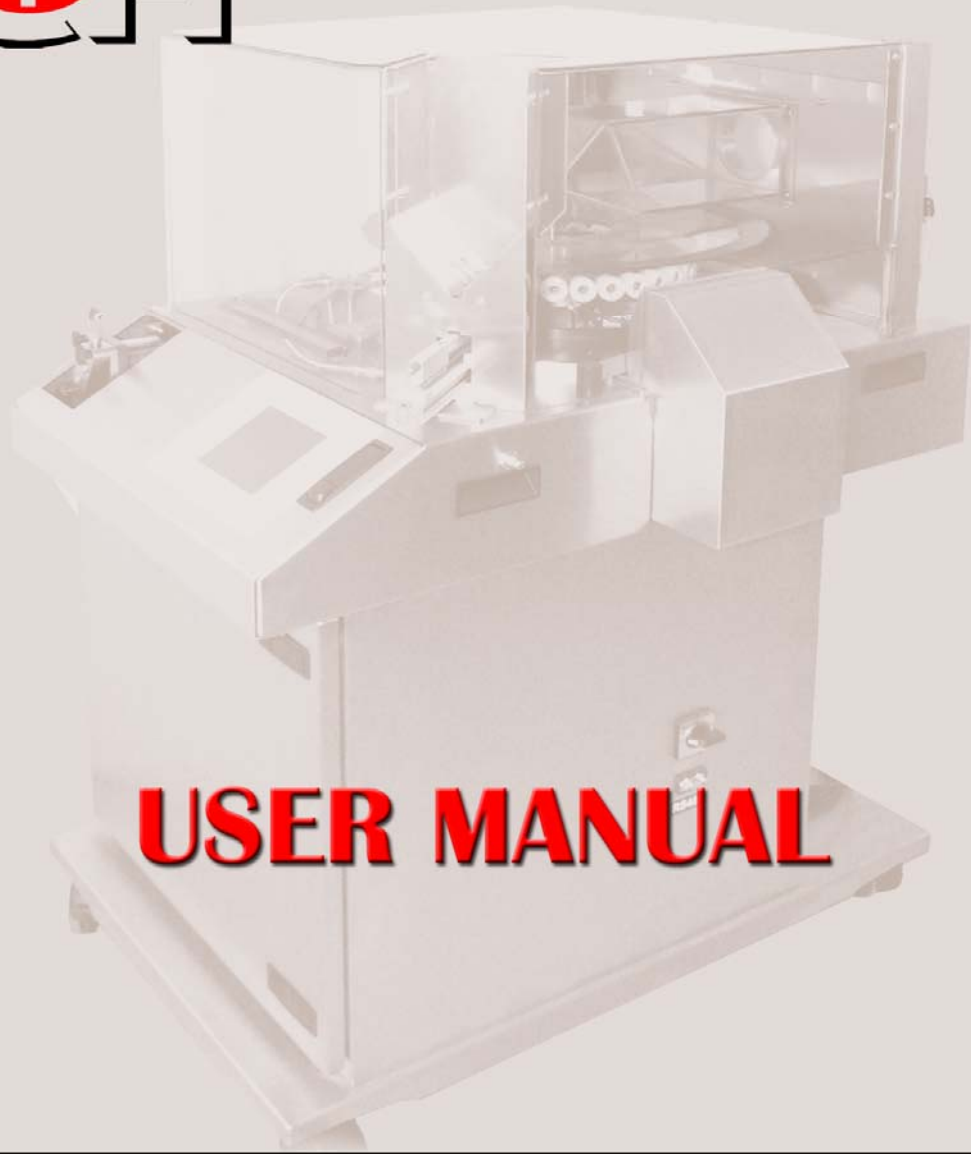


**CH TECHNOLOGIES (INC), USA.**



## **USER MANUAL**

**Jaeger-Baumgartner 2080  
Cigarette Smoking Machine**

## Table of contents

Page

### *JB 2080 User Manual*

Unpacking	3
Setup	6
Electrical Connections	6
General Layout	5
Care Recommendations	7
Installing	7
Fittings below the ISO flange	8
Smoke Ducts	10
Compressed Air	11
Tools	11
<i>Machine Operation</i>	
Hopper/Feeder	12
Rotating Head	13
ISO Flange	14
Pressure Drop	15
Cigarette Holders	16
Ejection	17
Ashtray and Waste Bowl	17
Smoke Filter-Gas Analysis	18
Sensors	18
Lighters	19
Hood	20
Heat Shield	21
Control Cabinet	22
Computer Control	23
Materials Used	23
Cleaning	24
Guarantee	24
Contact Information	24
What If?	25
Address of Suppliers	26

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## Unpacking

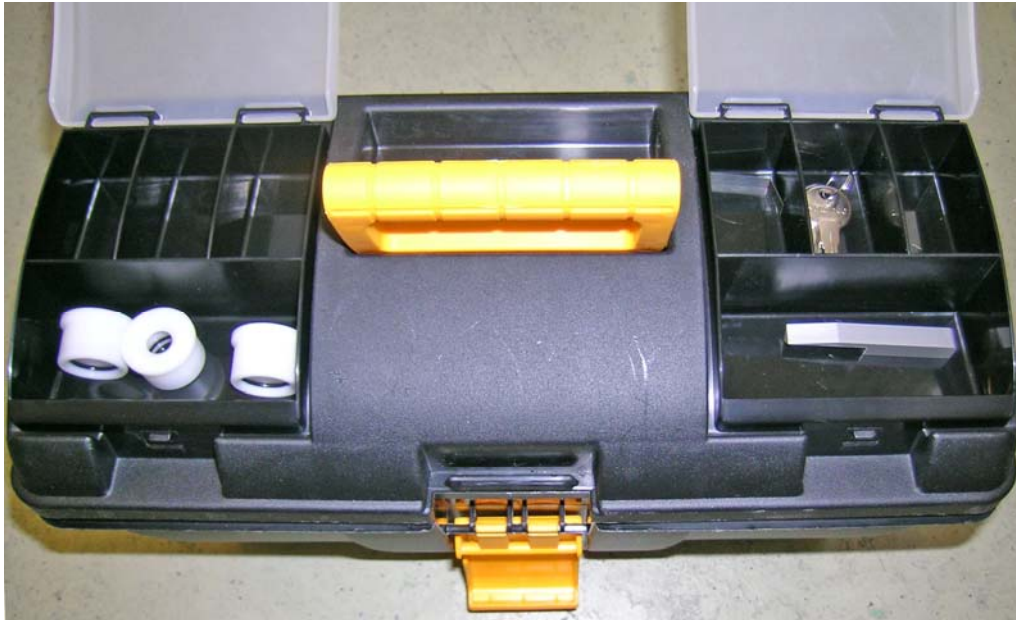
The Jaeger Baumgartner Cigarette Smoking Machine (CSM) is delivered complete within a single wood case. The front panel marked « Open this panel » is also ramp. A few “Torx” screws must be removed first. The machine is maintained in its transport case by a transverse beam locking the base plate. This beam is the next item to be removed. Accessories will be found in the parcel attached on the base plate.

