

3 Laboratory Requirements

3.1 Cello Position

The footprint of Cello depends on the configuration. For the machine shown in Figure 2, which comprises 2 Liquid Handling Modules, a single Reader Module, 2 or 3 incubators plus an input/ output module, the overall footprint is 4.6m long x 2.5m wide. The overall installed machine height is 2.4m.

The machine requires access around three sides, and clearance for opening module and aisle access doors. This brings the overall footprint to 5.3m long x 4.2m wide.

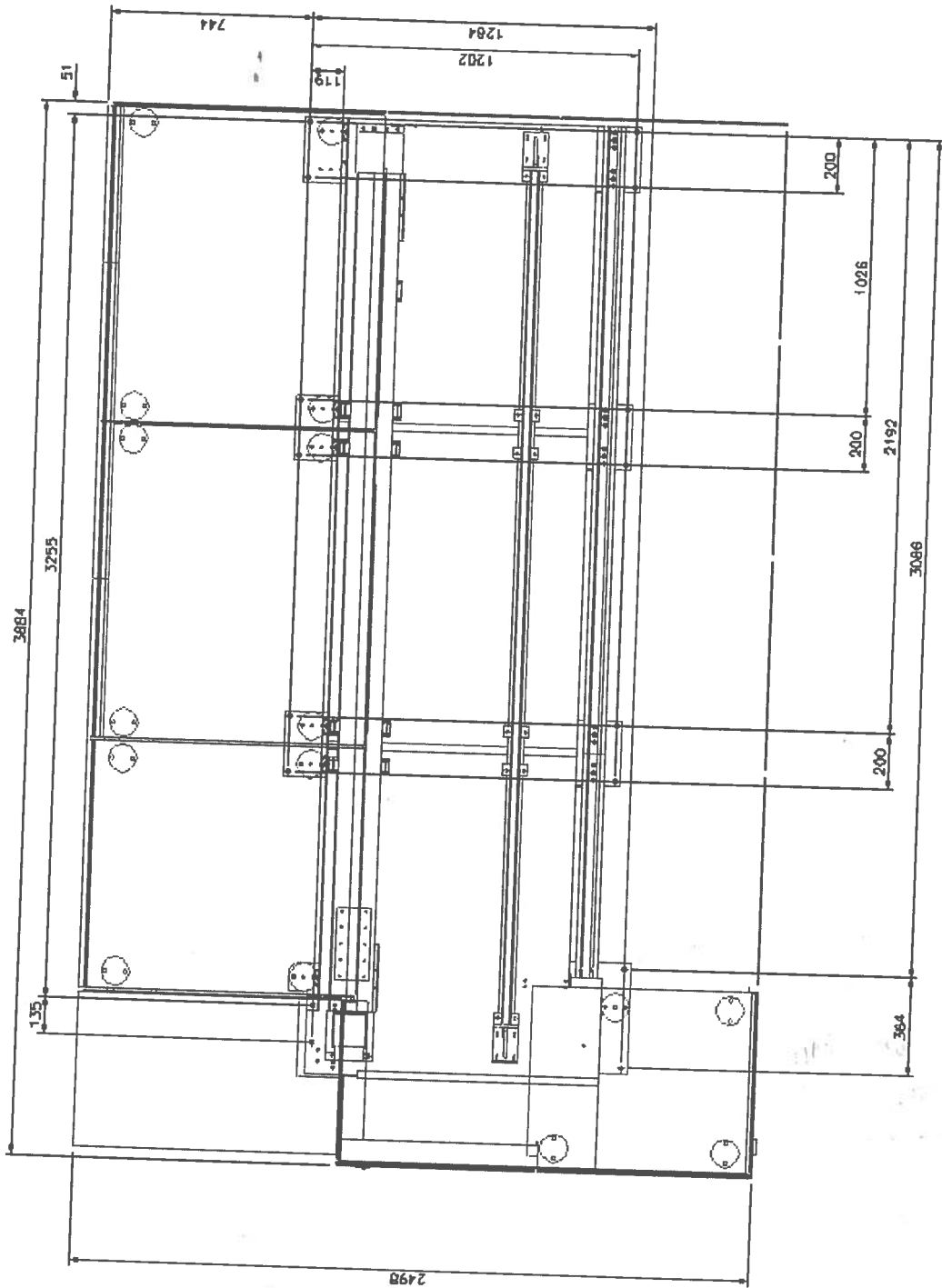
The end of the aisle opposite the operator access may be positioned against a wall.

