Contents

Section 1
Introduction

The RM-33N is a precision instrument that uses an electrodeless water conductivity sensor to control the flow of cleaning water for electroplating.

In this way the conductivity is used to measure the chemical concentration of the cleaning water

When correctly installed, this system will save at least 50% of the water previously used, while at the same time making sure that exactly the right amount of water is used to achieve the desired cleaning

The quality of the product, and chemical life are improved as a result, as well as the significant saving in water cost.

The reason for the saving is that the RM-33N constantly monitors how much chemical is present in the cleaning water, using a controller and solenoid valve to allow water ONLY to be used when the chemical concentration reaches a level certain level, called the ‘SETPOINT’
When the SETPOINT level is reached, the water valve opens, and the water flows for a short time, and then shuts off when the chemical concentration falls below the setpoint again.

The chemical concentration is then maintained in a very tight range, with precise control of water flow.

If this control system is not used, then there are wide variations in water flow, which, when averaged over time, uses twice the amount of water that is actually required.

Section 2

The System.

The RM-33N is a complete rinse water control system, ready assembled and supplied as a complete kit including everything that is required to control the rinse water in a cleaning stage.

The system diagram is shown on page 5

System components are:-

Controller	RM3301
Water control valve/flowmeter	RM3302
Conductivity sensor	RM3303
Remote controller	RM3307
Power supply (for 1 controller)	RM3304/1
Power supply (for up to 16 controllers)	RM3304/16
USB Interface box	RM3305
RMVIEW software	RM3306

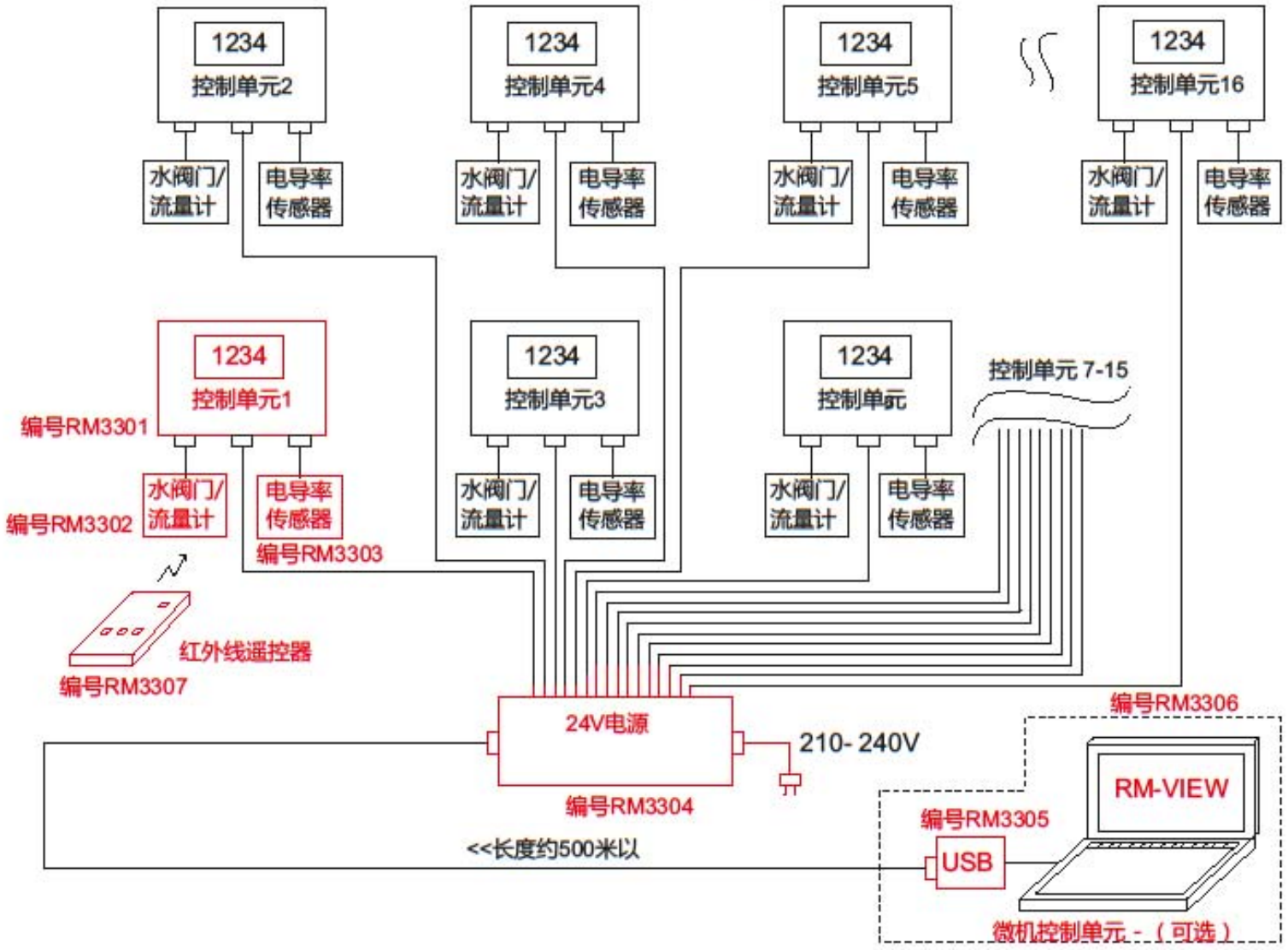
The minimum configuration is:- 1 each of RM3301, 3302, 3303, 3307, 3304/1 OR /16

Up to 16 RM3301 can operate from 1 Power Supply RM3304/16, allowing control of cleaning water for all the stages of a modern electroplating line

The main components are already pre-wired to make installation quick and simple.

