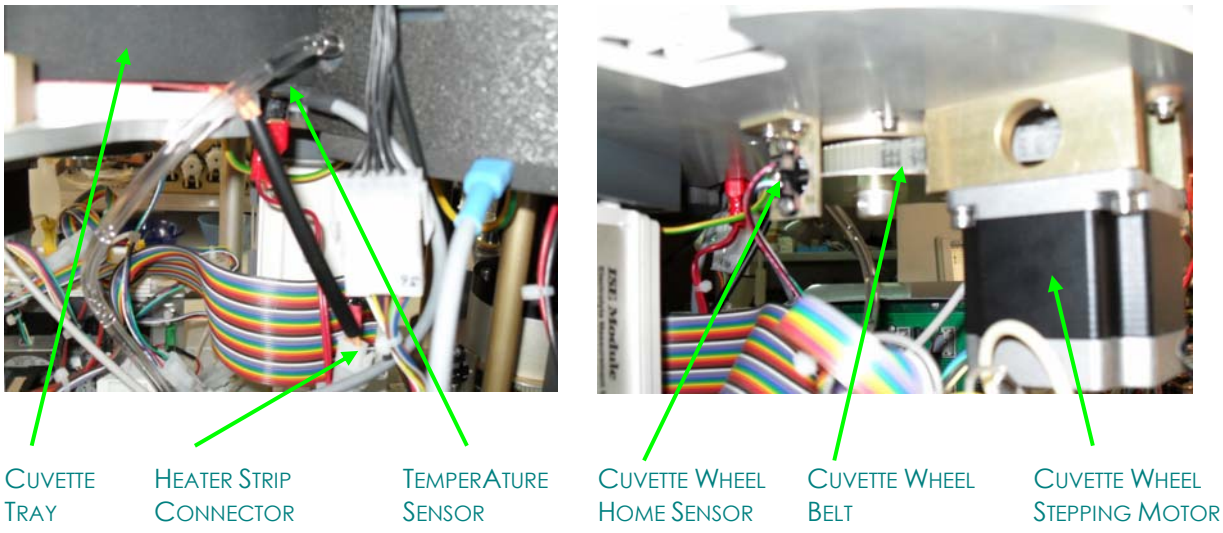
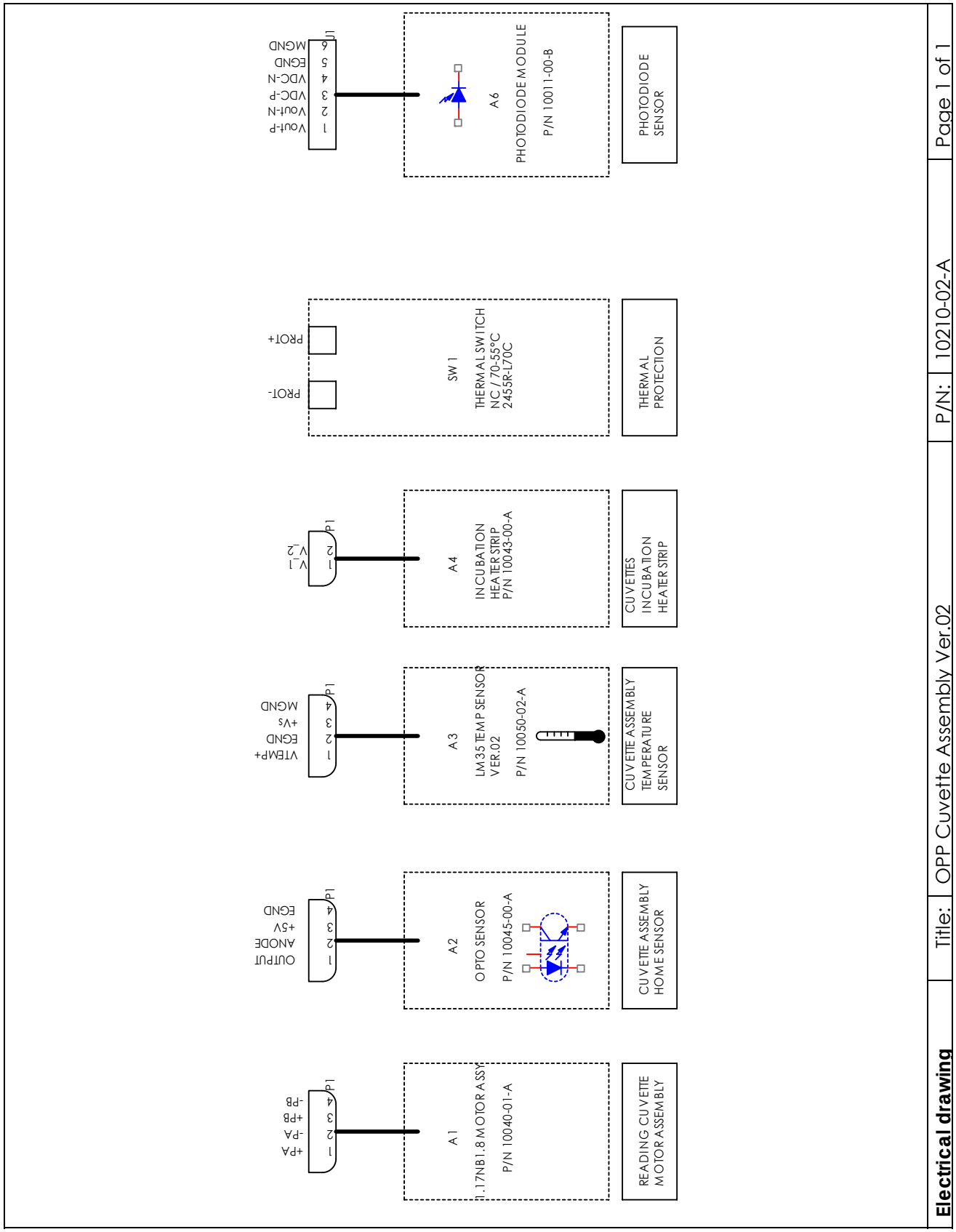


Figure 48: *Cuvette Assembly, Side & Bottom Views*

Part List Title: OPP Cuvette Assembly P/N: 10210-02-A

Pos.	Ref. Designator	Q.ty	UoM	Description	Value	Rating	Toler.	P/N
1	A1	1	PZ	1.17NM1.8 MOTOR ASSY VER.01				10040-01-A
2	A2	1	PZ	OPTO SENSOR				10045-00-A
3	A3	1	PZ	LM35 TEMP SENSOR VER.02				10050-02-A
4	A4	1	PZ	INCUBATION HEATER STRIP ASSY				10043-00-A
5	A6	1	PZ	PHOTODIODE MODULE				10011-00-B
6	SW1	1	PZ	THERMOSTAT, MULTIPURPOSE, OPEN @ 70°C+/-3°C,CLOSES @ 55°C+/-4°C, CONTACTS N/C, 250V, 10A				2455R-T147-B201A-BA13-L70C


Electrical drawing
Title: OPP Cuvette Assembly Ver.02
P/N: 10210-02-A
Page 1 of 1
READING CUVETTE MOTOR ASSEMBLY
A1
1.17NB1.8 MOTOR ASSY
P/N 10040-01-A
+PA
-PA
+PB
-PB
CUVETTE ASSEMBLY HOME SENSOR
A2
OPTO SENSOR
P/N 10045-00-A
OUTPUT
ANODE
+5V
EGND
CUVETTE ASSEMBLY TEMPERATURE SENSOR
A3
LM35 TEMP SENSOR
VER.02
P/N 10050-02-A
VTEMP+
EGND
+VS
MGND
CUVETTES INCUBATION HEATER STRIP
A4
INCUBATION
HEATER STRIP
P/N 10043-00-A
V_1
V_2
THERMAL PROTECTION
SW 1
THERMAL SWITCH
NC / 70-55°C
2455R-L70C
PROT+
PROT-
PHOTODIODE SENSOR
A6
PHOTODIODE MODULE
P/N 10011-00-B
Vout-P
Vout-N
VDC-P
VDC-N
EGND
MGND

3.2.6.1.1. 1.17NM 1.8 MOTOR ASSY P/N 10040-01-A

This is the stepping motor assembly used for the cuvette assembly.

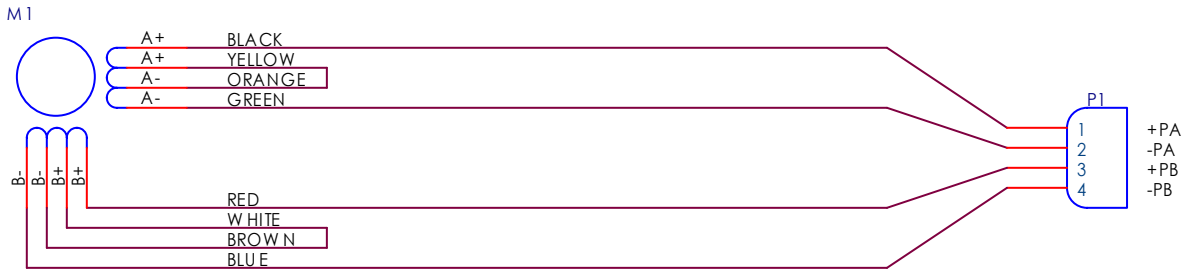


Figure 49: *1.17NM 1.8 Motor Assy*

To access motors, disassemble the cabinet. It is placed under the cuvette assembly on the right side of the instrument fixed on two supports. The rotor is moved through a belt.

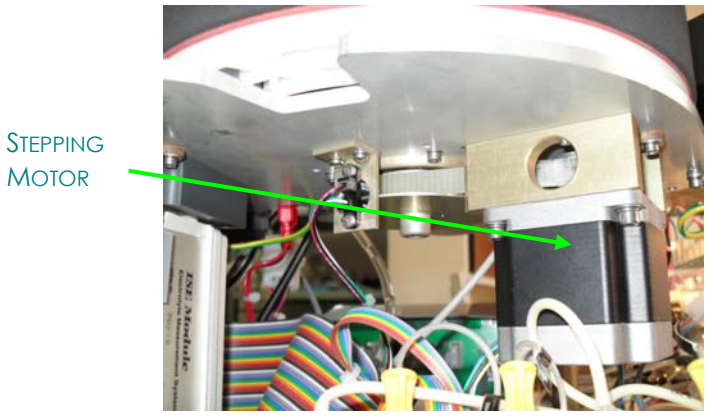


Figure 50: *Cuvette Motor Assy*

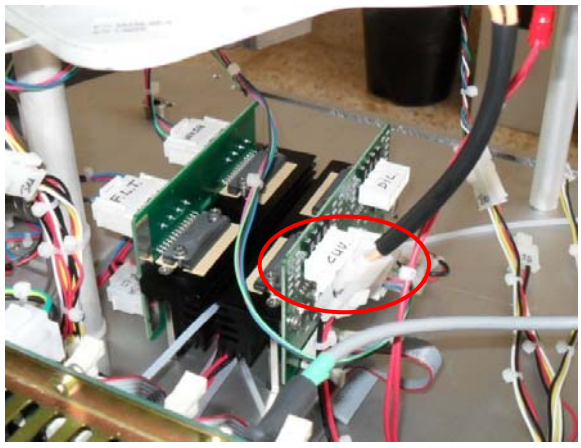


Figure 51: *Cuvette Motor Driver*

3.2.6.1.2. Opto Sensor, All Versions P/N 10045-00-A

This is the home sensor of the Cuvette Wheel stepping motor assemblies.
It is placed under the assembly and can be accessed from the front cover.

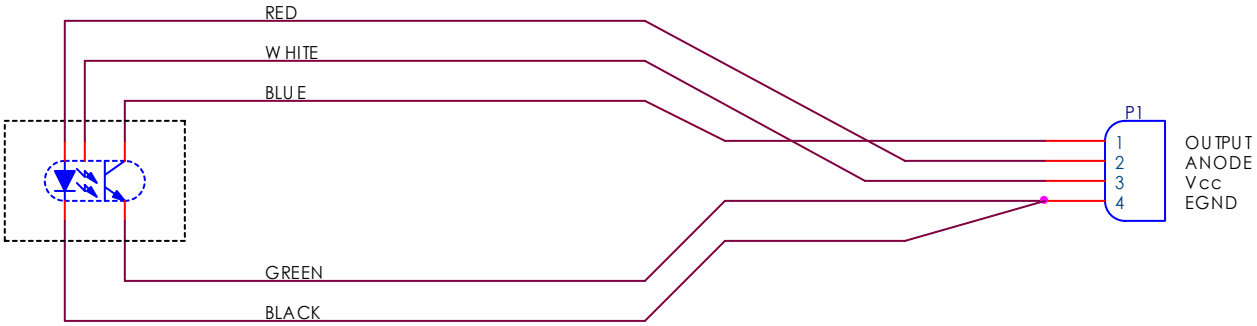


Figure 52: *Opto Sensor*

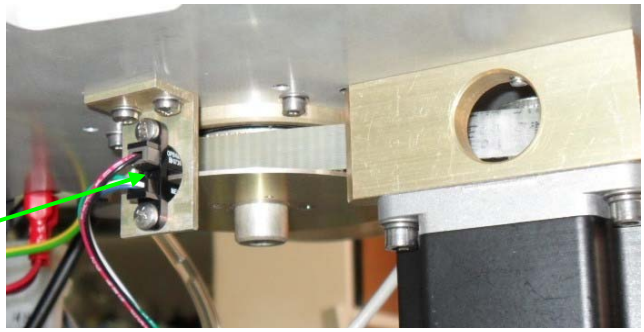


Figure 53: *Cuvette Wheel Home Sensors*

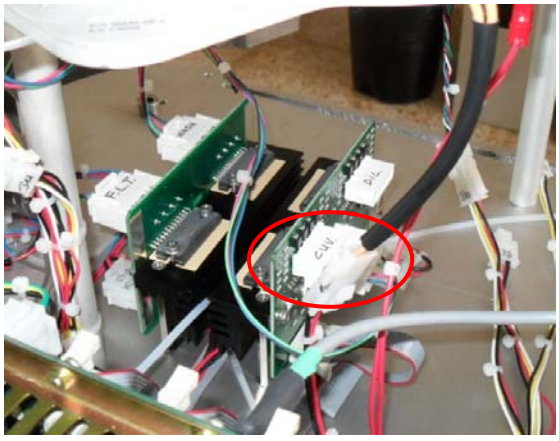


Figure 54: *Cuvette Motor Driver*

3.2.6.1.3. LM35 Temp Sensor Ver.02 P/N 10050-02-A

This is the temperature sensor used to control the incubation temperature.

Figure 55: *LM35 Temp Sensor Ver.02*

Incubation temperature sensor is placed under the cuvette assembly in the rear side. To access it remove the cabinet; sensor is fixed by one screw near the thermostat protection switch. The sensor is plugged to the Mother Board through a connector and a shielded cable; it's monitored by the Main Controller board.

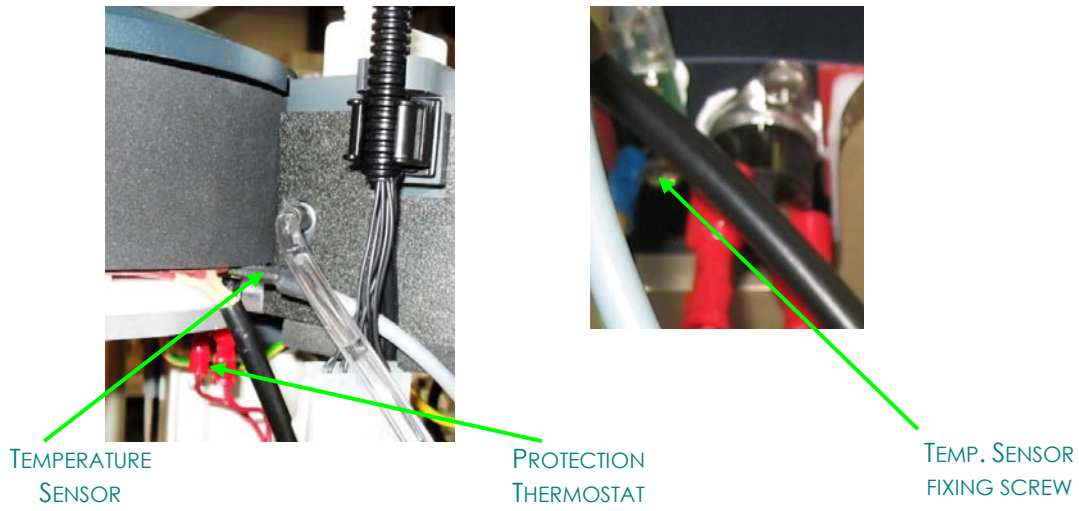


Figure 56: *Cuvette Wheel temperature sensor and Thermostat*

3.2.6.1.4. Incubation Heater Strip Assy P/N 10043-00-A

This is the heater used to warm up the cuvette assembly in order to reach the constant incubation temperature.

Figure 57: *Incubation Heater Strip*

Incubation heater strip is placed under the cuvette assembly. To access it remove the cabinet. It is driven by the Main Controller board through the PWR Switch & Regulator board.

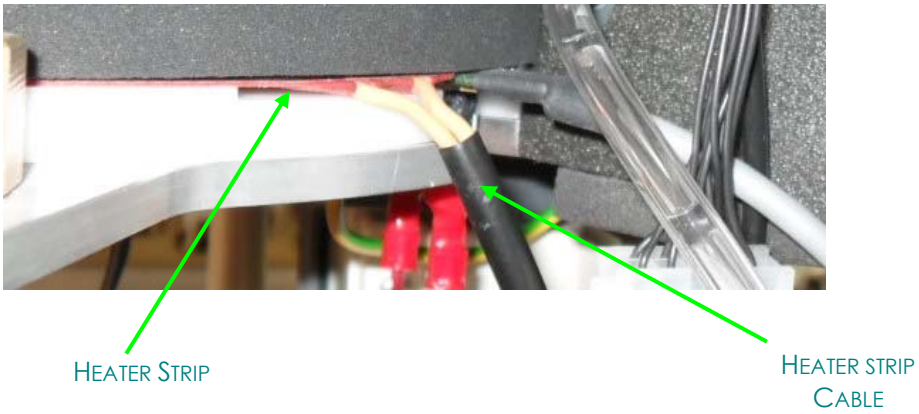


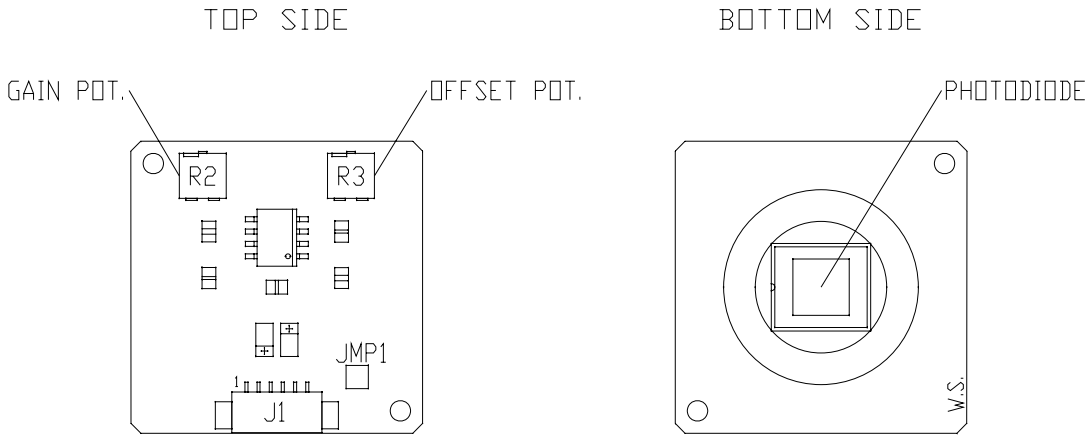
Figure 58: *Heater Strip*

3.2.6.1.5. Photodiode Module P/N 10011-00-B

This module is used to measure the light crossing the cuvette to be read: it is the photo-sensor pre-amplifier. It is placed at the end of the optical path and its part of the photometer.
It includes two potentiometers, one for Gain calibration (R2) and the other for off-set nulling (R3):

- R2 has been regulated at factory to give readings of about 20,000 counts at 340nm wavelenght over the full dynamic (65535 counts) and Gain = 1.
- R3 has been regulated at factory to decrease eventual signal off-set to give 5÷15 counts over the full dynamic (65535 counts).

These potentiometers do not require of any further calibration during normal operation. In case of replacing photodiode board or in case of modification of lighting conditions (replacement of lamp, filter set, replacement of lens) there could be the need of re-calibrating Gain, in this case potentiometers can be gently turned without disassembling parts through the upper cover of the cuvette wheel: **two holes have been provided for reaching potentiometers when cuvette number 32 is placed in reading position**; Gain = left potentiometer, Off-set = right potentiometer.



JUMPER CONFIGURATION (C=CLOSED, O=OPEN):

VERSION	JMP1
00	O

Figure 59: *Photodiode Module*

Note: No maintenance operations are foreseen at board level. Ask Producer for spare part.

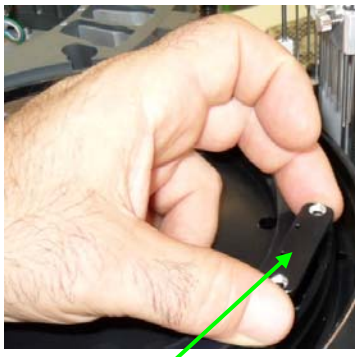
To access the boards, remove the cuvette wheel cover, remove the whole cuvette tray support and open the enclosure; unfasten the fixing screw and replace the board only with the same model. Assemble back all parts and perform Gain and Off-set calibration. See the procedure below.

DISASSEMBLE CUVETTE COVER AND ARM COVER

PUSH UP TO THE VERY TOP THE WASHING STATION HEAD

UNFASTEN THE SIX SCREWS THAT FIX THE CUVETTE SUPPORT TO THE TRAY

DISASSEMBLE THE CUVETTE SUPPORT FROM THE TRAY



UNFASTEN PHOTODIODE MODULE SUPPORT

REPLACE MODULE TAKING IT OUT FROM THE SUPPORT

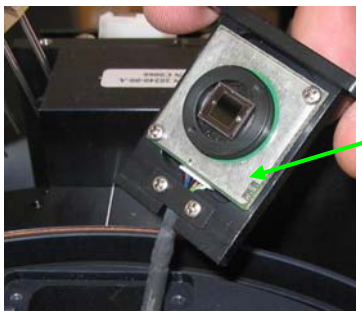


Figure 60: *Photodiode Module Replacing Procedure*

3.2.6.2. OPP Optical Group Ver.02, P/N 10212-02-A

This sub-assembly, controlled by the Read&Wash Controller P/N 10012-04-C, includes the filter wheel that is moved by a stepping motor assembly (**1.17NM0.9 Motor Assy** P/N 10042-01-A), and controlled through the related home sensor (***Opto Sensor Ver.00*** P/N 10045-00-A).
The OPP Cuvette Assembly includes also:

- the 20W Halogen Lamp Assy, P/N 10749-00-A
- the set of 8 interferential filters.

The filter wheel is managed by the Read&Wash Controller in order to position the requested wavelength on the optical path. Every machine cycle includes an home positioning of the wheel for on-line controlling.

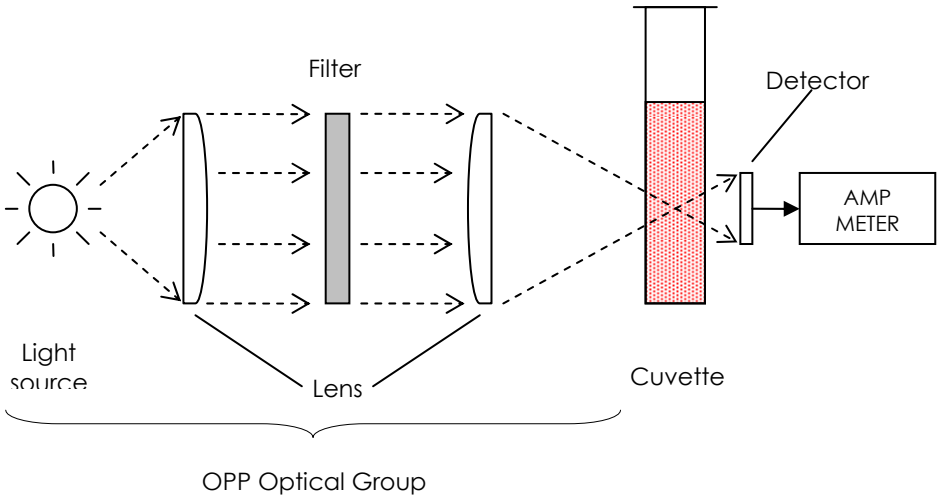


Figure 61: *Photometer*

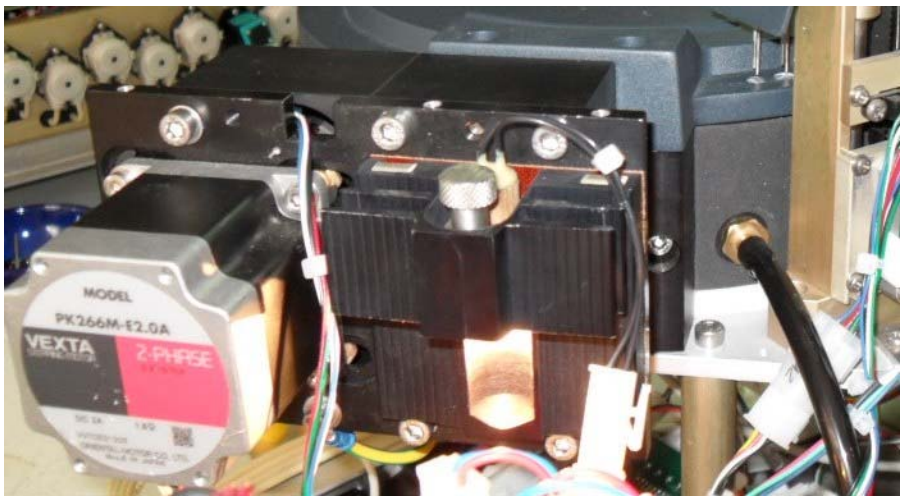
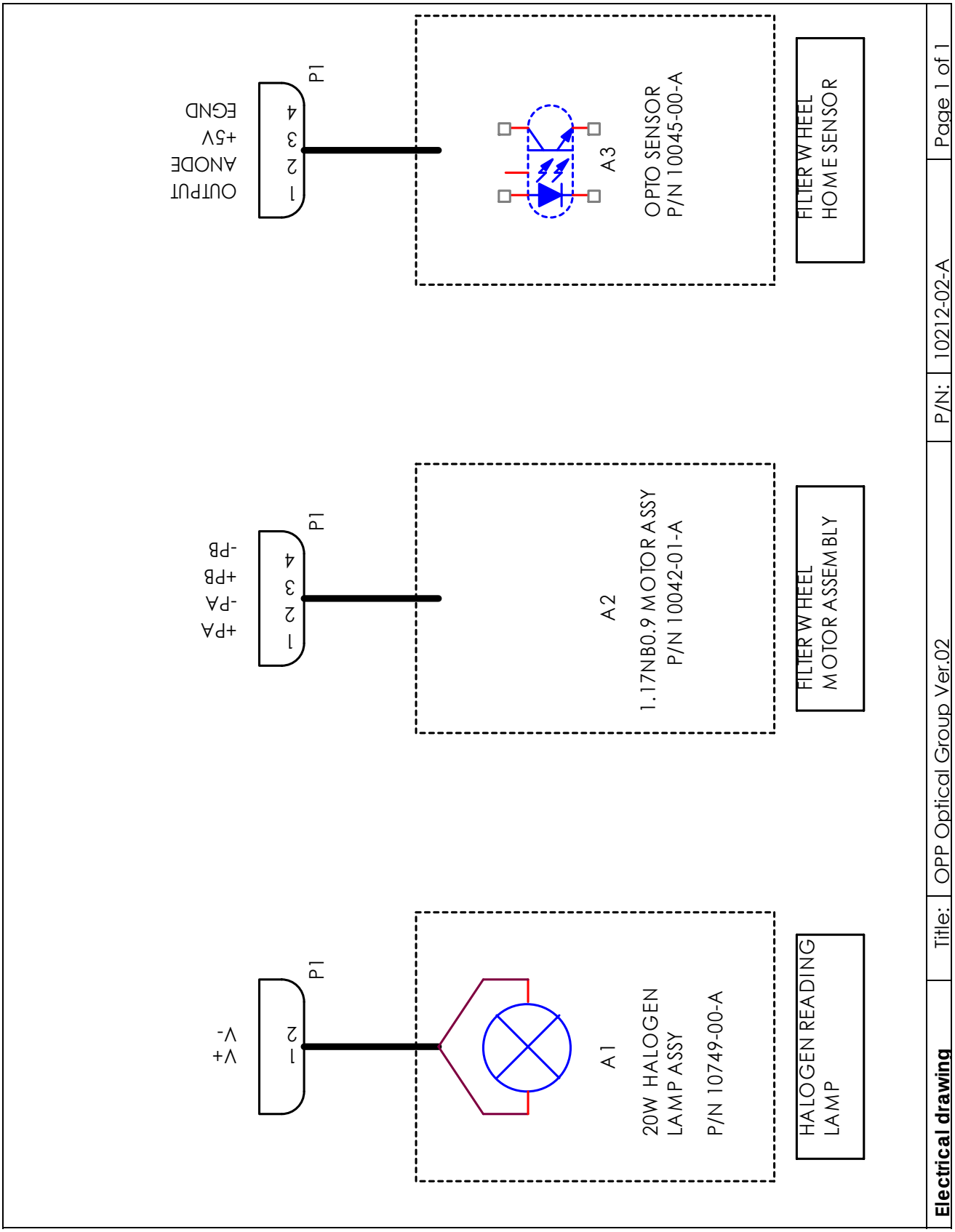


Figure 62: *OPP Optical Group, back view*

Part List Title: OPP Optical Group P/N: 10212-02-A

Pos.	Ref. Designator	Q.ty	UoM	Description	Value	Rating	Toler.	P/N
1	A1	1	PZ	20W HALOGEN LAMP ASSY				10749-00-A
2	A2	1	PZ	1.17NM0.9 M MOTOR ASSY VER.01				10042-01-A
3	A3	1	PZ	OPTO SENSOR				10045-00-A
4		1	PZ	SET OF INTERFERENTIAL FILTERS, 8 MATCHED FILTERS + CAP FOR OFFSET, λ=505nm, 546nm, 578nm, 630nm, 700nm, 340nm, 405nm, 492nm				


HALOGEN READING LAMP
20W HALOGEN LAMP ASSY
P/N 10749-00-A
A1
V+
V-
P1
1
2
FILTER WHEEL MOTOR ASSEMBLY
1.17NB0.9 MOTOR ASSY
P/N 10042-01-A
A2
+PA
-PA
+PB
-PB
P1
1
2
3
4
FILTER WHEEL HOME SENSOR
OPTO SENSOR
P/N 10045-00-A
A3
OUTPUT
ANODE
+5V
EGND
P1
1
2
3
4
Electrical drawing
Title: OPP Optical Group Ver.02
P/N: 10212-02-A
Page 1 of 1

3.2.6.2.1. 20W Halogen Lamp Assy, P/N 10749-00-A

This is the lamp used as light source for the photometric system.

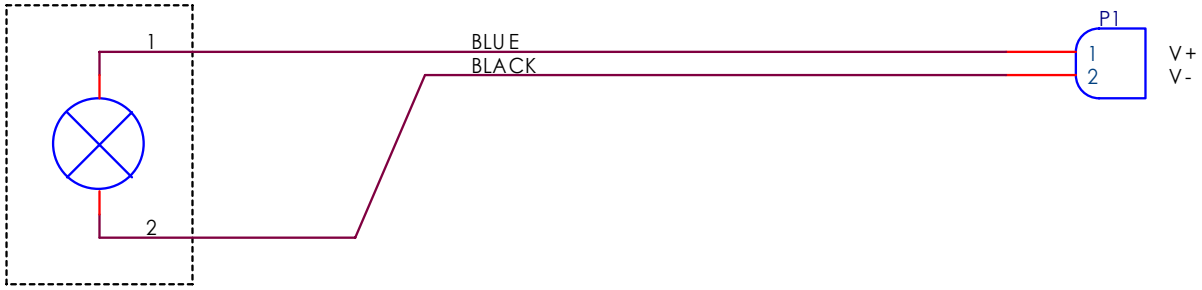


Figure 63: *20W Halogen Lamp Assy*

The lamp is placed into its heat sink within the Optical Group.

The Photometer Lamp must be replaced when the instrument is OFF; wait at least 5 minutes from the shutdown to allow the bulb to cool down and to avoid any burnings. The new lamp (provided by the Manufacturer with its own code) includes the fixing support; don't remove the lamp from its support: the lamp hight has been calibrated at factory.

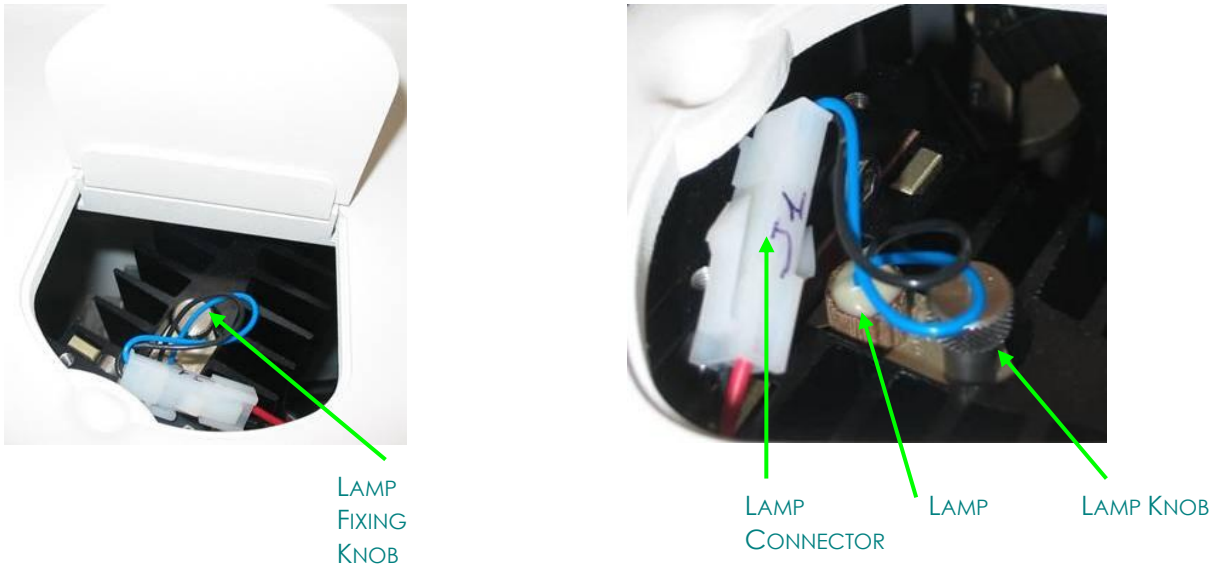


Figure 64: *20W Halogen Lamp*

To replace the photometer lamp simply open the wicket protecting the lamp assembly and follow the steps below:

- Unscrew and save the phillips screw that fixes the lamp wiring to the optical group main body.
- Unplug the lamp connector from the main wiring (pay attention do not let it slide inside the machine).
- Unfasten the lamp knob.
- Take out the lamp with its support.
- Place a new lamp, with its support, in the slot and tight the fastening knob.
- Plug the connector back to the fixed wiring.

- Screw up the phillips screw to fasten the lamp conductors to the optical group main body and close the wicket.
- Switch the instrument on, start the software and wait the end of the warm up.
- Run a *Gain Calibration Cycle* from the *Status* menu. The cycle includes an auto-zero cycle that allows the instrument to level the different wavelength gains and update the zero values of all the reading Cuvettes.

WARNING

Do not touch the lamp bulb with your fingers: grease and damp could affect its lasting performance.

3.2.6.2.2. 1.17NM 0.9 MOTOR ASSY, P/N 10042-01-A

This is the stepping motor assembly used for the filter wheel motion.

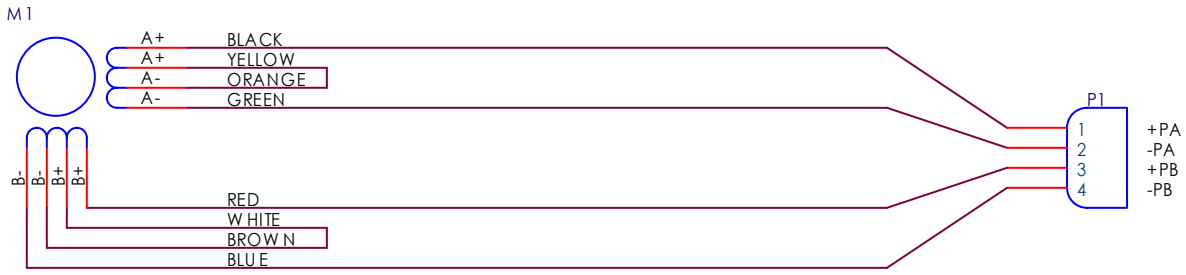


Figure 65: *1.17NM 0.9 Motor Assy*

To access the motor, disassemble the cabinet. It is placed behind the optical group. The filter wheel is moved through a belt.