Important Points:

- Services will be connected to the area marked "Services connection" on Cello diagram.
- Air extraction is required from the exhaust boxes on each liquid handling module (see section 3.3). The exhaust box positions will depend on the machine configuration. This must be discussed with the TAP project manager.
- The floor must be flat and level within +/-5mm.

3.1.1 Floor drilling

Cello is bolted to the floor of the Client's laboratory. A total of 16 holes $\phi 12\text{mm} \times 80\text{mm}$ deep will be drilled by TAP to fix down 4 sleeper plates.



3.2 Minimum Room Height

The minimum recommended room ceiling height for Cello is 2.5m.

3.3 Ventilation

If ethanol or other flammable solvents are used in the process in the Liquid Handling Modules (LHM) (eg for tip washing and sterilising), the customer must provide extraction to prevent a potentially explosive atmosphere occurring. This must be connected to the outflow from each exhaust box. This connection will be to a rectangular opening on each box. The drawing shows the hole size and fastener positions.

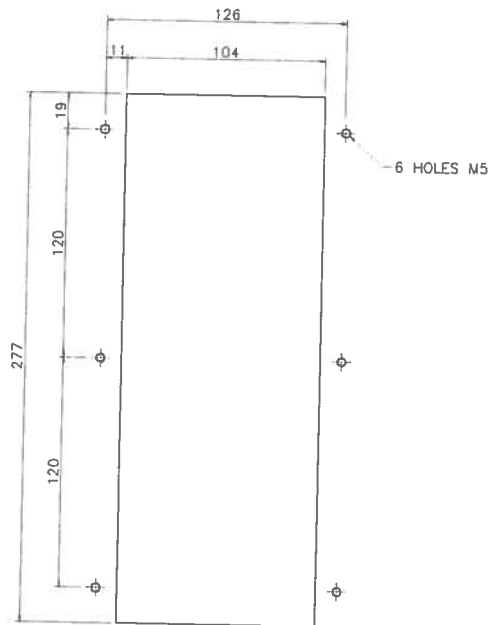


Figure 1 Extract box hole arrangement

In normal operation, there is sufficient dilution of ethanol vapour in the LHMs to keep well below the Lower Explosive Limit. Vapour is extracted through the exhaust boxes and vented into the laboratory extraction system provided by the customer.

The customer's extraction system can be a fixed and sealed or a "thimble" connection. A fixed system should be balanced with the Cello exhaust boxes and respond to a change in extract rate when an access hatch is opened. The advantage of a thimble connection is that



the building extract rate can be constant, whether the access hatches to the liquid handling modules are open or closed. However, it is important to make sure that any failure of the laboratory extraction system does not leave the Cello machine pumping ethanol vapour outside the thimble into a "sealed" lab space, building up to a dangerous concentration.

Important note: The customer's extraction system must be suitable for dealing with potentially explosive vapours.

Whenever flammable solvents are present on the machine, the power must be left on so the fans are running to maintain a safe atmosphere.

Cello has ethanol vapour detectors which will automatically shut down the machine if the vapour level reaches 25% of the Lower Explosive Limit. To resume operation, the customer's ventilation system must be run until the vapour level has dropped to a safe level which will allow Cello to be powered up.

Note that the exhaust box for each Liquid Handling Module has two HEPA filters in series for bio-hazard filtration.

3.3.1 Ventilation rates

In normal running, with all access doors closed, the exhaust system is extracts approximately 200m³/h.