RM3301, RM3302, RM3303 are wired, with 5m of cable. The +24V DC power supply connection is the only connection that is required to be done, and this needs to be attached when installing.

RM-33N系统示意图


1234
控制单元2
1234
控制单元4
1234
控制单元5
1234
控制单元16
水阀门/流量计
电导率传感器
1234
控制单元1
编号RM3301
1234
控制单元3
1234
控制单元
控制单元 7-15
水阀门/流量计
编号RM3302
电导率传感器
编号RM3303
红外线遥控器
编号RM3307
24V电源
210- 240V
编号RM3304
编号RM3306
RM-VIEW
编号RM3305
USB
<<长度约500米以
微机控制单元 -（可选）

Section 3 Components Description

RM3303 Water Sensor
Designed for extremely long life in the electroplating environment, it can remain in the washing water for very long periods of time without requiring cleaning or calibration.

The material used is polypropylene, with no electrodes or other metal parts that can become corroded.

This component uses advanced technology from the uk company, that measures water conductivity very accurately without any contacts, ie, electrodeless

Very long service life is ensured for this component

RM3302 Water control valve/flowmeter
This component uses a very high quality stainless steel valve made in Germany by Burkert.

The water valve is combined with an in-line turbine water flowmeter, which sends water usage data to the controller

Quick-disconnect solvent fitting water pipe connections are used, and there is also an inline mesh filter to prevent the valve seat from being damaged by small particles in th water.

When installed correctly, it is extremely reliable

RM3301 Controller
The controller is in a sealed case, with a transparent lid, and has no exposed buttons, or lid to open, so it is highly resistant to the environmental conditions.

Controller features.

Conductivity SETPOINT
The desired conductivity can be easily set, and remains in memory during power down.

Clear Display
The display is bright 7 segment red LED, allowing it to be read easily from a distance.
The resolution is 1uS, where 2uS = 1 ppm (part per million) of chemical in the cleaning water.

Water ALARM
There is an inbuilt alarm system, which cannot be switched off accidentally, so the fault needs to be cleared for the alarm to stop. The alarm indicator is a very bright red flashing light, and this comes on if there is no water flow through the flowmeter, in the situation where the valve is open.

Totalising water flow meter.
Water usage is recorded automatically in memory, showing litres used.

RM3304 24VDC power supply,
This is available in 2 sizes,
RM3304/1 is a low cost supply for use with a single controller that do not require RMVIEW, or that can be conveniently connected to a 220VAC supply nearby.

RM3304/16 can supply the power for up to 16 controllers, and provides the pathway for the RMVIEW data from each of the controllers connected to it.

The system uses 24VDC power to operate the controller and solenoid valve, for maximum safety.

RM3305, RM3306, -RMVIEW
RM3305 is a USB interface that can allow communication up to 500m from the situation of the RM3304/16.

RMVIEW is a windows based program that allows all the features of the system to be operated from a simple windows based program.

The controllers continue to work independently even if RMVIEW is closed, and the remote control could also be used if the computer is turned off .

Section 4
Installing the RM-33N
Fitting Conductivity Sensor in rinse tank:

Step 1) Positioning Sensor & rinse tank considerations:

The correct positioning of the sensor is important. It should be situated in the tank in which water enters, i.e. in a 3–stage rinse, it should be the 3rd and cleanest water stage

The sensor should be positioned by the water outflow if possible.

Make sure that the sensor is securely attached using the clamp provided.

Depending on your tank design, this is usually in the corner diagonally opposite the water feed, as shown in the diagram below. A sensor position on the same side of the tank as the outflow, and the opposite side to the water entry is acceptable.

The water should be fed via a pipe which goes to the BOTTOM of the tank, this is most important since top-feed of water is a great cause of water wastage, since it allows incomplete mixing of incoming water.