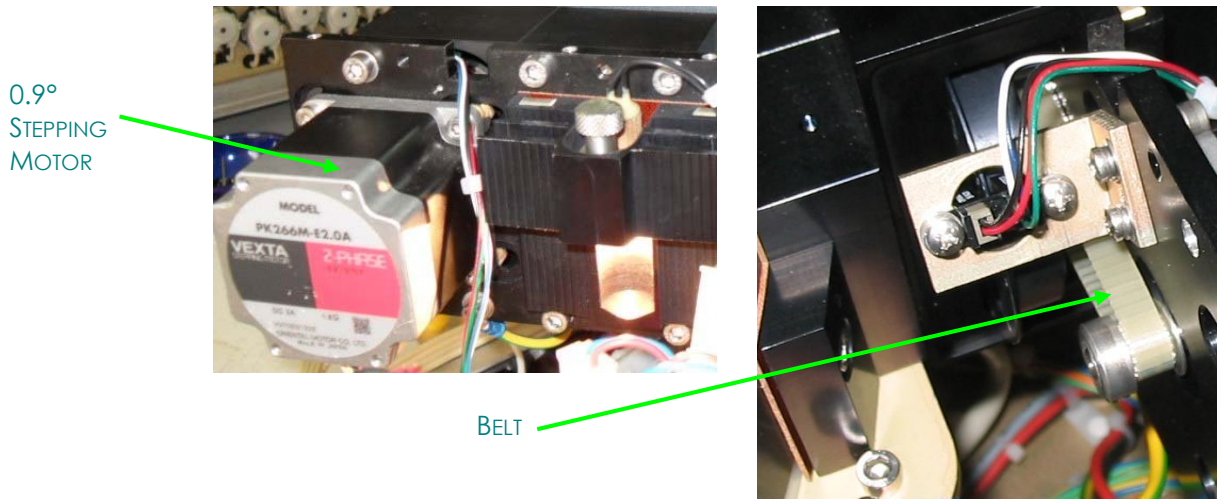


Figure 66: *Filter Wheel Stepping Motor*

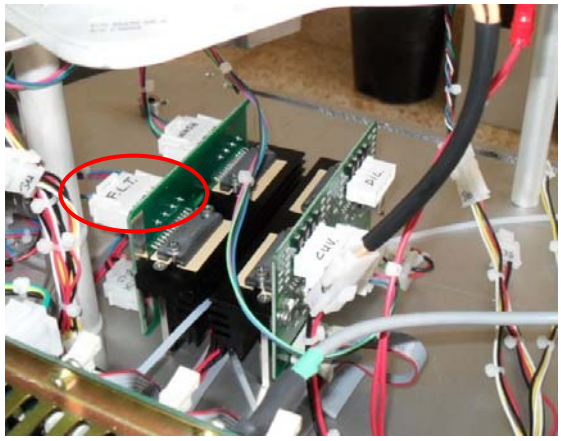


Figure 67: *Filter Wheel Motor Driver*

3.2.6.2.3. Opto Sensor Ver.00 P/N, 10045-00-A

This is the opto home sensor used for Filter Wheel motion control.

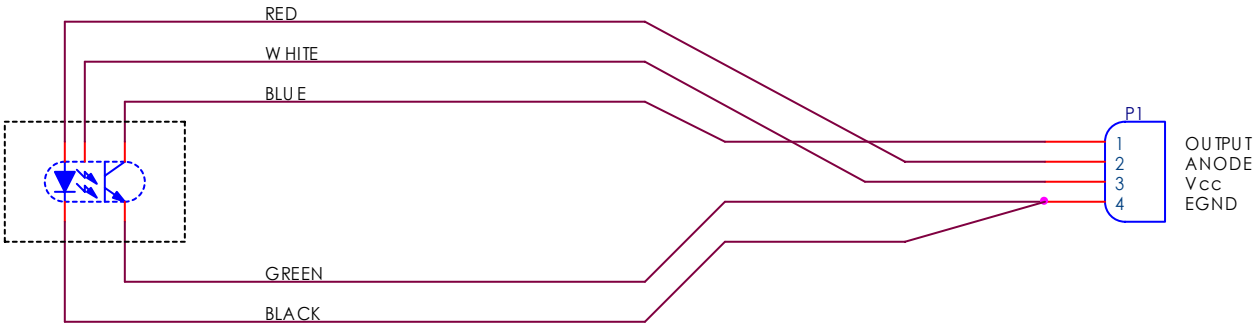


Figure 68: *Opto Sensor*

The Filter wheel home sensor is placed into the Optical Group behind a plastic back cover.
To replace it remove the cabinet and then remove the black plastic cover, that is fixed with one screw on the rear side; unfasten the screws fixing the support and replace the sensor. Align it on the wheel, replace back all parts and proceed with mechanical calibration of the filters (by using the service software KROMAServer). After replacing control filter wheel mechanical calibration and then run a *Gain Calibration Cycle*.

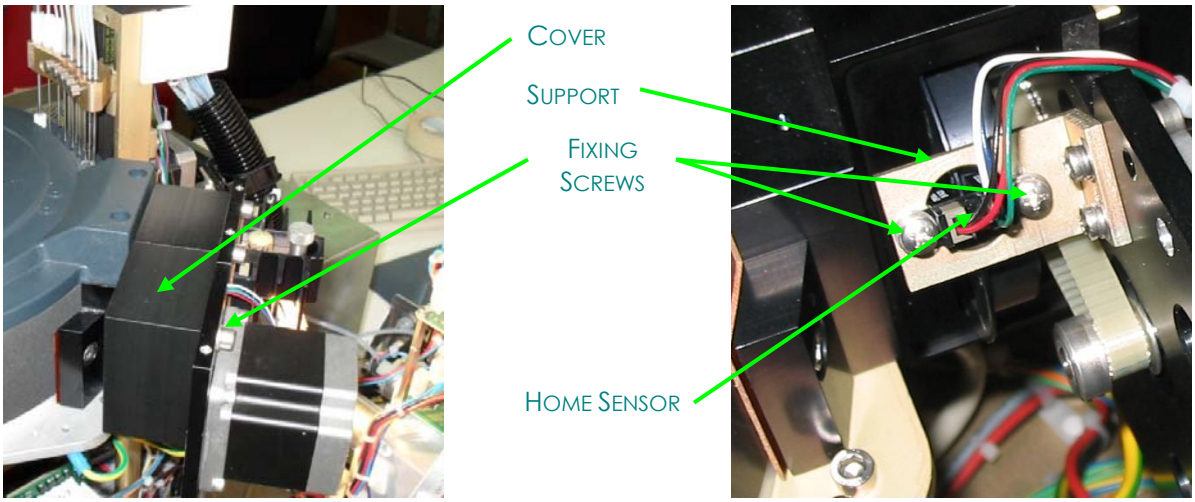


Figure 69: *Sample Wheel home sensor*

Replace sensor only with the same model.

3.2.6.2.4. Interferential Filters

The optical group includes a 10-positions filter wheel: interferential filters are 8, the wavelengths are included within 340nm and 700nm; one position is devoted to the auto-zero resetting of the off-set. One more position is free for possible *optional* wavelengths and isn't used in the standard configuration.
Positions on the filter wheel are numbered to easily recognize filters.
The cross-reference table between the physical wheel position and the filter wavelength located in that position is the following:

- Filter pos.0 505nm
- Filter pos.1 546nm
- Filter pos.2 578nm
- Filter pos.3 630nm
- Filter pos.4 700nm
- Filter pos.5 black cap (off-set)
- Filter pos.6 340nm
- Filter pos.7 not used
- Filter pos.8 405nm
- Filter pos.9 492nm

In order to replace a filter, remove the cover, remove the Optical group, disassemble it and carefully unplug the wheel. On the wheel, unfasten the big holed screw fixing the filter, remove the o-ring and extract the filter itself. Repeat the above steps on the other way round to assemble back the group.
Filters are special "matched" devices: replace them only with original ones got by the instrument Producer.

3.2.6.3. OPP Washing Station, P/N 10211-01-A

This sub-assembly, controlled by the Read&Wash Controller P/N 10012-04-C, includes the washing station of the reading cuvettes; it is moved by a stepping motor assembly (**1.20NM1.8 Motor Assy** P/N 10055-01-A), and it is controlled through one home sensor for the upper positioning and one opto-sensor for the lower positioning (***Opto Sensor Ver.00*** P/N 10045-00-A). The lower positioning sensor flags when needles have entered cuvettes; in this way the washing pumps can be activated for dispensing systemic solution.
The OPP Washing Station includes, 6 aspiration neddles, 1 drying tip and:

- 5 couples of needles, for aspiration and for dispensing;
- 1 dispensing needle;
- 1 aspiration needle;
- 1 drying tip (white Teflon).

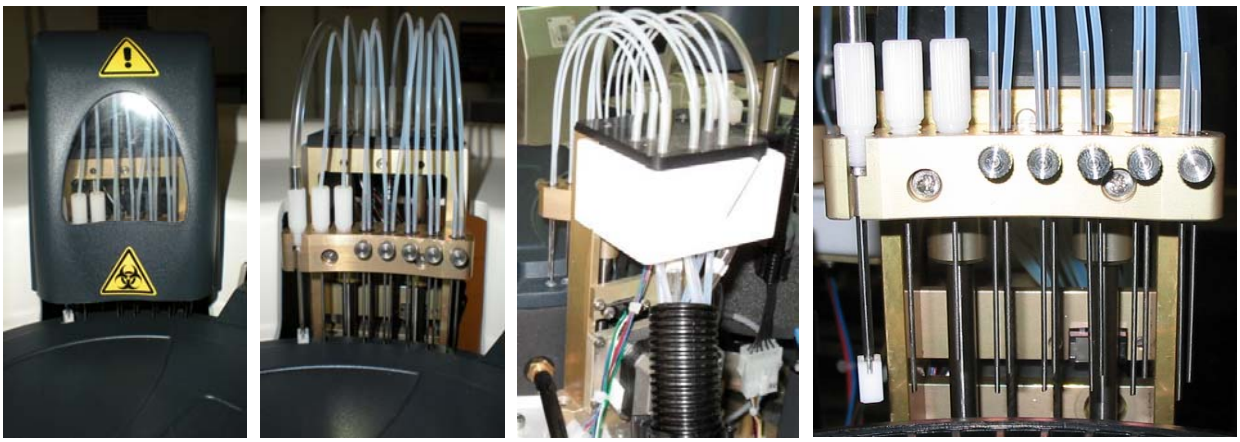


Figure 70: *Washing Station*

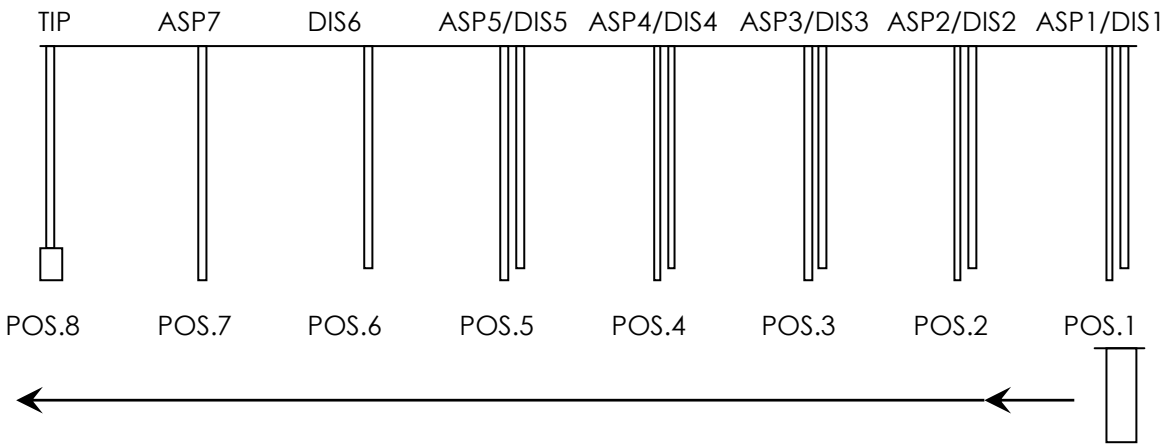


Figure 71: *Washing Station, Needles Configuration*

Needles of the washing station are driven by:

- 6 peristaltic pumps, for the washing solution dispensing (all peristaltic pumps are placed behind the front panel of the instrument);
- 2 diaphragm vacuum pumps, for aspiration and drying cuvettes (the diaphragm pumps are placed behind the back panel of the instrument).

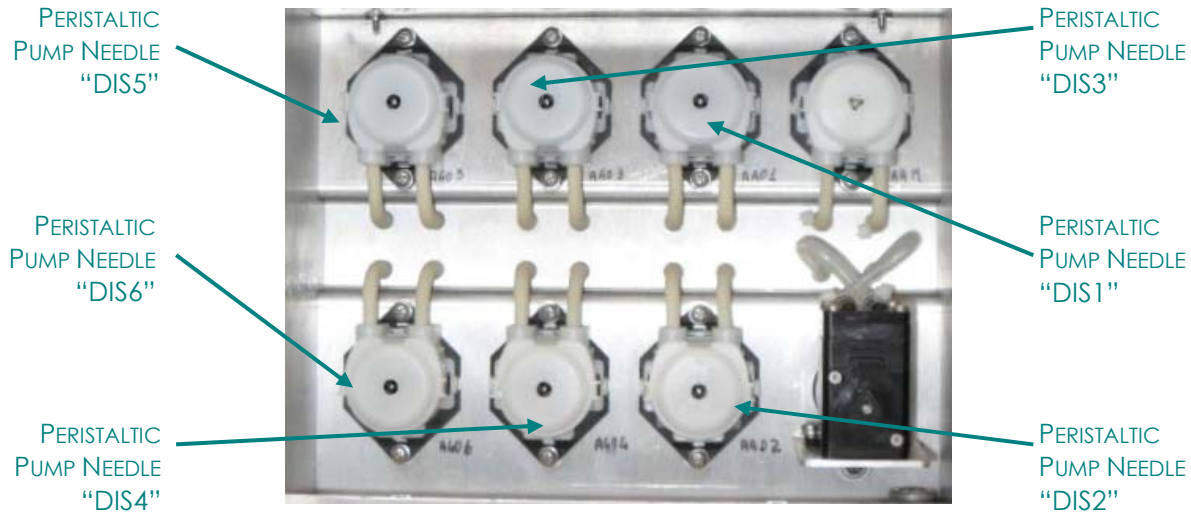


Figure 72: *Washing Station Peristaltic Pumps (Included in OPP Pumps & Drivers)*

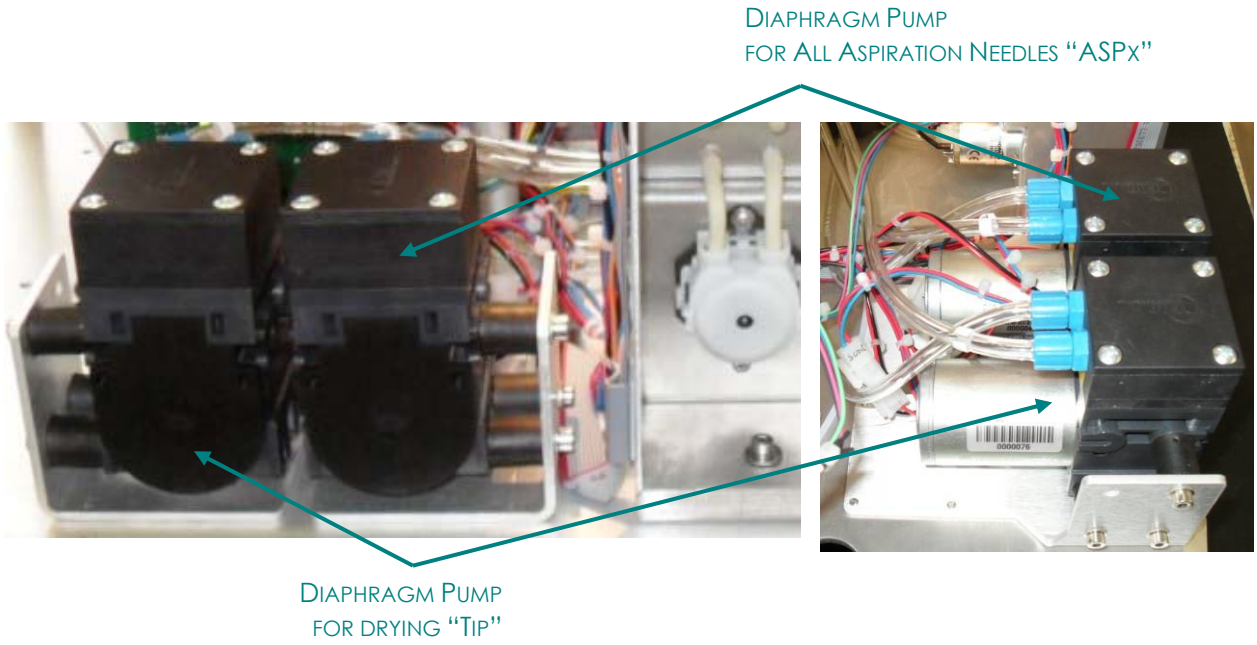


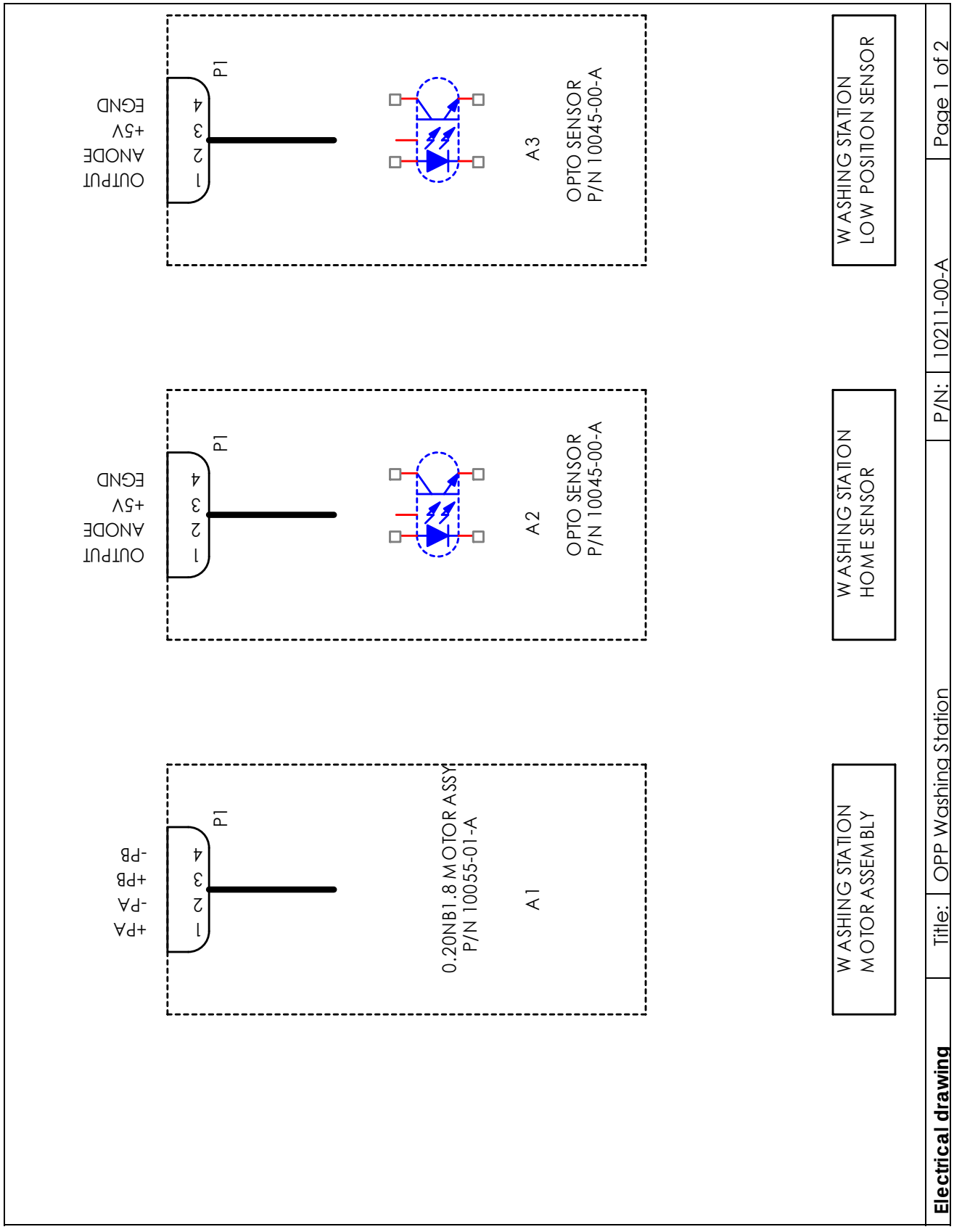
Figure 73: *Washing Station Diaphragm Vacuum Pumps*

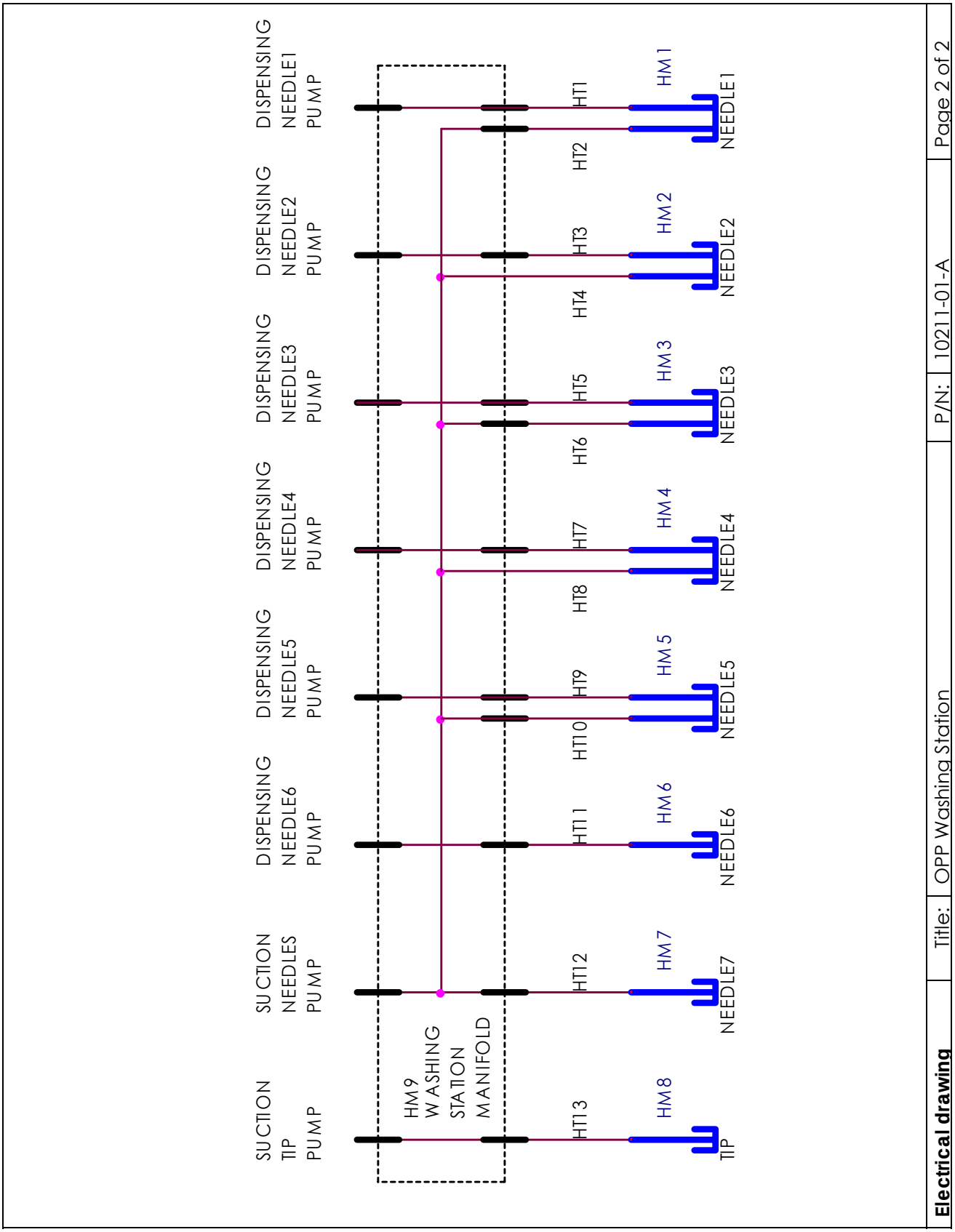
Each of the 6 peristaltic pumps is directly connected to only one dispensation needle (short ones) of the washing station. One of the two diaphragm pumps is connected in parallel to the 6 **aspirating needles** (long ones), the second one is dedicated to the **drying tip** only. During the washing cycle all cuvettes progressively run under each of the needles from position 1 up to position 8, moving one position on any every machine cycle. During the washing cycle, composed from a descent phase, a waiting phase and a rising phase, the needles, placed in the different positions, behave as follow:

- Positions 1 (couple of needles): the cuvette is discharged and then washed twice with Cleaner Solution; it comes out half-full;
- Positions 2÷4 (couple of needles): the cuvette is discharged and then washed twice with Systemic Solution; it comes out half-full;
- Position 5 (couple of needles): the cuvette is discharged and then washed once with Systemic Solution; it comes out empty;
- Position 6 (single needle): the cuvette is filled with Systemic Solution and then controlled optically (transparent or zero-value updating);
- Position 7 (single needle): the cuvette has been emptied out;
- Position 8 (tip): the cuvette has been dried from liquid residuals.

Part List Title: OPP Washing Station P/N: 10211-01-A

Pos.	Ref. Designator	Q.ty	UoM	Description	Value	Rating	Toler.	P/N
1	A1, A2	2	PZ	OPTO SENSOR				10045-00-A
2	A3	1	PZ	0.20NM1.8 MOTOR ASSY				10055-01-A
3	HM1-HM5	5	PZ	NEEDLES, DISPENSER-ASPIRATION, DIAM. 1,1mm				20261-00-0
4	HM6	1	PZ	NEEDLE, ASPIRATION, DIAM. 1,1mm				20077-00-0
5	HM7	1	PZ	NEEDLE, DISPENSER, DIAM. 1,1mm				20078-00-0
6	HM8	1	PZ	DRYING TIP ASSEMBLY				20239-00-0
7	HM9	1	PZ	WASHING STATION MANIFOLD				
8	HT1-HT12	1,85	M	FLEXIBLE TUBING, PTFE (TEFLON), AWG19 (INT.DIAM. 0,9mm, EXT.DIAM.=1,7mm)				PTFE TW19
9	HT13	0,15	M	FLEXIBLE TUBING, PLASTIC, TYGON, INT.DIAM.=3/32" (2,4mm), EXT.DIAM.=5/32" (4mm), THICKNESS=1/32" (0,8mm), TYPE TYGON R3603				AAC00004


WASHING STATION
LOW POSITION SENSOR
A3
OPTO SENSOR
P/N 10045-00-A
P1
1 OUTPUT
2 ANODE
3 +5V
4 EGND
WASHING STATION
HOME SENSOR
A2
OPTO SENSOR
P/N 10045-00-A
P1
1 OUTPUT
2 ANODE
3 +5V
4 EGND
WASHING STATION
MOTOR ASSEMBLY
A1
0.20NB1.8 MOTOR ASSY
P/N 10055-01-A
P1
1 +PA
2 -PA
3 +PB
4 -PB
Electrical drawing
Title: OPP Washing Station
P/N: 10211-00-A
Page 1 of 2


SUCTION TIP PUMP
SUCTION NEEDLES PUMP
DISPENSING NEEDLE6 PUMP
DISPENSING NEEDLE5 PUMP
DISPENSING NEEDLE4 PUMP
DISPENSING NEEDLE3 PUMP
DISPENSING NEEDLE2 PUMP
DISPENSING NEEDLE1 PUMP
HM9 WASHING STATION MANIFOLD
HT13
HT12
HT11
HT10
HT9
HT8
HT7
HT6
HT5
HT4
HT3
HT2
HT1
HM8
HM7
HM6
HM5
HM4
HM3
HM2
HM1
TIP
NEEDLE7
NEEDLE6
NEEDLE5
NEEDLE4
NEEDLE3
NEEDLE2
NEEDLE1
Electrical drawing
Title: OPP Washing Station
P/N: 10211-01-A
Page 2 of 2

3.2.6.3.1. 0.20NM 1.8 MOTOR ASSY, P/N 10055-01-A

This is the stepping motor assembly used for the washing station motion.

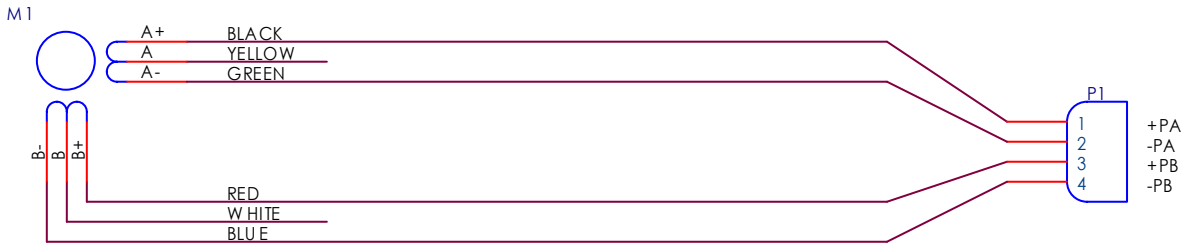


Figure 74: *0.20NM 1.8 Motor Assy*

To access the motor, disassemble the cabinet. Motor is placed behind the washing station. The group of needles is moved through a belt.

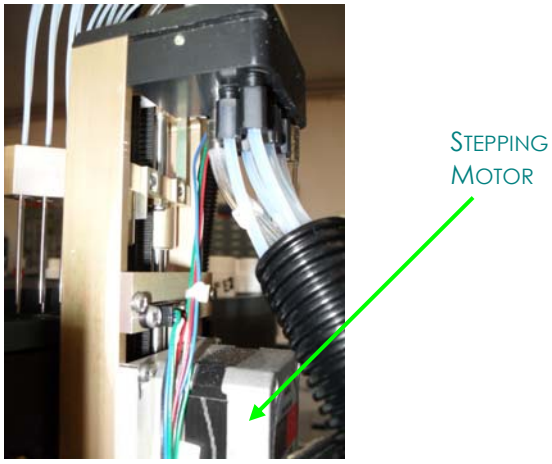


Figure 75: *Washing Station Stepping Motor*

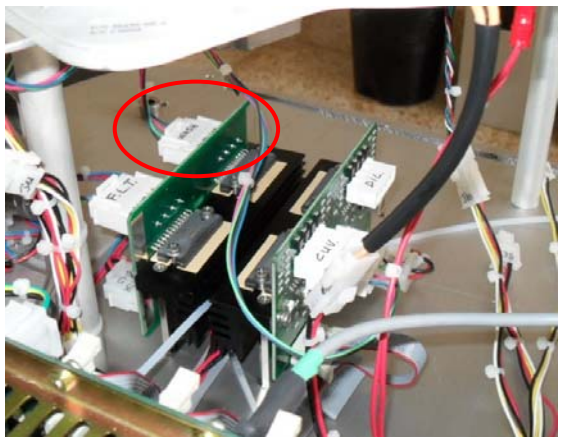


Figure 76: *Washing Station Motor Driver*

3.2.6.3.2. Opto Sensor Ver.00 P/N, 10045-00-A

This is the opto home sensor used for Filter Wheel motion control.

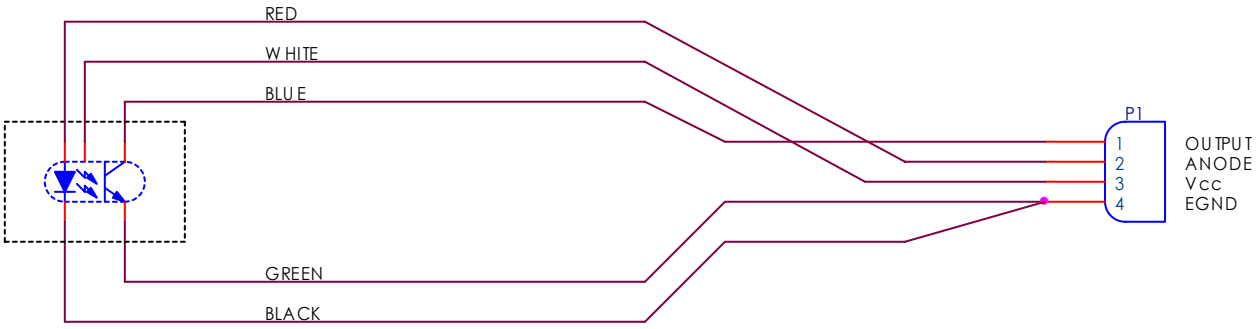


Figure 77: *Opto Sensor*

Two Washing Station opto sensors are placed in the rear side: one home sensor and one low position sensor.
To replace them remove the cabinet.

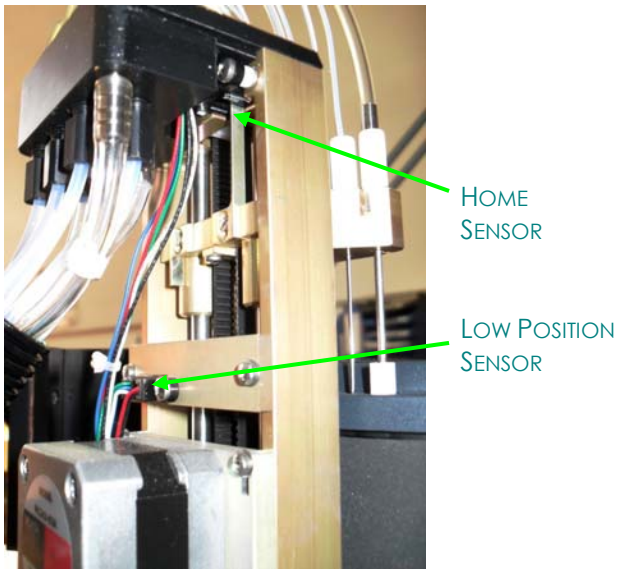
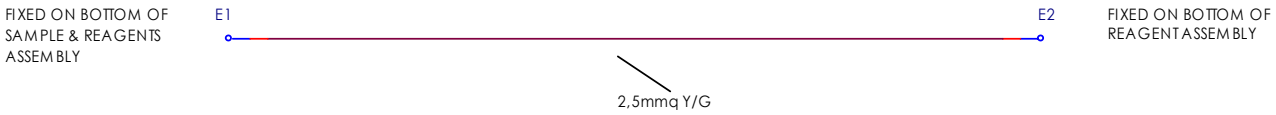


Figure 78: *Washing Station Stepping Motor*

Replace sensor only with the same model.

3.2.6.4. OPP 100M3 MGND Jumper P/N 10410-00-A and OPP 100M4 MGND Jumper

These jumpers are used to connect the bottom of reagent tray and the bottom of cuvette tray with the ground for protection, shielding and for correct liquid level sensor operation.
It is located under the sample and reagent tray.



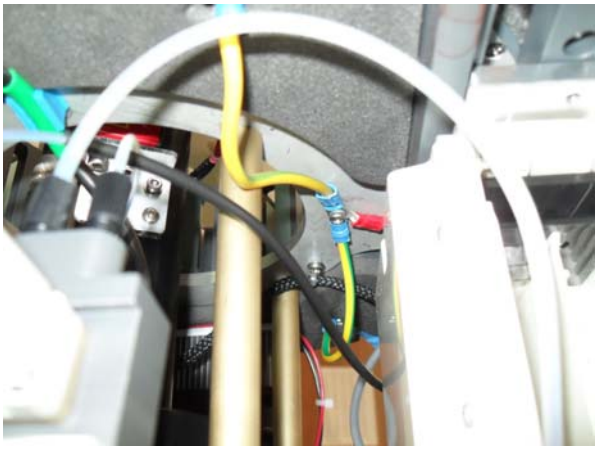


Figure 79: *OPP 100M3 MGND Jumper and OPP 100M4 MGND Jumper*

3.2.7. KROMA Pump Assembly, P/N 10801-00-A

This assembly is controlled by the KROMA 100 Controller Assembly P/N 10760-00-A and includes two boards (**Power Driver Module – 9x1A**, P/N 10006-00-C) for powering loads.
It is includes the following main parts:

- 2 Power Driver Modules;
- 6 peristaltic pumps for dispensing (washing station);
- 1 peristaltic pump for rinsing (sampling probe washing – ARM probe);
- 1 diagphram pump for aspiration (washing sink).

The pumps are connected to the power boards respecting the pictures below.

