OPERATING MANUAL

MACHINE NAME **OVEN FOR BAKING(POTATO CHIPS)**

MODEL **DIRECT / CYCLOTHERM HYBRID**

DYFM

DONGYANG DYNAMICS

Operator should read this manual before start-up system to prevent accident or injury person.

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- Length	10.6M
- Number of zones	1 M
- Zone length	10.6M
- Fuel	LPG
- Total number of burners	23
- With three zones	12
- Single burner capacity	12,000Kcal/h
- Total capacity	MAX. 372,000Kcal/h
- Pre-heating burners	8
- Number of natural draft steam chimneys	0
- Number of forced draft steam chimneys	2

INDIRECT HEATING SECTION

- Length	26M
- Number of zones	2
- Zone length	13M
- Fuel	LPG
- Burner type	MAXON 415
- Total number of burners	2
- Single burner output	375,000Kcal/h
- Total output	MAX. 375,000Kcal/h x 2
- Number of natural draft steam chimneys	0
- Number of forced draft steam chimneys	7

- Total length		37.6M
- Baking chamber length		1.1M
- Baking chamber width		41.36M
- Baking surface area		1.5M
- In feed extension length		2M
- Discharge extension length		Right
- Control side		
-Conveyor belt	Type	Caterpillar with apron
	Width	1.1M
	Length	82 M
	Return	out side the baking chamber
	Belt tensioning	take-up screw with comp. spring
	Belt tracking	guidance rail
- Baking time	From 2.5 to 7.5 min	
-Main drive	Motor	5.5Kw-4P-460V-60Hz
	Reduction gear	
	Variable speed drive	by frequency converter

GENERAL

A production line is composed of a set of machines that are synchronized to work together, controlled by precise electrical consents to the extent where no machine could work independent from the others.
The oven is the main machine in this production line and is the source of the majority of consents and controls for all the other machines that are part of the production line.

The following fuels can be used:

- natural gas CH4	net heat value 8,000 -8,500 Kcal/Nm³
- propane gas C3H8	net heat value 23,000-26,000 Kcal/ Nm³
- LPG	net heat value 26,200-26,800 Kcal/ Nm³
- fuel oil	viscosity 1.3-1.7°E at 20°C
	net heat value 10,000-10,500 Kcal/Kg (8,000-8,500 Kcal/lt)
- naphtha	viscosity 3.5-5°E at 50°C
	net heat value 9,300-9,700 Kcal/Kg (8,300-8,700 Kcal/lt)

INDIRECT HEATING SECTION

In the direct gas-fired oven a certain number of linear burners are installed above and below the conveyor system and they are aimed in such a way that the flame follows the direction of the product. The pitch can be varied depending on the zone and on the oven heating capacity.
Burners are then divided into groups whose modulation takes place simultaneously thus forming "regulation zones".
Every burner is equipped with its own safety and control instruments, adequate gas and air supply pipes and mixing devices.
Combustion fumes build up inside the baking chamber and are evacuated together with evaporation products, through the chimneys.

Conveyor

This is the support system for the product being baked. Type, pitch, thickness, weight and shape of the conveying unit depend on the type of product.

These changes also lead to changes in the diameters of drums, centering systems, guides, supports (cast-iron drums, rollers, welded structural frame).

List is signaled by a limit switch which activates the mechanical or pneumatic centering system

The most common conveying units use mesh belts for most products and for baking inside containers, solid belts for poured products, slat belts which contain the products, stone slat belts for pizzas.

Oven control board

This houses monitoring and control equipment, temperature regulators to select baking times, emergency stop and start push-buttons, alarm signals..

Connections to all users on the oven, except to the burners, start out from this control board.

DIRECT HEATING PARTS

Baking chamber

The baking chamber is made of high-temperature resistant electric welded sheet. It is divided in zones by an expansion joint. Channel is installed high inside the baking chamber for almost its entire length for aspiration of the vapors generated by the product being baked.

From the control side, outside the chamber, pipe with a suitable diameter comes out that permits connection to the burner and its fastening. Near each one of these pipes there is a bar across the chamber that supports and guides the burners during application.

The chamber is totally insulated by mineral wool contained in the outer panels.

Burner

It consists of tubular casing called sword. In the tube there are stainless steel blades whose length is the same as the useful length of the baking belt; the mixture comes out of these blades and it is ignited by an electrode which also acts as a flame detector.

Air-gas mixing takes place in a Venturi tube where the combustion air arrives under pressure from its own circuit whereas the gas arrives at zero pressure from its own circuit.