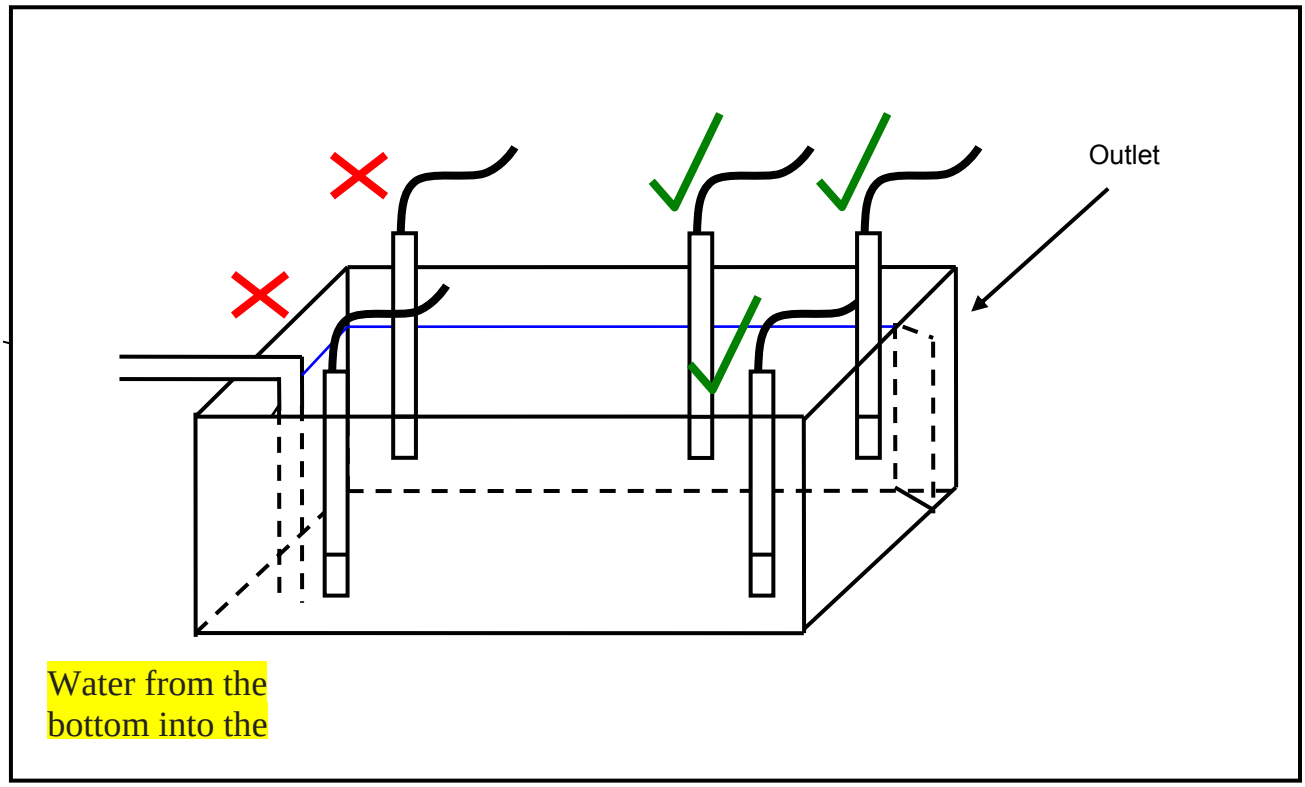


Fig 4.1a – Typical tank layout., showing sensor postioning

It is important that the sensor is *not* next to the water supply to the tank as this will affect the reading, and cause the water control valve to cycle needlessly.

Water supply pipe

It is good practice to direct the water supply pipe face the edge of the tank so that water is forced to mix as much as possible before exiting the tank. This can be achieved by fitting an elbow on the end of the inlet pipe. Again, ensure that the pipe is fully to the bottom of the rinse tank, otherwise the water savings will be greatly reduced.

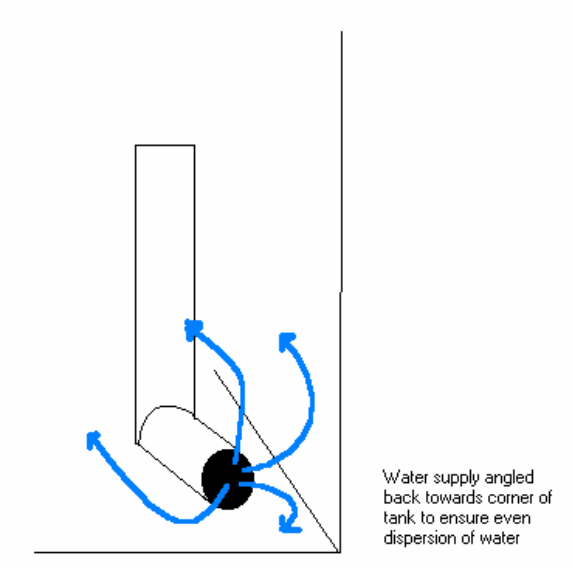


Fig 4.1b – directing water feed pipe.

Step 2) Mounting the conductivity sensor to the tank

The sensor clamps to the side of the tank – tighten the screw so that the sensor is held firmly in place.