The machine can then be rolled out as shown below.



The machine is transported on a 2” expanded polystyrene floor, which acts as a damper in case of shocks during transportation. It is recommended that the machine, in particular, the stainless steel base plate be checked that it does not show signs of damage due to vertical shocks (heave). Note the small toolbox visible at rear of box on the picture above.

The cover of the toolbox, shown below, contains usually two identical keys for the electrical cabinet, a pusher for short cigarettes, an ash spring and 3 cigarette holders. Additional items may be included on request.



(fig. #2)

The lower compartment of the toolbox, shown below, contains two sets of Allen keys, and a Torx screwdriver for the ashtray drive motor.



(fig. #3)

The ramp panel is installed so as to allow the machine to be rolled out. It is advisable that two persons do this to ensure a safe rollout.

Once rolled out, remove floor panel in box. The cigarette carousel is stored in a recessed well, and is protected from any damage which may occur during transport.



(fig. # 4)

We recommend keeping the transport case in storage and in good condition for machine repair or replacement, and in the event the machine must be shipped on a later occasion.



## Setup

### ***Product identification***

Each JB 2080 is identified by a profile number. This Number is located inside the swiveling front panel under the touch-screen on a black sticker. Please indicate this reference number whenever ordering spare parts.

### ***Electrical connections***

All electrical connections to the product must be rated according to the requirements for circuits, as defined in EN-Standards. The CSM accepts a variety of input voltages. A selector located inside the electrical cabinet must be set to the particular voltage.

The CSM is shipped with the voltage selector set on 110V 60 Hertz.

The machine is supplied with a standard 3-pole US Power cord located at the rear. The main switch is on the right side of the machine.

The CSM meets EC Safety standards.



### ***General Layout***

The CSM is composed of two stacked main units; (1) the smoking machine and, below, (2) the electrical cabinet.

The smoking machine groups all mechanical components which are necessary to automatically smoke cigarettes in restricted smoking condition according to the ISO 3308 standard. A front panel contains an interactive touch-screen for user inputs. Minimal electric components are mounted inside the CSM, notably the power source for the electrical lighter. For safety reasons the front panel is equipped with a key lock.

For normal operation, 86 psi air and if gas lighted, propane (or butane) gas must be supplied to the smoking machine.

The programmable control module is located in a cabinet containing electrical and electronic hardware. The assembly is on a base frame, it has 4 wheels which can be locked.

### ***Care recommendations***

Manipulation of the ash spring on the first (right rear) butt length sensor should be carried out with care. It is a 0.1mm spring steel blade. This spring will break long ash rods off the cigarettes. Inadvertently hitting it will damage or destroy it.

The carousel and the ISO flange are both in tempered stainless steel, a material currently used for cutlery and is quite immune to scratches. The ISO flange is coated with an extremely hard (1500 Hv) wear resistant coating. This favors low friction and, being non-adhesive, ease of cleaning. The annular sealing surfaces must stay in perfect condition and the 30 smoke ducts must have sharp edges. A dent will break the seal and may compromise the smoking function. Metallic objects, ie a hexagonal screwdriver, can be introduced in the smoke ducts, when doing this, use extreme care. Never put the bare carousel with the sealing surface on a table. Leaving the cigarette holders on the carousel should insure a sufficient clearance to protect the sealing surface, but prudence requires an additional cushion layer.

### ***Installing***

The CSM is serviced from the front. The PVC hood can be raised for access to the carousel, lighters and sensors. Access must also remain possible from the right side where the waste bowl is located and frequently removed. The door of the electrical cabinet front must remain accessible as well.

At the rear of the machine there is an exhaust air duct connection. It is 100mm OD, (approximately 4 inches). This should be permanently connected to a ventilation network. The volume flow should attain 120 m<sup>3</sup>/h (70 cuft/mn). It is recommended that the exhaust system be designed with an ample margin of flow e.g. 200 m<sup>3</sup>/h (120 cuft/min).

A compressed air line is necessary. Recommended pressure is 6 bar (86 psi). The connection on the machine is located inside the base behind the touch screen. It faces the operator. The connection will accept OD 6 mm tubing. One suitable material is Polyurethane tubing. The tube can be introduced from the front panel opening on the right. It can as well be introduced from the rear, through the base. The connectors on the pneumatic valve group and actuators are quick connects and no tools are required. A clean-cut tube end has to be pushed into the connector. To remove, press the blue plastic ring on the fitting connector while pulling the tube. The quick connector can be replaced for other tube diameters. Do not use wrenches or clamps on the outer diameter. It is recommended to an Allen key for removal.

Whenever optional gas lighting is used, a suitable gas delivery tube has to be connected on the 8mm OD burner tube. This is then laid around outside the ashtray fence towards the rear and out through the small window towards the right behind the waste bowl. A hand gas valve should be nearby. Propane and butane can both be used.