A manual regulator is installed on the gas supply that changes the gas percentage in the mixture and a flow rate adjustment solenoid valve.There is a push-button panel for every burner together with equipment suitable to deliver voltage from 4000 to 7000 Volts to strike the spark..

The line operator can watch the flame through the binocular.

Combustion air supply

Combustion air is taken from the environment or from outside the building; a centrifugal fan sucks the air in into a plenum to which a header is connected for distribution to top and bottom burners.
The air is filtered and a downstream safety thermostat detects its presence.
A modulating valve, a choke valve and a minimum flow valve are installed on the said headers.
The modulating valve regulates the amount of air for combustion and adjusts the flame either high or low. It is controlled by a temperature regulator installed on the oven control board.
The choke valve adjusts the general air delivery rate.
The minimum flow valve ensures a minimum air flow to the burners when the modulating valve is entirely closed to avoid internal combustions.
Air pressure to the burners can be read o the pressure gauges installed on a panel situated on top of the oven.

Gas supply

The gas circuit does not change with the type of gas. Only the dimensions of the pipes and the size of the installed equipment change.
The main supply pipe is installed by the customer; the gas header, which includes a manual ball valve and a gas filter, is attached to this supply pipe.
The gas pressure is reduced downstream to the required ratings by a stabilizer/pressure regulator and a pressure switch ensures the presence of gas.
The main solenoid valve carries out the main check and safety functions and a "0 pressure" regulator reduces the gas pressure to negligible values.
Incoming and outgoing pressure is controlled by a pressure gauge and a pressure switch.

Steam exhaust

Steam exhaust channels are installed on the top part of the baking chamber. These have adjustable dampers. These channels and the hood of the oven are connected to chimneys for expelling the steams outside the building.
A fan is installed on all the chimneys for forced ventilation. We achieve maximum extraction with fan damper closed in order to force the steams into the alternative path.
The steam exhaust dampers applied at the base of the chimney are adjusted depending on the technological requirements of the product. A connection for condensate drainage is located in this position.
For optimum chimney draft the chimneys must be lined with insulation with a minimum 50 mm. thickness. This will keep steams at a high temperature, guaranteeing better chimney draft and less condensate formation.

Temperature control

The return signal that controls burner operation comes from the iron-costantan thermocouples located at points in the oven that ensure achievement of the desired baking temperature diagram. Baking chamber temperatures are monitored by thermometers with direct and/or control-board read-outs.

Dampers

These are designed to adjust and control vapor aspiration to optimize the baking diagram and the consistency, weight, color and shape of the product being baked.

They can be controlled manually or can be motorized. Manufacturer and mechanic must be fully familiar with how these operate in order to achieve best baking results.

Installed dampers include:

- steam exhaust dampers for control of flow rate to be exhausted
- steam by-pass dampers positioned on the fan to obtain natural or forced draft.
- zone dampers, placed at divisions between zones, necessary to stop or regulate movement by hot air and vapor inside the oven.
- terminal dampers, placed at the oven input and output and required to prevent loss of steam through input and output and to create a beneficial steam bath to process the product.

Burner control board

Each burner is served by its own board housing all its control equipment and main controls.

INDIRECT HEATING PARTS

Baking chamber

The baking chamber is made of high-temperature resistant electric welded sheet. It is divided lengthwise in individual 5 - 7.5 - 10 - 13 m. zones or in double zones each served by a single burner. An expansion joint is inserted between one zone and the next.

Channel is installed high inside the baking chamber for almost its entire length. It aspirates the vapors generated by the product being baked.

Heat is generated by two nests of tubes, one placed above and the other below the baking plane for the entire length of the zone.

The fumes produced by combustion are conveyed into the nest of tubes at the start of the zone by collection header and are recollected by exhaust header at the end of the zone.

The chamber is fully insulated by mineral wool contained in the outer panels.

Burners

Burners are inserted in the combustion chamber and below the baking chamber.
They can be two-stage or modulating and can burn methane, propane, LPG, fuel oil, naphtha.
Each burner is equipped with electric fan for forced circulation of the combustion products. Burner and fan are interlocked and the burner cannot be turned on if the fan is not in operation.
The combustion units divide the oven into single or double baking zones.
Each combustion unit is equipped with a temperature regulator connected to thermocouple positioned on the smokestack and which monitors the real output temperature. The temperature regulator acts automatically on the burner to command high or low flame.
These frequent modulations achieve a constant baking temperature graph with only minimal temperature deviations from preset temperatures.
Two safety pyrostats prevent excess temperatures in the oven and damage to oven materials.
Each burner is supplied complete with inlet manifold which consists of the connection fitting for customer mains, a filter and a pressure regulator/stabilizer.