The extract rate will automatically increase by 450m³/h when the access window for each Liquid Handling Module is opened. So for a typical system with two Liquid Handling Modules, the maximum extract rate is $450 \times 2 + 200 = 1100\text{m}^3/\text{h}$.

3.4 Weight Of Machine And Floor Loading

The total weight of Cello depends on machine configuration. A typical system as shown in Figure 2 weighs approximately 5000 kg. Each module weighs between 300 and 700kg. Each module is supported on four 100mm diameter plastic swivel-type feet (exact locations available on request).

In addition to the machine weight, 250 kg should be allowed for the labware and media used in the machine. The customer is advised to check this estimate against the labware and media that they expect to use in or near to the machine.

If Cello is used with supply voltages other than 400 VAC (normal voltage for UK/Europe) then a further 200kg should be allowed for a transformer (if the transformer is to be sited next to the machine). Similarly the weight of a UPS (if required) should be included if it is to be located next to the machine (UPS is not supplied by TAP so we cannot advise on weight).

3.5 Laboratory Environment

The laboratory temperature should be between 10°C and 25°C.

The humidity should be between 40% and 60% RH.



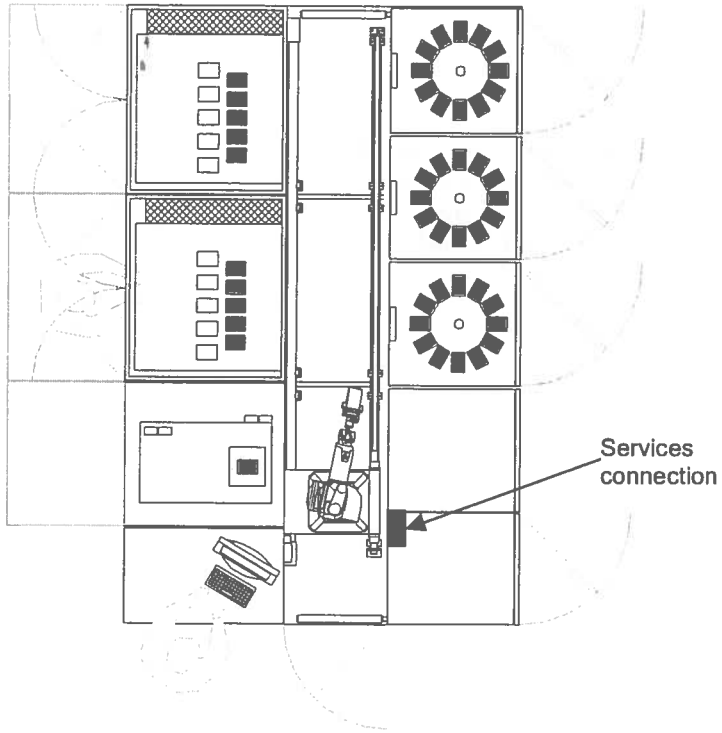


Figure 2 Plan-view of Cello.

4 Services

All services (including modem and network connections) are connected to the top of the machine in the area shown in figure 1.

TAP strongly recommends that all services be connected via plugs and sockets with separate isolators for each connection. This hardware should be provided by the customer and matching plugs should then be provided to TAP at least one month before shipping so TAP can adapt/connect as required. This applies to all services: electrical power, compressed air, carbon dioxide, network and telephone, but not to alarm contacts.

4.1 Electrical Power Requirements

Cello requires a three phase power supply.

4.1.1 400 Volt Supply

In the UK and in Europe, the main supply electrical supply should be 3 phase (+ Earth + Neutral) 400 VAC, capable of supplying 20A phase to neutral, 50/60 Hz; single cycle surge load of 120A.

4.1.2 Alternative Supply Voltages

TAP can provide a transformer for installations where 400 VAC is not available. Typically, the transformer would require a supply of 208 VAC, 40A, 3phase (+ Earth + Neutral); capable of 200A single cycle surge load. This transformer cannot be fitted inside Cello but can be fitted in a separate box, dimensions approximately 600mm wide x 300mm deep x 600mm high. Please call your TAP Project Manager to check the exact dimensions as they may vary.