On the electrical cabinet, except for a main switch at the side, there are no controls for the operator to adjust.

### ***Fittings below the ISO-flange***

There are several smoke ports on the periphery of the ISO flange allowing 1, 2 or 3 puffs (or more) during one turn of the carousel. The main puff port necessary for lighting is facing the electrical lighter. Under the ISO-flange, the CSM is supplied with a straight tube connector. This connector has a 1/8" NPT male thread to match the port in the flange. This fitting will accept 8mm OD tubing, preferably polytetrafluoroethylene (PTFE) or polyurethane (PU). It is a quick disconnect fitting. No tools are required to insert or remove a tube. Simply press the front ring to unlock the clamping system. The supplied make is a stainless steel "Legris" make but any other 1/8 NPT-8mm straight or elbow fitting can be installed.

The fittings usually have an outer hexagon suggesting the use of a fork key. We do not recommend the use of such tools mainly because the access is generally too obstructed.

Some JB 2080 machines are supplied with 1, 2 or 3 HPP pumps. Pump 1 is always connected to the main puff port.

The software supplied with all 2080 machines is able to manage 3 pumps. Optional controllers and an additional CPU is needed for more than a single HPP.

If there are 2 pumps mounted on the machine, the second (Pump 2) is normally connected to port at the 180 degree location, opposite from main port (half-turn).



If there are 3 pumps, pump 2 is connected to the 120 degrees location, while pump 3 is connected to the 240 degrees location.

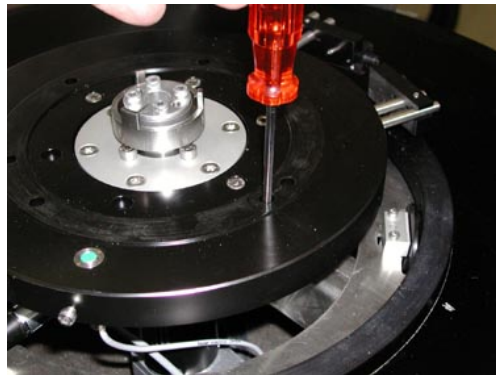
If there are 3 pumps, the machine can be run as if it were equipped with two pumps. In this case, pump 2 must be disconnected from its 120 degree port and connected to the 180 degree port. Pump 3 is a standby.

It is advisable to use Allen keys. Most fittings have an internal hexagon which allows this. Fig. 4 below shows an Allen key inserted in a Legris straight fitting. Some sizes are only accessible on the threaded side.



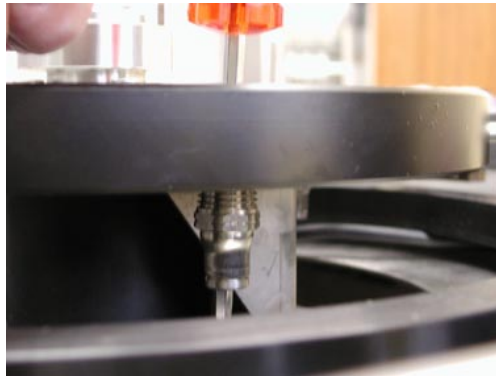
(fig 4)

Fig 5 shows how the fitting is tightened (or loosened) from above. Another advantage of the procedure is that prior to inserting the NPT thread, the Allen Key will line up the fitting with its thread.



(fig. 5)

Therefore, if other fittings are used, we recommend using those fittings that have an internal hexagon.



(fig. 6)

When changing a fitting, we recommend that PTFE tape be wrapped around the thread. Stainless steel has very poor self-lubricating properties and may seize if not wrapped.

### **Smoke ducts**

We recommend using polyurethane tubing or PTFE. The smoke tube can be lead out of the machine in several ways:

- Through the base using a port in front of the waste bowl.
- Above the ashtray by using an elbow coupling
- To the rear through a removable aluminum plate that closes off the ear of the base. The plate is optional. The unit is usually shipped as shown with an open back

(Rear view)