Fume recirculation

Combustion products are generated in combustion chamber, contained by casing. Fumes move to mixing chamber which has overpressure safety door. Fumes proceed along a lengthwise path until they reach intake header where, through damper, they are distributed to either the ceiling or the bedplate in the desired percentages.
The direction of flow in the baking chamber, inside the radiant tubes along the ceiling and the bedplate, is in the same direction as the product. When the fumes reach exhaust header they encounter choke dampers both on the ceiling and the bedplate that are used to adjust crosswise baking temperatures. The quantity of fumes to recycle and expel is adjusted using a damper placed on chimney.

Steam exhaust

Steam exhaust channels are installed on the top part of the baking chamber. These have adjustable dampers. These channels and the hood of the oven are connected to chimneys for expelling the vapors outside the building. Fan is installed on the chimney when forced ventilation is required because of high steam production. In this case we achieve maximum extraction with fan damper closed in order to force the steams into the alternative path.
The steam exhaust dampers applied at the base of the stack are adjusted depending on the technological requirements of the product. A connection for condensate drainage is located in this position.

Temperature control

The return signal that commands burner operation comes from the iron-costantan thermocouples located at points in the oven that ensure achievement of the desired baking temperature diagram. Baking chamber temperatures are monitored by thermometers with direct and/or control-board read-outs.

Dampers

These are designed to adjust and control flow rates of products of combustion and vapor to optimize the baking diagram and the consistency, weight, color and shape of the product being baked.
They can be controlled manually or can be motorized. Manufacturer and mechanic must be fully familiar with how these operate in order to achieve best baking results.
Installed dampers include:

- top/bottom dampers to distribute fumes above/below the product.
- chimney dampers to adjust the quantity of combustion products to recirculate or to expel to maximize fuel efficiency.
- branch dampers for dividing combustion products between the first and the second double zones.
- steam exhaust dampers to adjust the exhaust flow rates.
- steam by-pass dampers positioned on the fan, when a fan is provided, to obtain natural or forced draft.
- zone dampers, placed at divisions between zones, necessary to interrupt or regulate movement by hot air and vapor inside the oven.
- terminal dampers, placed at the oven's input and output and required to prevent loss of steam through input and output and to create a beneficial steam bath to process the product.
- fume choke dampers in the exhaust header. These are used to regulate the quantity of fumes inside each single radiant tube to adjust cross-wise heat distribution.

Burner control board

Each burner is served by its own board housing all its control equipment and a synoptic panel that indicates functions, commands and signals relative to the zone being served by the burner.
A trouble-shooting indicator lamp is provided for each function.

The machine has been designed and manufactured taking full notice of the EN and IEC Standards.
All rotating components and dangerous parts are inaccessible to the operators; various guards, covers and electrical safety components have been installed for this purpose.
The production line foreman must check that these are all efficient during machine assembly, testing, production and maintenance.
Burners are also furnished by their manufacturers complete with safety devices.

Cladding

Oven appearance and efficiency are all ensured by proper cladding. Cladding also encloses oven control and rotating components so that the oven operator is only in contact with their adjustment mechanisms.
Cladding, given its special jointed connections, can be considered as a fixed guard.

Fume recirculation fans

These are outside the cladding but are protected by a bin fastened rigid to the panels and can be considered a fixed protection.
Failure of these to operate prevents the burners from turning on.

Inspection doors

These can be maneuvered without the danger of being burned. The only precaution is to keep your head away the moment they are opened to avoid being hit by a jet of steam.

Overpressure safety door (anti-explosion)

This is installed in the mixing chamber facing the flame. Normally it is vertical. It opens if there is a sudden and violent increase in the pressure inside the combustion chamber. This pressure overcomes the counterweight on the door. Door opening is monitored by a sensor that will activate a solenoid valve to interrupt the fuel supply to the burner.

Safety pyrostats

There are two of these, P1 and P2, positioned in the burner board and activated by the thermocouple positioned in the input header.
A maximum temperature is set for each of these. For example 500°C for P1 and 600°C for P2. The safety device will intervene when these temperatures are exceeded.
When the thermocouple monitors a 500°C temperature then pyrostat P1 will command the burner to operate at low flame level. If the temperature still continues to rise, due to a breakdown or

malfunction, then pyrostat P2 will trip at 600°C and shut off the electrical supply to the burner, turning the burner off.
TRIPPING BY PYROSTAT N° 2 INDICATES AN EMERGENCY SITUATION. THE CAUSES BEHIND THIS SITUATION MUST BE ELIMINATED.