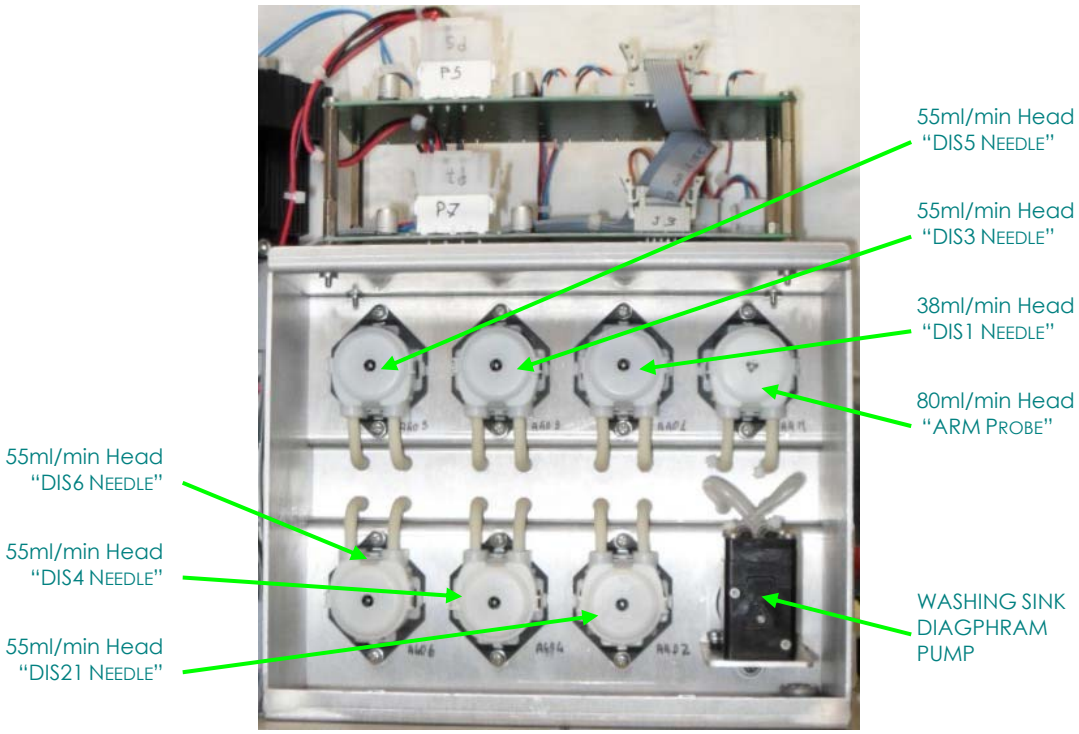


Figure 80: *Peristaltic Pump Heads Placement*

Signal to Power Output cross-reference tables:

Ref.Des.: A1, Power Driver module – 9x1A

Output	Load	Driven by	Connector
OUT01	Dispensing Needle2 Pump	Read & Wash Controller	J3
OUT02	Dispensing Needle4 Pump	Read & Wash Controller	J4
OUT03	ARM Coil Heater	ARM1 Controller	J5
OUT04	Spare Output	---	J6
OUT05	Spare Output	---	J7
OUT06	Spare Output	---	J8
OUT07	Spare Output	---	J9
OUT08	Spare Output	---	J10
OUT09	Spare Output	---	J11

Ref.Des.: A2, Power Driver module – 9x1A

Output	Load	Driven by	Connector
OUT01	Dispensing Needle1 Pump	Read & Wash Controller	J3
OUT02	Dispensing Needle3 Pump	Read & Wash Controller	J4

Output	Load	Driven by	Connector
OUT03	Dispensing Needle5 Pump	Read & Wash Controller	J5
OUT04	Dispensing Needle6 Pump	Read & Wash Controller	J6
OUT05	Diluter ARM Pump	ARM1 Controller	J7
OUT06	Washing Sink Pump	ARM1 Controller	J8
OUT07	Suction Needles Pump	Read & Wash Controller	J9
OUT08	Suction Tip Pump	Read & Wash Controller	J10
OUT09	ARM Diluter Electrovalve	ARM1 Controller	J11

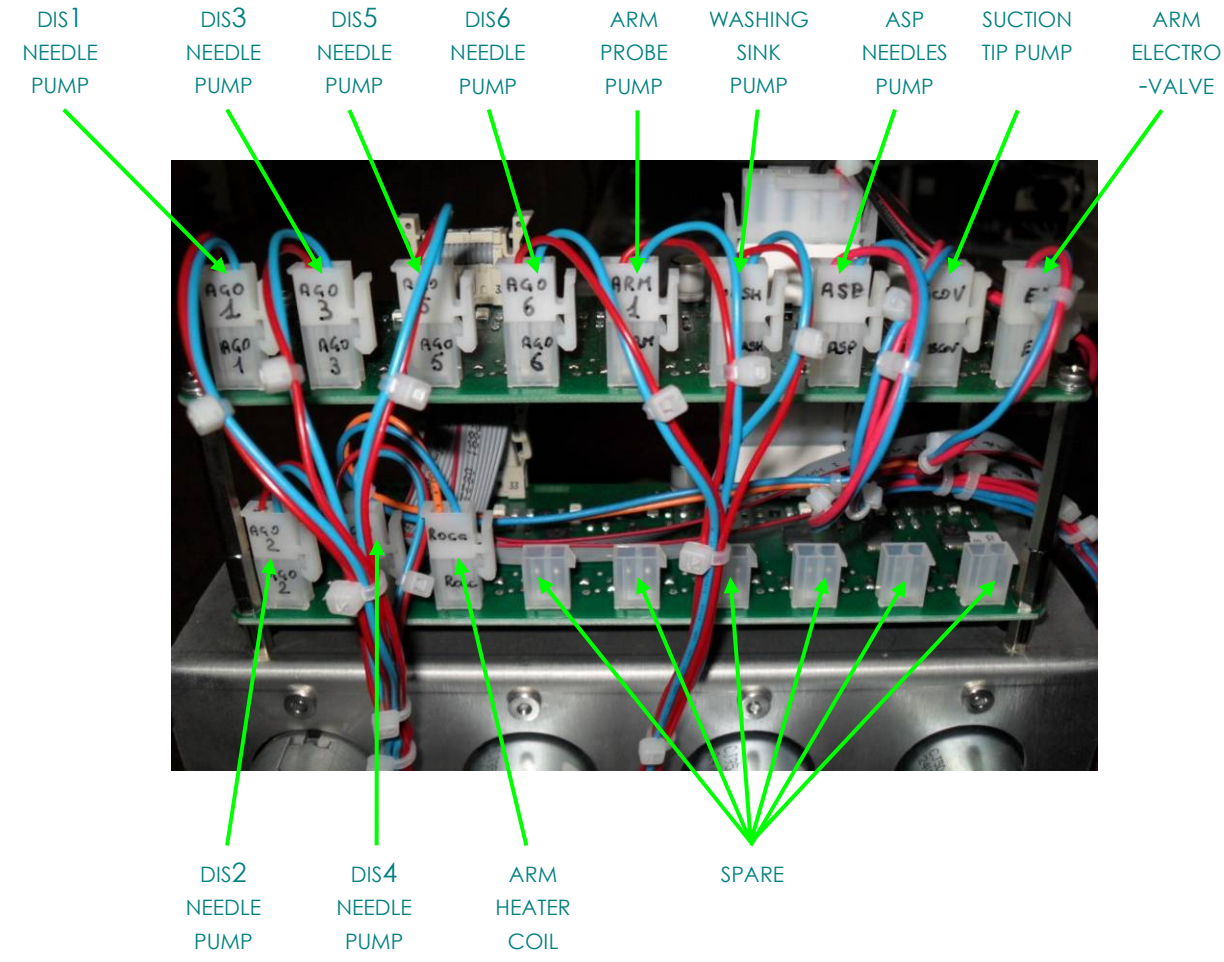


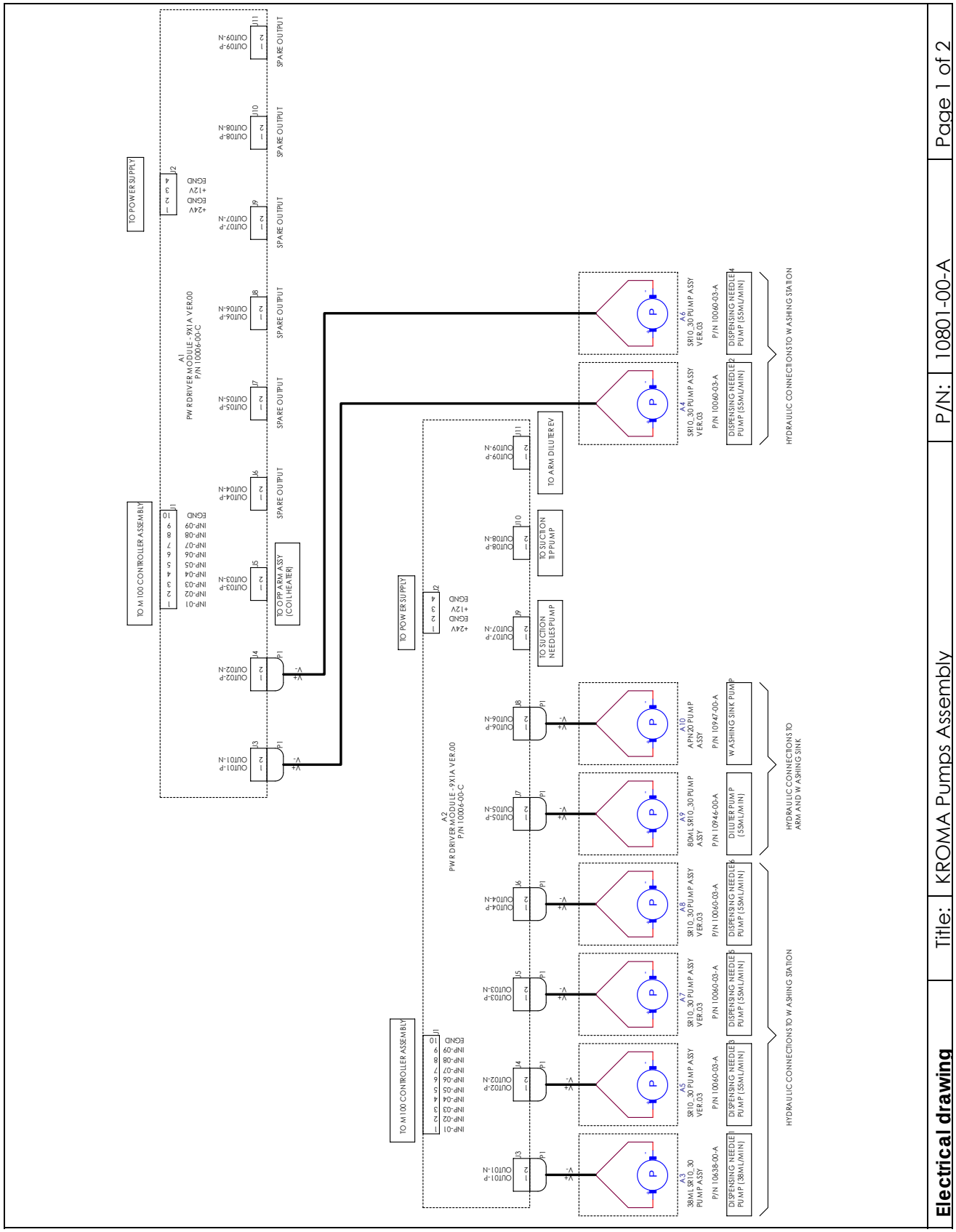
Figure 81: *Pumps and Loads Connection to Power Boards (back-view)*

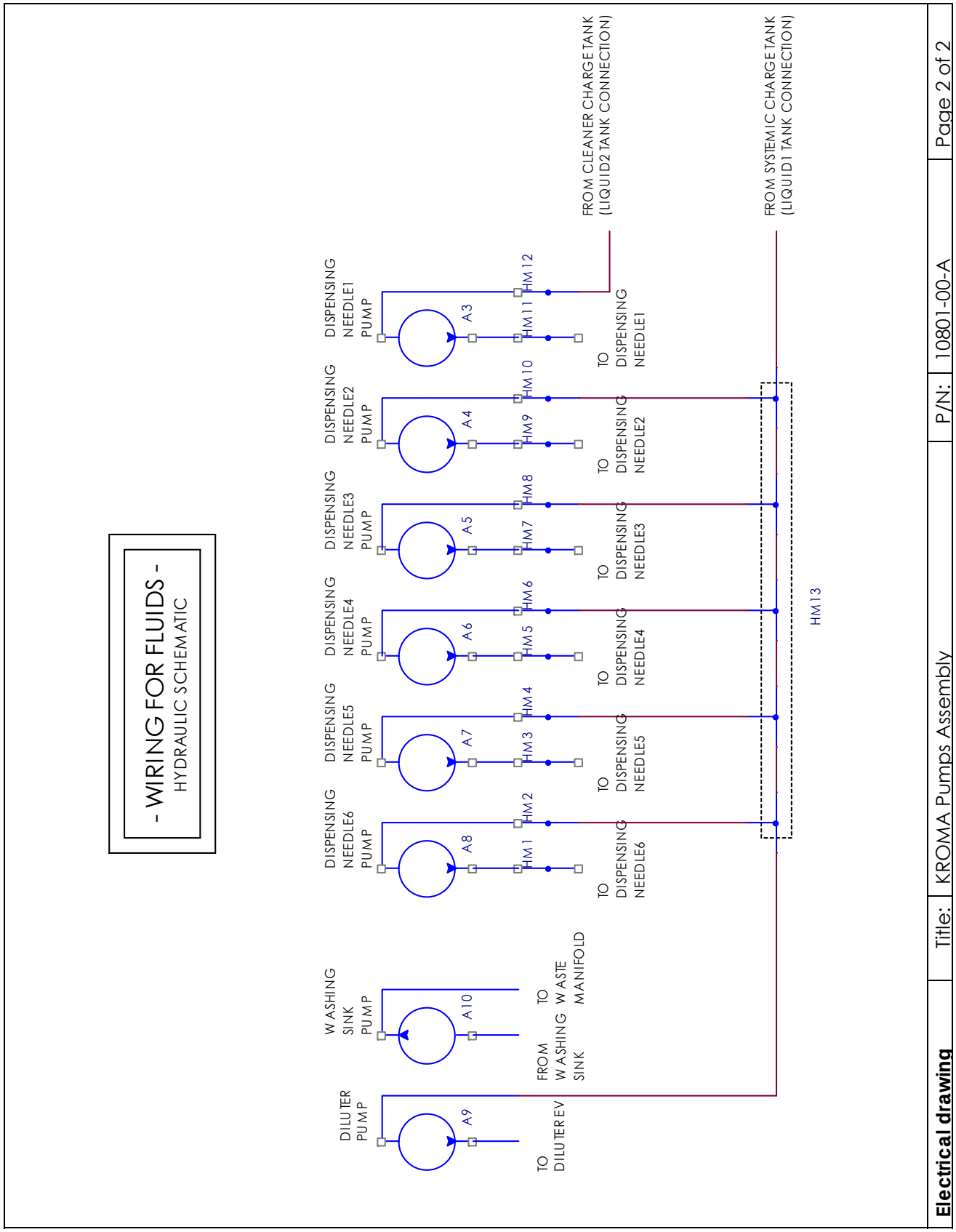
Part List Title: KROMA Pumps Assembly P/N: 10801-00-A

Pos.	Ref. Designator	Q.ty	UoM	Description	Value	Rating	Toler.	P/N
1	A1, A2	2	PZ	PWR DRIVER MODULE - 9X1A				10006-00-C
2	A3	1	PZ	SR10_30 PUMP ASSY VER.01				10060-01-A
3	A4-A8	5	PZ	38ML SR10_30 PUMP ASSY				10638-00-A
4	A9	1	PZ	80ML SR10_30 PUMP ASSY				10946-00-A
5	A10	1	PZ	APN20 PUMP ASSY				10947-00-A
6	HM1-HM12	12	PZ	NIPPLE, THREAD FITTING, BARBED FOR TUBING 1/8" mm, PVC, 1/4-28UNF THREAD, FOR FERULE AND TUBING PTFE EXT. DIAM. = 1/8"				
7	HM13	1	PZ	MANIFOLD 1 IN 5 OUT FOR TUBING INT. DIAM. = 1/8"				

Part List Title: KROMA Pumps Assembly P/N: 10801-00-A

Pos.	Ref. Designator	Q.ty	UoM	Description	Value	Rating	Toler.	P/N
8		1	m	TUBING, FLEXIBLE, TYGON, INT. DIAM. = 1/8" (3,17mm), EXT. DIAM. = 1/4" (6,35mm), WALL THICK. =1/16" (1,58mm), TIPO TYGON R3603				AAC00007
9		0.1	m	TUBING, FLEXIBLE, SILICONE, INT. DIAM. = 2mm, EXT. DIAM. = 3mm				


Electrical drawing
Title: KROMA Pumps Assembly
P/N: 10801-00-A
Page 1 of 2
TO M 100 CONTROLLER ASSEMBLY
TO POWER SUPPLY
PWR DRIVER MODULE - 9X1A VER.00
P/N 10006-00-C
A1
A2
SPARE OUTPUT
TO OPP ARM ASSY (COIL HEATER)
TO SUCTION NEEDLES PUMP
TO SUCTION TIP PUMP
TO ARM DILUTER EV
A3 38ML SR10_30 PUMP ASSY P/N 10638-00-A
A4 SR10_30 PUMP ASSY VER.03 P/N 10060-03-A
A5 SR10_30 PUMP ASSY VER.03 P/N 10060-03-A
A6 SR10_30 PUMP ASSY VER.03 P/N 10060-03-A
A7 SR10_30 PUMP ASSY VER.03 P/N 10060-03-A
A8 SR10_30 PUMP ASSY VER.03 P/N 10060-03-A
A9 80ML SR10_30 PUMP ASSY P/N 10946-00-A
A10 APN 20 PUMP ASSY P/N 10947-00-A
DISPENSING NEEDLE PUMP (38ML/MIN)
DISPENSING NEEDLE PUMP (55ML/MIN)
DILUTER PUMP (55ML/MIN)
WASHING SINK PUMP
HYDRAULIC CONNECTIONS TO WASHING STATION
HYDRAULIC CONNECTIONS TO ARM AND WASHING SINK


- WIRING FOR FLUIDS -
HYDRAULIC SCHEMATIC
FROM CLEANER CHARGE TANK (LIQUID2 TANK CONNECTION)
FROM SYSTEMIC CHARGE TANK (LIQUID1 TANK CONNECTION)
DISPENSING NEEDLE1 PUMP
A3
HM11
HM12
TO DISPENSING NEEDLE1
DISPENSING NEEDLE2 PUMP
A4
HM9
HM10
TO DISPENSING NEEDLE2
DISPENSING NEEDLE3 PUMP
A5
HM7
HM8
TO DISPENSING NEEDLE3
DISPENSING NEEDLE4 PUMP
A6
HM5
HM6
TO DISPENSING NEEDLE4
DISPENSING NEEDLE5 PUMP
A7
HM3
HM4
TO DISPENSING NEEDLE5
DISPENSING NEEDLE6 PUMP
A8
HM1
HM2
TO DISPENSING NEEDLE6
HM13
WASHING SINK PUMP
A10
FROM WASHING SINK
TO WASTE MANIFOLD
DILUTER PUMP
A9
TO DILUTER EV
Electrical drawing
Title: KROMA Pumps Assembly
P/N: 10801-00-A
Page 2 of 2

3.2.7.1. Power Driver Module - 9x1A, P/N 10006-00-C

This module is used to drive most of the peripheral loads of the instrument.
The board includes nine sections, one for each load. Two of these boards are included in the KROMA Pumps Assembly and they are interchangeable.
Loads will be enabled by signals generated in the Controller Boards (see previous paragraph): loads are enabled when the respective lamp is ON.

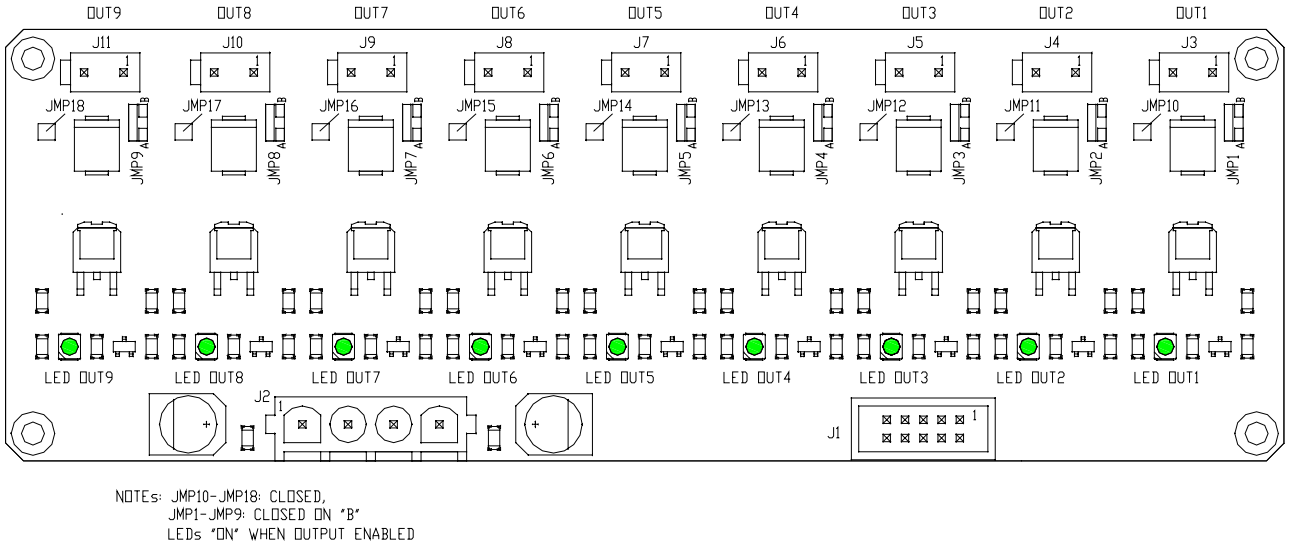


Figure 82: *Power Driver Module – 9x1A*

Note: No maintenance operations are foreseen at board level. Ask Producer for spare part.

To access the boards, open the side panel of the unit, both of them have been placed on the upper part of the pumps bracket.
To replace a board, remove the cabinet, unplug connectors, unfasten the screw that fix it on the support and replace it with a new one.
Replace board only with the same model.

3.2.7.2. 38ML SR10_30 Pump Assy, P/N 10638-00-A

This is the peristaltic pump used for dispensing needle1.

Figure 83: *38ML SR10_30 Pump Assy*

This peristaltic pump is placed behind the instrument right side panel on the pumps bracket. It flows about 38ml/min.
To replace **pump head**, disconnect external instrument charge tubing (green one), unplug pump tubing from manifold nipples, unplug the white pump head (by pressing the side brackets) and remove it from the motor shaft. Replace with the new head being careful to insert the shaft in the middle of the three rollers; plug tubing on the manifold nipple and connect back the external instrument charge tubing.

To replace the **entire pump**, including dc motor, follow the procedure above but unfasten the two fixing screws, unplug electrical connectors, extract the pump and replace with the new one.

Replace pump only with the same model.
In case of tubing internal walls gluing by long inactivity and so obstructing normal flow, open the head extract and gently massage the tubing and assemble all back.

3.2.7.3. SR10_30 Pump Assy Ver.01, P/N 10060-01-A

This is the peristaltic pump used for:

- dispensing needle2;
- dispensing needle3;
- dispensing needle4;
- dispensing needle5;
- dispensing needle6;

Figure 84: *SR10_30 Pump Assy Ver.01 and Ver.03*

Those peristaltic pumps are placed behind the instrument right side panel on the pumps bracket. They flow about 55ml/min.
To replace **pump head**, disconnect external instrument charge tubing (green one), unplug pump tubing from manifold nipples, unplug the white pump head (by pressing the side brackets) and remove it from the motor shaft. Replace with the new head being careful to insert the shaft in the middle of the three rollers; plug tubing on the manifold nipple and connect back the external instrument charge tubing.

To replace the **entire pump**, including dc motor, follow the procedure above but unfasten the two fixing screws, unplug electrical connectors, extract the pump and replace with the new one.

Replace pump only with the same model.
In case of tubing internal walls gluing by long inactivity and so obstructing normal flow, open the head extract and gently massage the tubing and assemble all back.

3.2.7.4. 80ML SR10_30 Pump Assy, P/N 10946-00-A

This is the peristaltic pump used for the ARM diluter; it is for sampling probe rinsing and washing.

Figure 85: *SR10_30 Pump Assy Ver.01 and Ver.03*

As the other peristaltic pumps, it is placed behind the instrument right side panel on the pumps bracket. It can be distinguished by the other models because its motor is quite bigger. It flows about 80ml/min.
To replace **pump head**, disconnect external instrument charge tubing (green one), unplug pump tubing from manifold nipples, unplug the white pump head (by pressing the side brackets) and remove it from the motor shaft. Replace with the new head being careful to insert the shaft in the middle of the three rollers; plug tubing on the manifold nipple and connect back the external instrument charge tubing.

To replace the **entire pump**, including dc motor, follow the procedure above but unfasten the two fixing screws, unplug electrical connectors, extract the pump and replace with the new one.

Replace pump only with the same model.
In case of tubing internal walls gluing by long inactivity and so obstructing normal flow, open the head extract and gently massage the tubing and assemble all back.

3.2.7.5. APN20 Pump Assy, P/N 10947-00-A

This is the diagphram pump used for drawing the washing sink; that well is the place where the sampling probe rinses and washes and this pump takes away all residuals so it must be considered as potentially infected.

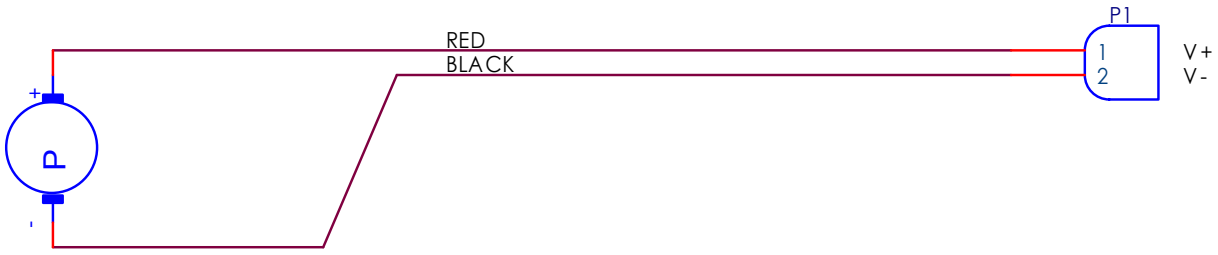


Figure 86: *SR10_30 Pump Assy Ver.01 and Ver.03*

As the peristaltic pumps, it is placed behind the instrument right side panel on the pumps bracket. To replace **pump** unfasten the two screws fixing the pump to the bracket; unplug electrical connectors and the tubings, extract the pump and replace with the new one. When plugging back the new tubing pay attention to follow the correct tubing position.

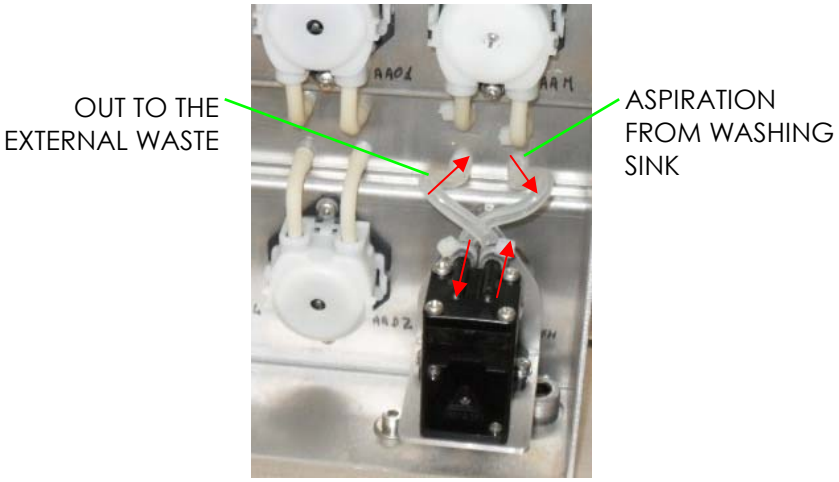


Figure 87: *APN20 PumpAssy – Washing Sink Pump*

The right nipple is coming from the washing sink and the left one goes to the waste, so the pump tubing must be connected consequently by crossing them.

Replace pump only with the same model.

3.2.8. Diluter Assembly Ver.00, P/N 10912-00-A

This assembly includes the 500ul diluter and the electrovalve for the sampling ARM.
The diluter assembly is a micro-metering pump driven by a Step Motor Driver equipped with an integrated bench-mark home sensor. It allows micro-volume aspiration and dispensing of fluids (samples and reagents). The home sensor is connected to the Controller Assembly (through the KROMA Sensor Wiring), the motor is directly connected to its Step Motor Driver.
The electrovalve is a two-way type used for fluid separation from the systemic solution used for probe washing and rinsing. Electrovalve is driven by PWR Driver Module A2 (through KROMA Sensor Wiring).

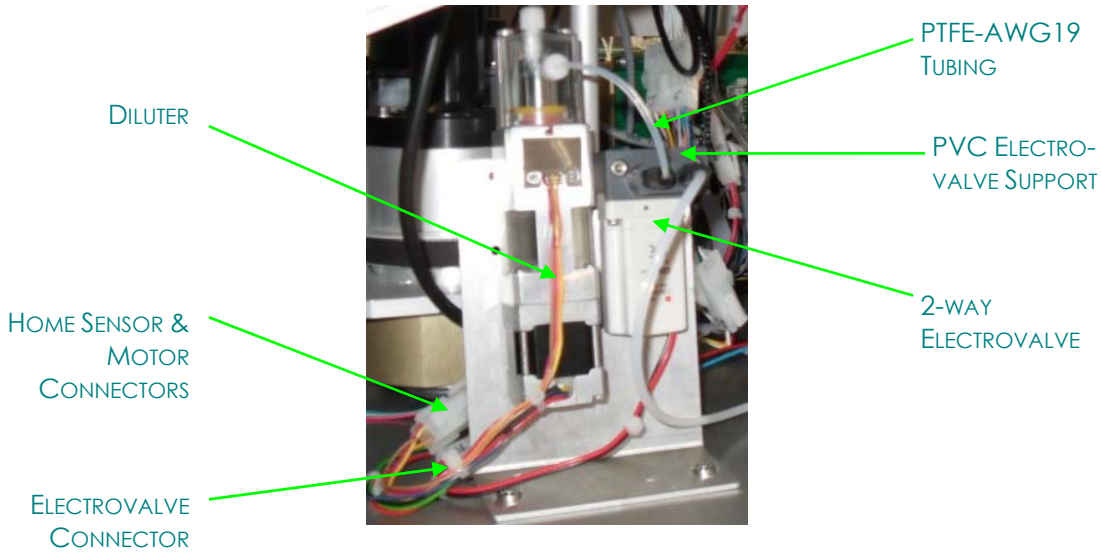
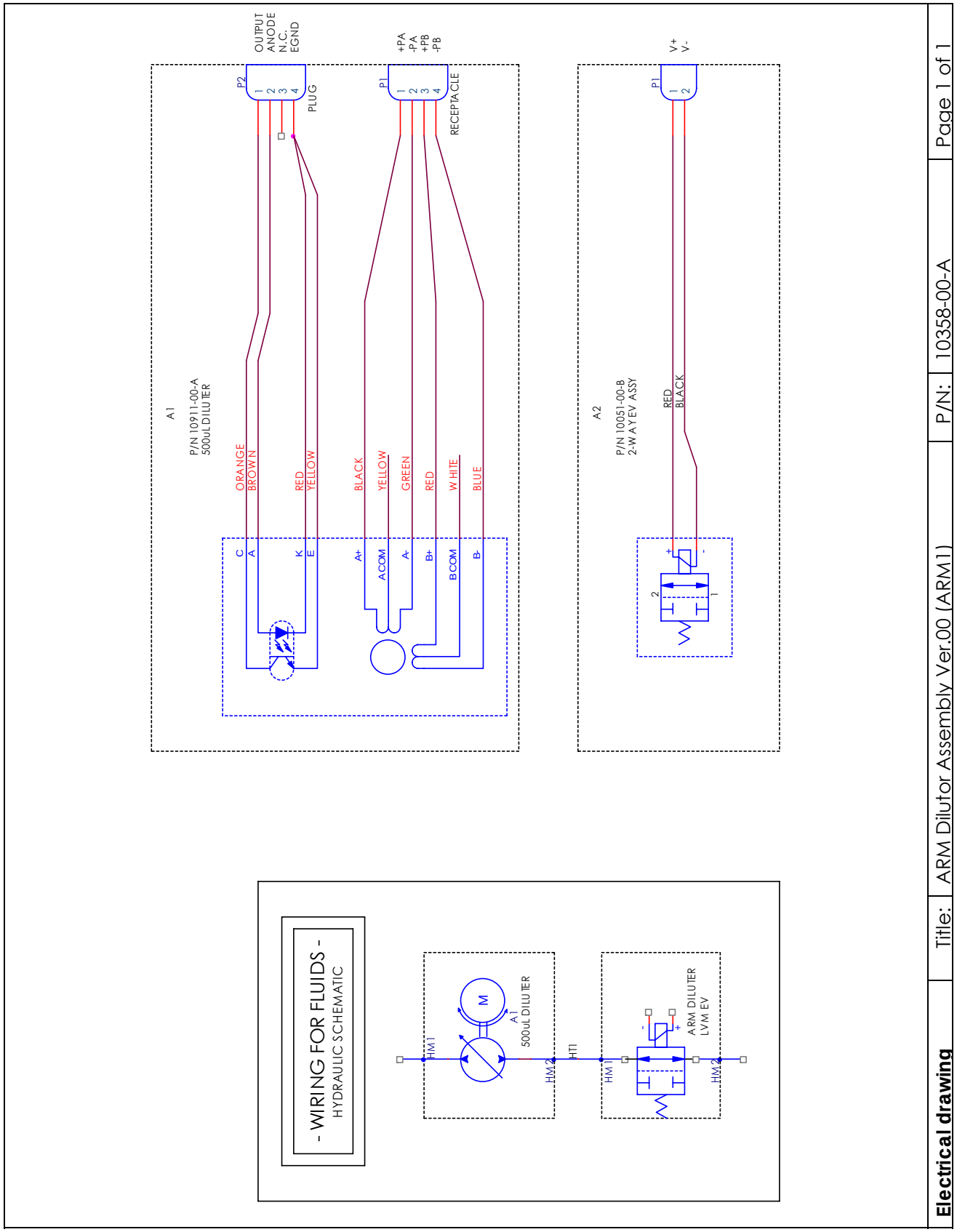


Figure 88: *Diluter Assembly Ver.00*

Part List Title: Diluter Assembly Ver.00 P/N: 10912-00-A

Pos.	Ref. Designator	Q.ty	UoM	Description	Value	Rating	Toler.	P/N
1	A1	1	PZ	500uL DILUTER				10911-00-A
2	A2	1	PZ	2-WAY EV ASSY				10051-00-B
3		0,15	M	FLEX TUBING, PTFE (TEFLON), AWG19 (INNER DIAM.= 0,9mm, OUTER DIAM.=1,7mm)				PTFE TW19

To replace electrovalve, unplug connector and tubing and unfasten the fixing screws; replace electrovalve and its PVC support.
To replace diluter, unplug both home sensor and motor connectors, unfasten the support and replace it. Take care about fastening the fittings on the diluter acrylic head: they must be fastened but not over-tight to avoid deformation and then pressure leakage in the hydraulic sampling circuit.
Replace both parts only with same models.


A1
P/N 10911-00-A
500uL DILUTER
P2
PLUG
OUTPUT
ANODE
N.C.
EGND
P1
RECEPTACLE
+PA
-PA
+PB
-PB
ORANGE
BROWN
RED
YELLOW
BLACK
YELLOW
GREEN
RED
WHITE
BLUE
C
A
K
E
A+
ACOM
A-
B+
BCOM
B-
A2
P/N 10051-00-B
2-WAYEV ASSY
V+
V-
RED
BLACK
- WIRING FOR FLUIDS -
HYDRAULIC SCHEMATIC
HM1
M
A1
500uL DILUTER
HM2
HT1
HM1
ARM DILUTER
LVM EV
HM2
Electrical drawing
Title:
ARM Dilutor Assembly Ver.00 (ARM1)
P/N:
10358-00-A
Page 1 of 1

3.2.9. ISE Module Assembly, P/N 10726-00-A (Option)

This assembly is composed by the ISE Module itself including the conditioning electronic, the pump assembly (substantially a bracket with the three pumps fo Calibrant A, Calibrant B and Waste) and the Reagent Button (connecting the Reagent Pack to the module).
The ISE Module has its own hardware and software and it is controlled by the instrument through an RS232 serial link.
It provides automatically the analysis of the sample and gives back the results (one for each of the four electrodes). The sample will be dispensed into the inlet upper cup by the sampling probe (ARM). Calibrat A and B are moved by two of the three peristaltic pumps from the reagent pack to the inlet cup. The third pump draws the waste to the reagent pack. The peristaltic pumps are controlled by the ISE Module directly.
The module is connected to the calibrants and waste through the reagent button hydraulic internal fittings. It also provides the 2-wires electrical connection to the Dallas reagent pack internal chip for data storing and reading (calibrant actual volumes, expiring date, total volumes).