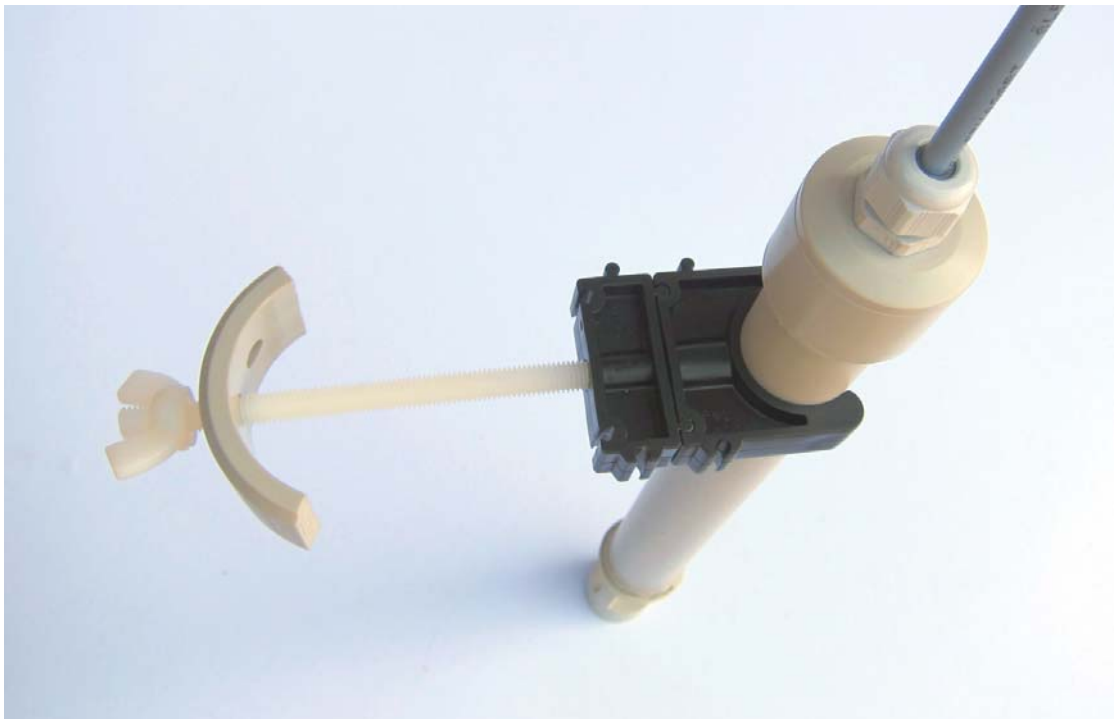


Fig 4.1c – tank conductivity sensor clamp.

Adjusting sensor submersion depth

The sensor head up to the welding joint must be completely submerged in water as shown in picture below. The position of sensor mounting clamp can be adjusted by moving the clamp up and down the sensor tube until desired level of submersion is achieved.

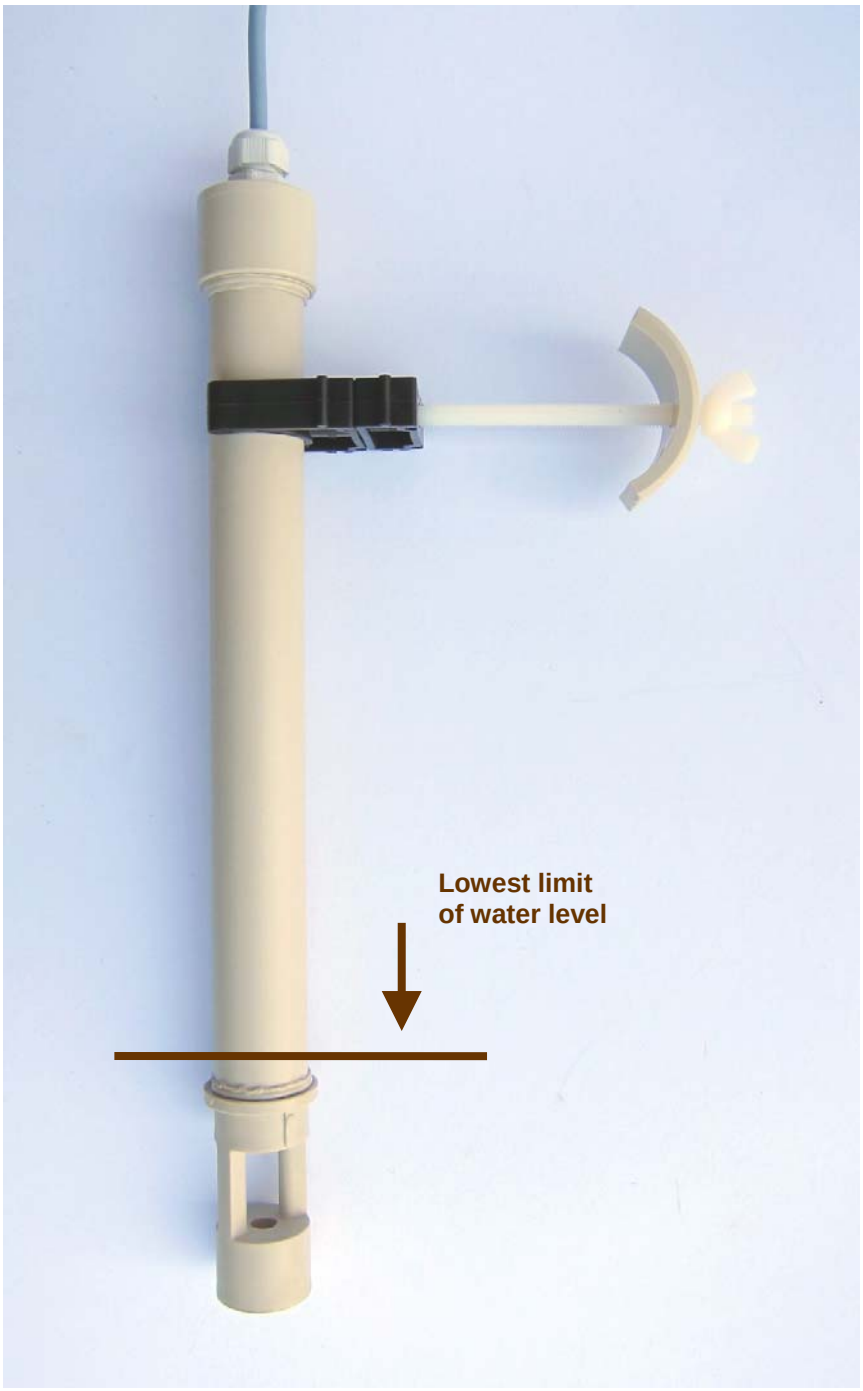


Fig 4.1d – Water level .