Possible causes:
- fan belts loose or broken
- chimney too restricted and insufficient draft
- radiant tube choke dampers too closed
- pyrostat defective or improperly set
- mechanical impediments to free fume circulation inside the ducts
- water present at the base of the chimney

The burner will not automatically start up again. Restart must be commanded by the operator who must only do this after he has discovered and eliminated the reason why the pyrostat tripped.

Emergency conveyor drive system
If there is a power failure the product being baked would remain stopped in the baking chamber and could begin to burn and cause a fire. There is a coupling to the reduction unit that drives the conveyer. This either has a manual crank drive system or connects to an emergency stand-by electricity generator to keep driving the conveying system and unload the product.

Conveyor stop
A ring gear is mounted on the idle counterpressure shaft on the drive unit. This has a sensor that transmits pulses at a regular frequency to the oven control system. This shaft is driven by friction from movement by the belt. This means then when the belt stops either because of breakage of some mechanical component or the belt slips due to insufficient tension then the pulses either stop or come at irregular intervals. This cuts off the electric circuit that supplies the burners, causing them to immediately stop.

Conveying system list
Limit switches monitor excess list and stop the conveying system if this takes place. This also stops the burners.

Belt elongation
Limit switches monitor excess mesh belt elongation which could lead to slippage. The conveyer is stopped and the burners are turned off.

Safety devices/checks inserted in the gas burners

- pressure switch or centrifugal contact to monitor the presence of combustion air
- maximum and minimum gas pressure switch
- gas leak check during ignition
- pressure stabilizer built into the main solenoid valve
- gas circuit wash-out
- electrode flame monitoring unit
- safety devices that protect against voltage drop
- air pressure check at start-up
- safety block signal device
- standby time for air pressure confirmation
- pre-ventilation time
- pre-ignition time
- safety time with signal of flame presence
- monitor presence of premature flame
- monitor spark failure

Safety devices/checks inserted in fuel oil burners

- monitor flame presence
- wash out of oil circuit
- oil shut-off valve

Flame control

Every burner is equipped with an ignition/flame detector electrode and an electronic safety and control unit (series MM) approved by national authorities and in accordance to DIN-DVGW Standards

In case of flame failure, after a given waiting time, the unit feeds the ignition device; from this moment it is necessary to wait for the flame to stabilize for 10 seconds; during this time the unit will try ignition again if the flame goes off.

Release is manual and it can be done only after 10 seconds from stop.

Gas pressure stabilization

A stabilizer/pressure regulator is installed on the gas circuit to protect the circuit against unexpected irregular pressures; it also allows the pressure to be reduced from supply values to the required values. It is the diaphragm type and it can be fitted either horizontal or vertical.

Gas presence

A pressure switch (P) set at 30 mbar is installed downstream the stabilizer; if pressure is lower than this setpoint, gas supply to the main solenoid valve is cut off and a sound alarm is given.

Gas circuit safeties and control

These functions are performed by a normally closed solenoid valve with an IP 54 protection; it cuts off gas supply when the following conditions occur:

- vapor exhaust motor stalled
- chimney depression failure (signalled by a pressure switch)
- conveyer system stopped or listing
- combustion air fan stopped
- air supply failure signalled by the pressure switch on the plenum
- anti-explosion door open
- automatic shut-down control
- upstream zone in operation
- gas pressure downstream the stabilizer lower than the value set on pressure switch P

Air pressure

A pressure switch with a minimum 50 mbar setpoint is installed in the plenum, downstream the fan; if the air pressure is less than this setpoint, gas supply is shut off and an alarm indicator lamp is turned on the control board.

Steam exhaust

A mechanical stop is fitted on the damper situated at the base of the chimney to prevent complete closure and thus to ensure evacuation of gas and unburnt matter existing in the chamber.

Metal surface temperatures

Not all oven components are accessible for maintenance the moment the burners are turned off. This is because cool-down time varies depending on the mass and position of the component.

In these cases maintenance personnel must wear suitable protective clothing.