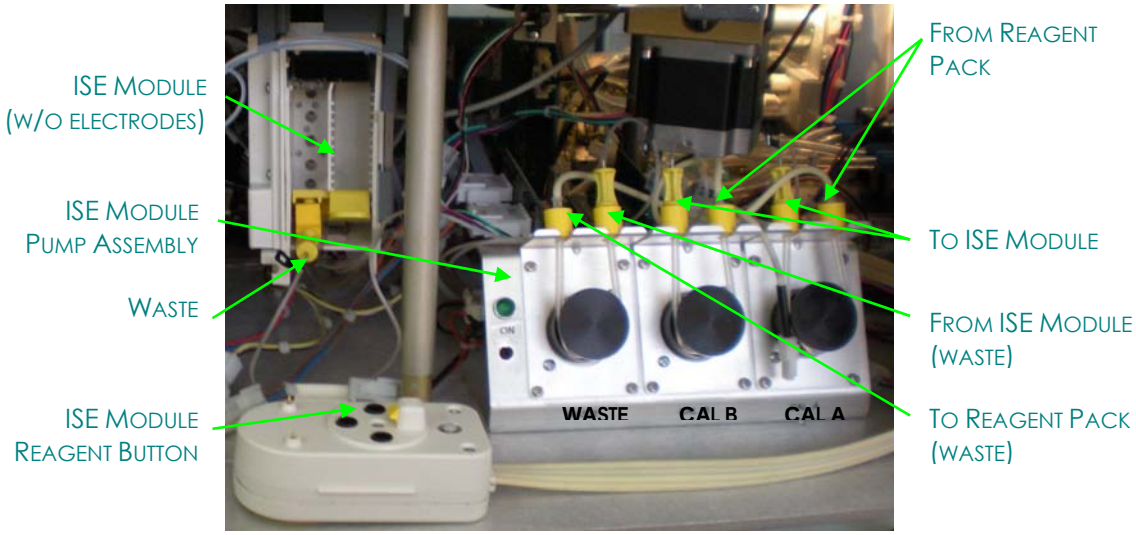
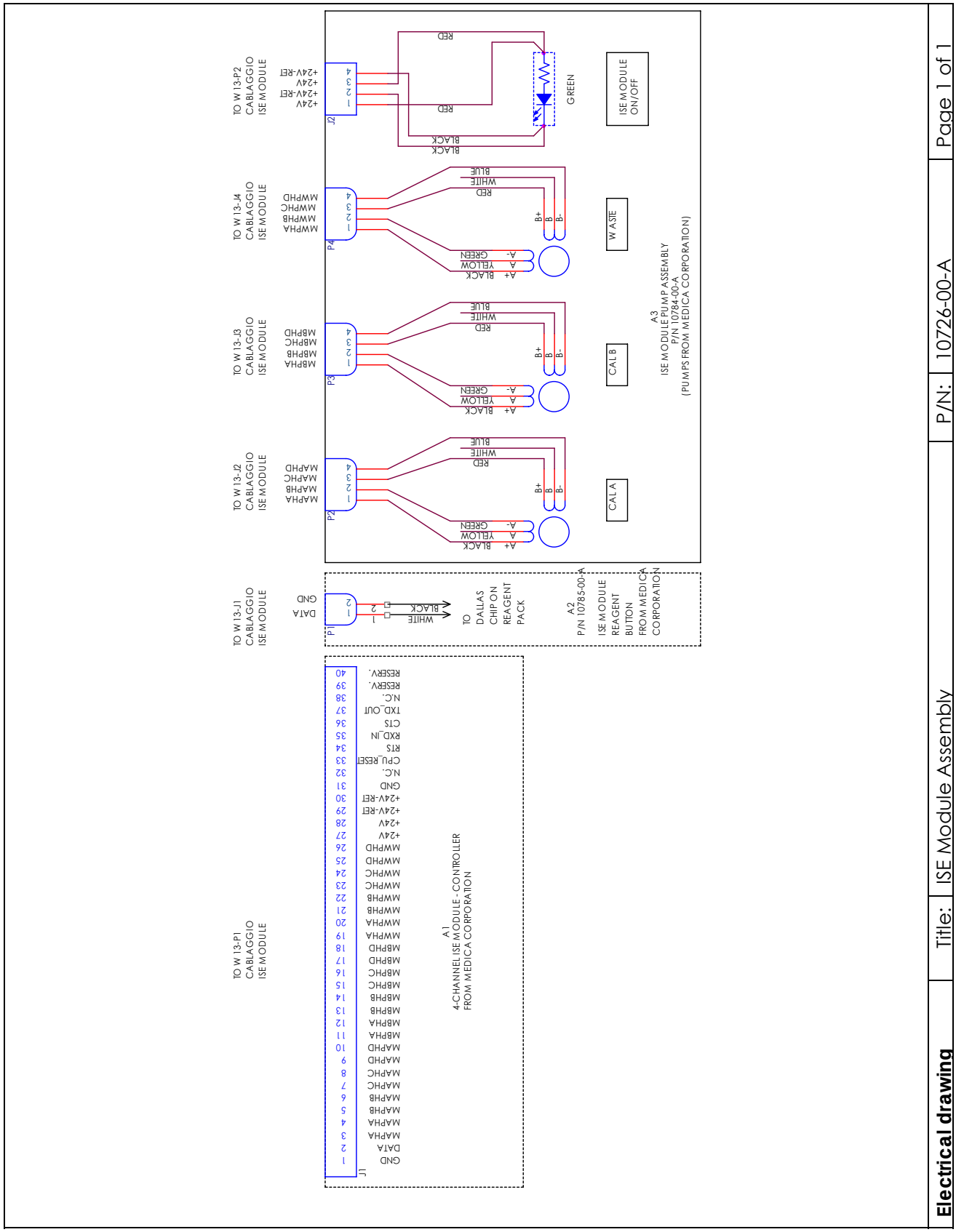


Figure 89: *ISE Module*

Part List Title: ISE Module Assembly P/N: 10726-00-A

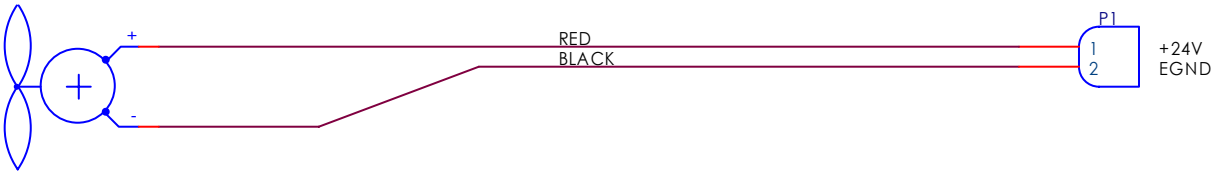
Pos.	Ref. Designator	Q.ty	UoM	Description	Value	Rating	Toler.	P/N
1	A1	1	PZ	4-CHANNEL ISE MODULE (RILAVORATO)				5008
2		1	PZ	Na ELECTRODE, PER 4-CHANNEL ISE MODULE P/N 5008				5201
3		1	PZ	K ELECTRODE, PER 4-CHANNEL ISE MODULE P/N 5008				5202
4		1	PZ	Cl ELECTRODE, PER 4-CHANNEL ISE MODULE P/N 5008				5203
5		1	PZ	Li ELECTRODE, PER 4-CHANNEL ISE MODULE P/N 5008				5205
6		1	PZ	REFERENCE ELECTRODE, PER 4-CHANNEL ISE MODULE P/N 5008				5204
7	A2	1	PZ	ISE MODULE REAGENT BUTTON				10785-00-A
8	A3	1	PZ	ISE MODULE PUMP ASSEMBLY				10784-00-A

Electrodes, reagent pack, cleaning solution and urine diluent are considered consumables. Replace both parts only with same models.


Electrical drawing
Title: ISE Module Assembly
P/N: 10726-00-A
Page 1 of 1
A1
4-CHANNEL ISE MODULE- CONTROLLER
FROM MEDICA CORPORATION
A2
P/N 10785-00-A
ISE MODULE
REAGENT
BUTTON
FROM MEDICA
CORPORATION
A3
ISE MODULE PUMP ASSEMBLY
P/N 10784-00-A
(PUMPS FROM MEDICA CORPORATION)
ISE MODULE
ON/OFF
WASTE
CAL B
CAL A
GREEN
TO
DALLAS
CHIP ON
REAGENT
PACK
TO W 13-P1
CABLAGGIO
ISE MODULE
TO W 13-P2
CABLAGGIO
ISE MODULE
TO W 13-J4
CABLAGGIO
ISE MODULE
TO W 13-J3
CABLAGGIO
ISE MODULE
TO W 13-J2
CABLAGGIO
ISE MODULE
TO W 13-J1
CABLAGGIO
ISE MODULE
J1
J2
P4
P3
P2
P1
GND
DATA
+24V
+24V
+24V-RET
+24V-RET
MWPHA
MWPHB
MWPHC
MWPHD
MBPHA
MBPHB
MBPHC
MBPHD
MAPHA
MAPHB
MAPHC
MAPHD
RED
BLACK
WHITE
BLUE
A+
A-
B+
B-
YELLOW
GREEN

3.2.10. 24V Fan Assy, P/N 10110-00-A

This fan is used for instrument cooling.



It is placed on the rear side of the instrument just behind the back panel.
To replace them, remove the cabinet, unplug connector and unfasten the fixing screws.
Replace only with same parts.

3.2.11. Microswitch Sensor, P/N 10943-00-A

This is the sensor used to detect when the cover/protection defence of the instrument is open. It is fixed on the cabinet and connected to the KROMA Sensor Wiring through a connector.

To replace sensor, remove the front panel, unplug connector and then remove the cabinet. Replace only with same parts.

3.2.12. ZRP Aspiration Pump Ver.00, P/N 10938-00-A and ZRP Aspiration Pump Ver.01, P/N 10938-01-A

These are the diagphram vacuum pumps connected to all washing station aspiration needles and to the washing tip. They are fixed on the base of the instrument and can be accessed by the side instrument panel.

The pump p/n 10938-00-A is placed on the right and it is the pump connected in parallel to all of the six washing station aspiration needles.
The pump p/n 10938-01-A is placed on the left and it is the pump connected to the washing station aspiration white drying tip.
To replace this pump, remove the instrument side panel, disconnect tubings and unplug connectors, unfasten the four screws fixing the pump on the base base and then replace the pump on the left. To replace magnet, just unscrew it from the cover.
Replace only with same parts; it's impossible to confuse Ver.00 and ver.01 pump connectors because they have been polarized by reversing the type on the wiring (male/female and female/male).

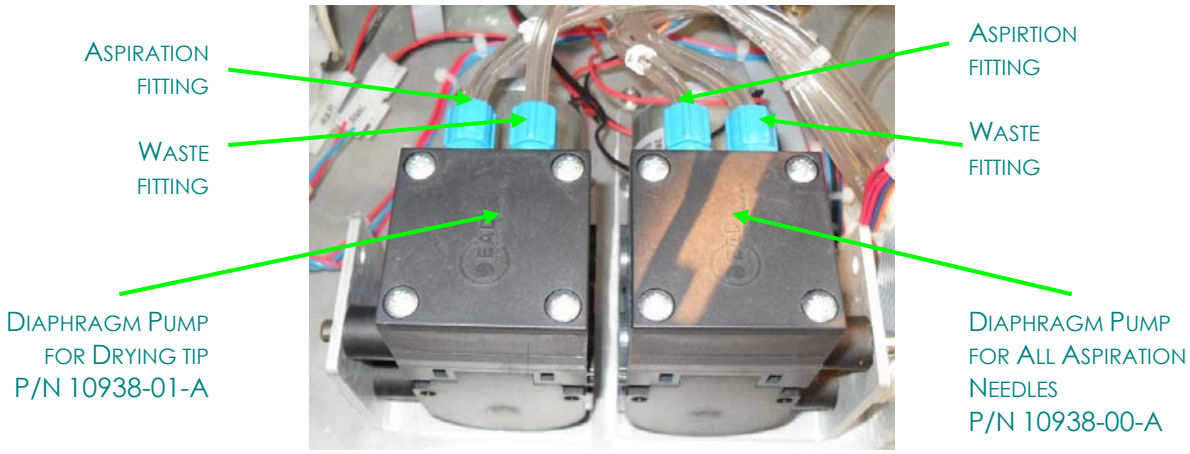


Figure 90: *ZRPAspiration Pumps*

3.2.13. Wirings of the Unit

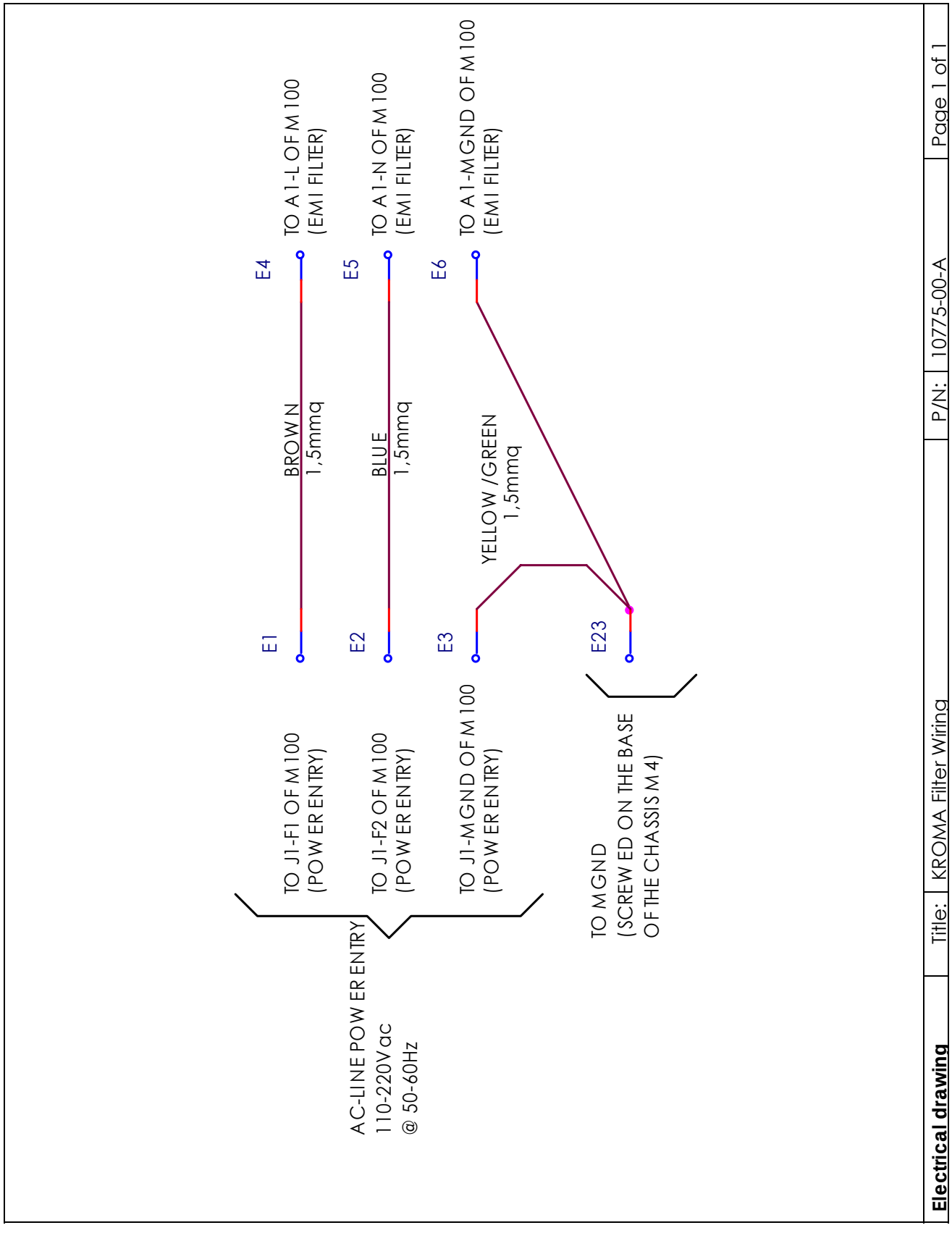
This section includes all the wirings of the unit.

3.2.13.1. KROMA Filter Wiring, P/N 10775-00-A

This is the wiring linking the AC Power inlet block to the EMI filter. It also grounds the instrument on the base (protection conductor). This wiring carries on AC power.

Part List Title: KROMA Filter Wiring P/N: 10159-00-A

Pos.	Ref. Designator	Q.ty	UoM	Description	Value	Rating	Toler.	P/N
1	E1-E6	6	PZ	FASTON TERMINAL, FEMALE, TOTAL INSULATION IN PC, TIN PLATED BRASS BODY, RED (AWG22-16, 0,25-1,5mmq), 6,35x0,8mm				RF-F-608P
2	E23	1	PZ	CRIMP HOLED TERMINAL, PRE-INSULATED, PVC, TIN PLATED BODY COPPER, YELLOW (AWG12-10, 4-6mmq), SCERW DIAM.= 4.3mm				GF-M4
3		0,26	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, CEE 73/23, H07V-K, 1,5mm2 (30/0,25), FROM -40°C TO +70°C, Uo/U=450-750V, BROWN				4520031
4		0,27	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, CEE 73/23, H07V-K, 1,5mm2 (30/0,25), FROM -40°C TO +70°C, Uo/U=450-750V, BLUE				4520021
5		0,55	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, CEE 73/23, H07V-K, 1,5mm2 (30/0,25), FROM -40°C TO +70°C, Uo/U=450-750V, YELLOW/GREEN				4520001
6		5	PZ	CABLE TIE, LENGHT=92mm, WIDTH=2,3mm, DIAM.=2-16mm				TYB23M

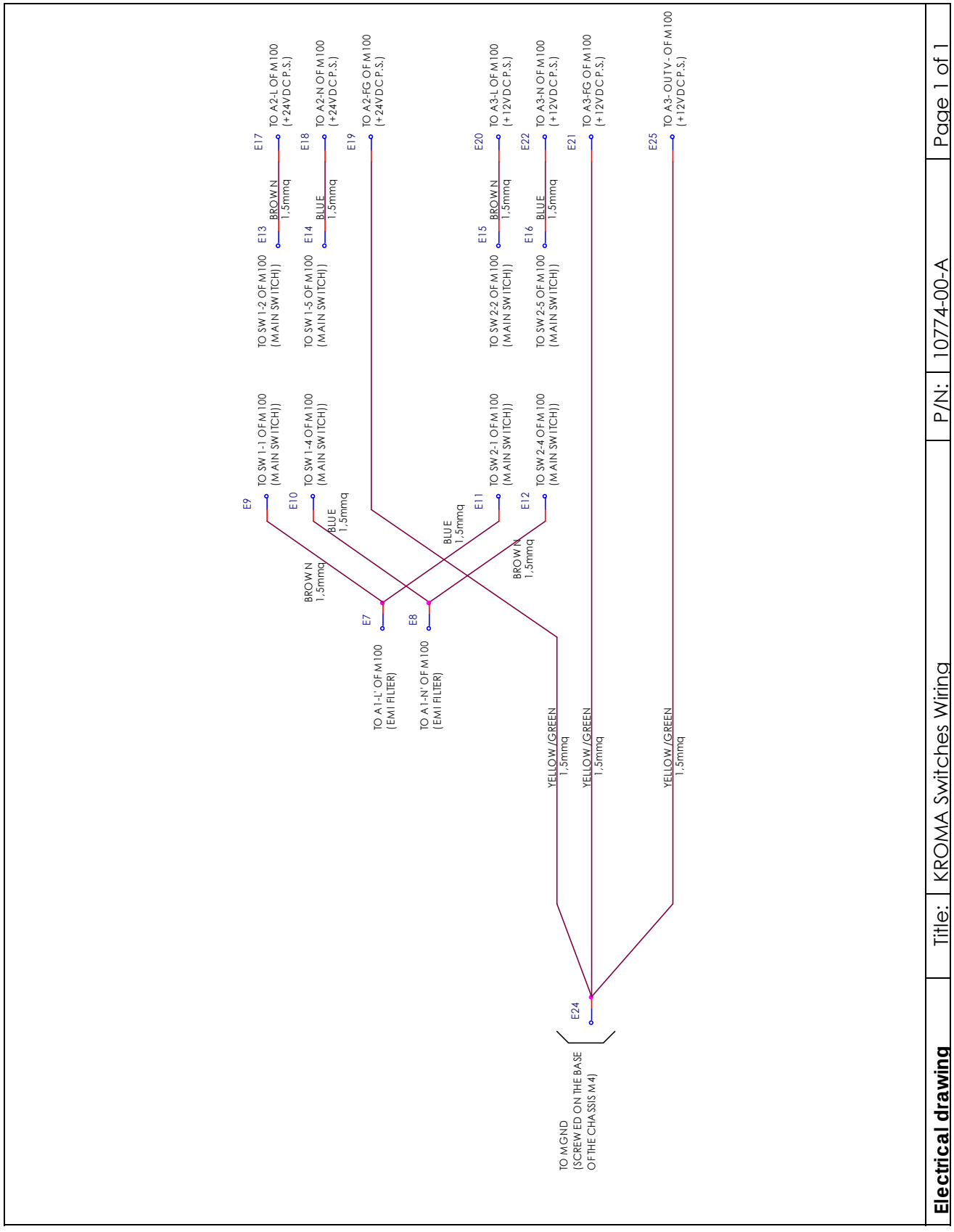

AC-LINE POWER ENTRY
110-220Vac
@ 50-60Hz
TO J1-F1 OF M100
(POWER ENTRY)
TO J1-F2 OF M100
(POWER ENTRY)
TO J1-MGND OF M100
(POWER ENTRY)
TO MGND
(SCREWED ON THE BASE
OF THE CHASSIS M4)
E1
E2
E3
E23
E4
E5
E6
BROWN
1,5mmq
BLUE
1,5mmq
YELLOW /GREEN
1,5mmq
TO A1-L OF M100
(EMI FILTER)
TO A1-N OF M100
(EMI FILTER)
TO A1-MGND OF M100
(EMI FILTER)
Electrical drawing
Title: KROMA Filter Wiring
P/N: 10775-00-A
Page 1 of 1

3.2.13.2. KROMA Switches Wiring, P/N 10774-00-A

This is the wiring of the ON/OFF Switches and of the protection conductor. This wiring carries on AC power.

Part List Title: KROMA Switches Wiring P/N: 10774-00-A

Pos.	Ref. Designator	Q.ty	UoM	Description	Value	Rating	Toler.	P/N
1	E7, E8	2	PZ	FASTON TERMINAL, FEMALE, TOTAL INSULATION IN PVC, TIN PLATED BRASS BODY, YELLOW (AWG12-10, 4-6mmq), 6,35x0,8mm				GF-F 608
2	E9-E16	8	PZ	FASTON TERMINAL, FEMALE, TOTAL INSULATION IN PC, TIN PLATED BRASS BODY, RED (AWG22-16, 0,25-1,5mmq), 6,35x0,8mm				RF-F-608P
3	E17-E22, E25	7	PZ	TERMINAL, U, PVC PRE-INSULATION, TIN PLATED BRASS BODY, RED (AWG22-16, 0,25-1,5mmq), SCREW 4mm				RF-U4
4	E24	1	PZ	CRIMP HOLED TERMINAL, PRE-INSULATED, PVC, TIN PLATED BODY COPPER, YELLOW (AWG12-10, 4-6mmq), SCERW DIAM.= 4.3mm				GF-M4
5		1,4	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, CEE 73/23, H07V-K, 1,5mm2 (30/0,25), FROM -40°C TO +70°C, Uo/U=450-750V, BROWN				4520031
6		1,4	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, CEE 73/23, H07V-K, 1,5mm2 (30/0,25), FROM -40°C TO +70°C, Uo/U=450-750V, BLUE				4520021
7		0,6	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, CEE 73/23, H07V-K, 1,5mm2 (30/0,25), FROM -40°C TO +70°C, Uo/U=450-750V, YELLOW/GREEN				4520001
8		6	PZ	CABLE TIE, LENGHT=92mm, WIDTH=2,3mm, DIAM.=2-16mm				TYB23M

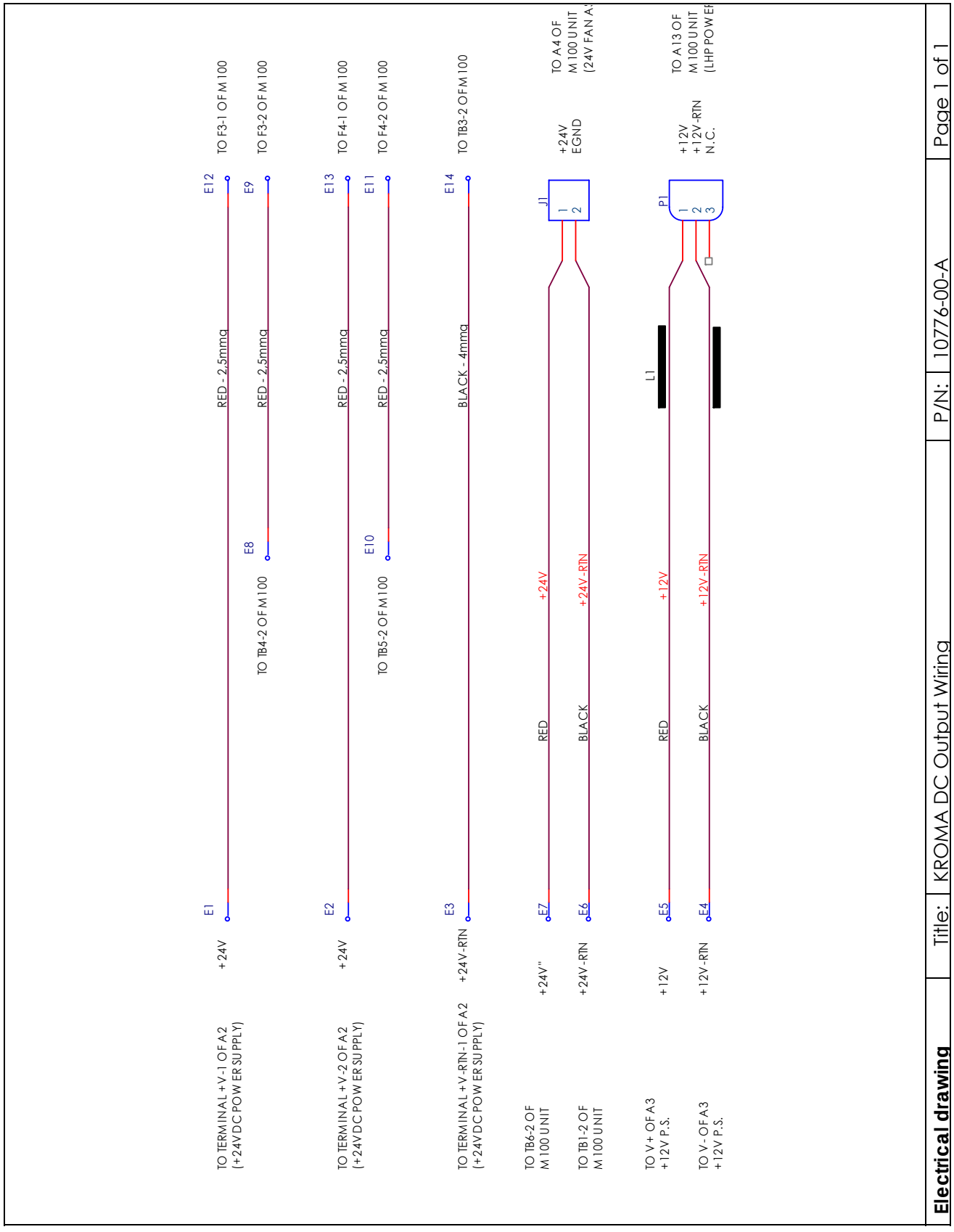

E9
TO SW 1-1 OF M100 (MAIN SWITCH))
E10
TO SW 1-4 OF M100 (MAIN SWITCH))
BLUE 1,5mmq
BROWN 1,5mmq
E7
TO A1-'L' OF M100 (EMI FILTER)
E8
TO A1-'N' OF M100 (EMI FILTER)
BLUE 1,5mmq
E11
TO SW 2-1 OF M100 (MAIN SWITCH))
E12
TO SW 2-4 OF M100 (MAIN SWITCH))
BROWN 1,5mmq
E17
TO SW 1-2 OF M100 (MAIN SWITCH))
E13
BROWN 1,5mmq
TO A2-L OF M100 (+24VDC P.S.)
E18
TO SW 1-5 OF M100 (MAIN SWITCH))
E14
BLUE 1,5mmq
TO A2-N OF M100 (+24VDC P.S.)
E19
TO A2-FG OF M100 (+24VDC P.S.)
E20
TO SW 2-2 OF M100 (MAIN SWITCH))
E15
BROWN 1,5mmq
TO A3-L OF M100 (+12VDC P.S.)
E22
TO SW 2-5 OF M100 (MAIN SWITCH))
E16
BLUE 1,5mmq
TO A3-N OF M100 (+12VDC P.S.)
E21
TO A3-FG OF M100 (+12VDC P.S.)
E25
TO A3-OUTV- OF M100 (+12VDC P.S.)
YELLOW /GREEN 1,5mmq
YELLOW /GREEN 1,5mmq
YELLOW /GREEN 1,5mmq
E24
TO MGND (SCREWED ON THE BASE OF THE CHASSIS M4)
Electrical drawing
Title: KROMA Switches Wiring
P/N: 10774-00-A
Page 1 of 1

3.2.13.3. KROMA DC Output Wiring, P/N 10776-00-A

This is the wiring linking the DC output voltages generated by he +24V and by the +12V power supplies. It connects: the +24Vdc output to the terminal block and to the fan and the +12Vdc output directly to the LHP Power board. This wiring carries on low voltage DC power.

Part List Title: KROMA DC Output Wiring P/N: 10776-00-A

Pos.	Ref. Designator	Q.ty	UoM	Description	Value	Rating	Toler.	P/N
1	E1, E2	2	PZ	TERMINAL, U, PVC PRE-INSULATION, TIN PLATED BRASS BODY, BLUE (AWG16-14, 1,5-2,5mmq), SCREW 4mm				BF-U4
2	E3	1	PZ	TERMINAL, U, PVC PRE-INSULATION, TIN PLATED BRASS BODY, YELLOW/GREEN (AWG12-10, 4-6mmq), SCREW				GF-U4
3	E4, E5	2	PZ	TERMINAL, U, PVC PRE-INSULATION, TIN PLATED BRASS BODY, RED (AWG22-16, 0,25-1,5mmq), SCREW 4mm				RF-U4
4	E6, E7	2	PZ	CRIMP PIN TERMINAL, PRE-INSULATED, PVC, TIN PLATED BODY COPPER, RED (AWG22-16 0,25-1,5mmq), L=10mm				RF-P 10
5	E8, E10	2	PZ	CRIMP PIN TERMINAL, PRE-INSULATED, PVC, TIN PLATED BODY COPPER, BLUE (AWG16-14, 1,5-2,5mmq), L=10mm				BF-P 10
6	E14	1	PZ	CRIMP PIN TERMINAL, PRE-INSULATED, PVC, TIN PLATED BODY COPPER, YELLOW (AWG12-10 4-6mmq), L=10mm				GF-P 10
7	E9, E11, E12, E13	4	PZ	FASTON TERMINAL, FEMALE, TOTAL INSULATION IN PVC, TIN PLATED BRASS BODY, BLUE (AWG16-14, 1,5-2,5mmq), 4,8x0,8mm				BF-F 408
8	J1	1	PZ	CONNECTOR, PLUG, STRAIGHT, CRIMP CONTACT, SINGLE ROW 1X2PIN, POLARIZATION, LOCK, MOLEX 5559 MINI-FIT JR SERIES, 94V-2				39-01-2021
9		2	PZ	CONTACT, CRIMP, MALE, 24-18AWG, FOR PLUG MOLEX 5559 SERIES, BRASS (PRE-PLATED TIN OVER COPPER), 5558 SERIES, REEL				39-00-0040
10	L1	1	PZ	FERRITE, EMI SUPPRESSION, CORE FOR CABLE, EXT. DIAM.=12mm, INT. DIAM.=5.6mm, L=30mm, Z=180Ohm @25MHz				RRH-120-56-300-K5B
11	P1	1	PZ	CONNECTOR, PLUG, STRAIGHT, CRIMP CONTACT, SINGLE ROW, 3X1PIN, POLARIZATION, LOCK, PITCH 6.35, TYPE UNIVERSAL MATE-N-LOCK				350766-1
12		2	PZ	CONTACT, CRIMP, FEMALE, 20-14AWG (0,5-2,0mmq), FOR TYCO AMP UNIVERSAL MATE-N-LOCK, TIN PLATED BRASS, 19A				926893-1
13		1,6	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, CEE 73/23, H07V-K, 2,5mm2 (50/0,25), FROM -40°C TO +70°C, Uo/U=450-750V, RED				4520042
14		0,5	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, CEE 73/23, H07V-K, 2,5mm2 (50/0,25), FROM -40°C TO +70°C, Uo/U=450-750V, BLACK				4520012
15		0,25	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, CEE 73/23, H07V-K, 4mm2 (56/0,3), FROM -40°C TO +70°C, Uo/U=450-750V, BLACK				4520013
16		0,23	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, UL1007, AWG18 (34/0,18), Tmax=+80°C, Vmax=300V, RED				CAV1007/18RO
17		0,27	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, UL1007, AWG18 (34/0,18), Tmax=+80°C, Vmax=300V, BLACK				CAV1007/18NE
18		14	PZ	CABLE TIE, LENGHT=92mm, WIDTH=2,3mm, DIAM.=2-16mm				TYB23M

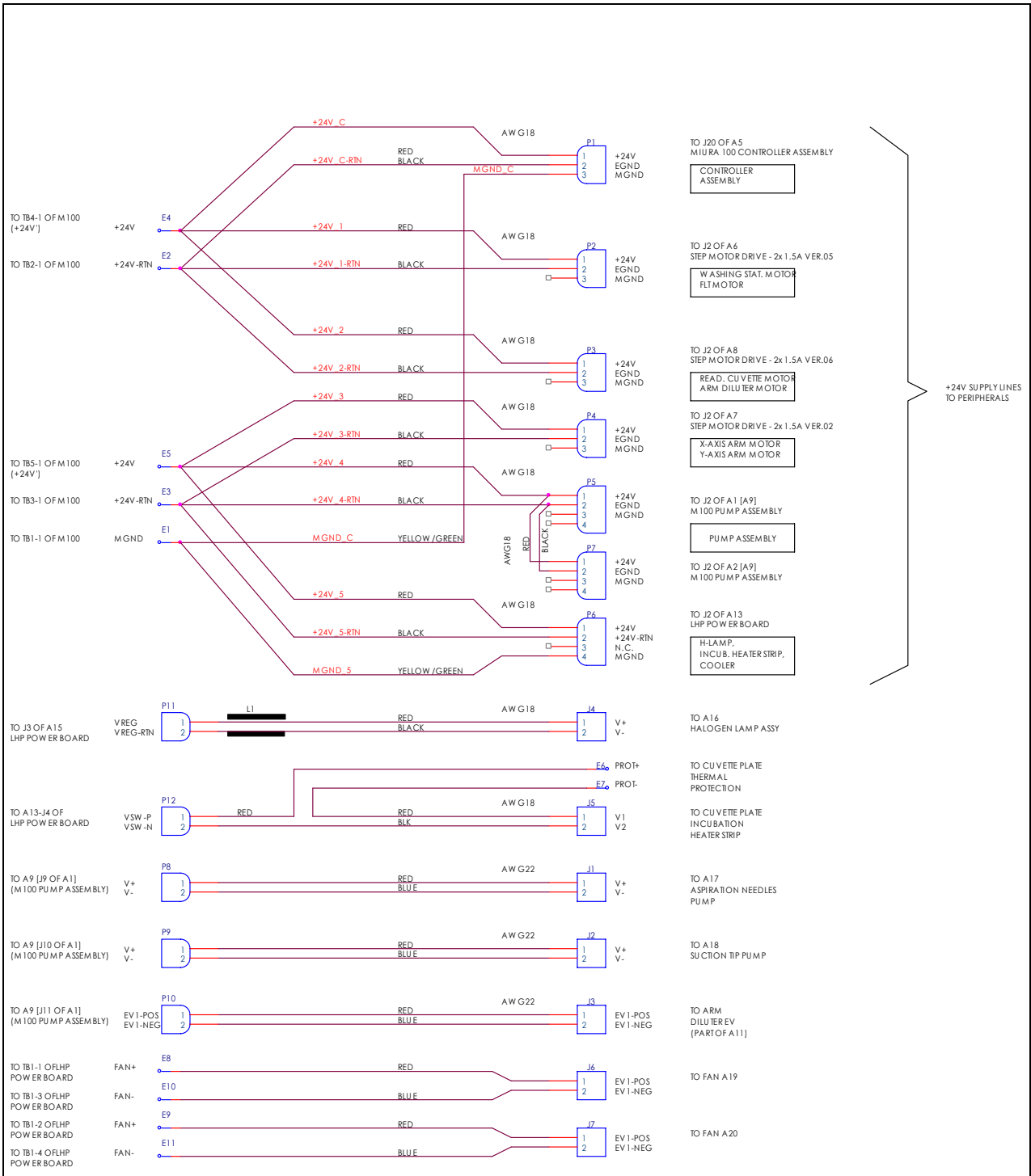

Electrical drawing
Title: KROMA DC Output Wiring
P/N: 10776-00-A
Page 1 of 1
TO TERMINAL +V-1 OF A2 (+24VDC POWER SUPPLY)
+24V
E1
RED - 2,5mmq
E12
TO F3-1 OF M100
E8
TO TB4-2 OF M100
E9
TO F3-2 OF M100
TO TERMINAL +V-2 OF A2 (+24VDC POWER SUPPLY)
+24V
E2
RED - 2,5mmq
E13
TO F4-1 OF M100
E10
TO TB5-2 OF M100
E11
TO F4-2 OF M100
TO TERMINAL +V-RTN-1 OF A2 (+24VDC POWER SUPPLY)
+24V-RTN
E3
BLACK - 4mmq
E14
TO TB3-2 OF M100
TO TB6-2 OF M100 UNIT
+24V''
E7
RED
+24V
J1
1
2
+24V
EGND
TO A4 OF M100 UNIT
TO TB1-2 OF M100 UNIT
+24V-RTN
E6
BLACK
+24V-RTN
TO V+ OF A3 +12V P.S.
+12V
E5
RED
+12V
L1
P1
1
2
3
+12V
+12V-RTN
N.C.
TO A13 OF M100 UNIT
TO V- OF A3 +12V P.S.
+12V-RTN
E4
BLACK
+12V-RTN

3.2.13.4. KROMA Power Wiring, P/N 10777-00-A

This is the power wiring that links the +2Vdc voltage from the distribution terminal blocks to each assembly to be supplied. It carries on low voltage DC power.