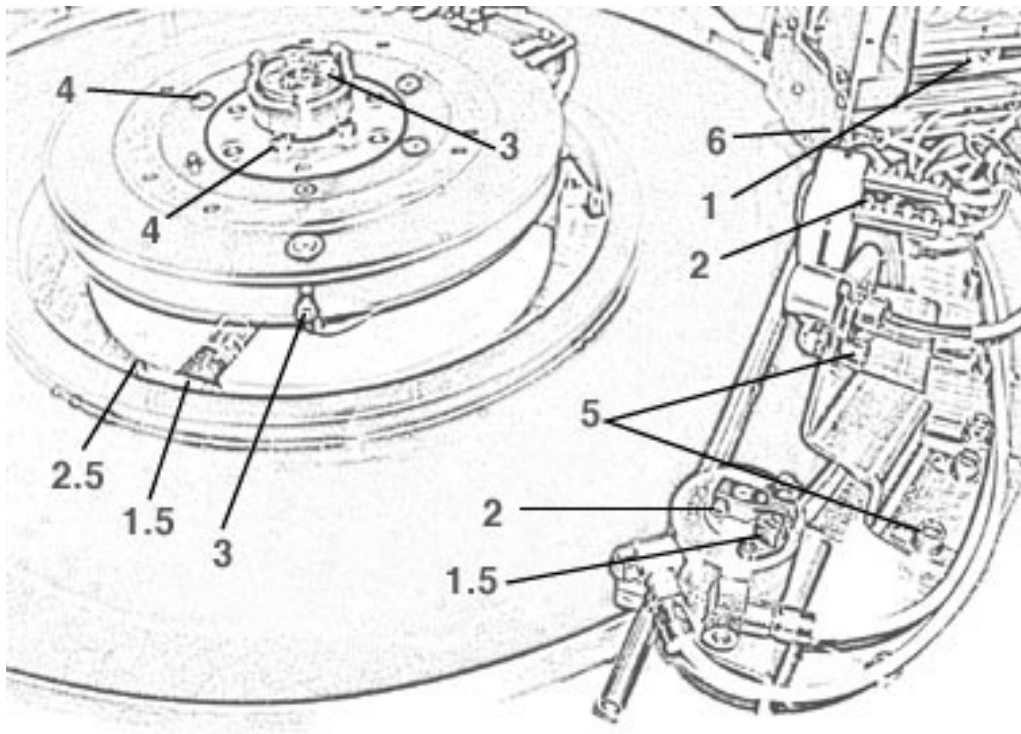


## **Compressed air**

Clean and dry compressed (not oil lubricated) air suitable for breathing is required to operate the hopper loader, the gas burner pivoting arm and to eject spent cigarette butts. Supply pressure to the laboratory should be about 6 bar (86 psi); a pressure governor is attached to the CSM for pressure adjustment if higher pressures are provided. The rotary and linear pistons are fitted with flow restrictors on the in and out lines. The restrictors can be set so as to easily obtain the desired speed of motion for a given air pressure.

## **Tools**

The toolbox mentioned previously contains hexagonal keys and hexagonal screwdrivers. The major sizes are indicated in the drawing below (fig. 7).

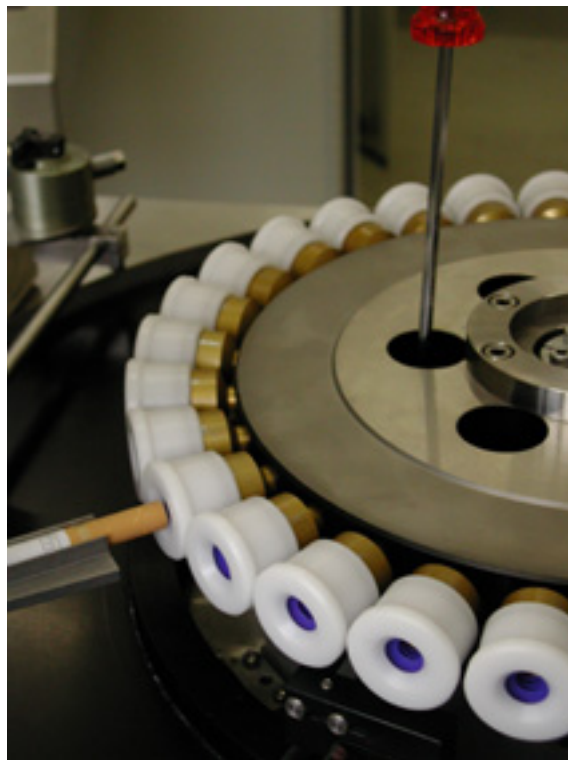


(fig. 7)

## Machine operation

### ***Hopper/Feeder***

It is good practice to check the alignment of the hopper spoon in relation to the cigarette holders. The first step consists of initializing the carousel so that it stops with the first holder facing the hopper. The spoon can be pushed manually forward so the cigarette can be positioned only millimeters ahead of the labyrinth seals and the alignment checked. The picture below shows the test. Note that the head is preferably rotated so that the large holes provide access to the four M6 screws locking the ISO flange to the base. By tightening the screws in a suitable order, it is possible to finalize the perfect height adjustment of cigarette and holders.



(fig. 8)

The cigarettes are stored in a hopper with a capacity of 400 standard cigarettes (dia 8mm length 100mm). The hopper accepts cigarette lengths from 50 to 100mm. Loading stroke is adjusted manually to cigarette length. The loading piston is a double acting FESTO piston. The speed of the piston can be adjusted with the flow control valves at both ends of the piston. Rocking devices in the hopper funnel avoid prevents bridging by a reciprocating motion. The hopper case is designed for cigarettes up to 32mm circumference. 1mm aluminum shims are provided to smoke the more usual 25 mm circumference cigarettes. They fit in the funnel. Without shims, the 25mm circumference cigarettes may jam the funnel. The hopper spoon sitting on the pneumatic feeder is designed for 25mm

circumference cigarettes of 80 to 100mm length. For other diameters and lengths below 80mm, specific spoons are also provided.

After filling the hopper with cigarettes, the acrylic window should be introduced. It is first used to align the cigarettes, and then when hooked in the appropriate notches, a minimal clearance to the cigarettes results in a correct alignment. As it is difficult to align the notches on both sides of the hopper, scribe marks are located every 5 mm as a reference. As an option, an Acrylic window in two pieces can also be supplied. The center part can be removed leaving an outer frame within the notches. It is then possible to manipulate the cigarettes without interrupting the function of the hopper.

Cigarettes are loaded into each holder of the rotating head by a pneumatic feeder. It carries the hopper spoon and a pusher that can be adjusted with a screw. The setting of this screw should remain steady over time in spite of repeated actuations. Therefore, the screw has an internal brake. The correct pusher setting has to be carried out with the Acrylic window in place with a minimal clearance left for the cigarettes, typically 1mm.

Some test strokes are required to adjust the correct depth of introduction. It is recommended that the pusher screw be set to the point where the cigarettes are not pushed too firmly. Compression folds will show on the paper wrapper if this occurs. The pusher screw is then released up to the point where the cigarettes load unharmed.

The machines supplied have been tested with cigarettes, which differ almost certainly from your test cigarettes. The first load tests with the particular cigarettes used in a new experiment may not be satisfactory. It will be necessary for the operator to spend some time making the adjustments. First, in terms of length, suitable labyrinth seals and loader adjustment is needed to obtain even loading of all holders. Also setting the lighter for best ignition may take some trials. The ejection pressure should be set so that the spent butt is ejected without fault.

Loading can be carried out irregardless of head movement, as loading is triggered by an angular sensor and software.