Step 3) Installing Water Control Valve & Flow Meter Module.

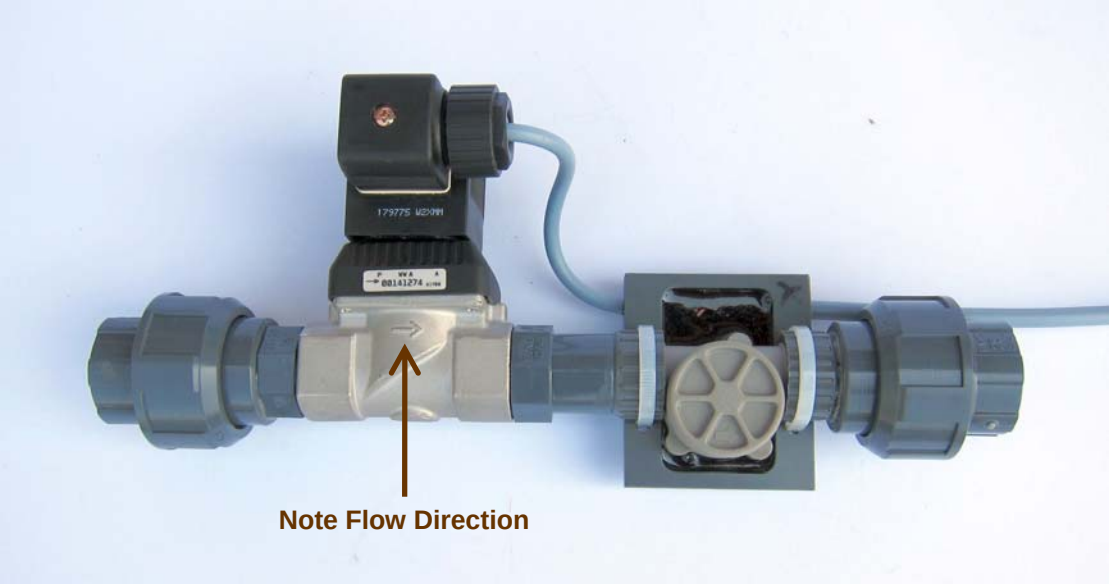


Fig 3.2a – water control valve & flow meter module.

The RM-33N has a pre-assembled water control valve and integrated flow meter module.

Connecting to pipe work:
The module is terminated at either end with plain 25mm PVC socket unions for insertion into the water feed pipe work.

IMPORTANT: Ensure that you fit the solenoid and flow meter in the correct water flow direction (marked by arrow on valve – see fig 3.2a above). The preferable orientation of the valve is with the operating coil uppermost. Take care the excessive strain is not placed on the flow meter wire and that there is some slack in the wiring when in its final position.

Prepare the sockets first with an abrasive paper and ensure they are clean using a suitable solvent. Apply a thin, even layer of glue to both the pipe and the solenoid adaptor and push both firmly together. It is important to ensure that solvent is not allowed to enter the valve body/flow meter assembly itself, otherwise damage may occur to the valve seating and sealing as well as to the flow meter bearings.

The module comes pre-wired to the control unit

IMPORTANT:
Remember to wait until the solvent adhesive is thoroughly hardened before pressurising the system.
The flow meter and valve assembly contain very small orifices which can be blocked by dust or dirt in the water system. Take caer to make sure that plastic cutting dust doest enter the valve.
Ensure that the pipe system is flushed through before fitting the assembly. If the pipes have been used for other chemicals, it is essential that they are thoroughly cleaned by running water through before operating.

Step 4) Installing the Control Unit

With the sensor fitted to the tank and the water control valve and flow meter module fitted in the water feed the next step is to install the control unit.

Fig.3a – the control unit

Mounting the control unit.

The control unit has 4 fixing holes for this purpose, the position is shown in the photo above.

First carefully unscrew the corner cover screws, They will remain in the lid when unscrewed.

When the lid is removed, then unplug the ribbon cable connector between the base circuit and the lid circuit.

Place the lid carefully in a clean dry place, taking care to keep the white sealing ring in place inside the lid seal groove.

Now the unit can be screwed in place using the four fixing holes in the rear of the box, outside the sealed area.

Mount the control unit at a convenient position where it will not be subjected to direct spills of water or chemicals, as well as convenient for receiving the IR remote control signal in a direct line of vision.
It should also be close enough to allow the water valve and sensor wires to have easy direct connection.

If there is a walkway beside the plating line, it is often convenient to mount it on the walkway, opposite to the cleaning stage that is being controlled, so that the conductivity can be shown on the display relates to the water of that particular cleaning stage.

To connect the water valve/flowmeter, unscrew the fixing nut from the cable gland, and push the connector through the left hand hole in the bottom of the enclosure. Loosen the cable gland, and push through enough wire so that the black 6 way connector can be fitted into position on the circuit board. Place the cable gland nut over the wire and connector, and tighten the cable gland firmly in place in its hole in the enclosure. Then place the 6 way connector into its respective socket on the circuit board marked ‘valve and flowmeter’ (it is the bottom connector).

To fit the conductivity sensor, repeat the same process as above, but using the black 4 way connector, and sensor wire, fitting this to the right hand hole in the base of the enclosure, and fitting the connector in place in the socket marked ‘sensor’ (it is the top connector).