Part List Title: KROMA Power Wiring P/N: 10777-00-A

Pos.	Ref. Designator	Q.ty	UoM	Description	Value	Rating	Toler.	P/N
1	E1-E5	5	PZ	CRIMP PIN TERMINAL, PRE-INSULATED, PVC, TIN PLATED BODY COPPER, BLUE (AWG16-14, 1,5-2,5mmq), L=10mm				BF-P 10
2	E6, E7	2	PZ	FASTON TERMINAL, FEMALE, TOTAL INSULATION IN PC, TIN PLATED BRASS BODY, RED (AWG22-16, 0,25-1,5mmq), 4,8x0,8mm				RF-F-608P
3	E8-E11	4	PZ	CONNECTOR, PLUG, STRAIGHT, CRIMP CONTACT, SINGLE ROW 1X2PIN, POLARIZATION, LOCK, MOLEX 5559 MINI-FIT JR SERIES, 94V-2				RF-P 8
4	J1, J3-J7	6	PZ	CONNECTOR, PLUG, STRAIGHT, CRIMP CONTACT, SINGLE ROW 1X2PIN, POLARIZATION, LOCK, MOLEX 5559 MINI-FIT JR SERIES, 94V-2				39-01-2021
5		12	PZ	CONTACT, CRIMP, MALE, 24-18AWG, FOR PLUG MOLEX 5559 SERIES, BRASS (PRE-PLATED TIN OVER COPPER), 5558 SERIES, REEL				39-00-0040
6	J2, P8-P12	6	PZ	CONNECTOR, RECEPTACLE, STRAIGHT, CRIMP CONTACT, SINGLE ROW 1X2PIN, POLARIZATION, LOCK, MOLEX 5557 MINI-FIT JR SERIES, 94V-2				39-01-2020
7		12	PZ	CONTACTS, CRIMP, FEMALE, 24-18AWG, FOR RECEPTACLE MOLEX 5557 SERIES, BRASS (PRE-PLATED TIN OVER COPPER), 5556 SERIES, REEL				39-00-0038
8	L1	1	PZ	FERRITE, EMI SUPPRESSION, CORE FOR CABLE, EXT. DIAM.=18.7mm, INT. DIAM.=10.5mm, L=28.6mm, Z=138Ohm @25MHz LOWER & BROADBAND=1-300MHz				2631626402
9	P1-P4	4	PZ	CONNECTOR, PLUG, STRAIGHT, CRIMP CONTACT, SINGLE ROW, 3X1PIN, POLARIZATION, LOCK, PITCH 6.35, TYPE UNIVERSAL MATE-N-LOCK				350766-1
10	P5-P7	3	PZ	CONNECTOR, PLUG, STRAIGHT, CRIMP CONTACT, SINGLE ROW, 4X1PIN, POLARIZATION, LOCK, PITCH 6.35, TYPE UNIVERSAL MATE-N-LOCK				350779-1
11		24	PZ	CONTACT, CRIMP, FEMALE, 20-14AWG (0,5-2,0mmq), FOR TYCO AMP UNIVERSAL MATE-N-LOCK, TIN PLATED BRASS, 19A				926893-1
12		5,33	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, UL1007, AWG18 (34/0,18), Tmax=+80°C, Vmax=300V, RED				CAV1007/18RO
13		6	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, UL1007, AWG18 (34/0,18), Tmax=+80°C, Vmax=300V, BLACK				CAV1007/18NE
14		1,1	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, UL1007, AWG18 (34/0,18), Tmax=+80°C, Vmax=300V, YELLOW/GREEN				CAV1007/18GI/VE
15		2,56	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, UL1007, AWG22 (17/0,16), Tmax=+80°C, Vmax=300V, BLUE				CAV1007/22BL
16		2,56	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, UL1007, AWG22 (17/0,16), Tmax=+80°C, Vmax=300V, RED				CAV1007/22RO
17		82	PZ	CABLE TIE, LENGHT=92mm, WIDTH=2,3mm, DIAM.=2-16mm				TYB23M


+24V_C
+24V_C-RTN
MGND_C
+24V_1
+24V_1-RTN
+24V_2
+24V_2-RTN
+24V_3
+24V_3-RTN
+24V_4
+24V_4-RTN
MGND_C
+24V_5
+24V_5-RTN
MGND_5
AWG18
RED
BLACK
YELLOW /GREEN
P1
P2
P3
P4
P5
P7
P6
+24V
EGND
MGND
+24V
+24V-RTN
N.C.
MGND
TO J20 OF A5
MIURA 100 CONTROLLER ASSEMBLY
CONTROLLER ASSEMBLY
TO J2 OF A6
STEP MOTOR DRIVE - 2x1.5A VER.05
WASHING STAT. MOTOR
FLT MOTOR
TO J2 OF A8
STEP MOTOR DRIVE - 2x1.5A VER.06
READ. CUVETTE MOTOR
ARM DILUTER MOTOR
TO J2 OF A7
STEP MOTOR DRIVE - 2x1.5A VER.02
X-AXIS ARM MOTOR
Y-AXIS ARM MOTOR
TO J2 OF A1 [A9]
M100 PUMP ASSEMBLY
PUMP ASSEMBLY
TO J2 OF A2 [A9]
M100 PUMP ASSEMBLY
TO J2 OF A13
LHP POWER BOARD
H-LAMP, INCUB. HEATER STRIP, COOLER
+24V SUPPLY LINES
TO PERIPHERALS
TO TB4-1 OF M100
(+24V')
TO TB2-1 OF M100
TO TB5-1 OF M100
(+24V')
TO TB3-1 OF M100
TO TB1-1 OF M100
+24V
+24V-RTN
MGND
E4
E2
E5
E3
E1
TO J3 OF A15
LHP POWER BOARD
VREG
VREG-RTN
P11
L1
J4
V+
V-
TO A16
HALOGEN LAMP ASSY
E6
E7
PROT+
PROT-
TO CUVETTE PLATE
THERMAL
PROTECTION
TO A13-J4 OF
LHP POWER BOARD
VSW -P
VSW -N
P12
J5
V1
V2
TO CUVETTE PLATE
INCUBATION
HEATER STRIP
TO A9 [J9 OF A1]
(M100 PUMP ASSEMBLY)
P8
J1
AWG22
BLUE
TO A17
ASPIRATION NEEDLES
PUMP
TO A9 [J10 OF A1]
(M100 PUMP ASSEMBLY)
P9
J2
TO A18
SUCTION TIP PUMP
TO A9 [J11 OF A1]
(M100 PUMP ASSEMBLY)
EV1-POS
EV1-NEG
P10
J3
TO ARM
DILUTER EV
(PART OF A11)
TO TB1-1 OFLHP
POWER BOARD
TO TB1-3 OFLHP
POWER BOARD
TO TB1-2 OFLHP
POWER BOARD
TO TB1-4 OFLHP
POWER BOARD
FAN+
FAN-
E8
E10
E9
E11
J6
J7
TO FAN A19
TO FAN A20
Electrical drawing
Title: KROMA Power Wiring
P/N: 10777-00-A
Page 1 of 1

3.2.13.5. KROMA Sensors Wiring, P/N 10779-00-A

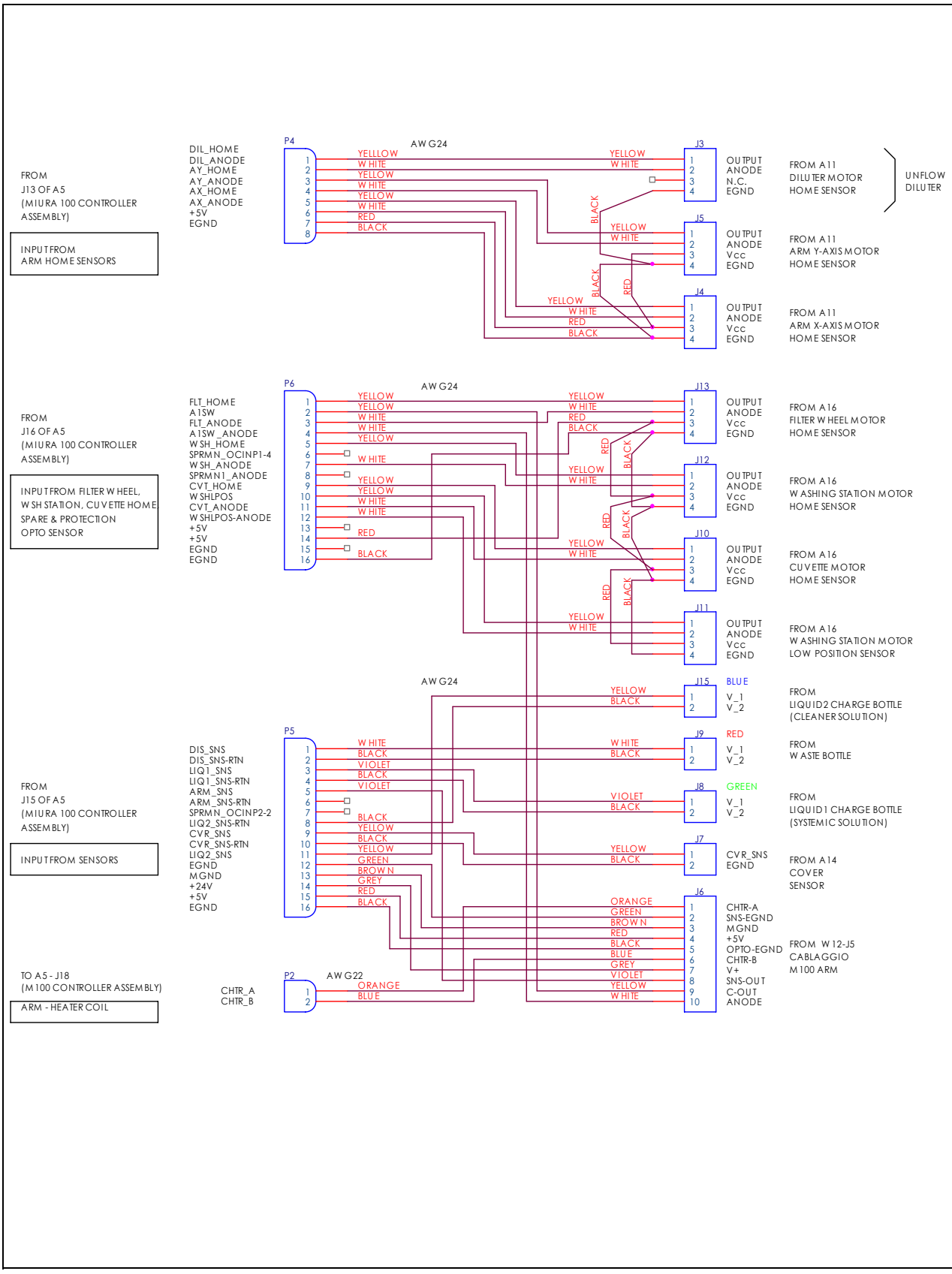
This wiring connects instrument sensors to the Controller Assembly (Mother Board): home sensors, tank floating level sensors, cover/protection defence sensors, liquid level detectors. It carries on small signals.

Part List Title: KROMA Sensors Wiring P/N: 10779-00-A

Pos.	Ref. Designator	Q.ty	UoM	Description	Value	Rating	Toler.	P/N
1	J3-J5, J10-J13	7	PZ	CONNECTOR, RECEPTACLE, STRAIGHT, CRIMP CONTACTS, DOUBLE ROWS 2X2PIN, POLARIZATION, LOCK, MOLEX 5557 MINI-FIT JR SERIES, 94V-2				39-01-2040
2	J6	1	PZ	CONNECTOR, RECEPTACLE, STRAIGHT, CRIMP CONTACTS, SINGLE ROW 5X2PIN, POLARIZZAZIONE, LOCK, POLARIZATION, LOCK, MOLEX 5557 MINI-FIT JR SERIES, 94V-2				39-01-2100
3	P2, J7	2	PZ	CONNECTOR, RECEPTACLE, STRAIGHT, CRIMP CONTACT, SINGLE ROW 1X2PIN, POLARIZATION, LOCK, MOLEX 5557 MINI-FIT JR SERIES, 94V-2				39-01-2020
4		34	PZ	CONTACT, CRIMP, FEMALE, 22-28AWG, FOR RECEPTACLE MOLEX 5557 SERIES, BRASS (PRE-PLATED TIN OVER COPPER), SERIE 5556, REEL				39-00-0046
5		9	PZ	CONTACTS, CRIMP, FEMALE, 24-18AWG, FOR RECEPTACLE MOLEX 5557 SERIES, BRASS (PRE-PLATED TIN OVER COPPER), 5556 SERIES, REEL				39-00-0038
6	P4	1	PZ	CONNECTOR, RECEPTACLE, FEMALE, STRAIGHT, CRIMP CONTACTS, SINGLE ROW 8X1PIN, 2.54, POLARIZATION, LOCK, TYCO-AMP MODU SERIES				280361-0
7	P5, P6	2	PZ	CONNECTOR, RECEPTACLE, FEMALE, STRAIGHT, CRIMP CONTACTS, DOUBLE ROW 8X2PIN, 2.54, POLARIZATION, LOCK, TYCO-AMP MODU SERIES				280366
8		40	PZ	CONTACT, CRIMP, FEMALE, 22-26AWG, FOR TYCO-AMP MODU				181270-2
9	J8	1	PZ	CONNECTOR, SOCKET, PANEL MOUNTING, STRAIGHT, FLAME RETARDANT PLASTIC (POLISOLFONE+PEEK), 2PINS, SOLDER AWG18-22 CONTACTS, CABLE OUTER DIAM.=4-5.2mm, POLARIZATION, SECURITY LOCK, 10A@400Veff, UL94V-0, REDEL SERIES, GREEN				PKG.M0.2GL.LV
10	J9	1	PZ	CONNECTOR, SOCKET, PANEL MOUNTING, STRAIGHT, FLAME RETARDANT PLASTIC (POLISOLFONE+PEEK), 2PINS, SOLDER AWG18-22 CONTACTS, CABLE OUTER DIAM.=4-5.2mm, POLARIZATION, SECURITY LOCK, 10A@400Veff, UL94V-0, REDEL SERIES, RED				PKG.M0.2GL.LR
11	J15	1	PZ	CONNECTOR, SOCKET, PANEL MOUNTING, STRAIGHT, FLAME RETARDANT PLASTIC (POLISOLFONE+PEEK), 2PINS, SOLDER AWG18-22 CONTACTS, CABLE OUTER DIAM.=4-5.2mm, POLARIZATION, SECURITY LOCK, 10A@400Veff, UL94V-0, REDEL SERIES, BLUE				PKG.M0.2GL.LA
12		5,49	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, UL1007, AWG24 (11/0,16), Tmax=+80°C, Vmax=300V, YELLOW				CAV1007/24GI
13		3,39	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, UL1007, AWG24 (11/0,16), Tmax=+80°C, Vmax=300V, RED				CAV1007/24RO
14		8,84	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, UL1007, AWG24 (11/0,16), Tmax=+80°C, Vmax=300V, BLACK				CAV1007/24NE
15		4,47	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, UL1007, AWG24 (11/0,16), Tmax=+80°C, Vmax=300V, WHITE				CAV1007/24BI
16		0,43	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, UL1007, AWG24 (11/0,16), Tmax=+80°C, Vmax=300V, BROWN				CAV1007/24MA
17		0,96	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, UL1007, AWG24 (11/0,16), Tmax=+80°C, Vmax=300V, PURPLE				CAV1007/24VI
18		0,43	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, UL1007, AWG24 (11/0,16), Tmax=+80°C, Vmax=300V, GREEN				CAV1007/24VE
19		0,43	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, UL1007, AWG24 (11/0,16), Tmax=+80°C, Vmax=300V, GREY				CAV1007/24GR
20		1,01	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, UL1007, AWG22 (17/0,16), Tmax=+80°C, Vmax=300V, ORANGE				CAV1007/22AR
21		1,01	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, UL1007, AWG22 (17/0,16), Tmax=+80°C, Vmax=300V, BLUE				CAV1007/22BL

Part List Title: KROMA Sensors Wiring P/N: 10779-00-A

Pos.	Ref. Designator	Q.ty	UoM	Description	Value	Rating	Toler.	P/N
22		1,1	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, UL1007, AWG18 (17/0,16), Tmax=+80°C, Vmax=300V, RED				CAV1007/18RO
23		1,1	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, UL1007, AWG18 (17/0,16), Tmax=+80°C, Vmax=300V, BLUE				CAV1007/18BL
24		50	PZ	CABLE TIE, LENGHT=92mm, WIDTH=2,3mm, DIAM.=2-16mm				TYB23M

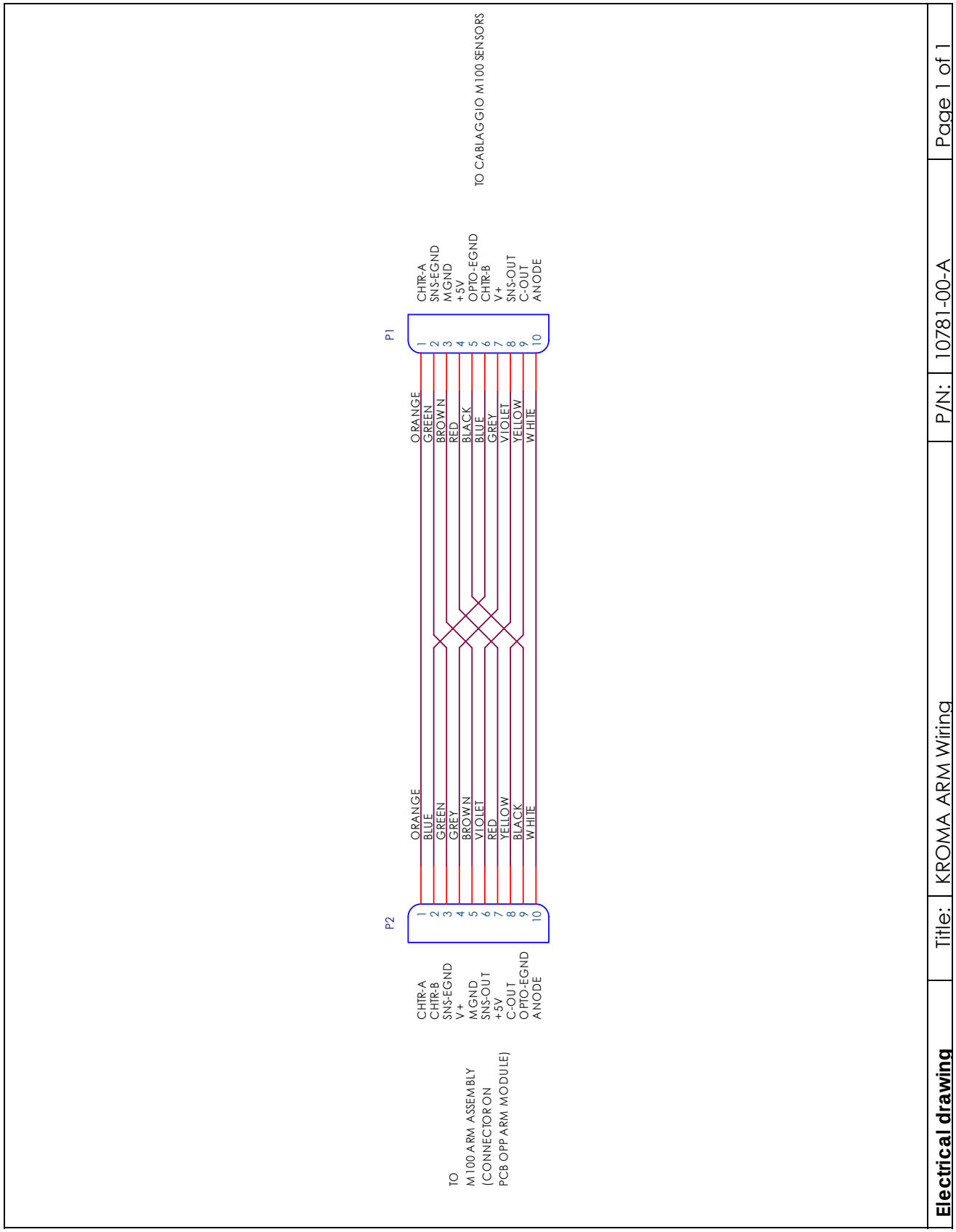

Page 1 of 1
P/N: 10779-00-A
Title: KROMA Sensors Wiring
Electrical drawing
FROM J13 OF A5 (MIURA 100 CONTROLLER ASSEMBLY)
INPUT FROM ARM HOME SENSORS
DIL_HOME
DIL_ANODE
AY_HOME
AY_ANODE
AX_HOME
AX_ANODE
+5V
EGND
P4
AWG24
YELLLOW
W HITE
YELLOW
W HITE
YELLOW
W HITE
RED
BLACK
J3
OUTPUT
ANODE
N.C.
EGND
FROM A11 DILUTER MOTOR HOME SENSOR
UNFLOW DILUTER
J5
OUTPUT
ANODE
Vcc
EGND
FROM A11 ARM Y-AXIS MOTOR HOME SENSOR
J4
OUTPUT
ANODE
Vcc
EGND
FROM A11 ARM X-AXIS MOTOR HOME SENSOR
FROM J16 OF A5 (MIURA 100 CONTROLLER ASSEMBLY)
INPUT FROM FILTER WHEEL, WSH STATION, CUVETTE HOME SPARE & PROTECTION OPTO SENSOR
FLT_HOME
A1SW
FLT_ANODE
A1SW _ANODE
WSH_HOME
SPRMN_OCINP1-4
WSH_ANODE
SPRMN1_ANODE
CVT_HOME
WSHLPOS
CVT_ANODE
WSHLPOS-ANODE
+5V
+5V
EGND
EGND
P6
AWG24
J13
OUTPUT
ANODE
Vcc
EGND
FROM A16 FILTER WHEEL MOTOR HOME SENSOR
J12
OUTPUT
ANODE
Vcc
EGND
FROM A16 WASHING STATION MOTOR HOME SENSOR
J10
OUTPUT
ANODE
Vcc
EGND
FROM A16 CUVETTE MOTOR HOME SENSOR
J11
OUTPUT
ANODE
Vcc
EGND
FROM A16 WASHING STATION MOTOR LOW POSITION SENSOR
FROM J15 OF A5 (MIURA 100 CONTROLLER ASSEMBLY)
INPUT FROM SENSORS
DIS_SNS
DIS_SNS-RTN
LIQ1_SNS
LIQ1_SNS-RTN
ARM_SNS
ARM_SNS-RTN
SPRMN_OCINP2-2
LIQ2_SNS-RTN
CVR_SNS
CVR_SNS-RTN
LIQ2_SNS
EGND
MGND
+24V
+5V
EGND
P5
AWG24
J15
BLUE
V_1
V_2
FROM LIQUID2 CHARGE BOTTLE (CLEANER SOLUTION)
J9
RED
V_1
V_2
FROM WASTE BOTTLE
J8
GREEN
V_1
V_2
FROM LIQUID1 CHARGE BOTTLE (SYSTEMIC SOLUTION)
J7
CVR_SNS
EGND
FROM A14 COVER SENSOR
J6
CHTR-A
SNS-EGND
MGND
+5V
OPTO-EGND
CHTR-B
V+
SNS-OUT
C-OUT
ANODE
FROM W12-J5 CABLAGGIO M100 ARM
TO A5 - J18 (M100 CONTROLLER ASSEMBLY)
ARM - HEATER COIL
CHTR_A
CHTR_B
P2
AWG22
ORANGE
BLUE

3.2.13.6. KROMA ARM Wiring, P/N 10781-00-A

This is the wiring linking the KROMA ARM Module board on top of sampling ARM with the KROMA Sensors wiring. It carries on both small signals and power.

Part List Title: KROMA ARM Wiring P/N: 10781-00-A

Pos.	Ref. Designator	Q.ty	UoM	Description	Value	Rating	Toler.	P/N
1	P1	1	PZ	CONNECTOR, PLUG, STRAIGHT, CRIMP CONTACT, SINGLE ROW 5X2PIN, POLARIZATION, LOCK, MOLEX 5559 MINI-FIT JR SERIES, 94V-2				39-01-2101
2		10	PZ	CONTACT, CRIMP, MALE, 24-18AWG, FOR PLUG MOLEX 5559 SERIES, BRASS (PRE-PLATED TIN OVER COPPER), 5556 SERIES				39-00-0041
3	P2	1	PZ	CONNECTOR, CRIMP, RECEPTACLE, STRAIGHT, 10X1PIN, PITCH 2.54, TYPE HE14				1-281838-0
4		10	PZ	CONTACT, CRIMP, FEMALE, 28-24AWG, FOR TYCO AMP TYPE HE14				182734-2
5		0,65	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, UL1007, AWG24 (11/0,16), Tmax=+80°C, Vmax=300V, RED				CAV1007/24RO
6		0,65	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, UL1007, AWG24 (11/0,16), Tmax=+80°C, Vmax=300V, BLUE				CAV1007/24BL
7		0,65	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, UL1007, AWG24 (11/0,16), Tmax=+80°C, Vmax=300V, BLACK				CAV1007/24NE
8		0,65	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, UL1007, AWG24 (11/0,16), Tmax=+80°C, Vmax=300V, BROWN				CAV1007/24MA
9		0,65	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, UL1007, AWG24 (11/0,16), Tmax=+80°C, Vmax=300V, WHITE				CAV1007/24BI
10		0,65	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, UL1007, AWG24 (11/0,16), Tmax=+80°C, Vmax=300V, YELLOW				CAV1007/24GI
11		0,65	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, UL1007, AWG24 (11/0,16), Tmax=+80°C, Vmax=300V, ORANGE				CAV1007/24AR
12		0,65	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, UL1007, AWG24 (11/0,16), Tmax=+80°C, Vmax=300V, GREEN				CAV1007/24VE
13		0,65	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, UL1007, AWG24 (11/0,16), Tmax=+80°C, Vmax=300V, GREY				CAV1007/24GR
14		0,65	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, UL1007, AWG24 (11/0,16), Tmax=+80°C, Vmax=300V, PURPLE				CAV1007/24VI
15		0,54	M	TUBE, ULTRA-FLEX, POLYAMMIDE 6, UL94-HB, IP68, OUTER DIAM.= 10mm, INNER DIAM.= 6,5mm, CURVE= 13mm, BLACK, FLEXA QUICK-SYSTEM SERIES, TYPE PA 6-S AD10				151941

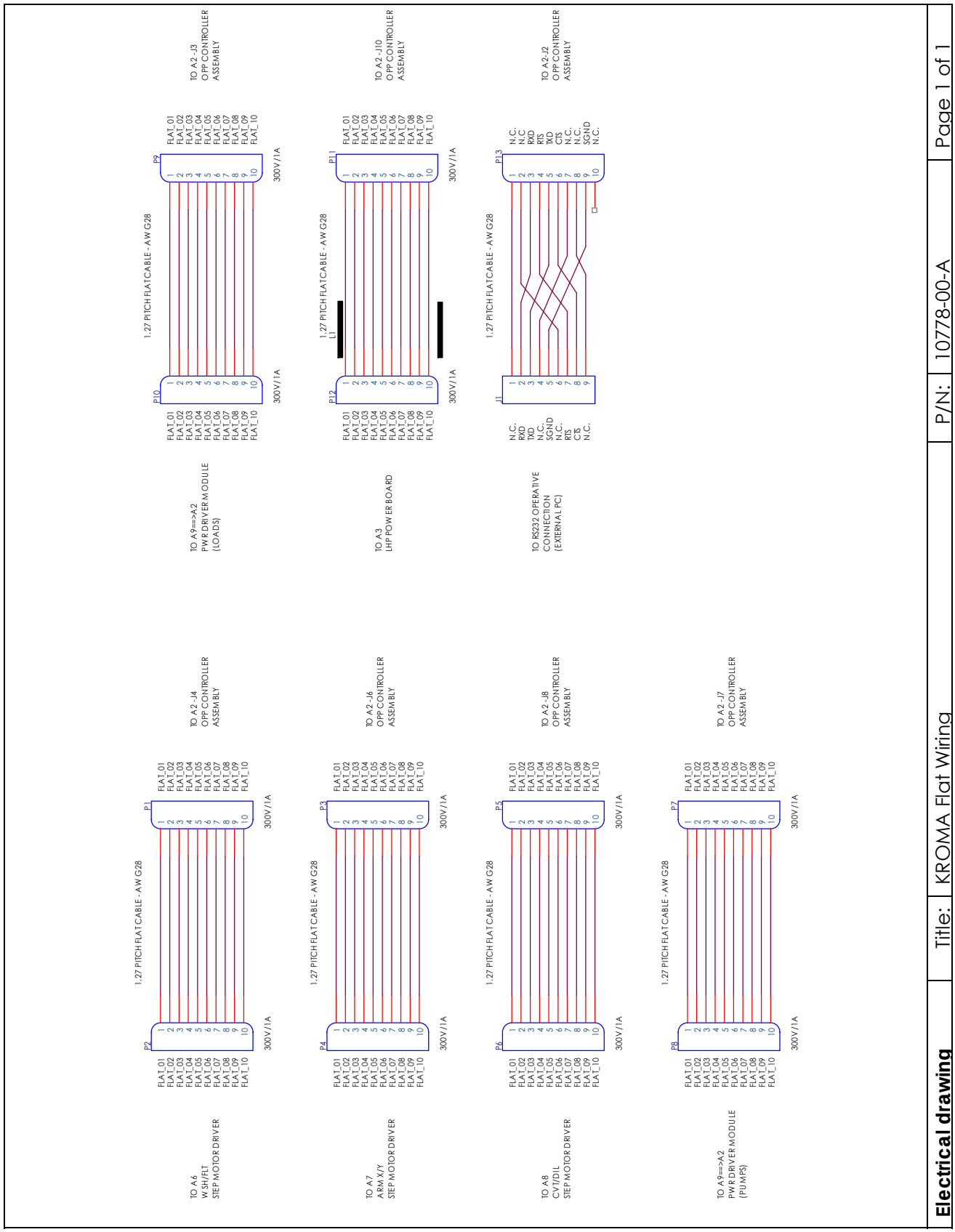

TO CABLAGGIO M100 SENSORS
P1
1 CHTR-A
2 SNS-EGND
3 MGND
4 +5V
5 OPTO-EGND
6 CHTR-B
7 V+
8 SNS-OUT
9 C-OUT
10 ANODE
ORANGE
GREEN
BROWN
RED
BLACK
BLUE
GREY
VIOLET
YELLOW
WHITE
P2
1 CHTR-A
2 CHTR-B
3 SNS-EGND
4 V+
5 MGND
6 SNS-OUT
7 +5V
8 C-OUT
9 OPTO-EGND
10 ANODE
ORANGE
BLUE
GREEN
GREY
BROWN
VIOLET
RED
YELLOW
BLACK
WHITE
TO
M100 ARM ASSEMBLY
(CONNECTOR ON
PCB OPP ARM MODULE)
Electrical drawing
Title: KROMA ARM Wiring
P/N: 10781-00-A
Page 1 of 1

3.2.13.7. KROMA Flat Wiring, P/N 10778-00-A

Six flat cables are used to link three Step Motor Driver, two Power Driver Modules and the LHP Power board to the Controller Assembly (Mother Board). They carry on control small signals. One more cable is for RS-232 serial link form DB-9 unit connector to the mother board.

Part List Title: KROMA Flat Wiring P/N: 10778-00-A

Pos.	Ref. Designator	Q.ty	UoM	Description	Value	Rating	Toler.	P/N
1	J1	1	PZ	CONNECTOR, SUB-D,9PIN, FOR FLAT CABLE, FEMALE, METALLIC FRONT, LOW PROFILE HDF				747303-4
2		1	PZ	STRAIN RELIEF, FOR CONNECTOR SUBD-9S, TIPO HDF				747275-4
3	L1	1	PZ	FERRITE, EMI SUPPRESSION, CORE FOR CABLE, W=38.53mm, H=12.06mm, D=30mm, Z=100Ohm @25MHz				RFS1-20-25-A5
4	P1-P13	13	PZ	CONNECTOR, FEMALE, 10 POLI, IDC, FOR FLAT CABLE AWG28, DIN 41651, PITCH 1,27mm, WITH STRAIN RELIEF				0918 510 6813
5		5	M	CABLE, FLAT, 10 CONDUCTORS, PVC, PITCH 1,27mm, AWG28 (7/36), 108Ohm, 300V, GREY				1-0057040-3
6		26	PZ	LOCK FOR FEMALE CONNECTOR				0918 000 9905 01
7		10	PZ	CABLE TIE, LENGHT=92mm, WIDTH=2,3mm, DIAM.=2-16mm				TYB23M

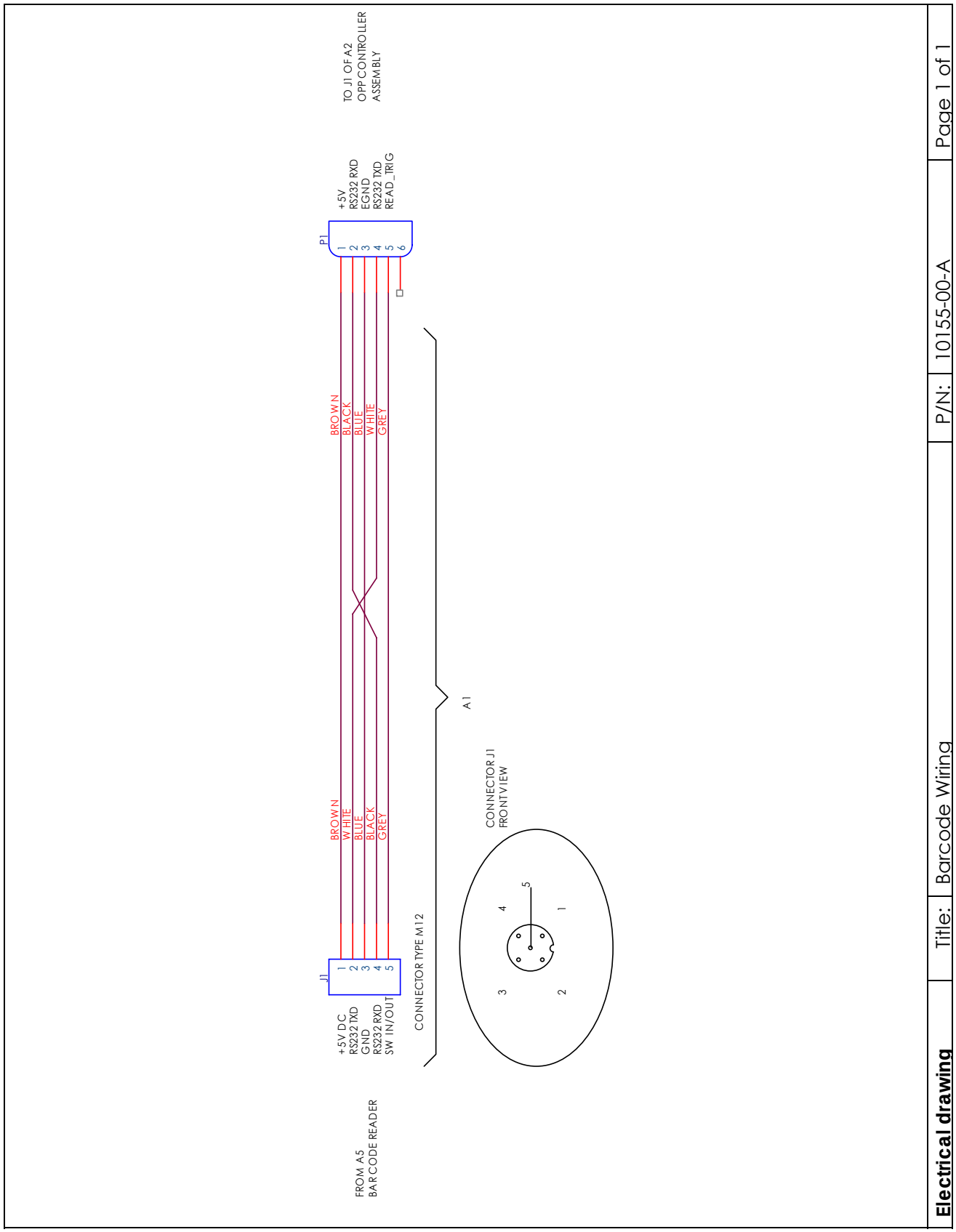

Electrical drawing
Title: KROMA Flat Wiring
P/N: 10778-00-A
Page 1 of 1
1.27 PITCH FLAT CABLE - AWG28
300V/1A
TO A6 W SH/FLT STEP MOTOR DRIVER
TO A7 ARM X/Y STEP MOTOR DRIVER
TO A8 CV1/DIL STEP MOTOR DRIVER
TO A9==>A2 PWR DRIVER MODULE (PUMPS)
TO A9==>A2 PWR DRIVER MODULE (LOADS)
TO A3 LHP POWER BOARD
TO RS232 OPERATIVE CONNECTION (EXTERNAL PC)
TO A2 -J4 OPP CONTROLLER ASSEMBLY
TO A2 -J6 OPP CONTROLLER ASSEMBLY
TO A2 -J8 OPP CONTROLLER ASSEMBLY
TO A2 -J7 OPP CONTROLLER ASSEMBLY
TO A2 -J3 OPP CONTROLLER ASSEMBLY
TO A2 -J10 OPP CONTROLLER ASSEMBLY
TO A2 -J2 OPP CONTROLLER ASSEMBLY
FLAT_01
FLAT_02
FLAT_03
FLAT_04
FLAT_05
FLAT_06
FLAT_07
FLAT_08
FLAT_09
FLAT_10
N.C.
RXD
TXD
SGND
RTS
CTS
N.C.