### ***Rotating head***

The rotating head – or carousel- supplied with the machine has 30 evenly distributed holders. The holders comply with ISO standard. The resulting distance between the centers of adjacent burning zones is less than 50mm in opposition to ISO 3308 (5.3.5). Loading the head with 15 cigarettes will fully comply with this particular



ISO requirement whenever it is mandatory. The rotating head is supported by an annular self lubricating seal (the ISO Flange) with 8 ports, 6 of which can be used to draw smoke, one is used for enhanced lighting, and one being the pneumatic butt ejection port. The annular sealing surfaces must be carefully handled. Never use metallic tools.

The rotating head is driven by a MAXON servomotor and zero backlash gear. Rotation can be set manually to either continuous rotation at constant speed, 1 rpm, or intermittent steps from port to port, or some ports skipped. Automatic operation is programmable to accept a wide variety of puff patterns. Maximum speed is 60 rpm to allow fast skipping wherever necessary.

Rotation is in clockwise direction seen from above the machine.

No tools are required to remove or mount the rotating head. Just lift it off. With reference to the motor drive, there is only one possible angular position for fitting on the drive coupling.

Optional items included; a rotary head with less ports than 30.

In contrast to other common designs, the rotary head and ashtray are fully independent of each other leaving about 20mm circular free access directly under the rotary head.

### ***ISO Flange***

The rotating head turns over a fixed flange. This is called the ISO flange. This flange has puffing ports at 0°, 84, 120°, 180°, 240°, 264°, 276°, 348°. The port located at 276° is used for pneumatic butt ejection. The 348° or -12° is for pre-ignition where new smoking materials need a substantially larger puff to ignite the cigarette.

The angles are counted in clockwise direction, 0° being at the front point that is closest to the operator and display.

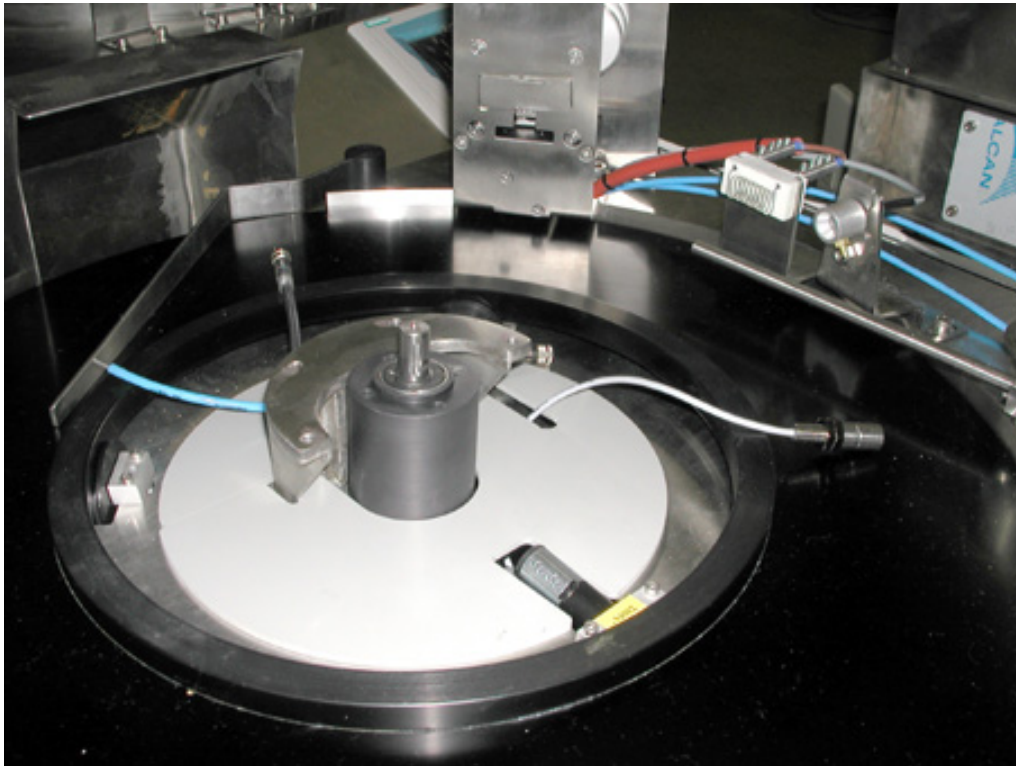
The rotating head and the ISO-Flange are tempered stainless steel. No particular lubrication is required unless sticky tobacco condensate causes increase friction. A small amount of silicone grease may be used.

All connectors to ports are female 1/8" NPT threads. The recommended connectors are straight or 90° fittings for 4 to 8 mm OD polyurethane or PTFE tubing. With the straight connector, a tube can be led out of the case below the ashtray to the rear. With 90° connectors a more direct path would lead above the ashtray to the sides of the machine, where analysis equipment, traps etc can be located.



In most cases, the length of tubing from the cigarette end to a point outside of the machine is about 0.5 meters. Shorter lengths are also possible.

There is a large opening below the ISO flange allowing access to the numerous ports. Once the setup is defined and routine work is underway, it is advisable to close this opening avoiding residues falling into the machine base. Upon request a closure can be provided. It consists of two PVC segments, which can be easily modified to leave space for piping or wiring, as may be required in an experiment. The picture below shows one available design.



(fig. 9)

### ***Pressure drop***

It is assumed that a standard puff (35 cc/2 sec) flows in a 4 mm ID tube, 0.5 meters long. This must be confirmed with a suitable meter, i.e., a soap bubble meter and stop watch.

The velocity in the tube is 1.4 m/s.

The pressure drop is 26 N/m<sup>2</sup>, well below the maximum limit in ISO 3308, 300 N/m<sup>2</sup>.

### ***Cigarette holders***

The anodized holders are screwed into 30 openings on the carrousel. The 5mm bore smoke duct has an internal 5 mm hexagonal section. This allows easy mounting and removing the parts with a 5mm Allen key. Never use tools grabbing the outer diameter of the holders.