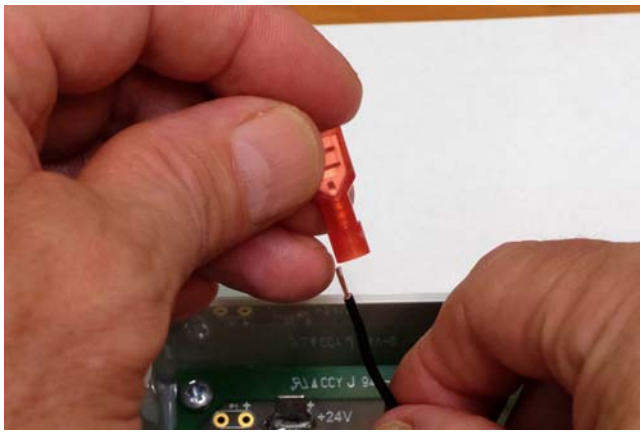
To connect the +24V supply wires to the controller, do the following:

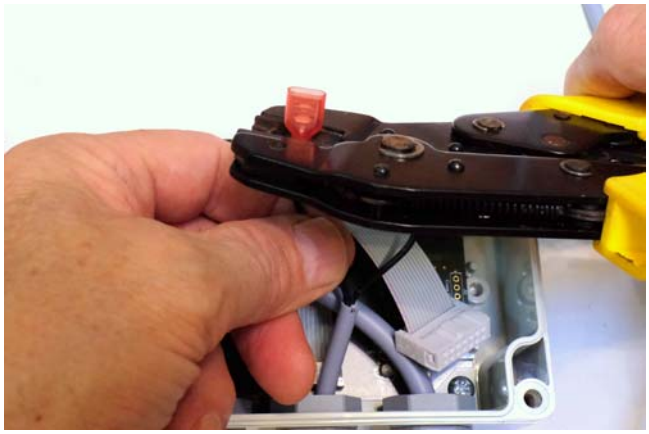
Route the wire from the power supply to the controller, and cut it to length, leaving enough wire to allow the connection inside the controller.

Remove the outer covering of the wire to leave approximately 5 – 6 cm of inner wire.

Feed the wire through the centre cable gland, into the box, and pull through sufficient cable to allow the connection to be made inside.

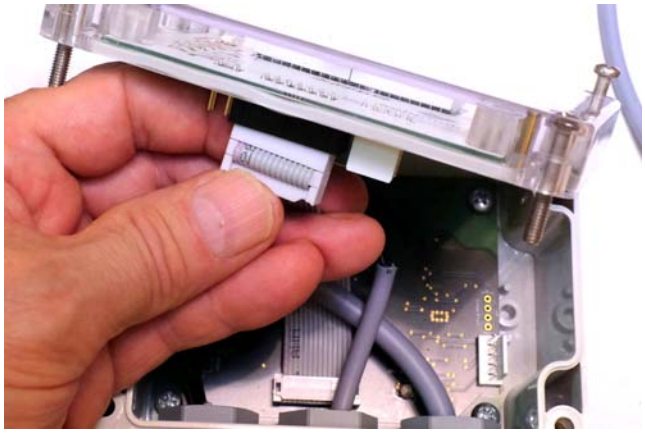
Strip the insulation from the wires, suitable for crimping the 6.35mm female connectors, and crimp these in place as shown.





Push the connectors firmly onto the male terminals on the pcb, taking care to put the +24VDC and 0V on to the correct connectors, as shown on the PCB:-

Now, taking the lid, reconnect the ribbon cable connector, and making sure that the white seal is correctly seated in the lid groove, carefully replace the lid.



Tighten the cover screws evenly, ensuring that the lid is sealed in position.

Finally , make sure that the cable glands are correctly tightened, so that no water or atmosphere can enter the controller enclosure during use.

Power may be applied at this stage, to verify the correct connection of the wiring. If the power connection is reversed, then the unit will not be damaged, but will not function, so requires that the two connections to be reversed.

IMPORTANT NOTE;-
Pay attention to the sealing of the controller when installing. Do not attempt to wire the controller using wire that does not fit or seal the cable gland in a completely watertight manner.

For this reason, each controller should be wired individually to the power supply, which, although less convenient than chaining the wiring from one controller to the next, gives the greatest protection to the controller.

Make sure that all cable glands are sealed, and not loose in the box holes, and that the lid is seated correctly, and the four cover screws are tightened evenly

The system is now ready for operation.

Section 5
Operation of the RM-33N

The controller:

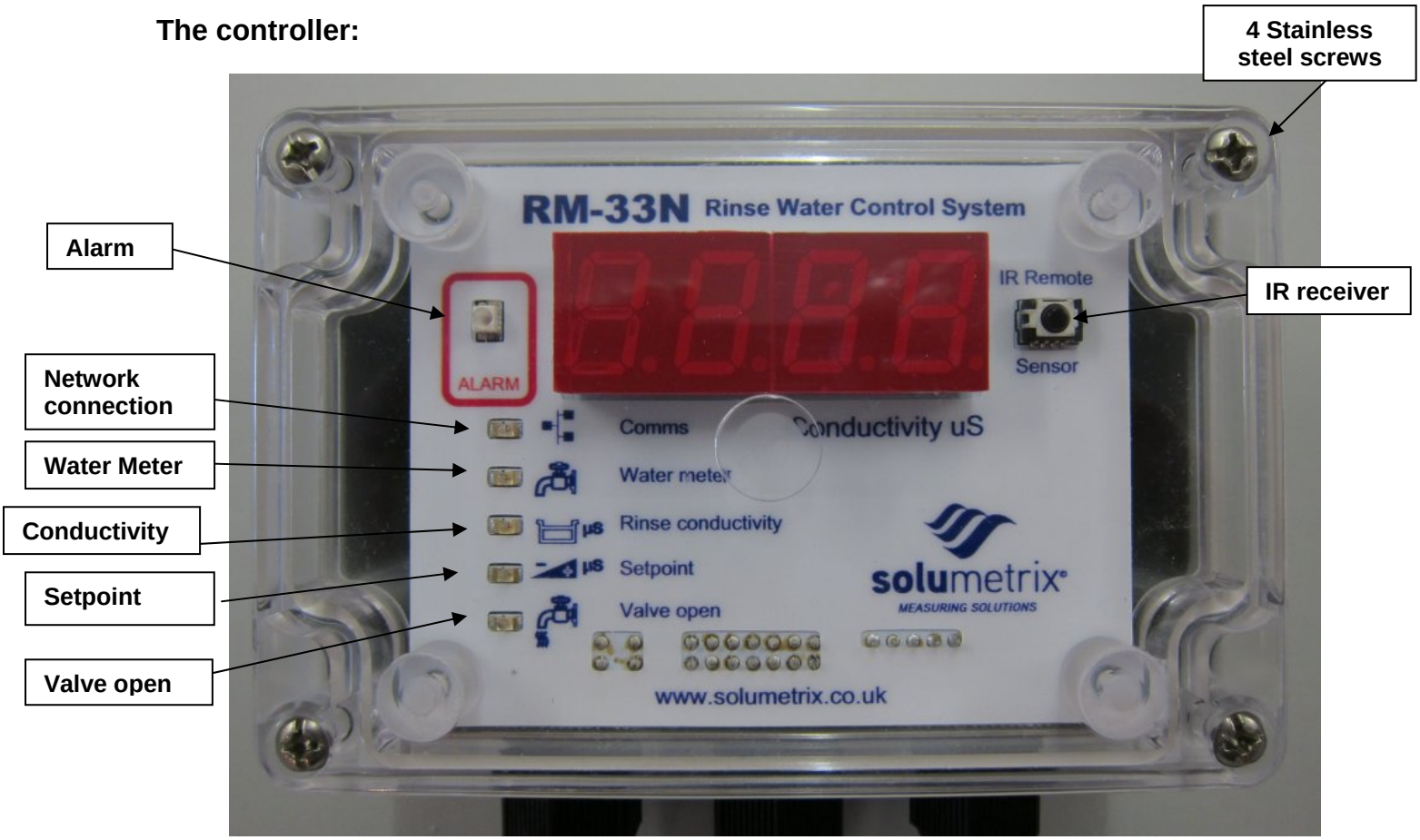


Fig 4.1a – RM-33

Fig 4.2 Infra-Red Remote Controller

In order to switch between display modes press the Mode select button – the selected mode will be indicated by a red LED. All values are displayed on the LCD display.

The display modes are as follows:

– **flow meter display mode.** The RM-33 has an integrated digital flow meter. In this mode the amount of water used is displayed in cubic metres and litres.

– **tank conductivity display mode**. In this mode the conductivity of the rinse tank is displayed in µS.

– **set-point adjust mode**. In this mode the set-point conductivity value at which the water control valve starts dosing the rinse tank is determined.


– **solenoid open**. A blue led comes on whenever the conductivity is above the set-point to indicate that the water control valve is set to open. If the water valve has been shut for less than 10 seconds however, the LED will light, and the valve will open after a delay to prevent the valve from excessive wear.

Viewing rinse tank conductivity:

To view the conductivity of the rinse water in the tank;

Repeatedly press the Mode select button until the 

LED lights up.

The LCD display indicates the level of conductivity in the tank in µS.

Adjusting rinse water conductivity set-point:

To adjust the rinse water conductivity set-point at which the water control valve opens to control the tank carry-in level;

Repeatedly press the Mode button until the 

LED lights up.

- Hold the Mode button down for 10 seconds and the 

LED will start to flash.
- Now use the Up/Down adjust buttons to change the Set-point indicated on the LCD display to the desired value.
- Once the desired set-point is reached, press the Mode button - this value will be stored as the new set-point and the water control valve will now be opened whenever this value is reached.

Water flow meter:

How to show the amount of rinse water used;

- Repeatedly press the Mode select button until the  LED is illuminated.

- The display first shows the cubic metres of water used (1000's of litres).

- By pressing the mode button again ( LED still illuminated) the remaining litres (indicated by an L on the display) are displayed.

- Once the counter reaches 9, 999, 999 litres it will roll over to zero. If you wish to manually reset the counter to zero litres at any time press the up/down buttons simultaneously.

Section 6
How to calculate the settings required for your RM-33N

Conductivity used for controlling the water

Conductivity is used as the way to measure how much dissolved chemical there is in the cleaning water.

If the conductivity is high, then this means that there is a lot of chemical in the water, and if conductivity is low, it means that the water is quite pure.

The units of conductivity are Siemens (S) , but this is too large a unit , so we use mS, which are one thousandths of a Siemen, and uS, which are one millionths of a Siemen.
1000 uS = 1 mS
1000 mS = 1 Siemen.