3.2.13.8. Barcode Wiring, P/N 10155-00-A

This is the wiring linking the barcode (if included in the instrument) with the Controller Assembly (Mother board). It carries on +5V power and small signals (trigger & serial RS-232).

Part List Title: Barcode Wiring P/N: 10155-00-A

Pos.	Ref. Designator	Q.ty	UoM	Description	Value	Rating	Toler.	P/N
1	A1	1	PZ	CABLE, MULTIPOLE, 5xAWG24, PRE-ASSEMBLED WITH CONNECTOR M12/5POLES, STRAIGHT, BLACK (MOD. KB-095-5000-5A), L=5m				50020499
2	P1	1	PZ	CONNECTOR, RECEPTACLE, FEMALE, STRAIGHT, CRIMP CONTACTS, SINGLE ROW 1X6PIN, 2.54, POLARIZED, LOCK, TYCO-AMP MODU SERIES				280360-0
3		6	PZ	CONTACT, CRIMP, FEMALE, 22-26AWG, FOR TYCO-AMP MODU				181270-2

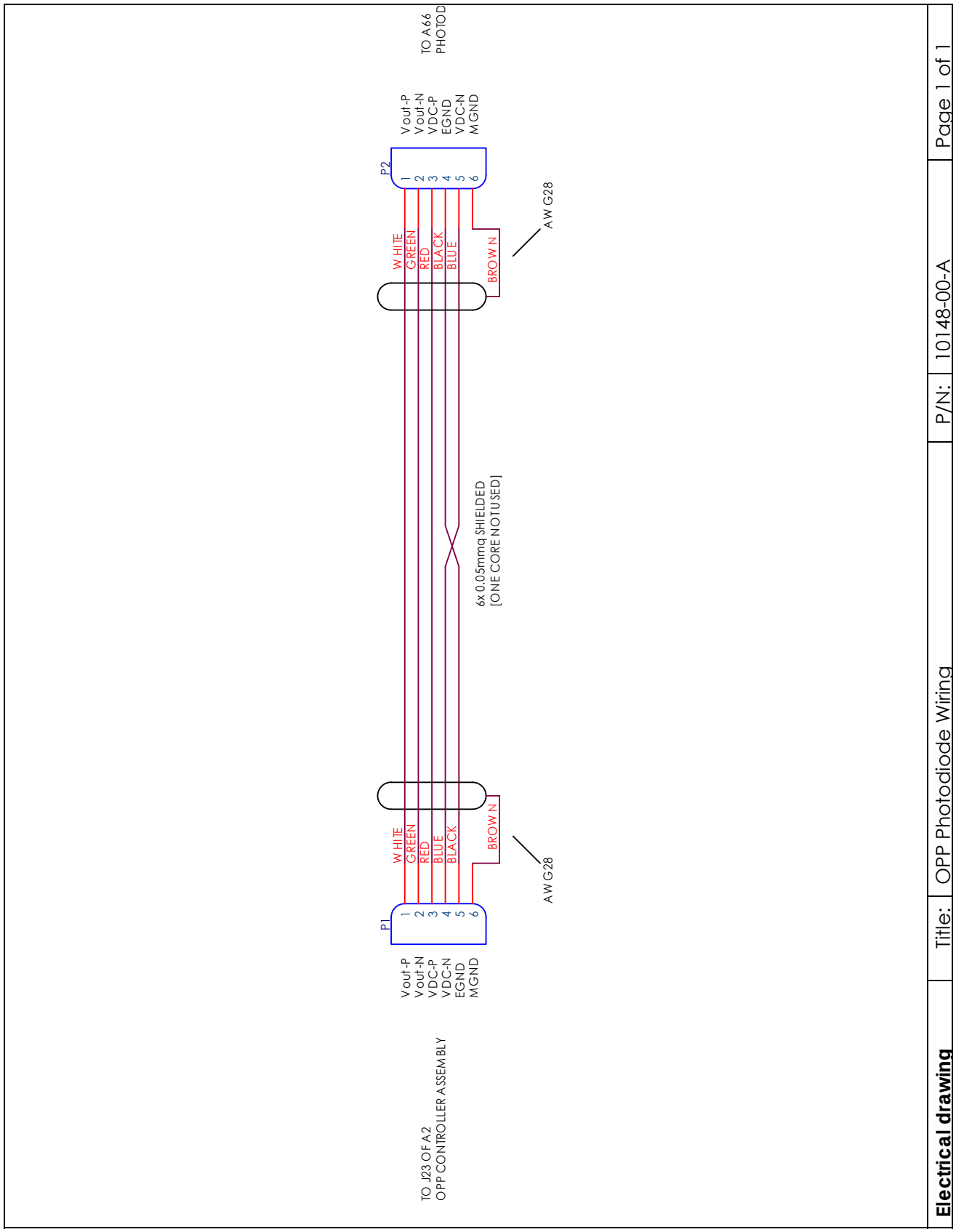

TO J1 OF A2
OPP CONTROLLER
ASSEMBLY
+5V
RS232 RXD
EGND
RS232 TXD
READ_TRIG
P1
1
2
3
4
5
6
BROWN
BLACK
BLUE
WHITE
GREY
BROWN
WHITE
BLUE
BLACK
GREY
J1
1
2
3
4
5
+5V DC
RS232 TXD
GND
RS232 RXD
SW IN/OUT
CONNECTOR TYPE M12
A1
CONNECTOR J1
FRONT VIEW
FROM A5
BAR CODE READER
Electrical drawing
Title: Barcode Wiring
P/N: 10155-00-A
Page 1 of 1

3.2.13.9. OPP Photodiode Wiring, P/N 10148-00-A

This is the shielded cable linking the Photodiode module to the Controller Assembly (Mother Board). It carries on the reading analog signal from photodiode.

Part List Title: OPP Photodiode Wiring P/N: 10148-00-A

Pos.	Ref. Designator	Q.ty	UoM	Description	Value	Rating	Toler.	P/N
1	P1	1	PZ	CONNECTOR, RECEPTACLE, FEMALE, STRAIGHT, CRIMP CONTACTS, SINGLE ROW 6X1PIN, 2.54, POLARIZATION, LOCK, TYCO-AMP MODU SERIES				280360-0
2		6	PZ	CONTACT, CRIMP, FEMALE, 28-30AWG, FOR TYCO-AMP MODU				181271-2
3	P2	1	PZ	CONNACTOR, WIRE-TO-BOARD, RECEPTACLE, CRIMP CONTACT, SINGLE ROW 6X1PIN, 1.25, POLARIZATION, LOCK				51021-0600
4		6	PZ	CONTACT, CRIMP, FEMALE, 28-32AWG, FOR RECEPTACLE MOLEX 51021 SERIES				50058-8100
5		0,4	M	MULTICONDUCTOR CABLE, 6 CONDUCTORS, PCV, 7/0.1mm INSULATED, NOM. AREA PER CONDUCTOR=0,055mm^2, SHIELDED, PVC GREY SHEAT, MAX DIAM.=3,8mm, TYPE 7-2-6C, DEF 61-12, 0,25A, 70°C, 250Vac (CORES: RED/GREEN/YELLOW/WHITE/BLACK/BLUE)				860180 25M
6		0,08	M	CONDUCTOR, COPPER, FLEX, PVC, UL1213, AWG28 (7/36), 300V, BROWN				5852-BR005

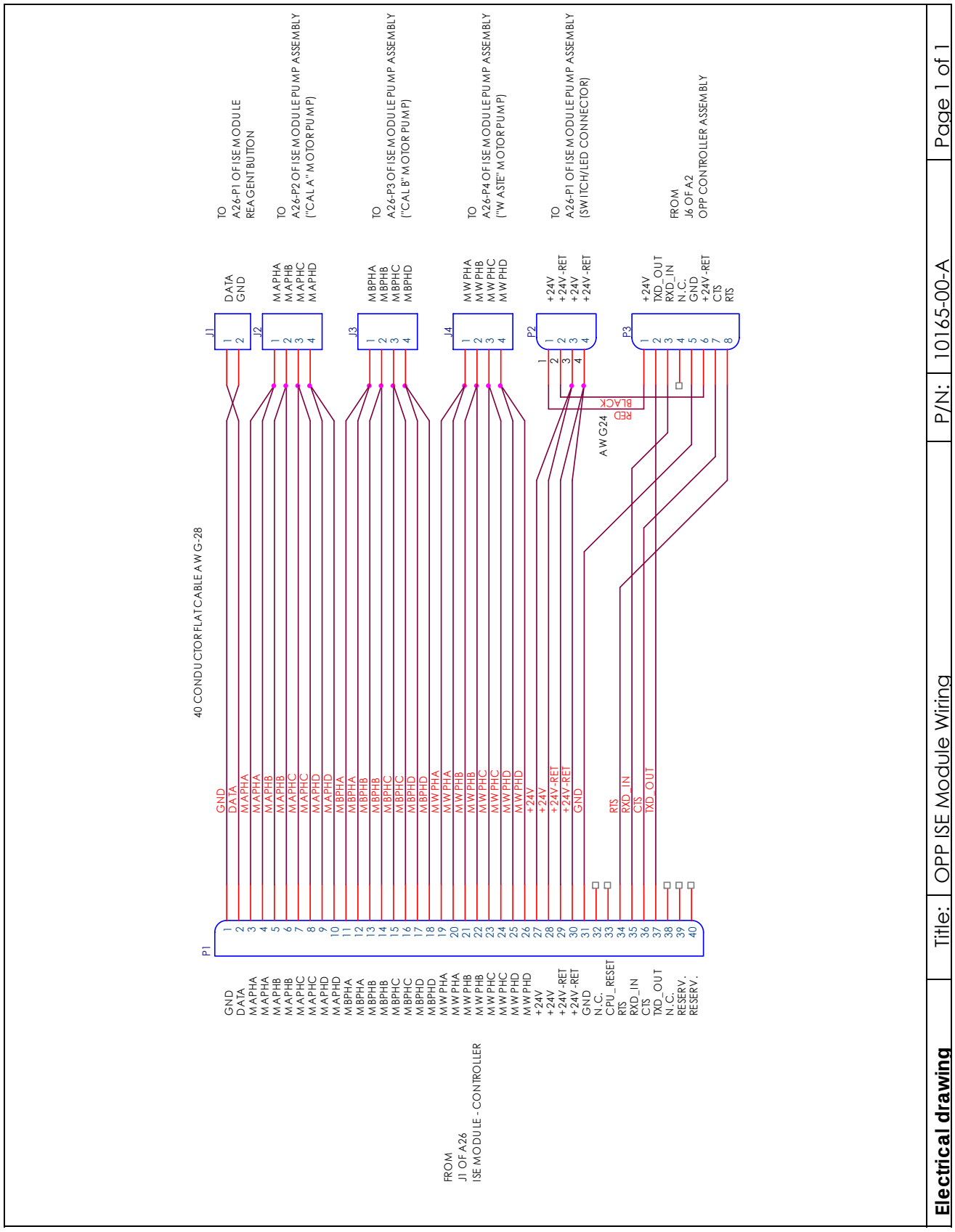

TO A66
PHOTOD
Vout-P
Vout-N
VDC-P
EGND
VDC-N
MGND
P2
1
2
3
4
5
6
WHITE
GREEN
RED
BLACK
BLUE
BROWN
AWG28
6x 0.05mmq SHIELDED
[ONE CORE NOT USED]
AWG28
BROWN
WHITE
GREEN
RED
BLUE
BLACK
P1
1
2
3
4
5
6
Vout-P
Vout-N
VDC-P
VDC-N
EGND
MGND
TO J23 OF A2
OPP CONTROLLER ASSEMBLY
Electrical drawing
Title: OPP Photodiode Wiring
P/N: 10148-00-A
Page 1 of 1

3.2.13.10. OPP ISE Module Wiring, P/N 10165-00-A (Option)

This wiring connects the ISE Module if included in the instrument to the Controller Assembly (mother board). It carries on power and small signals.

Part List Title: OPP ISE Module Wiring P/N: 10165-00-A

Pos.	Ref. Designator	Q.ty	UoM	Description	Value	Rating	Toler.	P/N
1	J1	1	PZ	CONNECTOR, PLUG, STRAIGHT, CRIMP CONTACT, SINGLE ROW 1X2PIN, POLARIZATION, LOCK, MOLEX 5559 MINI-FIT JR SERIES, 94V-2				39-01-2021
2	J2, J3, J4	3	PZ	CONNECTOR, PLUG, STRAIGHT, CRIMPING CONTACTS, DOUBLE ROW 2X2PIN, POLARIZATION, LOCK, MOLEX 5559 MINI-FIT JR SERIES, 94V-2				39-01-2041
3		14	PZ	CONTACT, CRIMP, MALE, 22-28AWG, FOR PLUG MOLEX 5559 SERIES, BRASS (PRE-PLATED TIN OVER COPPER), 5558 SERIES, REEL				39-00-0048
4	P2	1	PZ	CONNECTOR, RECEPTACLE, STRAIGHT, CRIMP CONTACTS, DOUBLE ROWS 2X2PIN, POLARIZATION, LOCK, MOLEX 5557 MINI-FIT JR SERIES, 94V-2				39-01-2040
5		4	PZ	CONTACT, CRIMP, FEMALE, 22-28AWG, FOR RECEPTACLE MOLEX 5557 SERIES, BRASS (PRE-PLATED TIN OVER COPPER), SERIE 5556, REEL				39-00-0046
6	P1	1	PZ	CONNETCTOR, FEMALE, 40-POLES, IDC, FOR AWG28 FLAT CABLE, DIN 41651, 1,27mm PITCH, WITH STRAIN RELIEF				0918-540-6813
7	P3	1	PZ	CONNECTOR, RECEPTACLE, FEMALE, STRAIGHT, CRIMP CONTACTS, SINGLE ROW 8X1PIN, 2.54, POLARIZATION, LOCK, TYCO-AMP MODU SERIES				280361-0
8		7	PZ	CONTACT, CRIMP, FEMALE, 22-26AWG, FOR TYCO-AMP MODU				181270-2
9		0,4	M	CABLE, FLAT, 40 CONDUCTOR, PVC, 1,27mm PITCH, AWG28 (7/36), 105Ohm, 300V, GREY, SINGLE CONDUCTORS CODED WITH COLOURS				3302-40
10		0,2	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, UL1007, AWG24 (11/0,16), Tmax=+80°C, Vmax=300V, RED				CAV1007/24RO
11		0,2	M	CONDUCTOR, COPPER, FLEX, PVC, FLAME RETARDANT, UL1007, AWG24 (11/0,16), Tmax=+80°C, Vmax=300V, BLACK				CAV1007/24NE
13		8	PZ	CABLE TIE, LENGHT=92mm, WIDTH=2,3mm, DIAM.=2-16mm				TYB23M


Electrical drawing
Title: OPP ISE Module Wiring
P/N: 10165-00-A
Page 1 of 1
FROM ISE MODULE - CONTROLLER J1 OF A26
P1
GND DATA MAPHA MAPHA MAPHB MAPHB MAPHC MAPHC MAPHD MAPHD MBPHA MBPHA MBPHB MBPHB MBPHC MBPHC MBPHD MBPHD MWPHA MWPHA MWPHB MWPHB MWPHC MWPHC MWPHD MWPHD +24V +24V +24V-RET +24V-RET GND N.C. CPU_RESET RTS RXD_IN CTS TXD_OUT N.C. RESERV. RESERV.
40 CONDUCTOR FLAT CABLE AWG-28
GND DATA MAPHA MAPHA MAPHB MAPHB MAPHC MAPHC MAPHD MAPHD MBPHA MBPHA MBPHB MBPHB MBPHC MBPHC MBPHD MBPHD MWPHA MWPHA MWPHB MWPHB MWPHC MWPHC MWPHD MWPHD +24V +24V +24V-RET +24V-RET GND RTS RXD_IN CTS TXD_OUT
J1
J2
J3
J4
P2
P3
DATA GND
MAPHA MAPHB MAPHC MAPHD
MBPHA MBPHB MBPHC MBPHD
MWPHA MWPHB MWPHC MWPHD
+24V +24V-RET +24V +24V-RET
+24V TXD_OUT RXD_IN N.C. GND +24V-RET CTS RTS
AWG24
RED
BLACK
TO A26-P1 OF ISE MODULE REAGENT BUTTON
TO A26-P2 OF ISE MODULE PUMP ASSEMBLY ("CAL A" MOTOR PUMP)
TO A26-P3 OF ISE MODULE PUMP ASSEMBLY ("CAL B" MOTOR PUMP)
TO A26-P4 OF ISE MODULE PUMP ASSEMBLY ("WASTE" MOTOR PUMP)
TO A26-P1 OF ISE MODULE PUMP ASSEMBLY (SWITCH/LED CONNECTOR)
FROM J6 OF A2 OPP CONTROLLER ASSEMBLY

Section 4 MAINTENANCE

4. Generalities

This section provides the service recommendations for a proper maintenance of the instrument KROMA.
NOTE: the producer reminds again the operator that the periodic visual inspection of the instrument is the first and easier way to guarantee the best performance of the instrument itself.

4.1. General Rules

General instructions for a periodic maintenance:
- Make sure that the instrument working area is clean and kept clear.
- Any fluid leakage in the working area must be immediately rinsed and dried.
- The instrument must be constantly inspected to ensure a good system performance.
- Waste of disposals must observe the safety norms and the local law.
- If any part of the system breaks down, it must be immediately repaired or replaced by Authorized Technical Personnel.
- Read carefully the information on infected fluids provided in this manual (see Section 1).

WARNING
An improper maintenance could affect the system performance.

4.1.1. Cleaning

The reagent wheel, the sample wheel and the working area must be cleaned with a soft cloth that doesn't leave any residues.

4.1.2. Disinfection

This paragraph contains the information and instructions for a proper disinfection of the instrument.

WARNING
Read carefully Section "Safety" before performing the instrument maintenance.

- During maintenance of the instrument a complete protection must be worn: gown with long sleeves (ending with elastic bands), shock-resistant rubber gloves and protective glasses.
- Prepare two sodium hypochlorite solutions (commercial hypochlorite): one at 1%, the other at 0.5%. The commercial hypochlorite has generally a 5,25% concentration, in which case prepare the solutions as follows:
  Solution A (about 1%): 200ml hypochlorite and 800ml deionised water.
  Solution B (about 0.5%): 100ml hypochlorite and 900ml deionised water.

WARNING
The procedure recommended in this section does not ensure that all the virus and micro-organisms are inactive and the instrument is sterilized, although it minimizes any risk.

4.1.2.1. Instrument Disinfection

First, wet all the parts presenting contaminate fluid deposits with cotton wool soaked in Solution A. Then, remove the deposits and wet the rest of the surface with the same solution. This must be kept wet for at least 15 minutes in order to be fairly disinfected. Remove then the hypochlorite with cotton wool soaked in deionised water.

WARNING

Do not soak the metallic parts (probes, washing station needles) longer than 20 minutes as the solution can have a corrosive effect.

4.1.2.2. Metallic Probes Disinfection

Dip at least 3cm of each metallic sampling probe in a basin containing Solution A for 15 minutes at least, and then rinse them carefully in deionised water.

4.1.2.3. Waste Tubing Disinfection

Dump the waste tubing in a container for contaminated materials and replace it with a new tubing; otherwise, if the tubing is not damaged, unplug the side fittings and soak everything in Solution A for 20 minutes, then rinse it with distilled water.

4.1.2.4. Charge Tubing Disinfection

Wash the Tygon® tubing from external tanks of the instrument; this will prevent tubing and valve to be obstructed by eventual salt crystals:

1. Disconnect from tanks the Tygon® charging tubing of systemic solution;
2. Wash the inner and outer tubing with a sodium Hypochlorite Solution A.
3. Rinse them with distilled water.
4. Let the Tygon® tubing dry out.
5. Put all tubing back in the proper tanks (systemic solution tanks must be full) and run two *Refill All* cycles.

4.1.2.5. Washing Station Needles Disinfection

Clean the metallic needles with cotton wool soaked in Solution A and then clean them carefully with deionised water. Then power on the instrument and let it complete a *Refill All* cycle.

4.1.2.6. Waste Tank Disinfection

Completely empty the tank into a container for contaminated materials. Fill the tank with Solution A and let it soak for about 20 minutes, and then rinse it carefully in deionised water.

4.1.2.7. Systemic Solution Tank Cleaning

Completely empty tank into a proper container. Fill tanks with bi-distilled water and shake them, then empty in a proper container; repeat this procedure several times in order to clean it form eventual deposits or residuals.

WARNING

The above procedure does not ensure that all the virus and micro-organism are inactive and the machine is sterilized, although it reduces only the risk at a minimum level.

4.2. Safety Precautions

The maintenance operations left to the user must be carried out with the instrument OFF and with the power supply cable disconnect from the socket.

4.3. Periodic Maintenance Plan

In the following paragraphs are scheduled the periodic operations to carry out on instrument KROMA; read carefully all instructions.

4.3.1. Daily Maintenance Scheduling

Follow the instructions described below for the daily maintenance.

Note: missing of Maintenance Scheduling by end user invalidates product *warranty terms and conditions*.

At the beginning of the day

1. Check the volume of the Systemic Solution tank and refill it before run.
2. Check the volume of the Cleaner Solution tank and refill it before run.
3. Check the volume of the Waste tank and empty it before run.
4. Check the Tygon® tubing to/from external tanks in order to detect and eliminate occlusions or eventual defects.

WARNING

Waste is potentially infectious and can be hazardous to health. It must be disposed according to national and international instructions for the safe disposal of Bio-hazardous waste.

At the end of the day

1. In case of ISE Module on board run a cleaning cycle.
2. On automatic instrument shut down procedure never disable the final washing.
3. Remove and disinfect any fluid leakage in the working area.
4. Remove all reagents from the reagent tray and clean the upper carousel in case of fluid leakage; disinfect any potentially contaminated part.
5. Check for condensation on the bottom of the reagent tray: if too much, take out bottles and sop it up with a dry clean cloth.
6. Remove all samples from the sample tray and clean the upper carousel in case of fluid leakage; disinfect any potentially contaminated part.

4.3.2. Weekly Maintenance Scheduling

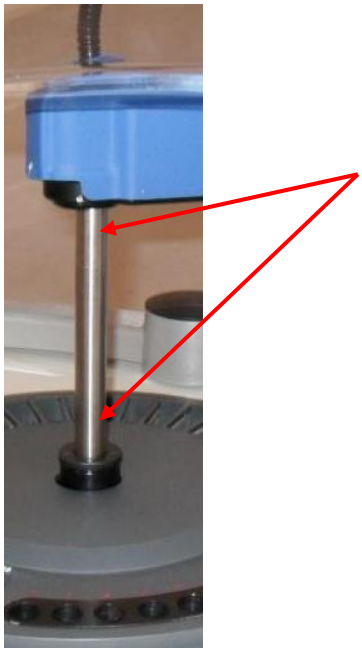
The user MUST follow instructions described below for the weekly maintenance.

1. It is very important that every five days, at the end of the working day, the operator runs the automatic **cuvette *Extra wash* cycle** from the *Status* menu, in order to deeply clean reading cuvettes; remember to place an keep on board the *EW Cvt* solution (Extra Wash Cuvette solution). In case of big test runners with **high test volumes** (>1,500test/day), this procedure must be repeated every day.
2. Remove all reagents from the reagent tray and clean the bottom of the tray in case of fluid leakages or condensation; disinfect any potentially contaminated part.
3. Clean the outside surface of the metallic Sampling Probe with an ethanol solution at 70%.
4. Make sure that sample Probe is fixed in the proper positions and that it's undamaged.

4.3.3. Two Months Maintenance Scheduling

The user MUST follow the instructions described below for the twice-monthly maintenance.

1. Run a *Gain Calibration Cycle* from the *Status* menu in order to equalize, reset and check optical filter gains and to optimize measurement dynamic.
2. Wash the Tygon® tubing to/from external tanks of the instrument; this will prevent tubing and valves to be obstructed by salt crystals.
3. Clean Systemic solution tank.
4. Clean Cleaner solution tank.
5. Clean Waste tank.
6. Gently oil the outer surface ARM's shaft with some Vaseline grease (see picture below). Use a dust-free cloth slightly soaked with some Vaseline grease in order to spread it all along the outer surface of the steel upper arm shaft; this will resolutely help the continuous up and down shaft sliding.



4.3.4. Six Months Maintenance Scheduling

The user MUST ask the Authorized Technical Personnel to carry on the following steps for the semi-annual maintenance.

1. Replace **all Reading Cuvettes** between 6 and 12 months according to the user working volume of tests.
2. Clean and disinfect metallic Sampling Probe.
3. Replace the washing station white tip.

4.3.5. One Year Maintenance Scheduling

The user MUST ask the Authorized Technical Personnel to carry on the following steps for the **annual maintenance plan**.

1. Replace all peristaltic pump heads (about 450,000 machine working cycles in 1 year).
2. Replace photometer halogen lamp for optimized performances (2,000 hours or 1 year max).
3. Replace the sampling probe for optimized performances (replace earlier if damaged).
4. Replace tanks tubing with new ones for best operation.
5. Clean and disinfect the instrument probe washing sink to remove soils.
6. Verify instrument operation and check positions coordinates.

4.4. ISE Module Maintenance Scheduling

This section provides the user recommendations for a proper maintenance of the ISE Module when integrated into instrument KROMA (option).
NOTE: the producer reminds again the user that the periodic visual inspection of the devise is the first and easier way to guarantee the best performance of the device itself.
The ISE Module requires very little operator maintenance. The only daily maintenance required is to run the cleaning solution after the last sample of the day; the system automatically run it after 50 patient samples, whichever is first. Clean the sample inlet port once per month. All other parts and expendables are replacement items (see schedule in the following). Use only Producer approved components to avoid warranty terms decay.

4.4.1. Scheduling for LOW Volume Users

The scheduled periodic operations to carry out on ISE Module for low volume users (processing **less then 100 samples/day**) have been listed in the following paragraph; read carefully all instructions.

4.4.1.1. Daily Maintenance Scheduling

The user MUST follow the instructions described below for the daily maintenance.
At the beginning of the day
1. After instrument Warming Up check the ISE Calibration values in the *ISE module conf* menu. If not in range run again ISE Initialization.
2. Check pump tubing integrity.
3. Check for the red ball indicator floating in the internal reference electrode solution. If it no longer floats replace electrode.

At the end of the day
1. Run a Cleaning Cycle from the *ISE module conf* menu before instrument shut down (make sure that the *ISE Cs* cleaning solution bottle is on board).
2. Remove and disinfect any fluid leakage around the sample entry port in the working area.
3. Check for fluid leaks around tubing fittings and below the ISE Module itself.

WARNING
Liquid waste can be potentially infectious and can be hazardous to health. It must be disposed according to national and international instructions for the safe disposal of Bio-hazardous waste.

4.4.1.2. One Months Maintenance Scheduling

The user MUST follow the following instructions for the monthly maintenance.
1. Clean ISE module upper sample inlet port using a cotton swab and distilled water and paying attention not to leave any residues.

4.4.1.3. Six Months Maintenance Scheduling

The user MUST ask the Authorized Technical Personnel to replace the following components for the semi-annual maintenance.
1. Li+ Electrode.
2. Na+ Electrode.
3. K+ Electrode.
4. Cl- Electrode.
5. Reference Electrode.

6. Pump tubing (on ISE Module peristaltic pumps).

4.4.1.4. One Year Maintenance Scheduling

The user MUST ask the Authorized Technical Personnel to replace the following components for the annual maintenance.
1. Fluidic tubing.

4.4.2. Scheduling for HIGH Volume Users

The scheduled periodic operations to carry out on ISE Module for high volume users (processing **greater then 100 samples/day**) have been listed in the following paragraph; read carefully all instructions.

4.4.2.1. Daily Maintenance Scheduling

The user MUST follow the instructions described below for the daily maintenance.

At the beginning of the day
1. After instrument Warming Up check the ISE Calibration values in the *ISE module conf* menu. If not in range run again ISE Initialization.
2. Check pump tubing integrity.
3. Check for the red ball indicator floating in the internal reference electrode solution. If it no longer floats replace electrode.

At the end of the day
1. Run a Cleaning Cycle from the *ISE module conf* menu before instrument shut down (make sure that the *ISE Cs* cleaning solution bottle is on board).
2. Remove and disinfect any fluid leakage around the sample entry port in the working area.
3. Check for fluid leaks around tubing fittings and below the ISE Module itself.

WARNING

Liquid waste can be potentially infectious and can be hazardous to health. It must be disposed according to national and international instructions for the safe disposal of Bio-hazardous waste.

4.4.2.2. One Months Maintenance Scheduling

The user MUST follow the following instructions for the monthly maintenance.
1. Clean ISE module upper sample inlet port using a cotton swab and distilled water and paying attention not to leave any residues.

4.4.2.3. Six Months Maintenance Scheduling

The user MUST ask the Authorized Technical Personnel to replace the following components for the semi-annual maintenance.
1. Pump tubing.

4.4.2.4. At 3,000 samples Maintenance Scheduling

The user MUST ask the Authorized Technical Personnel to replace the following components after 3,000 samples.

1. Li+ Electrode.

4.4.2.5. At 10,000 samples Maintenance Scheduling

The user MUST ask the Authorized Technical Personnel to replace the following components after 10,000 samples.

1. Na+ Electrode.
2. K+ Electrode.
3. Cl- Electrode.
4. Reference Electrode.

4.4.2.6. One Year Maintenance Scheduling

The user MUST ask the Authorized Technical Personnel to replace the following components for the annual maintenance.

1. Fluidic tubing.

4.5. Maintenance Procedures

4.5.1. Generalities

Refer to the following paragraphs for the some maintenance operations including replacing of parts. For other special procedures ask the Producer.

4.5.2. Reading Cuvettes Replacement

In order to replace all reading cuvettes the instrument must be ON and the User Interface software in running. Make sure that the new cuvettes are clean and not scratched in the narrow walls.

NOTE: cuvettes replacement requires complete protection, gown with long sleeves (ending with elastic bands), shock-resistant rubber gloves and protective glasses.

NOTE: replace cuvettes only with original ones provided by the manufacturer with code P3140000002 (or P3140000103 – reading plate with cuvettes).

Replace the cuvette following the instructions below:

1. Open the *Status* menu.
2. Make sure that cuvettes to be replaced have been left empty by the instrument at the end of the working session, otherwise set a *Start up* cycle in the *Status* menu.
3. Select *Move cvt tray* and enter the cuvette number = 2.
4. Under the cuvette tray cover, top front aperture, there are 3 cuvettes (1 to 3): take them out by using the appropriate extraction tool.
5. Repeat steps described in 3-4 (step by 3 cuvettes at time) until all the cuvettes have been taken away.
6. Select *Move cvt tray* and enter the cuvette number = 2.
7. Under the protection top front aperture, there are 3 empty cuvette places (1 to 3): place a new cuvette in each place (leave it falling down in the seat and then press until triggering the click that ensures the cuvette is fixed in the tray).
8. Repeat steps described in 6-7 (step by 3 cuvettes at time) until all cuvettes have been replaced.
9. Start a *Gain Calibration Cycle* from the *Status* menu. The cycle includes an auto-zero cycle that allows the instrument to wash all cuvettes, to level the different wavelength gains and update the zero values of all the reading cuvettes.

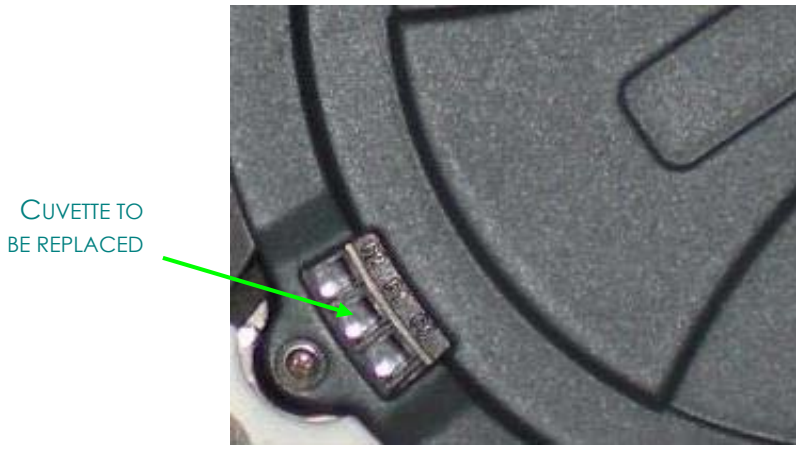


Figure 91: *Cuvette Replacement*

4.5.2.1. Single Cuvette Replacement

Replace a single Cuvette if required by the software, if it is damaged or deteriorated.

1. Make sure that the Cuvette to be replaced has been empty by the instrument at the end of the working session.
2. In the *Status* menu select *Move cvt tray* and enter the number of the cuvette to be replaced. Within the protection cover top front aperture, the cuvette to be replaced has been moved: take it out, using the appropriate extraction tool, and replace it with a new one (leave it falling down in the seat and then press until triggering the click that ensures the cuvette is fixed in the tray).
3. Run *Start up* from the *Status* menu, so that the machine updates the zero values of all the reading cuvettes.

4.5.3. Peristaltic Pump Heads Replacement

Replace peristaltic pump heads only with instrument powered down.
NOTE: for the peristaltic pump head replacement wear complete protection, with long sleeves (ending with elastic bands), shock-resistant rubber gloves and protective glasses. Replace peristaltic pump heads only with original parts provided by the Manufacturer.

Replace the peristaltic pump heads following the instructions below:
1. Open the right side panel of the instrument.
2. Unplug the peristaltic pump tubing from the Pump Assembly nipples after sliding the tubing lock washer.

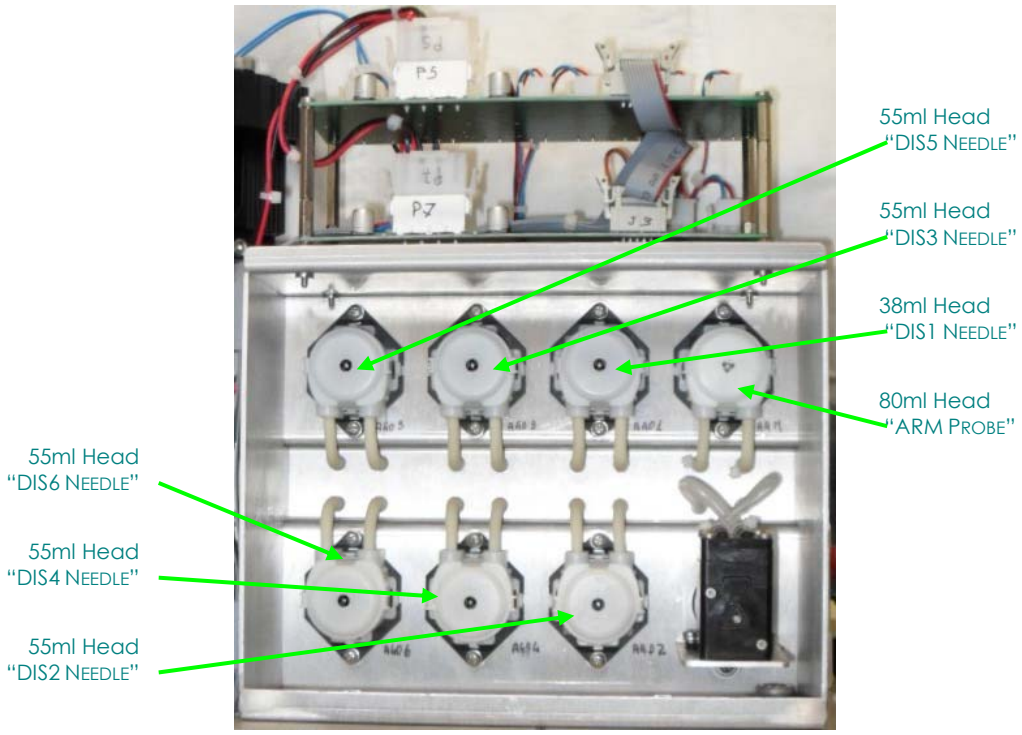


Figure 92: *Peristaltic Pump Heads Placement*

3. Release retention head clips and slip the head off from its motor shaft.
4. Clean the motor shafts with a dry cloth.
5. Plug the new heads on its motor shafts.
6. Plug the peristaltic pump tubing in the proper nipples.
7. Close the instrument right side panel.
8. Switch the instrument on, start the software and wait the end of the warm up.
9. Run a *Start up* cycle from the *Status* menu to wash cuvettes and to update their auto-zero values.