The POM holder caps are designed to receive color coded labyrinth seals and washers according to ISO. There must be 4 labyrinth seals in the holder. The three first seals receiving the cigarettes have the cup facing the cigarette. The last labyrinth is flipped as shown below.



(fig. 10)

Once inserted in the holder the visible labyrinth must be as below.



(fig. 11)

## ***Ejection***

The butts are ejected pneumatically. The gust can be adjusted with a flow restrictor that is located next to the hopper. The flow direction is marked on the restrictor. Erroneous mounting will prevent operation of the restrictor. It is recommended to eject with the lowest possible airflow. A too intensive gust may blow out the foam discs in the holders and may cause jamming of new cigarettes.

## ***Ashtray and waste bowl***

The annular ashtray is located below the rotary head and turns separately. Speed can be varied manually on the touch-screen between 1 and 5 rpm. A scraper wipes the ashes into the waste bowl or external chute. The ashtray surface is located 59mm below cigarette axis to conform to ISO requirements.

It is recommended to vacuum clean under the ashtray on a regular basis by lifting it slightly to allow access with the vacuum nozzle.

Should it be necessary to remove the ashtray, 4 Inhex M5 screws of the ISO flange must be removed to tilt the flange and allow removal.

The ashtray will stop turning if there is excessive friction. This happens if too much wastes accumulate under the disk or if the disk touches the outer fence. It is important to ensure that the three wheels center the disk well enough to avoid any contact with the outer fence. The wheel on the small drive motor is adjustable. For adjustment let the ashtray rotate until the access slot of the motor wheel is at the top. Stop the ashtray rotation, engage a 1.5 mm hex screw driver as shown below to loosen the key, slide the wheel outwards so that the ashtray disk fits snugly on the three wheels, tighten the key. The motor shaft has a flat for the locking screw. Do not rotate the wheel out of alignment with this flat.

(fig. 12)

The waste bowl slides as a drawer. It is on the right side and may contain water. As an option, a waste butt deflector with open bottom can be fitted for extended smoking runs.



## **Smoke Filter - gas analysis**

Gas analysis devices and filters for collection can be connected to the supplied quick connectors between the rotary head and the ashtray. The smoke tubes can be installed above the rotary ashtray and led directly outside of the PVC hood. A small PVC plate located on the right behind the waste bowl can be modified with cutouts to accommodate passage of tubing, cables etc. As an alternative, the gas line may be run into the base assembly and then to the rear with the back panel open.

## **Sensors**

Several sensors are arranged around the rotating head:

One capacitive sensor within the ISO flange identifies the angular position of the head. It is used to initialize the rotating head position when starting the session.

This allows later identification of each holder and, as a consequence, of each cigarette.

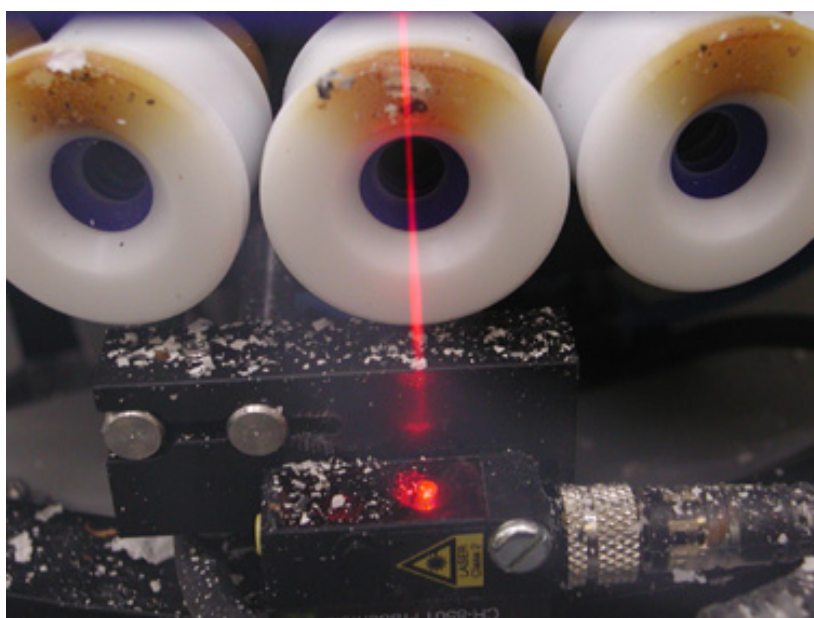
An optical sensor is used to identify the butts to be ejected pneumatically whenever butt length is used to activate ejection instead of puff number.

The optical reflection sensor is located below the cigarette holders (right side) and can be set manually to the appropriate butt length position.

An “empty holder” optical reflection sensor immediately preceding the hopper is necessary to check the successful ejection of the previous butt. It then authorizes loading if required by software. It is located below the cigarette holders and is set marginally ahead of the cigarette holders. It should also detect faulty ejections occurring when only the tobacco is ejected, leaving the filter and some residual paper in the holder.

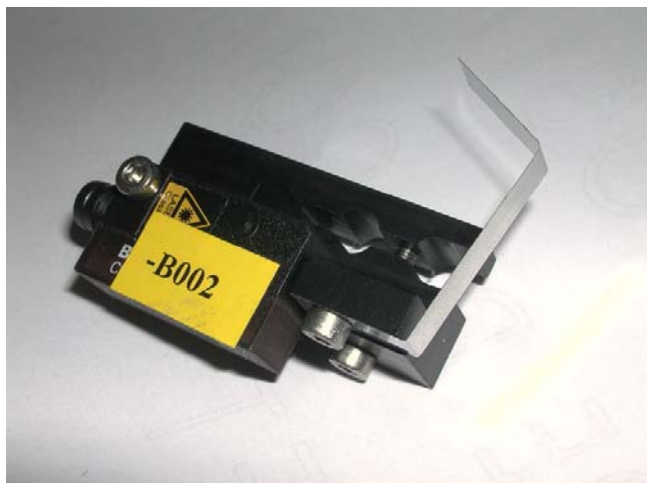
The laser beam is visible in the smoke as shown below. The condition noted reflects a few hours of smoking.