Process chemicals have a conductivity which are in the range 25,000 – 650,000 uS, = 25 – 650 mS.

For most chemicals, the concentration in ppm (parts per million) is 1ppm= 2uS.

Process chemicals vary considerably in conductivity, an acid such as HCL can be as high as 650 mS.

This measurement method gives a very convenient way of measuring the chemical concentration in the rinse water, just divide the uS reading by 2, and this gives the ppm of the chemical in the water.

Rinse ratio

The rinse ratio is the ratio between the concentration of chemical in the process solution, and the concentration of the chemical in the cleaning water.

If the cleaning water is very clean, then the rinse ratio is high, and if it is allowed to become loaded with chemical, then the rinse ration is low.

Effect of incoming water conductivity

The incoming water conductivity is the conductivity of the water that is going to be used by the control system, and it has an effect on the rinse ratio.

Normal tap water has a conductivity that is depending on the region, and depends on how much Calcium there is in the water.

If purified water is used, then the conductivity is very low indeed, ranging from 5 – 40uS.

For normal tap water, the conductivity can be between 50uS and as high as 700uS in areas with a lot of calcium

Calculating Real Rinse Ratios

The effect of the incoming water conductivity is important, especially when high rinse ratios are needed.

Rinse Ratio is calculated as being:-

(Process Chemical uS) ÷ (SETPOINT uS – Incoming water uS).

(SETPOINT uS – Incoming water uS) is a figure indicating the amount of chemical in the cleaning water.

For guidance, this figure, when divided by 2, gives the parts per million of chemical in the cleaning water.

To be able to use the RM-33N, you need to calculate the SETPOINT

So, step by step, it is done this way:

First measure process chemical uS, using 5JI

Then, measure your incoming water conductivity, also using 5JI. Do not try to use another type of measuring meter, it will not be accurate for both measurements, because of the very wide range between the readings.

Then, you can decide how much chemical that can be allowed in your cleaning water. This is the target uS value for the amount of chemical that is allowed in the cleaning water.

The higher that the value of the target uS is, the higher will be the SETPOINT, and there will be greater water saving, so always choose a value which is low enough to prevent problems with carry-over of chemistry, but high enough to allow good water saving.

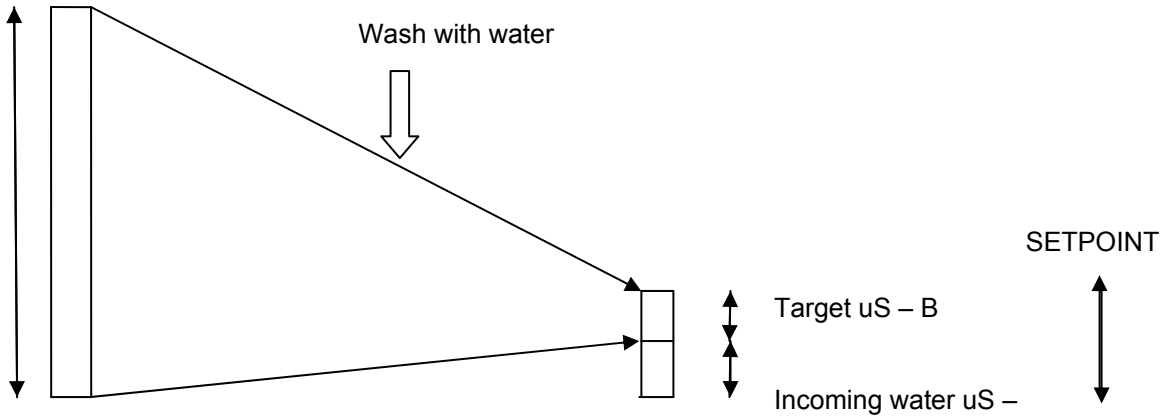
Example:
If we are using Hcl, (650,000uS) and have decided that target uS value is 200uS in the final cleaning water, and the incoming water conductivity is 250uS, then---

SETPOINT = incoming water conductivity + target uS value

So, SETPOINT = 250 + 200 = 450

This can be seen from this diagram:

Process chemical uS - A



Rinse Ratio is A / B

As shown above, the rinse ratio is = process chemical uS ÷ (SETPOINT – incoming water uS), which in this case is 650000 ÷ (450 – 250) = 3250.

The excel program we supply can quickly do this calculation for you.

The 5JI electrodeless conductivity meter

Section 7
Safety precautions

The RM-33N can be used in environments where toxic and corrosive chemicals are present.
The user of this system must be aware of dangers of these hazardous substances and take all necessary precautions in this respect when installing and using the RM-33N.

The RM-33N control unit must be powered by suitable 24 volts DC power supply. Ensure that proper cables are used, and isolate the mains power before working on any of the system components.

CAUTION!

To avoid electric shock never place the power supply in places where water could get inside, and never open the box of power supply as it contains live mains voltage!

Never attempt to connect the RM-33Ncontrol unit directly to the mains, it is intended for operation from 24VDC only, and never short circuit the output of power supply as it will result permanent damage to the control unit or power supply!

Use protective gloves when handling and of the system components that are situated in the electroplating environment.

If conductivity sensor needs to be replaced use protective clothing to protect your skin from hazardous chemicals, and make sure that sensor surface is rinsed after pulling the sensor out of the tank.

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