Refer to the pictures below for pumps and load connections to the PWR Driver Board connectors:

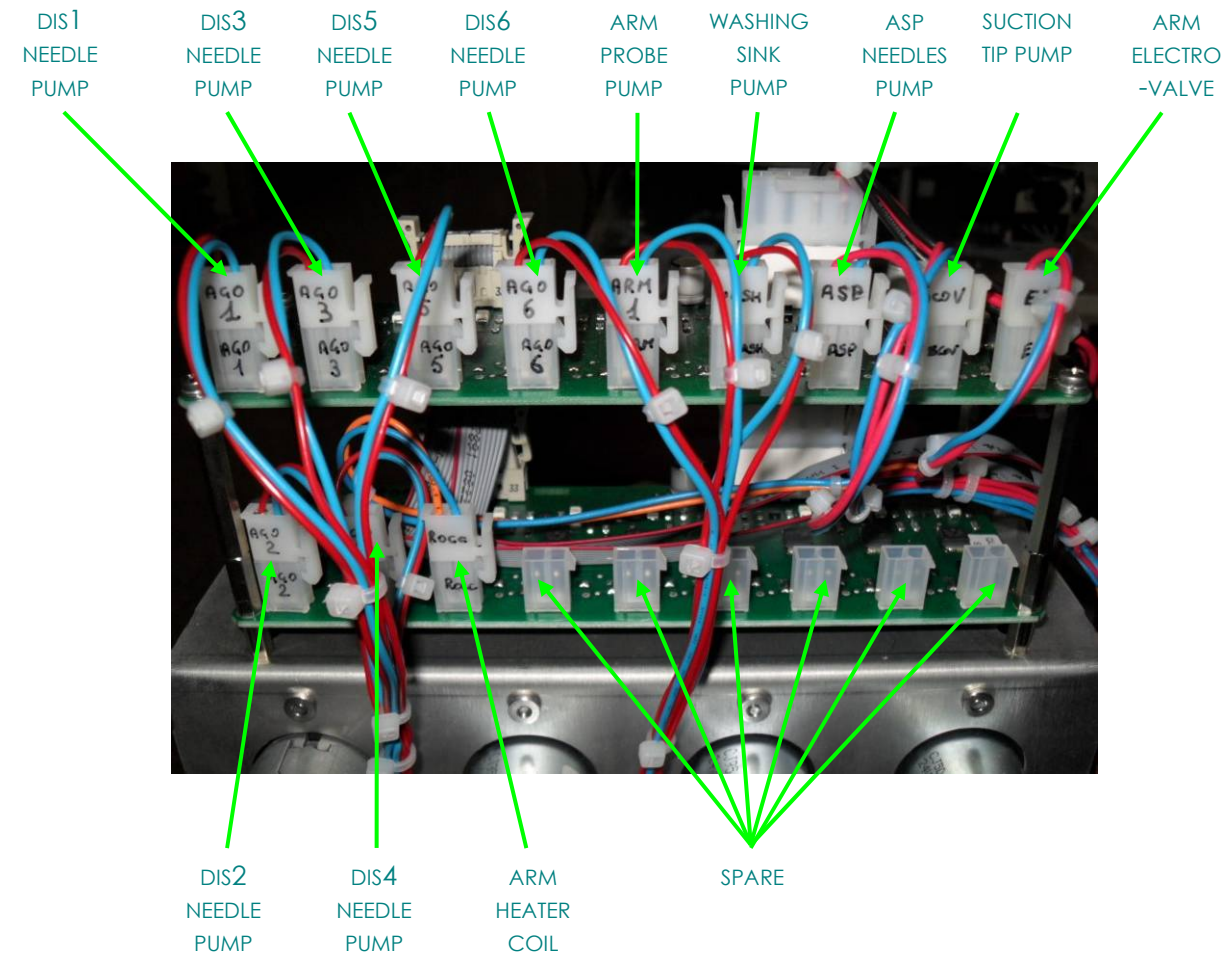


Figure 93: *Pumps and Loads Connection to Power Boards (back-view)*

Refer to KROMA Pump Assembly schematic and paragraph for connections.

4.5.4. Photometer Lamp Replacement

Replace the Photometer Lamp with the instrument in power off; wait at least 5 minutes from the shutdown to allow the bulb to cool down and to avoid oneself burns. The new halogen lamp +12V/20W (provided by the Manufacturer with code P3140000105) includes the fixing support but not the knob: save it.
Don't remove the lamp from its metallic support: the lamp height has been calibrated at factory and the fixed on that support.

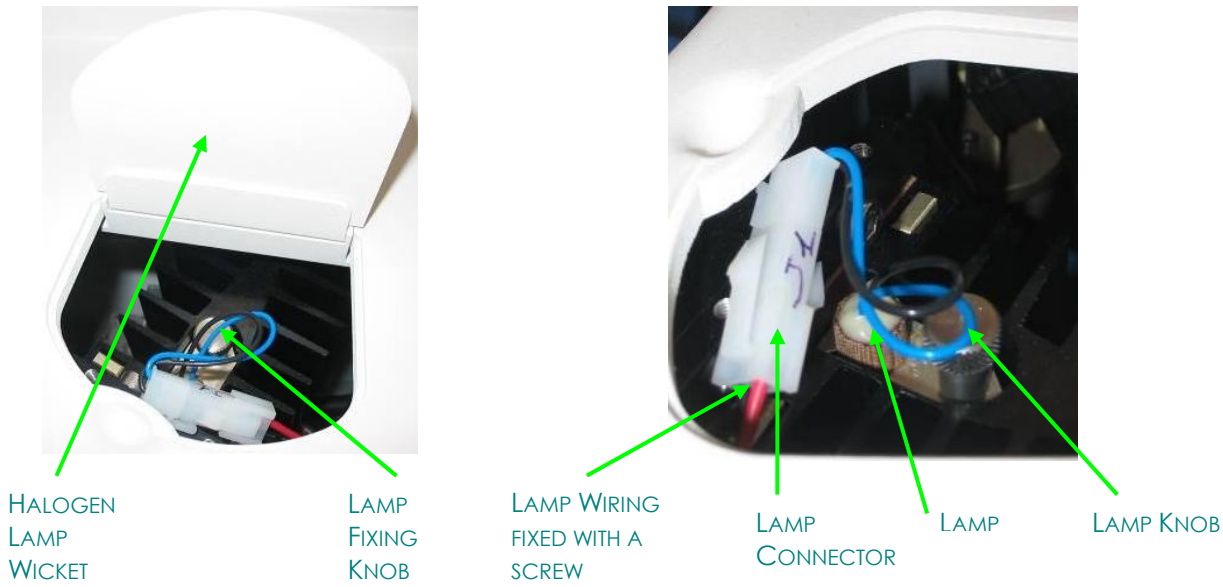


Figure 94: *Photometer Lamp Replacement*

To replace the photometer lamp follow the instructions below (ref. to the pictures):

1. Open the wicket protecting the lamp assembly.
2. Unplug the lamp connector from the main wiring (pay attention do not let it slide inside the machine).
3. Unfasten the lamp knob.
4. Take out the lamp with its support.
5. Place a new lamp, with its support, in the slot and tight the fastening knob.
6. Plug the connector back to the fixed wiring.
7. Switch the instrument on, start the software and wait the end of the warm up.
8. Start a *Gain Calibration Cycle* from the *Status* menu. It includes the auto-zero cycle that allows the instrument to level the different wavelength gains and update the zero values of all the reading Cuvettes.

WARNING

Do not touch the new lamp bulb with your fingers: grease and damp could affect its lasting performance.

4.5.5. Sampling Probes Replacement

Replace the sampling probe with instrument in OFF.
Make sure that the new probe (provided by the Manufacturer with code: P3140000016) does not present any imperfection.
NOTE: for the sampling probe replacement a complete protection must be worn, with long sleeves (ending with elastic bands), shock-resistant rubber gloves and protective glasses.

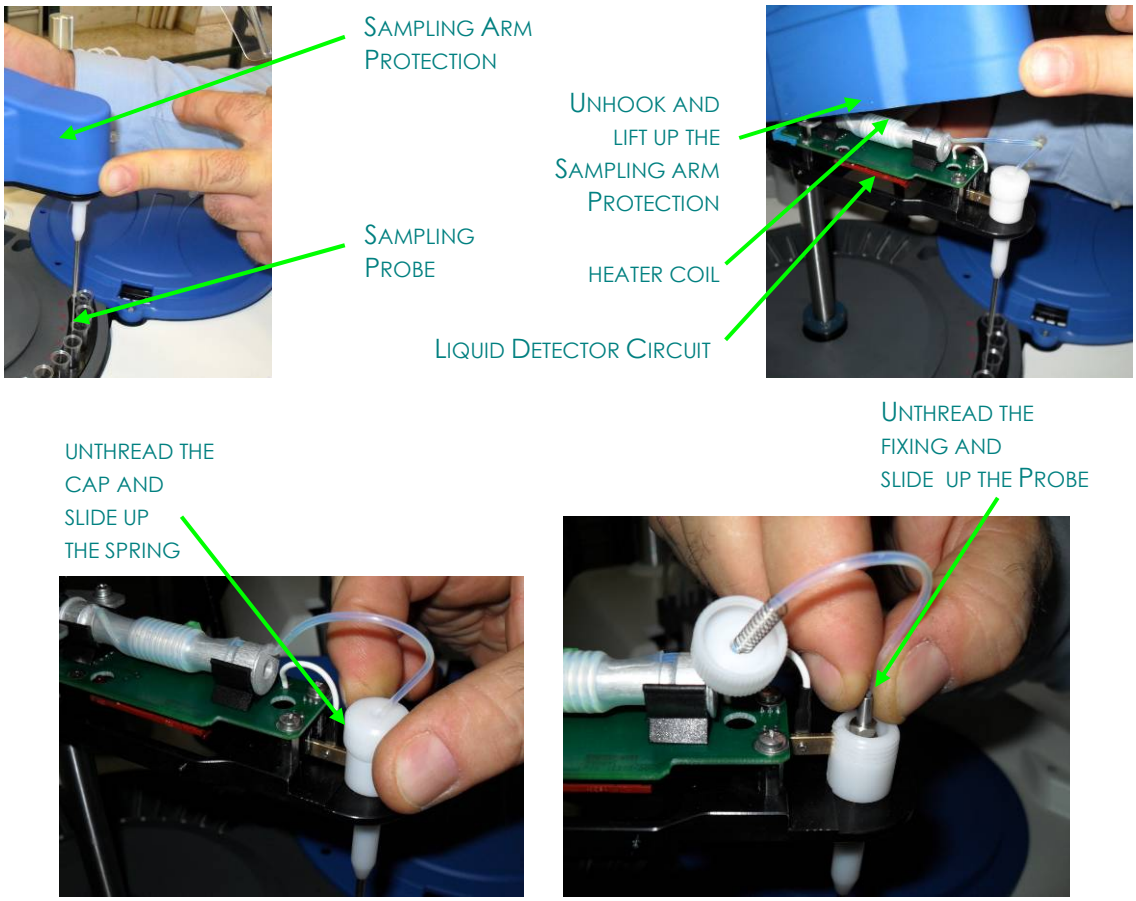


Figure 95: *Sampling Probe Replacement*

To replace the probe follow the instructions below (ref. to the pictures):

- Unfasten the arm protection cover by slightly stretching it, and slide it backwards to lift it.
- Unscrew the cap and slide it, together with the spring, along the teflon tubing.
- Unscrew the probe fixing and slide it along the pipe.
- Take the old probe out of the teflon tubing (do not bend the tubing), put it in a container for contaminated materials, and replace it with a new one.
- Place the new probe top end into the teflon tubing (do not bend the tubing and use latex gloves).
- Slide the fixing along the tubing and screw it paying attention that the probe is not blocked.
- Slide the spring and the cap along the tubing and screw the cap; make sure that probe can move freely in its seat in opposition to the retention spring without to get blocked.
- Fasten the arm cover in its original position by slightly stretching it.
- Switch the instrument on, run the software and wait the end of the warm up.
- Run three *Arm Rinsing* commands from the *Status* menu. The cycle includes probe washing and refill of the probe hydraulic tubing.

4.5.6. ISE Module Maintenance Procedure

Refer to the following paragraphs for details about the main maintenance procedures over the ISE Module when integrated in the KROMA system (option).

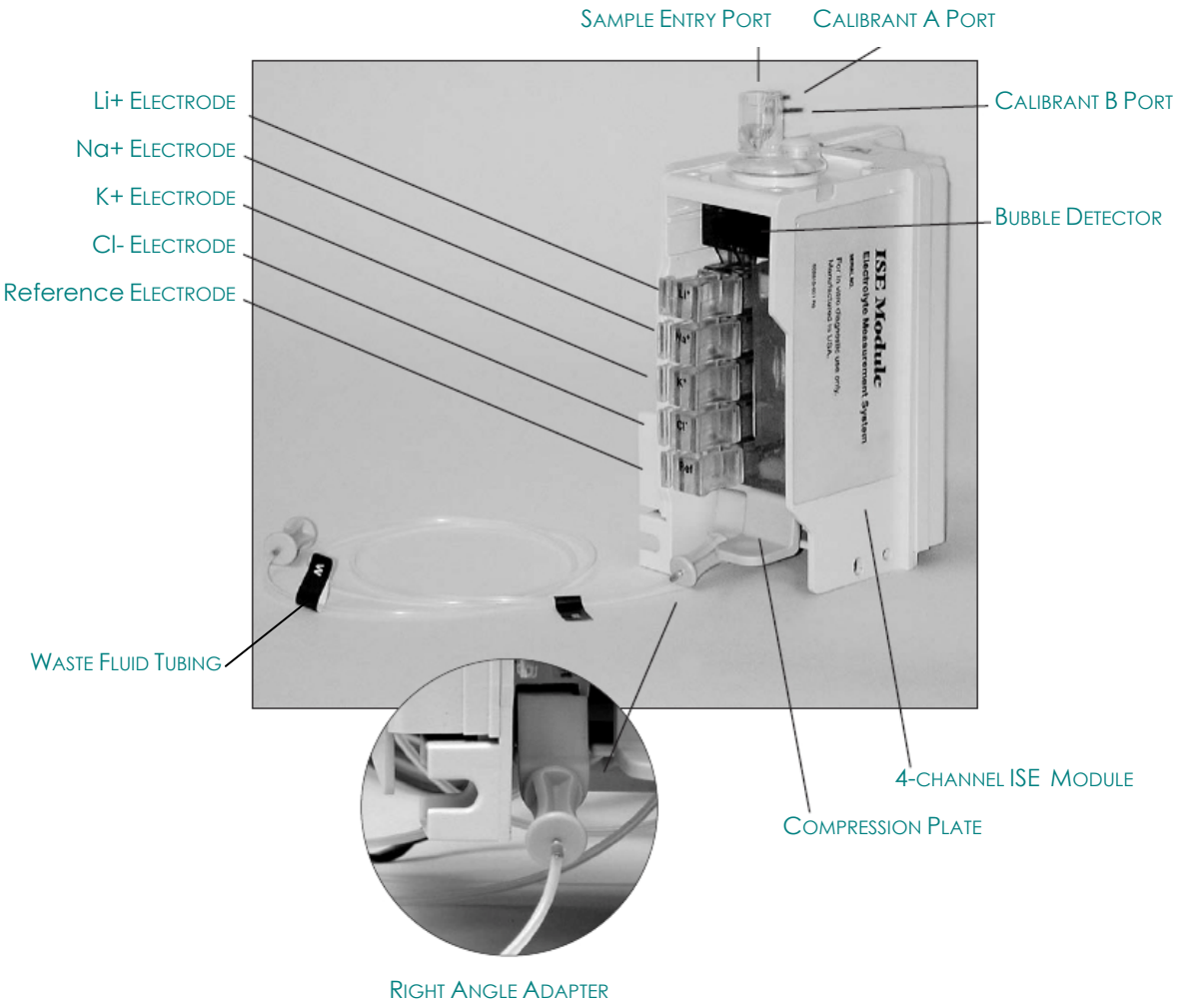


Figure 96: *ISE Module, Outline*

4.5.7. Reagent Pack Replacement

When exhausted, Reagent Pack must be changed with a new one.
Replace Reagent Pack with system in *Idle* status.
Follow the procedure below:

1. Consider the ISE Module Reagent Pack containing Calibrat A, Calibrat B and Waste;
2. Press the yellow button of the Reagent Pack Connector and disconnect it from the pack;
3. Connect the Reagent Pack Connector on the new pack and be sure that it's stable on it;
4. From the *ISE module conf* menu run the *Initialize* command

5. Place the Reagent Pack back in its place paying attention not to bend or occlude tubing, close the front panel and start working.

Figure 97: *ISE Module, Reagent Pack replacement*

WARNING

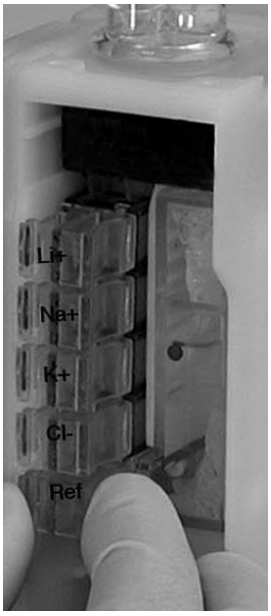
Biohazard Waste: used reagent pack contain waste material and they must be always considered potentially infected. Dispose off according to local laws and rules.

4.5.8. Electrodes Replacement

When electrodes maintenance period has expired they must be replaced with new ones. Replace Electrodes only with system powered OFF.
Follow the procedure below:

1. From the *ISE module conf* menu run the command *Maint* to purge the ISE Module path;
2. Shut down the system (software and instrument);
3. Open the front panel of the instrument and carefully extract the Reagent Pack;
4. Depress the compression plate and remove all electrodes from the ISE Module (start with the upper one);
5. Dispose off the electrodes to be replaced according to local rules (**they can be infected**);
6. Remove new electrodes from sealed bag;
7. Remove the yellow flag from Reference electrode and if necessary soak the reference electrode in warm water until the lumen of the electrode has been cleared of salt build-up (**do not throw away the yellow flag with its flow path line – it can be used in case of ISE Module storage**);
8. Install the new electrodes in the ISE Module (starting from the bottom – Reference electrode);
9. Power Up the system;
10. If the system doesn't go into the Warming Up, run the *Initialize* command from the *ISE module conf* menu (being the electrode new, it could drift) otherwise jump to the next step;
11. Wait for 15 minutes then run again the *Initialize* command (time required for new electrode re-hydrating).

WARNING
Used electrodes must be always considered potentially infected.



4.5.9. Electrodes Storage

In a day or two with the power off, the user might notice that it may take some time for the electrodes to regain stability. The longer this period, the more acute the problem will occur. The original silicone pump tubes may start crimping after a couple of weeks depending on the ambient temperature. The solutions in the various lines may dry out and form blockages or restrictions.
If the laboratory plans to store the instrument or to leave it OFF for long time (more then one week), the following steps should be performed:

ISE Module de-activation

1. From the *ISE module conf* menu run the command *Do clean cycle* to clean the ISE Module path;
2. From the *ISE module conf* menu run the command *Maint* to purge (and empty) the ISE Module path;
3. Shut down the system (software and instrument);
4. Open the front panel of the instrument;
5. Remove the Reagent Pack from the reagent connector and discard;
6. Depress the compression plate and remove all electrodes from the ISE Module (start with the upper one), including the Reference electrode;
7. Place **Na+** and **Cl-** electrodes into their individual sealed bags;
8. Reinsert the Reference Electrode flow path line with yellow flag, if available, and then put into its individual sealed bag;
9. Aspirate a small volume of Calibrant A from the top port of the Reagent Pack into a syringe fitted with a blunt needle;
10. Inject sufficient Calibrant A into the lumen of the **K+** and **Li+** electrodes until fluid fills the lumen;
11. Cover both ends of the lumen (both sides of the K+ and Li+ electrodes) with tape to hold the Calibrant in place;
12. Insert the K+ and Li+ electrodes into their sealed bags.

Note: for all electrodes, make sure that they are wiped dry prior to storing in sealed bags.

WARNING

Used electrodes must be always considered potentially infected.

ISE Module re-activation

(Operate with system instrument down)

1. Remove all electrodes from sealed bag;
2. Remove tape from K+ and Li+ electrodes;
3. If necessary soak the reference electrode in warm water until the lumen of the electrode has been cleared of salt build-up (**do not throw away the yellow flag with its flow path line – it can be used in case of ISE Module storage**);
4. Remove the yellow flag from Reference electrode and if necessary soak the reference electrode in warm water until the lumen of the electrode has been cleared of salt build-up (**do not throw away the yellow flag with its flow path line – it can be used in case of ISE Module storage**);
5. Install electrodes in the ISE Module (starting from the bottom – Reference electrode);
6. Connect the Reagent Pack to the ISE Module reagent connector;
7. Power Up the system;
8. If the system doesn't perform Warming Up, from the *ISE module conf* menu run the *Initialize* command (being the electrode new, it could drift) otherwise jump to the next step;

Wait for 15 minutes then run again the *Initialize* command (time required for new electrode re-hydrating).

In the following the reader will find some suggestions about **"storing the electrodes"** if the analyzer is going to be off for an extended period of time (more then one week); see also the KROMA User Manual (last rev.).
If you leave the electrodes in the analyzer with the Power in OFF status, KCl salt will migrate through the membrane of the reference electrode into the flow path of the electrodes and may cause a problem when the analyzer is powered back on. The electrodes may be removed to prevent a problem.

The **reference electrode** is shipped with a small brown plastic tube installed in the flow path of the electrode to prevent the flow path from becoming clogged with dried KCl. It is recommended that the tube be re-installed in the flow path of the reference electrode if the tube is still available. Alternatively, a blunt tip 22 gauge needle can be inserted into the reference electrode flow path to prevent clogging.

The **Na and Cl electrodes** can simply be removed from the module and stored in a plastic bag. It would be best if the flow path of the K electrode be filled with some Cal A solution and then sealed with tape similarly to when it is received. This will help it re-equilibrate quicker when first installed.
You also note that electrodes sometimes need some time to equilibrate when first installed. This is particularly true of the **K electrode** if it has dried out. The membrane needs to rehydrate and re-equilibrate in order to provide stable performance. It is a matter of just letting the electrodes re-hydrate and this is a function of time, not the amount of calibration solution that flows past it. If you are experiencing this issue, I would suggest installing the electrodes, purging the calibration solutions and letting the electrodes sit in Cal A for awhile and then attempt to calibrate. It is difficult to specify a time as some electrodes equilibrate immediately while some take a bit of time to stabilize. Running a serum sample as a daily cleaner, (which will allow the serum to sit in the electrode flow path for a bit of time), may be helpful.

4.5.9.1. Troubleshooting Low Slope, Noise and Drift Error or Other ISE Module Issues

Low slope is usually the result of an electrode losing its sensitivity over time although it could be due to other issues. The **noise error** indicates instability of the mV values for a given solution during successive measurement during one analysis. **Drift** indicates that the analyzer is not observing stable mV values between measurements of the calibration solutions.

The first level of troubleshooting is to run the appropriate daily ISE Module Cleaner solution a couple of times to remove any built up protein residues in the flow path. If that does not eliminate the observed problem, make sure the routine maintenance has been performed, such as replacing the reference electrode and pump tubing. If that does not work, replace the questionable electrode(s) and see if this cures the problem. If not, salt contamination may be the source of the problems.
In all types of Ion Specific Electrode (ISE) modules, the possibility of dried salt providing an electrical leakage path exists which can result in various errors including "Drift" or "Noise" or incorrect slope values.
Customers often do not go into the maintenance mode (Menu ISE Module Conf. → command "MAINT") to empty the flow path prior to removing electrodes. This causes the solution that is in the flow path to leak onto the electrode contacts or bubble detector contacts. These small amounts of the calibration solutions eventually dry out; leaving traces of salt residues that may not be visible

to the naked eye. These "salt tracks" are conductive to electricity and may provide electrical leakage paths from the electrodes interfering with their function. The electrical signal coming from the ISE electrodes is extremely small and any interference with those weak signals will result in errors. Customers must replace the electrodes properly. They should always wipe the ISE Module with a dry cloth whenever replacing electrodes, just in case solution has leaked. To eliminate this electrical leakage and resulting signal errors, the salt tracks need to be cleaned up. This is best done by removing all the electrodes from the analyzer and wiping down their contacts with a damp paper towel and allowing them to dry. The next step is to remove any traces of dried salt from the ISE module by taking another damp paper towel and wiping down the areas where the electrode contacts plug into the module. Follow this by removing the moisture with a dry paper towel and allow to dry. When assured everything is properly dry, reinstall all the electrodes and retest. Also check the electrode contacts. Make sure the contacts are clean. If they are dirty or corroded, clean them gently with a pencil eraser, (being careful not to remove the delicate gold coating). The contacts in the module are spring loaded. Make sure the springs are functioning properly and the contacts are moving in and out.

Another potential source of noise errors in particular is related to flow. When the pump stops, the flow is also supposed to stop. Noise occurs when the solution in the system keeps moving while the analyzer is measuring the sample or calibrant. A "noise in Cal A" error occurs when the ISE Module reads the mV's for the electrodes while Calibrant A is present. What actually occurs is that the ISE Module takes six mV readings in rapid succession. Then the ISE Module calculates the average of the six readings. If one of the readings is more than 0.7mV above or below the average, then you will receive a "noise" error. This can occur due if there is a small flow problem and the Calibrant A is moving when the reading is taking place. You must make sure that all of the electrodes are seated properly and the o-rings are present. A quick test of this is to dispense Cal A into the Sample Cup and observe if the solution stays inside the cup. If it slowly empties, then you have a small air leak. Also make sure the pump tubing has been replaced as per the routine maintenance schedule.

Assuring proper and continuous instrument grounding is also necessary. Sometimes moving an analyzer to a different location will help determine if improper grounding or fluctuating strong EMF fields are involved with inducing errors (i.e. big elevator motors, …). Installation of an Uninterruptible Power Supply, which also corrects for out of specification local power, is also a possible solution to noise and drift problems.

Noise can also occur if the reference electrode is older than six months. Ensure that they perform maintenance when required.

Of course, if one electrode is continually giving noise errors, simply replace the electrode.

"Drift in Cal A" occurs after sample analysis. After every sample analysis, calibrant A is positioned in front of the electrodes and an mV reading is taken. It then compares the mV result to the previous Calibrant A reading. If the change is more than 7 mV, you will get a "drift" error. Troubleshooting is similar to the procedure listed above for "noise" errors. However, in both cases, try running a cleaning cycle and re-calibrating as a first step.

If problems continue, it is probably due to external factors such as poor or intermittent electrical instrument grounding, improper supply voltage or Electro Magnetic Field, (EMF), effects from other instrumentation such as the electrical motors in refrigerators or centrifuges.

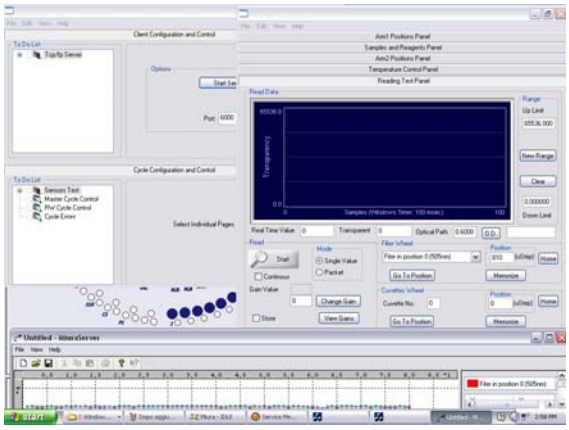
The 4-channel ISE Module calibration cycle is calibrant B-A-B-A. This enables the system to check for drift errors during calibration and not just for sample analysis. It also enables the system to check for drift in both Cal A and Cal B.

4.5.10. Optical Group – Main Steps for Filters Calibration

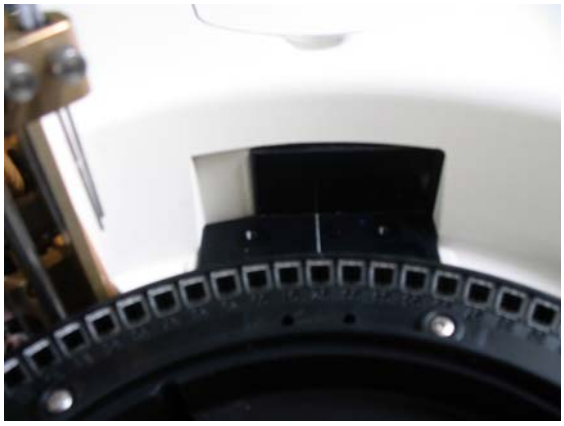
The following procedure must be carried whenever the filter wheel has been removed: filter replacement, motor replacement, filter wheel home sensor replacement, lens replacement or when the operator recognizes the need (i.e.: bad result reproducibility on the same filter, etc.).

Optical gain calibration @ 20000 counts

1	Open the KROMAServer service program
2	Enter the sub-menu named "reading Test Panel" and the sw will show a window including several commands related to: the filter wheel, the cuvette wheel, etc.
3	Home the cuvette wheel and then set cuvette nr. 32 to be read under the optical path. It is necessary to position cuvette #32 because with the cuvette cover it is possible to reach "Gain" and "Off-set" potentiometers by two upper throughholes. A very thin and long slotted screwdriver is needed for this operation (screwdriver diameter about 2mm, screwdriver length at least 30mm → 25mm needed).



4 Dismount the cuvette cover and check that the centre of the cuvette #32 is alligned with the optical path (identified by a sign on the black support).
If the cuvette is not correctly alligned modify step by step the value in the field position of the section "cuvette wheel".
Note: to obtain good readings, avoid unstable cuvette's wall reflections, taking care that the optical path be in correspondence of the cuvette centre.

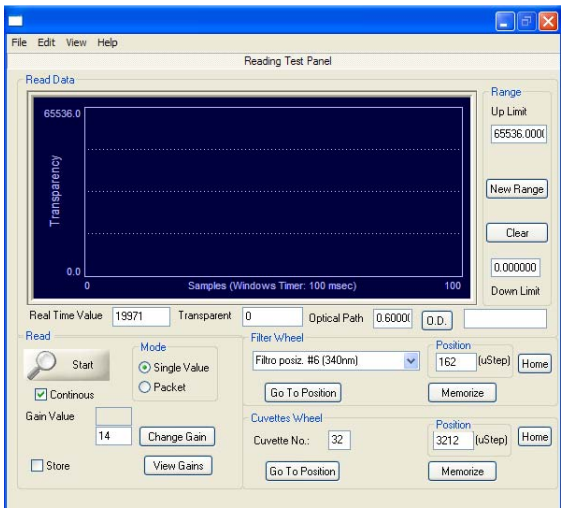


5 Fill cuvette #32 with 300µl of distilled water and assemble back the cuvette cover caring the allignement with the washing station tip.

6 Introduce in the field "Change gain" the value 14 for the gain digital potentiometer and set it by activating the command aside. The value, when accepted, will be displayed in the field gain value. This value means real gain = 1, in this way the instrument doesn't amplify the reading signal.

In the following the optical gains cross-reference table showing the correspondence between the digital potentiometer setting values and the real mathematical/electronic signal gain has been annexed.

7 In the filter wheel section, select the filter posit.#6 = 340nm. Click Home and then click Go To Position (it is better to perform any positioning after homing the group).
On the left of the panel, in the "Read" section check the selection "Continuous"; in the "Mode" section check the selection "Single Value" and then click on Start.
Reading values will be displayed in the "Real Time Value" field and in the plot in terms of AtoD counts.



8	The actual value read in the "Real Time Value" field must be manually trimmed around 20000 counts. This can be done by turning the potentiometer "Gain" which is the one placed under the left hole of the cover. Turning clockwise → value increases, turning counter clockwise → value decreases. Please gently insert the thin screwdriver to reach the potentiometer screw and also turn the potentiometer gently to avoid damaging. Trim to reach 20000 counts.

9	After having set the gain one value for 340nm, In the filter wheel section, select the filter posit. #5 – buio-OFFSET. Click Home and then click Go To Position. The actual value read in the "Real Time Value" field must be manually trimmed around 10 ± 5 counts. This can be done by turning the potentiometer "OffSet" which is the one placed under the right hole of the cover. Turning clockwise → value increases, turning counter clockwise → value decreases. Please gently insert the thin screwdriver to reach the potentiometer screw and also turn the potentiometer gently to avoid damaging. Never set values of 0.

Calibration control of the optical filter positions

1

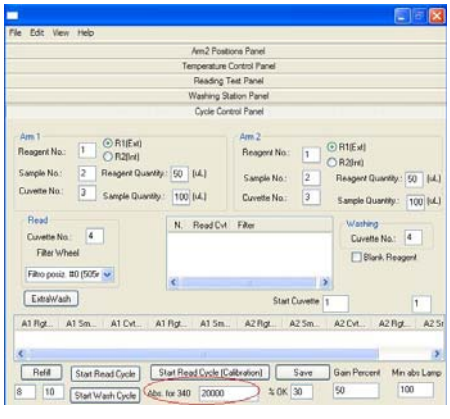
In the filter wheel section, select again the filter posit.#6 = 340nm. Click Home and then click Go To Position (it is better to perform any positioning after homing the group).
By reading the "Real Time Value" field and looking at the plot, start searching the highest and most stable value. Set the plot down and up limits to zoom at about ±50 points on the centre "Real time value" to help the research. A value is stable when cycling homing and resetting back to 340nm the real time value is within ±20/30 read points on about 3 sequencial µsteps. This position generally correspond to the centre of the filter.

2

Once that the highest and stable point has been found, memorize its position and run, as usual, the parameter download ("save parameter", see *MNM-10800-01-A ENG*, *KROMAServer SW Manual for Calibration*).
Reapeat the same procedure for all filters without taking care about the absolute mean value (that will be different from 20000).
The interval between one filter and the subsequent is 160 µsteps. This means that at the actual position is necessary to add 160 to get the next one as starting point for calibration of the next filter. Consider that after the 340 filter calibration, all the others will be very near to the theoretical 160µsteps-multiple positions.
Positions #7 (not used) and #5 (off-set) doesn't need fine tuning calibration.

3

At the end of the calibration, in the Cycle Control Panel, set the value "Abs for 340" = 20000 and save it. Download then parameters and then shut down the software and power off the instrument.



4

Restart the software and the instrument and run a **Gain Calibration Cycle** for wavelenght gains recalculation. In this way gains will be recalculated and set so to equalize different filter transparent values around 20000 counts.