Average cool-down times:

- all surfaces inside the baking chamber	16 hours
- burner plates	8 hours
- input and output hoods	6 hours
- inspection door frames	4 hours
- steel band type belt	2 hours
- wire-mesh type belt	1 hour
- slat type belt	2 hours
- fume recirculation fans	0,5 hours

Access doors to discharge and infeed extensions

These are fixed guards without safety microswitches because the oven must not be stopped unless there are dangerous situations. The key for the lock must be kept by assigned and expert personnel.

WARNING: IT IS ABSOLUTELY PROHIBITED TO INHIBIT OPERATION OF THE SAFETY DEVICES INSTALLED ON THE MACHINE

The dough (molded, cut, leavened and in any case in its final configuration) or containers (pans, trays, fillets, etc.) are loaded automatically onto the conveying system and start to approach the baking chamber.
Make sure that loads are centered on the conveying system and that no obstacles are present, such as siderails that are too close.
Some types of products require preheating of the conveying system. During this stage the product will undergo a first phase of gelatinization of proteins, denaturalization of starches, extraction of vapor from the bedplate and stabilization of forms and shapes.
Some products (bread) need to be sprayed with steam when they enter into the baking chamber.
The product proceeds down its path in the baking chamber. Baking phases, leavening, color, weight and shape are superintended by the baker through the inspection windows. These can be opened to remove samples to test.
When the baked product exits from the baking chamber it proceeds on the same conveying system for a few meters for preliminary cool-down and to facilitate detachment.
Depending on the type of product it will be picked up and delivered to the next conveyer by a flat scraper, comb scraper or motorized roller.

The oven is sized and designed to bake products according to the procedures specified in the contract. We recommend enquiring of the manufacturer when it is desired to bake different products in order to have an overall analysis of possible impediments and objections.
It is, for example, absolutely prohibited to bake in containers if this is not specified in the contract. It is also prohibited to change type of container.
Nor can the product conveying mechanism be changed without prior authorization from the manufacturer.
This is also true regarding types of burner or changing type of fuel. The oven manufacturer must be informed and you must wait until he gives his approval even if the burner manufacturer has already given his approval.

The machine is not built to work in an explosive atmosphere and consequently it is prohibited to use it in such an environment.

THE MANUFACTURER IS NOT RESPONSIBLE FOR ANY DAMAGE TO THE MACHINE CAUSED BY IMPROPER USE AND LEADING TO INVALIDATION OF GUARANTEE COVERAGE.

No skilled personnel is required for installation. The presence of at least one expert installer is sufficient.

The maximum installation height is 3100 mm.

Workers must wear protective gloves. Personnel charged with installing mineral wool must wear protective face masks.

SITE

- Installation requires assembly of small to medium size components in hard-to-reach areas (below the baking chamber). As a consequence the installation site must be well illuminated.

- The space around the machine must be sufficient to permit easy maintenance. Remember that no particularly bulky components will require replacement. We recommend leaving at least 1400 mm. of space between oven and wall on the oven controls side and at least 1000 mm. on the opposite side.

- Condensate and wash water drain pits must already be installed and ready before installing the oven. Make sure they are not placed where the oven's legs will rest on the floor.

- If other production lines are working in the same area you must create a barrier or set up a curtain between the production zone and the assembly area during assembly.
  Do not install mineral wool in the oven with other production systems in operation even when this barrier has been set up. It is impossible to prevent migration of noxious mineral wool dust in the atmosphere during assembly.

- The floor at the installation site must be properly level. Variations up to 30 mm. in height can be compensated for by shimming up the oven support feet.

- Check the load capacity of the floor where the infeed and discharge expansions are positioned.