4.2 Uninterruptible Power Supply (UPS)

For the machine to run with the best performance and reliability TAP recommends that the whole machine is run on an Uninterruptible Power Supply (UPS). Where there is a history of long power failures this should be fed from a maintained power supply.

The main variable is the hold up time, which is really determined by the end users according to their confidence and experience. The hold-up time should be a minimum of 5mins - in this case an input power failure will always trigger an immediate controlled shut down. TAP would suggest a hold-up time of 30 minutes, which will allow Cello to continue without interruption for short-term "brown outs".

Cello requires two digital inputs from the UPS to indicate:

1. Input power failure
2. Low battery

The low battery signal should be triggered when the UPS has 5 minutes run time left.



For UPS sizing, the power factor of the machine is estimated to be not less than 0.75. TAP can provide details of a suitable UPS vendor.

4.2.1 UPS specification

- Europe: 380-440VAC 3 phase, neutral and earth input
- US: 208VAC (or 480VAC) 3 phase, neutral and ground input
- 400VAC 3 phase, neutral and earth/ground output
- 20A per phase (14kVA)
- 5kW average running load
- Surge load 120A
- VF (dry) contacts to signal the user building monitors and the TAP system

4.3 Compressed Air

A compressed air supply is required with a minimum supply pressure of 6 bar. Consumption will be approximately 0.5 cfm at 6 bar (3.5 cfm free air). The peak flow rate will be approximately 2 cfm (50 l/min) at 6 bar. The supply must be unlubricated, filtered to 5µm, and dried to a dew point < 10°C.

4.4 Carbon Dioxide

The machine requires a supply of PURE carbon dioxide gas (NOT 5% in air). Supply pressure should be 1 bar (14psi). Consumption will vary depending on usage and the required concentration.

4.5 Wash water

Cello requires water for washing pipette tips. This should be tissue culture quality, through a 0.22µm filter immediately upstream of Cello. The supply pressure should be less than 0.6m head. The peak flow rate is expected to be 100ml/min for each Liquid Handling Module during washing cycles. Wash volumes will depend on the customer's process. TAP will advise on request.

4.6 Waste

Cello will produce waste from re-feeding plates and from the tip washing process. Aqueous and alcohol waste is separated, which allows the customer to deal with them separately if they require this. Alternatively, the customer may combine the two waste outlets.

The waste may be held in containers outside Cello, or taken to drains via buffer containers. In either case, Cello requires two waste container level sensors to be connected to it. This allows Cello to respond appropriately if a waste container is full (or the drain is blocked). If

only one container (and hence one level sensor) is used because the aqueous and alcohol waste lines are combined, a dummy plug is connected to Cello for the unused sensor input.

Waste volumes will depend on the customer's process. TAP will advise on request.

4.7 Alarm Contacts

The machine will be provided with volt-free alarm contacts. These contacts can be used by the customer as required. For example, they may be linked to a paging system, or an audible or visual alarm. Supply and specification of these items is the responsibility of the user.

VF contact	Alarm signal
1	Alcohol vapour over limit (hard wired inside Cello)
2	Incubators out of range or air flow out of limits (hard wired inside Cello)
3	Configurable software alarm (eg, "waste tank full"); a number of conditions may be added to trigger this alarm
4	Liquid handling module 1 access flap open (to be used for Client's BMS to increase exhaust fan speed if required)
5	Liquid handling module 2 access flap open (to be used for Client's BMS to increase exhaust fan speed if required)
6	System running

4.8 Telephone Connection

There will be times when the Cello operator will need to operate Cello and talk to TAP at the same time, for Service and Support issues, fault finding etc. This means that the operator needs to have access to a telephone next to Cello.

TAP recommend that a cordless telephone is fitted next to Cello, so that the operator can walk around Cello and operate/inspect certain parts of Cello while still talking to TAP.

4.9 IT Provisions

See TAP-9024-01-0501 IT Inf Requirements.doc for the IT infrastructure requirements required for the Cello Machine.