Ash may fall on the optical sensors aiming upwards obstructing their visibility. The lens windows are therefore blown clean at every butt ejection with small air jets derived from the main ejection flow making them relatively immune to obstruction due to ash. The location below the cigarettes is by far preferable to a position above the



cigarettes where condensate would be detrimental to optical instruments.

In contrast to cigarettes being smoked by humans, the lack of movement, e.g. flicking of ash will prevent ash rods from falling off the glowing butt. This may cause erroneous measurement by the optical sensors. The sensor measuring butt length is equipped with a spring to kick off excessive ash rods. The arrangement is shown below.



(fig. 14)

A thermal sensor on a separate arm checks at position  $+12^\circ$  that the cigarette has been correctly lit. If this is not the case, the software will eject it before the end of the next revolution. This sensor also has an air connector. Depending on the staining, an additional 4mm OD PU tube can be drawn from the air ducts to the optical sensors to keep this Infrared sensor clean.

## **Lighters**

Lighting is carried out shortly after loading as first the puff is drawn. An electrical lighter is supported. The power of the 2080 lighter is 180W. Electrical power is decreased when no lighting is required thus extending life of the resistor. Correct position is about 1 mm away from tip of cigarettes. The custom designed resistor can be easily replaced. Alternate styles can be added as required.

Lighting with a swiveling pilot light gas lighter is an extra cost option. The retractable lighter is driven by a rotary NORGREN piston. The feature can also be used for ordinary cigarettes, or switched off if desired. The gas lighter is without automatic ignition and without flame survey. If installing the gas lighter provided with the machine, set it to light the cigarette at port  $0^\circ$ .

A pre-light position is also provided for new smoking materials (nsm) where the length remains constant for the full smoking cycle. A lighter for the  $-12^\circ$  prelight puffing port (NSM) is optional.



## **Hood**

A clear PVC hood covers the machine, leaving the hopper top and front open for access when reloading. The hood is mounted on a hinge at the rear with two gas springs to maintain the raised hood when in the open position. The 100mm air connection to the ventilating network is at the rear of the hood on the fixed back wall. Thus, the air exhaust duct can be left installed when opening the PVC hood.



(Hood)

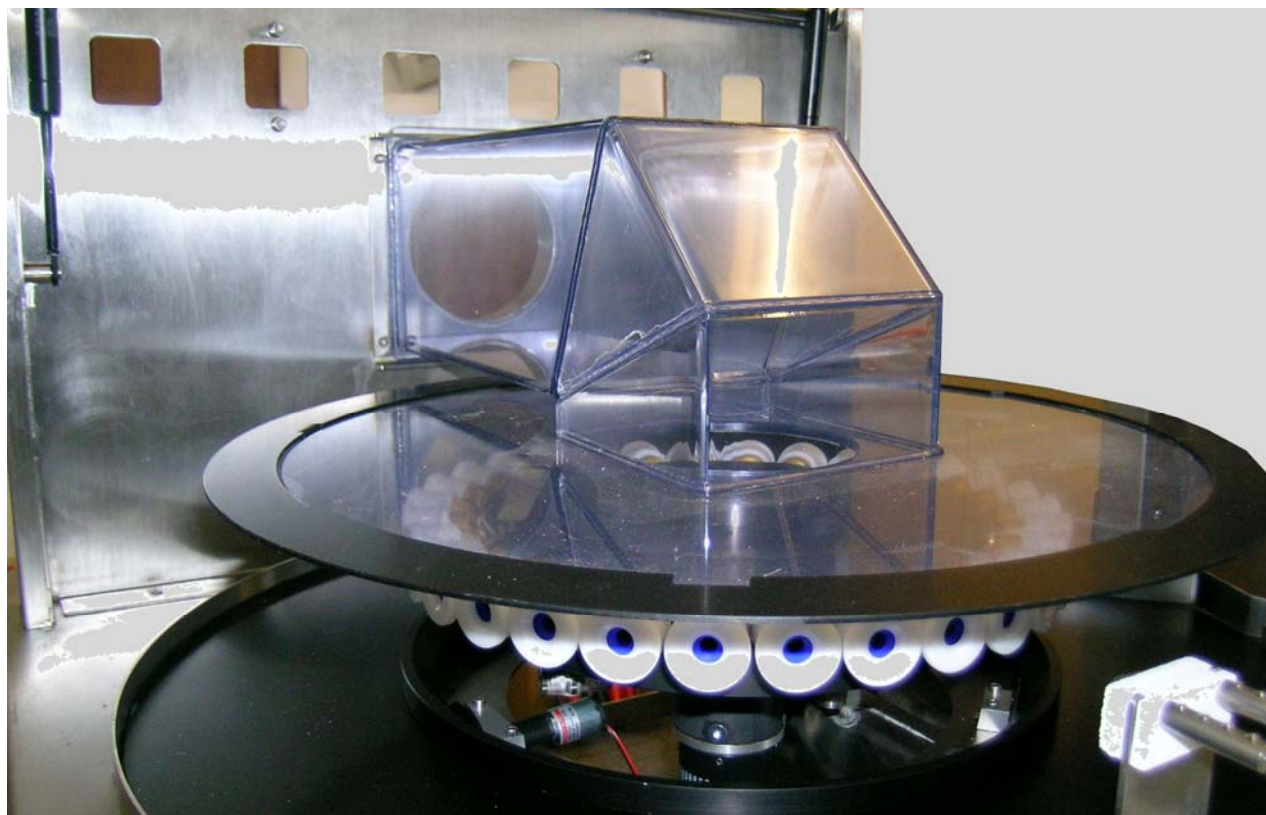
A circular collector also in clear PVC directly connected to the exhaust draws air from the periphery to the center of the carousel ensuring an even centripetal flow. This collector shown below complies with ISO 3308.