ASSEMBLY

- Before starting with assembly operations make sure there is a safety and accident prevention box nearby and accessible and equipped with first aid materials.
- The Customer's assigned officer must be present when the layout of the oven is marked on the floor since there may be requirements or needs that differ from what was specified in the contractual layout.
- Make sure that there is enough room to handle the drive and return units since these are only put in position at the end of the assembly process.
- Check levels with an electronic level or with a precision instrument. Maximum tolerance is 2 mm. of level difference for every 10 meters of oven.
- Chambers and stands are duly marked and must be assembled in the numerical order indicated in the drawing.
- All components are bolted together; check that bolts are properly tightened.
  Remember to insert seals and gaskets where these are specified.
- Use special care when tightening the radiant tube connection sleeves. Bolts must be tightened alternately and the open ring sheet must close down until its two ends are almost in contact and at a constant gap. Check that the sheet is not deformed or damaged.
- Use care when levelling the frames or rollers or drums that support the conveying belt to prevent it from listing.
- Infeed and discharge extensions are fastened to the floor by expansion sheaves. If floor and foundation are not strong enough to ensure a good anchor then create 6 - 8 pits with 30 mm. diameter anchor rods. Wait at least 48 hours for the cement to harden before fastening the structure in place.
- Keep to the manufacturer's instructions when putting the conveying belt together. In particular:
  + belts can be welded or riveted: in the first case you need a welder and other equipment and a good understanding of joining techniques. This operation, as a consequence, should be done by the supplier's expert technician.
  When riveting a belt together the belt comes with the equipment necessary for preparing its edges, stretching them, perforating and punching them, removing the punches, riveting and countersinking the rivets. If the joint is the overlapping type make sure the jump up is in the opposite direction to the direction of belt movement.
  + there is only one system for joining wire-mesh: the two ends must be clamped in vices that are brought together by sliding along threaded side bars. Insert the cross rod when the end coils overlap and spot weld it in place.
  Be careful regarding the direction of movement of the belt. The selvage must be pulled and not pushed.

DIRECT HEATING SECTION

Gas supply: a fully assembled gas header is supplied for each zone. Hook-up to the header must be made with a 2" pipe painted yellow RAL 1021.
Paths and connections of cable trays, air pipelines and fuel pipelines etc. to the machine must be compatible with the use to which the machine is to be put. Pipelines, for example, must not be fastened to mobile guards.
Gas supply pressure, read on the manifold pressure gauge, must be 35 mbar; to be sure of this and to keep within the stabilizer operation range, gas supply pressure must not be less than 45 mbar nor higher than 100 mbar.

Combustion air supply: a centrifugal fan and a fully assembled header painted (Gray or White) are supplied for each zone.
Therefore no connection needs to be made on the site.
Max. air pressure in the circuit is 70~80 mbar.

INDIRECT HEATING SECTION

Gas burners: these are supplied complete with input manifold. Supply is done using a 1 1/2" pipe going to the individual burner. This pipe must be painted RAL 1021 yellow.
Gas pressure when it enters the manifold pressure gauge must be 30~40 mbar.

Supervisors and machinery operators should be instructed and trained in at least the following:

- Machinery safety procedures, including emergency procedures.
- The correct and safe way of operating machinery.
- Knowledge and understanding of the dangers they face.
- Understanding the purpose and function of the safeguards which protect them.
- Reporting faults immediately, including guard defects.
- Wearing and care of protective clothing and equipment.
- Need for good housekeeping.
- Statutory requirements.

SAFETY PROCEDURES

- Make sure that all the machine safety systems are in efficient working condition (emergency stop devices - earth connections - guard microswitches - optical and acoustic alarm systems)
- Before starting the machine ensure the immediate area around and on the machine is clear of unnecessary equipments.
- Never operate the machine with guards removed or insecurely fitted.
- Whilst the machine is in operation do not make any adjustments which are not part of the normal running procedures.
- Always ensure that operators are conversant with the machines functions and are fully aware of the position and purpose of control switches and emergency-stop buttons.
- Always isolate the machine at the mains before making adjustments to moving parts or electrical circuits.
- Never allow loose items of clothing to come in contact with the machine.
- Always ensure that only qualified personnel make adjustments to electrical circuits.
- Before starting the machine ensure all terminal box and trunking leads are securely fitted.

SAFETY DEVICES CAN BE INTENTIONALLY EXCLUDED DURING OVEN ASSEMBLY, START-UP AND TESTING.
IN THIS CASE THE OPERATOR MUST BE INSTRUCTED AND INFORMED REGARDING RESIDUAL DANGERS AND MUST WORK IN TOTAL SECURITY TO PREVENT HARM TO HIMSELF AND TO OTHERS.
ALL SAFETY DEVICES MUST BE IMMEDIATELY RESTORED TO FULL OPERATION WHEN THESE PROCEDURES ARE TERMINATED AND WHEN IT IS NO LONGER NECESSARY TO HAVE FREQUENT ACCESS TO THE DANGER ZONE.

THE MANUFACTURER IS NOT RESPONSIBLE FOR HARM TO PERSONS OR PROPERTY CAUSED BY TAMPERING WITH GUARDS AND SAFETY DEVICES.