Digital potentiometer value vs. Real Gain - Cross-reference table

Bit	G	Bit	G	Bit	G	Bit	G	Bit	G
0	0,147059	**52**	3,129412	**103**	6,054412	**154**	8,979412	**205**	11,90441
1	0,204412	**53**	3,186765	**104**	6,111765	**155**	9,036765	**206**	11,96176
2	0,261765	**54**	3,244118	**105**	6,169118	**156**	9,094118	**207**	12,01912
3	0,319118	**55**	3,301471	**106**	6,226471	**157**	9,151471	**208**	12,07647
4	0,376471	**56**	3,358824	**107**	6,283824	**158**	9,208824	**209**	12,13382
5	0,433824	**57**	3,416176	**108**	6,341176	**159**	9,266176	**210**	12,19118
6	0,491176	**58**	3,473529	**109**	6,398529	**160**	9,323529	**211**	12,24853
7	0,548529	**59**	3,530882	**110**	6,455882	**161**	9,380882	**212**	12,30588
8	0,605882	**60**	3,588235	**111**	6,513235	**162**	9,438235	**213**	12,36324
9	0,663235	**61**	3,645588	**112**	6,570588	**163**	9,495588	**214**	12,42059
10	0,720588	**62**	3,702941	**113**	6,627941	**164**	9,552941	**215**	12,47794
11	0,777941	**63**	3,760294	**114**	6,685294	**165**	9,610294	**216**	12,53529
12	0,835294	**64**	3,817647	**115**	6,742647	**166**	9,667647	**217**	12,59265
13	0,892647	**65**	3,875	**116**	6,8	**167**	9,725	**218**	12,65
14	0,95	**66**	3,932353	**117**	6,857353	**168**	9,782353	**219**	12,70735
15	1,007353	**67**	3,989706	**118**	6,914706	**169**	9,839706	**220**	12,76471
16	1,064706	**68**	4,047059	**119**	6,972059	**170**	9,897059	**221**	12,82206
17	1,122059	**69**	4,104412	**120**	7,029412	**171**	9,954412	**222**	12,87941
18	1,179412	**70**	4,161765	**121**	7,086765	**172**	10,01176	**223**	12,93676
19	1,236765	**71**	4,219118	**122**	7,144118	**173**	10,06912	**224**	12,99412
20	1,294118	**72**	4,276471	**123**	7,201471	**174**	10,12647	**225**	13,05147
21	1,351471	**73**	4,333824	**124**	7,258824	**175**	10,18382	**226**	13,10882
22	1,408824	**74**	4,391176	**125**	7,316176	**176**	10,24118	**227**	13,16618
23	1,466176	**75**	4,448529	**126**	7,373529	**177**	10,29853	**228**	13,22353
24	1,523529	**76**	4,505882	**127**	7,430882	**178**	10,35588	**229**	13,28088
25	1,580882	**77**	4,563235	**128**	7,488235	**179**	10,41324	**230**	13,33824
26	1,638235	**78**	4,620588	**129**	7,545588	**180**	10,47059	**231**	13,39559
27	1,695588	**79**	4,677941	**130**	7,602941	**181**	10,52794	**232**	13,45294
28	1,752941	**80**	4,735294	**131**	7,660294	**182**	10,58529	**233**	13,51029
29	1,810294	**81**	4,792647	**132**	7,717647	**183**	10,64265	**234**	13,56765
30	1,867647	**82**	4,85	**133**	7,775	**184**	10,7	**235**	13,625
31	1,925	**83**	4,907353	**134**	7,832353	**185**	10,75735	**236**	13,68235
32	1,982353	**84**	4,964706	**135**	7,889706	**186**	10,81471	**237**	13,73971
33	2,039706	**85**	5,022059	**136**	7,947059	**187**	10,87206	**238**	13,79706
34	2,097059	**86**	5,079412	**137**	8,004412	**188**	10,92941	**239**	13,85441
35	2,154412	**87**	5,136765	**138**	8,061765	**189**	10,98676	**240**	13,91176
36	2,211765	**88**	5,194118	**139**	8,119118	**190**	11,04412	**241**	13,96912
37	2,269118	**89**	5,251471	**140**	8,176471	**191**	11,10147	**242**	14,02647
38	2,326471	**90**	5,308824	**141**	8,233824	**192**	11,15882	**243**	14,08382
39	2,383824	**91**	5,366176	**142**	8,291176	**193**	11,21618	**244**	14,14118
40	2,441176	**92**	5,423529	**143**	8,348529	**194**	11,27353	**245**	14,19853
41	2,498529	**93**	5,480882	**144**	8,405882	**195**	11,33088	**246**	14,25588
42	2,555882	**94**	5,538235	**145**	8,463235	**196**	11,38824	**247**	14,31324
43	2,613235	**95**	5,595588	**146**	8,520588	**197**	11,44559	**248**	14,37059
44	2,670588	**96**	5,652941	**147**	8,577941	**198**	11,50294	**249**	14,42794
45	2,727941	**97**	5,710294	**148**	8,635294	**199**	11,56029	**250**	14,48529
46	2,785294	**98**	5,767647	**149**	8,692647	**200**	11,61765	**251**	14,54265
47	2,842647	**99**	5,825	**150**	8,75	**201**	11,675	**252**	14,6
48	2,9	**100**	5,882353	**151**	8,807353	**202**	11,73235	**253**	14,65735
49	2,957353	**101**	5,939706	**152**	8,864706	**203**	11,78971	**254**	14,71471
50	3,014706	**102**	5,997059	**153**	8,922059	**204**	11,84706	**255**	14,77206
51	3,072059								

Section 5 PROBLEM SOLVING

5. Introduction

This section provides the user with some of the rules for effective corrective actions.

5.1. Auto-diagnosis System

When the instrument is turned on, the firmware operates a system performance self-diagnosis and provides the hardware reset as soon as the software starts up.
Warning messages alert the user in case of failures.
Moreover, during instrument operation the system checks "on line" the main assemblies and reports any functional anomaly.
From a hardware point of view the following assemblies and functions are controlled:

- serial link between the external PC and the instrument;
- electronic controller boards, and their intra-communication;
- motors and motions (including diluters) and correct homing;
- correct positioning of the cuvettes wheel;
- incubation temperature;
- vertical sampling arms "crash";
- washing station operation;
- barcode reader operation (if included).

The system also displays warning windows in case of alarm or functional notices (empty loading tanks, full waste tank, etc.)
The system activates an acoustic beeper in the following events:

- at the end of the warming up;
- at the end of an analysis run;
- in case of alarm.

If the instrument is switched off for more than 60 seconds and then it is powered up again, the system automatically resets and recovers the serial connection.

5.2. Main Failures and Corrective Actions

This paragraph provides a list of the most common problems and a description of the possible corrective actions:

Problem	Possible Cause	Corrective Action
REAGENT AND/OR SAMPLE PROBES FAILURES DURING ASPIRATION AND DISPENSATION	1. Arm Heater Coil tubing not connected or damaged:	Verify that the tubing of the Heater Coil is correctly plugged on the sampling probe without any leakage. Verify that the fittings on the Diluter Head are correctly fastened and without fluid leakages. If the tubing or the fittings are damaged, change them with new ones.
	2. Diluter head:	Verify that the Diluter Head doesn't leak out and that, during

Problem	Possible Cause	Corrective Action
		sampling, the white Diluter Plunger moves up and down. In case of damage replace the part.
	3. Diluter electrovalve not working:	Verify that during sampling, the Electrovalve switches ON and OFF. If not, replace the part.
	4. Systemic solution external charge tubing is empty, liquid doesn't flow:	Verify that system solution tank isn't empty and that the Tygon® tubing is undamaged and not bended or obstructed and that the filter dips into the liquid. If damaged replace it.
	5. Teflon® tubing of the diluter head is empty:	Verify that the Heater Coil Teflon® tubing is undamaged and not bended or obstructed. If damaged change it. Verify that the Teflon® tubing between Electrovalve and Diluter Head is undamaged and not bended or obstructed. If damaged replace it.
	6. Sampling Probe occluded:	Verify that the probe isn't occluded and it is internally clean. Clean it first with several washings (*Smp arm rinsing*) then use disinfection procedure for probes. If damaged change it. The systemic solution must be clean and without floating particles; verify and clean the tank internal filter.
REAGENT AND/OR SAMPLE PROBES DO NOT WASH, MISSING OF WASHING SOLUTION FLOW	1. Diluter electrovalve not working:	Verify that during sampling, the Electrovalve switches ON and OFF. If not replace the part.
	2. Teflon® tubing between Electrovalve and Diluter damaged:	Verify that the Teflon® tubing fittings between Electrovalve and Diluter Head are correctly fastened, undamaged and that tubing is not bended or obstructed. If damaged replace it.
	3. Hydraulic circuits empty (most common cause when *arm* doesn't wash):	Verify that systemic solution tank isn't empty and that the Tygon® tubing is undamaged and not bended or obstructed and that the filter dips into the liquid. If damaged replace it.
	4. Peristaltic Pumps worn away or not working:	Verify the Peristaltic Pump heads: if worn, change them.

Problem	Possible Cause	Corrective Action
		Verify the Peristaltic Pump motors: they must turn during washing. If not moving, replace them.
	5. Sampling probe occluded:	Verify that the probe isn't occluded and it is internally clean. Clean it first with several washings (*Smp arm rinsing*) then use disinfection procedure for probes. If damaged change it. The systemic solution must be clean and without floating particles; verify and clean the tank internal filter.
TEST RESULTS NOT RELIABLE NOR REPEATABLE:	1. Sampling probe occluded:	Verify that the probe isn't occluded and that it is internally clean. Clean it first with several washings (*Smp arm rinsing*) then use disinfection procedure for probes. If damaged change it. The Systemic solution must be clean and without floating particles; verify and clean the tank internal filter.
	2. Diluter Head:	Verify the Diluter Head, if it contains floating particles or big air bubbles clean it with several probe washings (*Smp arm rinsing*).
	3. Arm Heater Coil tubing not connected or damaged or shows many air bubbles inside:	Verify that the tubing of the Heater Coil is correctly plugged on the sampling probe without any leakage. Verify that the fittings on the acrylic Diluter Head are correctly fastened. Verify if probe tubing or fittings are undamaged, otherwise replace them with new ones.
	4. Dirty cuvettes:	Run a washing cycle (*Start-up*), take out the cuvette and control that their narrow walls are clean inside and outside; **dirty cuvettes must be replaced**.
	5. Photometer lamp:	Verify the photometer lamp is on and stable, if not replace it.
	6. Externally wet cuvettes:	Switch the instrument off, take out all cuvettes, in case they are wet carefully dry them with a clean soft cloth. Run a *Gain*

Problem	Possible Cause	Corrective Action
		Calibration cycle.
	7. Decayed Reagent:	Verify that the reagent used for the method, whose results are out of control, is not expired.
	8. Wrong or decayed control:	Verify that the control used for the method, whose results are out of control, is not expired and it's the correct one.
	9. Contamination:	Verify that the solution in cuvette is not contaminated by external agents.
	10. Damaged Filter:	Run a *Gain Calibration* cycle and, in case of filter alarm replace the filter.
POOR CUVETTE WASHING, THE CUVETTES ARE WET INSIDE.	1. Waste tubing:	Verify that the external Waste tubing is not bended or obstructed and well fastened to its side fittings.
	2. Aspiration tubing of the Washing Station:	Verify that the aspiration Teflon® and Tygon® tubing, placed under the Washing Station protecting Cap, are undamaged and without leakages. If damaged replace them.
	3. Aspiration Pumps:	Verify that both Aspiration Pumps works during washing. Check absence of obstructions of the valves into the head. If not working, try to clean or replace the part.
	4. Drying Tip:	Verify that the Washing Station drying tip is undamaged. If damaged, replace the part.
	5. Washing Station aspiration needles:	Verify that the longest needles of the Washing Station are clean and not damaged nor occluded. If not clean them.
POOR CUVETTE WASHING, THE CUVETTES ARE DIRTY INSIDE.	1. Peristaltic Pumps worn away or not working:	Verify the Peristaltic Pump heads: if worn, change them. Verify the Peristaltic Pump motor: they must turn during washing. If not moving, replace them.
	2. Washing Station dispensing tubing:	Verify that the aspiration Teflon® tubing, placed under the Washing Station protecting Cap, are undamaged and without leakages. If damaged, replace them.
	3. Washing Station dispensing needles:	Verify that the shortest needles of the Washing Station are clean and not damaged nor

Problem	Possible Cause	Corrective Action
		occluded. If not clean them.
THE INSTRUMENT DOESN'T RESETS OR CORRECTLY WARMS UP WHEN POWERED ON	1. Serial link failure:	Verify that the serial cable connecting the instrument and the PC is correctly fastened on both sides.
	2. Power On problem:	Switch the instrument off and keep it off for 2 minutes; then power it on again. If not enough, power off the system (PC and instrument) for 2 minutes and power it on once more.
EXTERNAL PRINTER NOT WORKING	1. Absence of link:	Verify the connection between instrument and external PC and the correct installation of the printer driver in the PC.
THE SAMPLING PROBE WASHING SINK DOESN'T GET EMPTY DURING WORKING SESSIONS	1. Emptying Peristaltic Pumps worn or not working:	Verify the Peristaltic Pump head: if worn, change it. Verify the Peristaltic Pump motor: it must turn during washing. If not moving, replace it.
THE SOFTWARE DOESN'T START WHEN RUN AFTER POWER UP:	1. Database could be corrupted:	Call for service and substitution of database with the latest valid back up copy. PAY ATTENTION DURING SYSTEM SHUT DOWN: follow always the correct procedure and do not switch the PC off manually before the procedure is completed.

5.3. Performance Messages

The Status menu of the User Interface software constantly shows the performance status of the instrument during operation.
The system only shows message windows, when alarm or warning conditions occur.

Message	Meaning
LOADING	The system is loading information and data.
STARTING	The system is starting.
WARMING UP	The system is performing the warming up procedure. It can include a washing cycle and, after the lamp stabilization, an auto-zero cycle or only a lamp warming up if the instrument OFF time was short.
IDLE	The system is ready to operate and waiting for commands.
REFILLING	The system is performing a refill all cycle; it includes cuvette washing and, at the end, probes rinsing.
READING AND WASHING	The system is in auto-zero cycle; it includes cuvette washing and reading.
CALIBRATING	The system is in calibration cycle; it includes a first cuvette washing and reading cycle for filter gains calibration and then an auto-zero cycle.
SCHEDULING	Start analysis has been run, the system is scheduling the analysis in order to proceed with the working session.
RUNNING	The system is performing a working session.
ABORTING	A working session has been interrupted and the system is reading and washing all cuvettes (auto-zero cycle).
IN ALARM	The system is in alarm status: a message window is at the same time shown; an action is required to proceed.
IN WARNING	The system is in warning status: a message window is at the same time shown; an action or decision can be asked to the operator.

5.3.1. Error Messages and Actions Required

This paragraph provides a list of the error codes, its displayed linked messages, and the actions required in case of any problem occurring during the instrument working:

Code	Message	Cause	Action
101	Warning: Close the cover for running.	The Protection defence of the instrument has been open during run.	Sampling is arrested. Reading of reactions actually in incubation will be continued up to the end, also with protection defence open. Close the protection defence to restart and continue the working session.
102	Warning: Systemic solution is going to finish.	Systemic solution is ending.	Sampling is arrested. Reactions actually in incubation are anyway carried out also with cover open and concluded. After readings, cuvettes are washed and the system waits for tank refilling. Refill the Systemic solution tank by unfastening the tank cap and keeping the float sensor in the empty position (down): the system then restarts the sampling run. Do not disconnect tubing during run.
103	Warning: Cleaner solution is going to finish.	Cleaner solution is ending.	Sampling is arrested. Reactions actually in incubation are anyway carried out also with cover open and concluded. After readings, cuvettes are washed and the system waits for tank refilling. Refill the Cleaner solution tank by unfastening the tank cap and keeping the float sensor in the empty position (down): the system then restarts the sampling run. Do not disconnect tubing during run.
104	Warning: Waste tank is getting full.	Waste tank is almost full.	Sampling is arrested. Reactions actually in incubation are anyway carried out also with cover open and concluded. After readings cuvettes, are washed and the system waits for tank refilling. Empty the tank or replace with an empty one AFTER the end of the washing phase and keeping

Code	Message	Cause	Action
			the float sensor in the full position (up): the system then restarts the sampling run. Do not disconnect tubing during cuvette washing or running.
105	Warning: Some reagents are empty. In the Status menu click on red reagents.	Some reagents, used in the Work List, are finished. A reagent that is finished is marked in RED on the Status menu.	Click on the RED reagent and follow the instructions on the screen. Press *Retry* after replacing the bottle; press *Abort* to skip that type of analysis; press *Exit* to exit the window without any decision and change. To change the bottle: click on *Pause* and wait that ARM stops, open the protection defence and replace the bottle; close the protection defence and click on *Continue*, then click on *Retry*.
106	Warning: Some samples are empty. In the Status menu click on red reagents.	Some samples are finished. A sample (or standards or controls) that is finished is marked in RED on the Status menu.	**In case of *Sample*:** Click on the RED sample and follow the instructions on the screen. Press *Retry* after refilling the sample; press *Abort* to skip the hanging analyses; press *Exit* to exit the window without any decision and change. To refill the sample: click on *Pause* and wait that ARM stops, open the cover and refill the tube; close the protection defence and click on *Continue*, then click on *Retry*. **In case of *Standard*:** Click on the RED standard and follow the instructions on the screen. Press *Retry* after replacing Standard; press *Abort* to skip standardization, controls and analyses related to that standard; press *Ignore* to skip standard and to use old Factor in memory for computing results (for control and analyses); press *Exit* to exit the window without any decision and change. To refill the standard: click on *Pause* and wait that ARM stops, open the protection defence and refill the cup; close the

Code	Message	Cause	Action
			protection defence and click on *Continue*, then click on *Retry*. **In case of *Control*:** Click on the RED control and follow the instructions on the screen. Press *Retry* after replacing Control; press *Abort* to skip controls and related analyses; press *Ignore* to skip control and to process anyway the related analysis; press *Exit* to exit the window without any decision and change. To refill the control: click on *Pause* and wait that ARM stops, open the protection defence and refill the cup; close the protection defence and click on *Continue*, then click on *Retry*.
107	Alarm: Refill Systemic solution tank and in Status menu press Continue button.	Systemic solution is over; the system is blocked.	Refill the tank and then press the button *Continue* in the Status menu.
108	Alarm: Refill Cleaner solution tank and in Status menu press Continue button.	Cleaner solution is over; the system is blocked.	Refill the tank and then press the button *Continue* in the Status menu.
109	Alarm: Empty Waste tank and in Status menu press Continue button.	Waste is full; the system is blocked.	Empty the tank and then press the button *Continue* in the Status menu after replacing it.
110	Alarm: Internal hardware communication error. In run press Continue button else restart the System.	Hardware error.	Press the button *Continue* in the Status menu to retry, the system should recover. In case the alarm is again detected check if the instrument is ON. Shutdown the program, the PC and the instrument and then restart the system.
111	Alarm: Washing station not working. In run press Continue button else restart the System.	The Washing Station isn't properly working, it didn't enter cuvettes.	Verify the absence of obstacles under the washing station needles. Press the button *Continue* in the Status menu to retry, the system should recover. In case the alarm is again detected, shutdown the program, the PC and the instrument and then restart the system.
112	Alarm: Cuvette wheel	The cuvette wheel motion fails	Press the button *Continue* in the

Code	Message	Cause	Action
	encoder not working. In run press Continue button else restart the System.	positioning.	Status menu to retry, the system should recover. In case the alarm is again detected, shutdown the program, the PC and the instrument and then restart the system.
113	Alarm: Sample ARM is crashing. In run press Continue button else restart the System.	The Sampling ARM crashed against an obstacle during its way down.	Remove any obstacle on the probes way down, i.e.: sample caps, etc. Press the button ***Continue*** in the Status menu to retry, the system should recover. In case the alarm is again detected, shutdown the program, the PC and the instrument and then restart the system. If the problem persists check if the probe is entering the correct positions (tips of washing sinks, cuvettes, …) and calibrate position [X and Y].
115	Alarm: Serial communication error. Check the cable.	Error due to serial link hardware failure between the external PC and the instrument.	Shutdown the program, the PC and the instrument and verify that the serial cable is fastened on both ends and that is undamaged otherwise change it. Restart the system. If the problem persists check internal serial cable and Main Controller.
117	Alarm: Problem on filter xxx. Run a Calibration Cycle.	Filter xxx could be damaged.	In case the alarm is again detected, shutdown the program, the PC and the instrument and restart the system. Run a ***Calibration*** cycle. If the problem persists check filter calibration.
118	Alarm: X-Sample ARM motion not properly working. In run press Continue button else restart the System.	The Sampling ARM doesn't rotate correctly.	Verify the absence of obstacles on the working area. Press the button ***Continue*** in the Status menu to retry, the system should recover. In case the alarm is again detected, shutdown the program, the PC and the instrument and restart the system. If the problem persists check calibration.
119	Alarm: Y-Sample ARM motion not properly working. In run press Continue button else restart the System.	The Sampling ARM doesn't rise and descend correctly.	Verify the absence of obstacles on the working area. Press the button ***Continue*** in the Status menu to retry, the system should recover. In case the

Code	Message	Cause	Action
			alarm is again detected, shutdown the program, the PC and the instrument and restart the system. If the problem persists check calibration.
120	Alarm: Diluter Sample ARM motion not properly working. In run press Continue button else restart the System.	The sampling ARM diluter fails during motions.	Verify the absence of obstacles or particles into the Diluter transparent head; press the button ***Continue*** in the Status menu to retry, the system should recover. In case the alarm is again detected, shutdown the program, the PC and the instrument and restart the system. If the problem persists check calibration.
126	Alarm: Washing station motion not properly working. In run press Continue button else restart the System.	The Washing Station is not properly working, the motion has problems.	Verify the absence of obstacles under the needles. Press the button ***Continue*** in the Status menu to retry, the system should recover. In case the alarm is again detected, shutdown the program, the PC and the instrument and then restart the system. If the problem persists, check calibration.
128	Warning: Incubation temperature out of range.	Incubation temperature out of limits.	Verify that the operating ambient temperature is within specification. If not, do not operate the instrument. If it's within the range, shutdown the program, the PC and the instrument and restart the system after 10 minutes. If the problem persists check calibration.
129	Warning: Bar-code reader out of order.	Barcode communication out of order.	Shutdown the program, the PC and the instrument and restart the system. If the problem persists check wiring and device.
130	Warning: Check Photometer lamp.	Photometer lamp doesn't work properly.	Check that the lamp is on and stable. Shutdown the program, the PC and the instrument and restart the system. If the problem persists change the lamp and run a calibration cycle.
131	Alarm: Client-Server TCP/IP error. Restart the system.	PC internal software error.	Shutdown and restart the system. If the problem persists reload SW.
132	Problem during WL	Error during Work List	At the end of the actual

Code	Message	Cause	Action
	scheduling process. Try again.	scheduling.	working session, select *Clean WL* form the *Status* menu and repeat the procedure.
133	Communication error. Command cannot be send to server. Try again.	Temporary Client/Server error.	Retry after some seconds.
134	Database error. Restart the system.	Internal database error.	At the end of the actual working session shutdown and restart the system. If the problem persists check database presence.
135	Database not found. Call for service.	Internal database error.	At the end of the actual working session shutdown and restart the system. If the problem persists check database presence.
136	Problem during filing process. Not all patient data registered.	Error during filing of patients in archive.	None, results are lost.
137	Alarm: Filter motor not properly working. In run press Continue button else restart the System.	The filter wheel fails during motion.	Press *Continue* in the Status menu to retry, the system should recover. In case the alarm is again detected, shutdown the program, the PC and the instrument and restart the system. If the problem persists check calibration.
142	Warning: unknown method loaded by smart card. It can be activated only within instrument operating under smart-card.	A method not included in the list has been loaded by smart card and its memorization in the database failed.	Memorize method.
143	Alarm: the original database was not found. The system has restored the last automatic back up. Please restart the system.	The database is missing or corrupted.	The system has restored the last automatic back up copy of the database. Some results has been be lost. Restart the system.
144	Alarm: critical internal error. Please try to restart the system.	The software or pert of it could be missing or corrupted.	Try to restart the system. Check SW versions.
145	Warning: Ise module communication lost. In Status page click on Ise icon.	The ISE Module doesn't respond. It could be OFF or its wiring isn't properly fixed or it's damaged.	Check if the ISE module is in ON condition. Check that wiring is properly fixed on the back of the ISE Module and on the mother-board.
146	Warning: Ise module	Some air is in the Calibrant A	Reinitialize ISE Module from *ISE*

Code	Message	Cause	Action
	purge A error. In Status page click on Ise icon.	tubing or the Calibrant A is finished.	*module conf* menu. Do it more times if required. Change Reagent pack and initialize ISE Module from *ISE module conf* menu. If the problem persists help to pull up fluid from the pack with a syringe.
147	Warning: Ise module purge B error. In Status page click on Ise icon.	Some air is in the Calibrant B tubing or the Calibrant B is finished.	Reinitialize ISE Module from *ISE module conf* menu. Do it more times if required. Change Reagent pack and initialize ISE Module from *ISE module conf* menu. If the problem persists help to pull up fluid from the pack with a syringe.
148	Warning: Ise module pump cal error. In Status page click on Ise icon.	Calibration of pump motors failed. Air in fluids or hardware failure.	Check for liquid leakages in the ISE Module and check that tubing are free. Check for electrodes properly seated. Re-initialize ISE Module from *ISE module conf* menu. Do it more times if required. If the problem persists check Y-calibration in the inlet cup.
149	Warning: Ise module bubble cal error. In Status page click on Ise icon.	Air in fluids or fluid leakage or hardware failure.	Check for liquid leakages in the ISE Module and check that tubing are free. Check for electrodes properly seated. Re-initialize ISE Module from *ISE module conf* menu. Do it more times if required. If the problem persists check for bubbles into the tubing or change the sensor.
150	Warning: Ise module air in urine. In Status page click on Ise icon.	Air detected into urine sample or pump tubing obstructed.	Check the sample it must be free of bubbles. Repeat the sample. Check for liquid leakages in the ISE Module and check that tubing are free. Check for electrodes properly seated. Re-initialize ISE Module from *ISE module conf* menu.
151	Warning: Ise module calibration error. In Status page click on Ise icon.	ISE Calibration was not successful. Values out of range or difference between the two	Repeat calibration by re-initializing ISE Module from *ISE module conf* menu. Do it more

Code	Message	Cause	Action
		consecutive calibrations out of range.	times if needed. Check for electrodes properly seated.
152	Warning: Ise module air in cal A. In Status page click on Ise icon.	Calibrant A is segmented with air or fibrine is plugging the electrode flow-path.	Check for electrodes properly seated and compressed. Check compression plate, spring and seal. Remove and reassemble electrodes (verify that electrodes and o-rings are properly installed). Run a cleaning procedure from *ISE module conf* menu (command *Clean cycle*). Re-initialize ISE Module from *ISE module conf* menu.
153	Warning: Ise module air in cal B. In Status page click on Ise icon.	Calibrant B is segmented with air or fibrine is plugging the electrode flow-path.	Check for electrodes properly seated and compressed. Check compression plate, spring and seal. Remove and reassemble electrodes (verify that electrodes and o-rings are properly installed). Run a cleaning procedure from *ISE module conf* menu (command *Clean cycle*). Re-initialize ISE Module from *ISE module conf* menu.
154	Warning: Ise module air in cleaner. In Status page click on Ise icon.	Cleaning solution is segmented with air or fibrine is plugging the electrode flow-path.	Check the cleaning bottle it must be free of bubbles. Check for electrodes properly seated and compressed. Check compression plate, spring and seal. Remove and reassemble electrodes (verify that electrodes and o-rings are properly installed). Run a cleaning procedure from *ISE module conf* menu (command *Clean cycle*).
155	Warning: Ise module air in segment. In Status page click on Ise icon.	Air in segment.	Check samples to be free of bubbles. Check for liquid leakages in the ISE Module and check that tubing are free. Check for electrodes properly seated and the o-ring are in place. Re-initialize ISE Module from *ISE module conf* menu.
156	Warning: Ise module no flow. In Status page click	No flow in the path or fibrine is plugging the electrode flow-	Check for electrodes properly seated and compressed. Check

Code	Message	Cause	Action
	on Ise icon.	path.	compression plate, spring and seal. Remove and reassemble electrodes (verify that electrodes and o-rings are properly installed). Run a cleaning procedure from *ISE module conf* menu (command *Clean cycle*).
157	Warning: Ise module dallas reading error. In Status page click on Ise icon.	Reagent Pack chip damaged or reagent pack connector not properly plugged.	Check Reagent Pack connection properly installed and fixed to the reagent connector. Change the Reagent Pack. If the problem persists check proper crimping of the wires or change the pack.
158	Warning: Ise module dallas writing error. In Status page click on Ise icon.	Reagent Pack chip damaged or reagent pack connector not properly plugged.	Check Reagent Pack connection properly installed and fixed to the reagent connector. Change the Reagent Pack.
159	Alarm: Internal memory error.	System memory data not congruent.	Restart the system. If the problem persists contact service.
160	Warning: L.I.S. module client error. Please restart the application.	Error on the L.I.S. KROMA interface.	Restart the system.
161	Warning: some controls are out of range. Please verify in status menu.	Some controls set in Work List are out of range.	Click on the RED control and follow the instructions on the screen. Press *Retry* to repeat Control; press *Abort* to skip controls and analyses related to that control; press *Ignore* to ignore control result and to run anyway analyses; press *Exit* to exit the window without any decision and change.
162	Warning: KROMA LIS Server not active or not enabled.	LIS interface not answering.	Restart the system. If the problem persists check the Ethernet connection.
163	Alarm: the version of the firmware is wrong.	The firmware version programmed on controller boards is not updated.	Update the firmware.
164	Alarm: Fatal error from firmware. Call for service	Firmware internal error: missing of congruency.	Restart the system (instrument + PC). If the problem persists check controller boards.
165	Alarm: barcode not properly working. Call for service.	Barcode reader not working.	Restart the system (instrument + PC). If the problem persists replace the reader.

Code	Message	Cause	Action
166	Alarm: flash memory corrupted. Call for service.	Error during parameters loading or down loading.	Restart the system (instrument + PC). If the problem persists replace the Main Controller board.
167	Alarm: communication lost with MASTER controller. In run press "Continue" button, else restart the system.	Main Controller board not properly working.	Restart the system (instrument + PC). If the problem persists replace the Main Controller board.
168	Alarm: communication lost with ARM 1 controller. In run press "Continue" button, else restart the system.	ARM1 Controller board not properly working.	Restart the system (instrument + PC). If the problem persists replace the ARM1 Controller board.
170	Alarm: communication lost with R&W controller.In run press "Continue" button, else restart the system.	R&W Controller board not properly working.	Restart the system (instrument + PC). If the problem persists replace the R&W Controller board.
171	Alarm: Cuvette tray motion not properly working. In run press Continue button, else restart the system.	The cuvette tray motion fails during motion.	Press the button ***Continue*** in the Status menu to retry, the system should recover. In case the alarm is again detected, shutdown the program, the PC and the instrument and then restart the system. Verify if some obstacles is into cuvette tray to stop the rotation. If the problem persists check the belt.

Section 6 ADDITIONAL INFORMATION

6. Technical Kit

The following kit should be available at service site:

SPARE PARTS			
Item	**Code**	**P/N**	**Kit**
STEP MOTOR DRIVE - 2X1.5A - VER.02	P3140000060	10002-02-A	1 pcs
STEP MOTOR DRIVE - 2X1.5A - VER.05		10002-05-A	1 pcs
STEP MOTOR DRIVE - 2X1.5A - VER.06		10002-06-A	1 pcs
PWR DRIVER MODULE - 9X1A - VER.00	P3140000049	10006-00-C	1 pcs
PHOTODIODE MODULE - VER.00	P3140000048	10011-00-B	1 pcs
MAIN CONTROLLER VER.01	P3140000028	10012-01-C	1 pcs
ARM1 CONTROLLER	P3140000029	10012-02-C	1 pcs
R&W CONTROLLER	P3140000031	10012-04-C	1 pcs
CNT POWER SUPPLY - VER.01	P3140000033	10028-01-A	1 pcs
LHP POWER BOARD		10762-00-A	1 pcs
0.5ML DILUTOR ASSEMBLY	P3140000063	10036-00-A	1 pcs
1.17NB1.8 MOTOR ASSY	P3140000044	10040-00-A	1 pcs
0.48NB1.8 MOTOR ASSY	P3140000042	10041-00-A	1 pcs
1.17NB0.9 MOTOR ASSY	P3140000045	10042-00-A	1 pcs
INCUBATION HEATER STRIP	P3140000047	10043-00-A	1 pcs
OPTO SENSOR VER.00	P3140000035	10045-00-A	1 pcs
OPTO SENSOR VER.03		10045-03-A	1 pcs
LM35 TEMP SENSOR VER01	P3140000038	10050-01-A	1 pcs
LM35 TEMP SENSOR VER02	P3140000039	10050-02-A	1 pcs
2-WAY EV ASSY		10051-00-B	1 pcs
0.20NB1.8 MOTOR ASSY	P3140000046	10055-00-A	1 pcs
BUZZER ASSY	P3140000053	10058-00-A	1 pcs
SR10_30 PUMP ASSY VER.01	P3140000051	10060-01-A	1 pcs
ZRP ASPIRATION PUMP VER.00 (FOR ASPIRAT. NEEDLES)		10938-00-A	1 pcs
ZRP ASPIRATION PUMP VER.01 (FOR TIP)		10938-01-A	1 pcs
RS232 FS9F CABLE ASSY	P3140000084	10062-00-A	1 pcs
24V FAN ASSY	P3140000066	10110-00-A	1 pcs
12V 60x60 FAN ASSY		10112-00-A	1 pcs
CABLAGGIO PHOTODIODE	P3140000011	10148-00-A	1 pcs
CABLAGGIO BARCODE		10155-00-A	1 pcs
OPP ARM MODULE REV.C	P3140000040	10205-00-C	1 pcs
PCB COIL HEATER	P3140000041	10209-00-A	1 pcs
WASHING STATION HEAD	P3140000074	10211-00-A	1 pcs
0.43NB1.8 MOTOR ASSY	P3140000043	10252-00-A	1 pcs
LIQUID 1 TANK REV.B		10405-00-B	1 pcs
LIQUID 2 TANK REV.B		10406-00-B	1 pcs
WASTE TANK REV.B		10407-00-B	1 pcs
ASPIRATION NEEDLE FOR WASHING STATION (SINGLE)	P3140000005	DMC-20077	1 pcs
DISPENSING NEEDLE FOR WASHING STATION (SINGLE)	P3140000006	DMC-20078	1 pcs
DRYING TIP FOR WASHING STATION NEEDLE (SINGLE)	P3140000097	DMC-20169	1 pcs
DRYING TIP + NEEDLE FOR WASHING STATION (SINGLE)	P3140000050	N.A.	1 pcs

SPARE PARTS			
Item	**Code**	**P/N**	**Kit**
KIT OF ASPIRATION + DISPENSING NEEDLE FOR WASHING STATION (PAIR)	P3140000098	DMC-20261	1 kit
FITTING DIAM. 2,3mm	P3140000024	N.A.	10 pcs
FITTING DIAM. 3mm	P3140000026	N.A.	10 pcs
NUT (BIGGER) 20281-00-A	P3140000089	N.A.	10 pcs
NUT (SMALLER) 23-08-010A	P3140000090	N.A.	10 pcs
FERULE 1/8 YELLOW, P-300	P3140000106	N.A.	20 pcs
FERULE 1/8 BLUE, P-200	P3140000107	N.A.	20 pcs
CABLAGGIO KROMA SWITCHES		10774-00-A	1 pcs
CABLAGGIO KROMA FILTER		10775-00-A	1 pcs
CABLAGGIO KROMA DC OUTPUT		10776-00-A	1 pcs
CABLAGGIO KROMA POWER		10777-00-A	1 pcs
CABLAGGIO KROMA FLAT		10778-00-A	1 pcs
CABLAGGIO KROMA SENSORS		10779-00-A	1 pcs
CABLAGGIO KROMA ARM		10781-00-A	1 pcs
CABLAGGIO LHP POWER		10940-00-A	1 pcs
KROMA 100 CONTROLLER MOTHER BOARD		10803-00-B	1 pcs
500ul DILUTER		10911-00-A	1 pcs
MICROSWITCH SENSOR		10943-00-A	1 pcs
38ML SR10_30 PUMP ASSY	S3141000534	10638-00-A	1 pcs
80ML SR10_30 PUMP ASSY	S0200000107	10946-00-A	1 pcs
APN20 PUMP ASSY	S3141000575	10947-00-A	1 pcs

ACCESSORIES AND CONSUMABLES			
Item	**Code**	**P/N**	**Kit**
HALOGEN LAMP 12 V 20 W	P3140000105	10749-00-A	1 pcs
KIT OF FUSES	P3140000075	N.A.	1 kit
KIT OF TUBES (El-Valve & washing station)	P3140000076	N.A.	1 kit
KIT OF TUBES FOR CLEANER SOLUTION TANK (5 lt - blue)	P3140000083	10648-00-B	1 pcs
KIT OF TUBES FOR SYSTEMIC SOLUTION TANK (20lt - green)	P3140000082	10647-00-B	1 pcs
KIT OF TUBES FOR WASTE TANK (25lt - red)	P3140000081	10649-00-B	1 pcs
MULTICLEAN SOLUTION 6x2 lt	P3140000112	N.A.	6x2 lt
PC SERIAL CABLE	P3140000022	N.A.	1 pcs
PRIMARY TUBES FOR SAMPLES	P3140000100	N.A.	1000 pcs
READING CUVETTES	P3140000093	N.A.	200 pcs
READING TRAY WITH 80 CUVETTE	P3140000103	N.A.	1 kit
REAGENT BOTTLE R1 WITH CAP - 50 ml	P3140000019	N.A.	50 pcs
REAGENT BOTTLE R2 WITH CAP - 20 ml	P3140000086	N.A.	50 pcs
RINSE SOLUTION (Ew Cvt) 6x50 ml	P3140000113	N.A.	6x50 ml
RINSE SOLUTION (Ew Prb) 6x20 ml	P3140000115	N.A.	6x20 ml
SAMPLE CUPS 3 ml	P3140000001	N.A.	1000 pcs
SAMPLING PROBE	P3140000016	N.A.	1 pcs
SYSTEMIC SOLUTION 6x50 ml	P3140000087	N.A.	6x50 ml
TOOL FOR SINGLE CUVETTE EXTRACTION	P3140000077	N.A.	1 pcs
ISE Module Cl- Electrode	S3141000286	5203	1pcs
ISE Module K+ Electrode	S3141000285	5202	1pcs
ISE Module Li+ Eletrode	S3141000287	5205	1pcs
ISE Module NA+ Electrode	S3141000284	5201	1pcs

ACCESSORIES AND CONSUMABLES			
Item	**Code**	**P/N**	**Kit**
ISE Module Cleaning Solution 90 ml	S3141000292	5421	1pcs
ISE Module Fluid Tubing kit	S3141000294	5611	1kit
ISE Module Pump Tubing kit	S3141000293	5610	1kit
ISE Module Reagent Pack (Cal A, Cal B, Waste)	S3141000290	5420	1pcs
ISE Module Reference Electrode	S3141000288	5204	1pcs
ISE Module Spacer Electrode	S3141000289	5206	1pcs
ISE Module Tubing Adapter	S3141000295	5612	1kit
ISE Module Urine Diluent 125 ml	S3141000351		1pcs
ISE Module Urine Diluent 500 ml	S3141000291	5408	1pcs

Note: Distributors must anyway have in-house one Technical Assistance Kit any 10 to 15 instruments for speeding up service operations and for assure a fast and reliable maintenance. Ask the Producer for the kit.