ISO requires approximately 0.2 m/s air velocity at cigarette level. It is recommended that the user measure the velocity and accordingly adjust the extraction flow to meet this requirement.



## ***Heat Shield***

Excessive heat radiation of the lighters and smoldering cigarettes on the PVC collector outer edge must be avoided. A heat shield is provided to avoid damage. The illustration below shows the collector with its black annular aluminum heat shield in place.



(fig. 15)

## **Control Cabinet**

A DB-9 plug on the control cabinet is provided for connection to an external PC or a network for remote control. The protocol is RS-485 and adaptors are available. Three additional power connectors on the rear wall are provided as a power outlet for external smoke pumps. External power supplies are 110V 60 Hz, but other voltages can be set with a selector. The external power supply is on the rear of the cabinet. A main switch is located on the right side.

A inside view of the electrical cabinet is shown below. No user serviceable parts are located in this section.



(fig. 16)

## **Computer Control**

The programmable computer on the CSM 2080 machine allows flexibility in the choice of operating sequences. The programmable control module is located in the lower cabinet which contains electrical and electronic hardware. Detailed documentation is attached for the controls and wiring, this is found in sections 2 and 3.

Working cycles of rotary head, cigarette feeder, ejection and ashtray speed can be configured according to number of cigarettes on the head and rotary speed, either continuous or intermittent.

The computer supplied with the CSM 2080 can be programmed to receive and translate standard communication protocols ie:

- Profibus FMS
- Profibus DP
- Modbus
- Ethernet

Specific communication cards (except the PC communication card) are not supplied with the machine. These are optional items to be specified by buyer.

Specific protocols must be written and tested for non-standard information input. Transfer can be via the RS 232 input with a converter from and to RS 485.

## **Materials used**

As a rule, stainless steel 304 (4301) is used for most parts, (i.e.) plate steel. The rotary head and ISO flange, smoke connectors, are AISI 420 (4034) stainless steel tempered to 52 Rc. These parts are surface treated to reduce friction and adhesion. It is strongly recommended that the rotating head is handled with extreme care to keep the annular sealing surface free from scratches and dents.

Aluminum parts i.e. for cigarette holders are made from anodized 6081 alloy. A color code can be used to identify interchangeable parts like loading spoons, which are specific to cigarette diameters. Most plastic parts are in POM; the transparent hopper window is PVC. O-Rings are NBR 70 Shore. The smoke hood is clear PVC. Tubing for pneumatics is Polyurethane.

## ***Cleaning***

Tar and ash accumulation are common to smoking machines. Tar will harden with time and stick moving parts together. It is recommended to clean the machine after every session or at least once a day if several sessions are carried out. The cleaning agent should be a solvent for tar one such as ethanol. Raise the hood, remove collector, remove carousel. Clean collector surfaces, carousel surfaces, and cigarette holders regularly. Check the condition of labyrinth seals at least weekly. A compatible lubricant can be applied to the sealing surface of the carousel. Most users use silicone grease. To clean the smoke ducts in the ISO flange a pipe cleaner or Q-tip cotton swab soaked with ethanol may be used. Another practice consists of connecting a tube to the smoke ports used during the day and using a solvent. This will also clean the pump. CAUTION is required as the solvent is combustible or flammable.

A vacuum cleaner can be used to remove the ash on the machine surface and under the ashtray. It is recommended to use a narrow nozzle for best access under the ashtray.

## ***Guarantee***

All parts are warranted 1 year after delivery or 18 months after the date of order, whichever occurs first. Defective parts are to be returned for inspection, repair or replacement at the option of the manufacturer.

**CH Technologies USA), nc.**  
**263 Center Avenue**  
**Westwood, New Jersey 07675**  
**+1 (201) 666-2335**  
[www.inhalation.org](http://www.inhalation.org)

## What if?

### Cigarettes jam in the hopper?

- Check that there is sufficient clearance between the back covering window and the cigarette end. Typically 1-2 mm is OK. Note position of pins on the rack detents, they should be even in all 4 locations.
- Check position of pusher at end of spoon. It should even with the loading surface.
- Check by moving spoon manually that the cigarettes fall into the spoon and ahead of pusher.
- Check that there are no tobacco residues in the hopper spoon.

### Cigarettes misload the holder?

- Check alignment of cigarette with holders. Alignment should be centered within 1 mm. If height misaligned, proceed as described on page 7.
- Note which holder misloads. If systematic, dismount that holder and check that there are 4 labyrinth seals in the correct mounting sequence (last reversed).

### The ashtray does not rotate?

- Check ashtray drive motor function and drive roll rotation.
- Check tightening of screw of drive roll. Screw must be on a "flat" of the motor shaft. If in doubt loosen screw slightly, slide roll away and look for the flat.
- The motor roll must be adjusted so that the ashtray has about a maximum 1mm radial clearance in the 3 rolls. It should not ride on the conical flanges of the rolls but only on the O-Rings.
- The support rolls must roll very freely, clean if required.
- Check rubbing points: the ashtray will not rotate if it touches the outer fence at its periphery. This may be caused by excessive clearance in the rolls.
- Check waste deposits below ashtray. Ash will accumulate there over weeks and it is required to vacuum clean about once a week by slightly lifting the ashtray.
- Clean the ashtray surface and outer edge; sticky residues will block the ashtray against the wiper.

### The carousel does not rotate?

- Remove and clean.
- Check function of drive motor

## Addresses of suppliers

The hardware and spares are available at following US or Canadian agents:

### FESTO

Festo Corp.  
395 Moreland Rd.  
Hauppauge NY 11788  
USA  
Phone 631 435 0800  
Fax 631 435 8026

### FESTO Inc.

5300 Explorer Drive  
Mississauga Ont L4W 5G4  
Canada  
Phone 905 624 9000  
Fax 905 624 9001

### LEGRIS

Legris Inc.  
7205 E. Hampton  
MESA AZ 85208  
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### MAXON

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### Klüber Lubrication

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