PRELIMINARY OPERATIONS

- Check the oil and grease levels in all components that use them.
- Clean protective oils and greases off all surfaces in contact with the dough.
- Check that there are no foreign bodies on the conveyor and in the hopper.
- Close the fixed and movable guards. A safety switch cuts off electrical power to the main motor and the machine will not start if the movable guards are not in position.
- Start the motors and check that all rotating components rotate in the right direction (especially the rotation direction of the fume recirculation fans).
- Check that the baking time indicated on the display corresponds to the real baking time. Do this by timing the time between entry and exit from the oven of a marker applied to the conveyer.
- Check that fuel pressure is correct.
- Check the height of the zone dampers in the baking chamber to make sure there is enough room for the product being baked to pass under them.
- Check the direction of rotation of zone dampers that open by a rotating movement. These must open in the same direction as the product moves forward. If this is not the case there could be a back up and the product could start to burn.
- See the EQUIPMENTS chapter for preliminary tests on the pneumatic circuit.
- Turn on pneumatic controls and check that all movements are correct.

SET-UP

- Start the conveyer and use the selector to set the desired speed. Check the baking time on the time display.

  The conveyor must be run for at least 4 hours without heating and with automatic centering units disengaged. This is to permit the operator to center the conveyor using the adjustment screws on the return roller and the support rollers.
- Actuate the main switch on the burner control board. Start the combustion air fans, the fume recirculation fans and the steam exhaust fans (if any).
- Start the indirect gas burners one after the other at 30 minute intervals and wait the wash-out time prior to flame ignition. Use the zone temperature control to set baking chamber temperature.

- Select the bottom and top direct burners that you want to turn on based on the required baking diagram.

  Do not go past 130°C the first day of heating in the chambers. Do not go past 200°C the second day. Then, during following days, gradually increase the temperature until you reach the values in the baking diagram.

- Select the bottom and top direct burners that you want to turn on based on the required baking diagram.
- Ignite the selected burners one at a time; to do this, rotate the selector to the right, the indicator lamp will come on and at the same time the electrode strike the spark; the gas solenoid valve opens and the air-gas mixture is formed.

  After ignition, the electrode detects the flame and ensures a steady flow of the mixture.

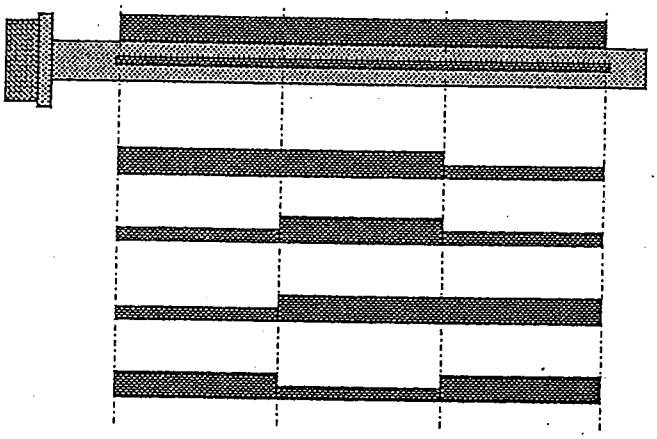
  If the electrode does not detect the flame, the device will strike a spark again and if no flame detection occurs, the solenoid valve shuts off the gas flow causing burner blockage and the red indicator lamp comes on.

  Repeat this procedure after 10 seconds but rotating the selector to the left for 2 seconds and then to the right; the red indicator lamp goes off and the burner starts up again.
- Check the color and the length of the flame of every burner; the best flame must be 30 - 50 mm long and it must sky blue in color.

  If there is too much gas the flame is red; if there is too much air the flame goes off.

  A gas flow regulator is installed on every burner.
- Set the temperature in the chamber on the zone temperature regulator; on the first heating day do not exceed 130°C in the chambers and 200°C on the second day.

  During the following days increase the temperature until the baking diagram values are reached.



- If three-zone controlled burners are installed, five election is made with a rotary distributor showing the five permissible positions.

When performing tests with the product make all the adjustments and settings permitted by the dampers mounted on the oven.

- Turn the oven off by actuating "automatic turn-off". This turns the burners off first and keeps the following units in operation for about two hours until the main switch automatically disengages:
  - fume recirculation fans
  - steam exhaust fans
  - conveyor
  - safety devices and alarms
- When performing tests with the product make all the adjustments and settings permitted by the dampers mounted on the fume and steam circuits:
  - crosswise adjustment using the choke dampers. Rotating these clockwise shuts down the fume passage in each single radiant tube and consequently decreases the temperature.
  - for double zones rotating the damper clockwise increases the quantity of fumes delivered to the second zone.
  - adjust chimney draft and the quantity of fumes that is expelled.
  - adjust steam discharge with the guillotine damper. Pulling this out decreases the duct area.
  - adjust the external air supply.
  - check, after one week of full-speed operation, that all dampers move without impediments.
- Every day, during testing, check elongation of the conveyor belt. Generally the wire-mesh needs to be shortened after the first week of testing and again after one month of production.
- Check that auxiliary machines operate properly and are stable when they operate under a full load. Abnormal noises and/or vibrations mean that some component is not properly secured.
- Check, from outside, that fumes exit properly from the chimneys.
- Check, through the window on the burner support, that flame length is correct in both low and high flame modes.
- Do not open inspection doors during the cool-down phase at the end of the production cycle. Doing this could unevenly cool the conveyor and cause it to list.
- These operations, to protect operator safety, should **NEVER** be done with the machine in operation:
  - lubricate and top up with lubricants
  - clean the drive roller, pressure and conveyor support rollers
  - remove products through inspection doors by hand, without using the special tool.
- Oven stop systems:
  - turn off main switch.
  - actuate the emergency push-button on the oven board and the burner boards.
  - open moveable guards and safety devices.

OVEN HEAT INERTIA

Turn on the oven about an hour before starting production and raise it to a temperature which is 20°C lower than the required temperature. Set the required temperature only 10-13 minutes before starting production to avoid loading the product when the oven is running on a low flame.

If the required temperature is set immediately, the temperature will exceed the setpoint by 10°C due to the modulation effect, consequently half of the burners go out, the temperature drops below the setpoint and if the product is loaded now it will not be baked properly.

Example: required temperature 270°C (depending on the type of product)

- light the burners about one hour before beginning production
- set 270°C on the thermoregulator
- with an empty oven the temperature rises up to 280°C
- the temperature drops and, if the product is loaded during this phase, it will drop as far as for instance 230°C
- burners start working in low flame
- the temperature goes up again and takes a long time before it reaches 270°C because the product in the oven is cold.

Recommended cycle:

- light the burners about one hour before starting production
- set 250°C on the thermoregulator
- with a hot oven, the temperature can reach 260°C but it will never reach 280°C which would cause half the burners to go out
- 10-13 minutes before starting production, set 270°C on the thermoregulator
- the temperature will rise and when the setpoint is reached or slightly exceeded, load the product.

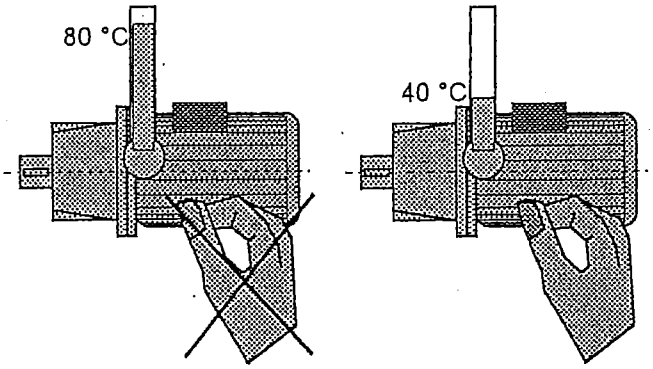
Maintenance staff should be trained in at least the following:

- Principles of the safeguarding machinery.
- Electrical and mechanical safety.
- Precautions during maintenance work, including safe systems of work.
- Wearing and care of protective clothing and equipment to minimize the risk of injury.
- Maintenance personnel must be specifically authorized to perform maintenance.
- They must be furnished with safety equipment including protective work garments.

PRELIMINARY OPERATIONS

- When the problem seems to be malfunctioning of thermo-couples, thermometers, temperature regulators, etc., we recommend interchanging these with others installed in other parts of the oven to check if it is the device or its supply line that is defective.
- For pneumatic circuit maintenance: refer to the EQUIPMENTS chapter.
- To lubricate standard market components: comply with the general and specific guidelines given in the enclosed booklet.

- Caution: multiple source voltages in cabinet. All sources should be disconnected before servicing.
- Check that all other energy sources are turned off. Lock, for example, the compressed air shut-off valve and remove the key.
- Wait untill the equipment cools before working.



- Caution: to reduce the risk of fire, replace only with same type and rating of fuse.

DAILY

- Cleaning of components in contact with the dough must be done at the end of the work shift or the work day or, when the work cycle is round-the-clock, at least twice a week.
- Clean dough residue off the drive rollers and the belt support rollers.

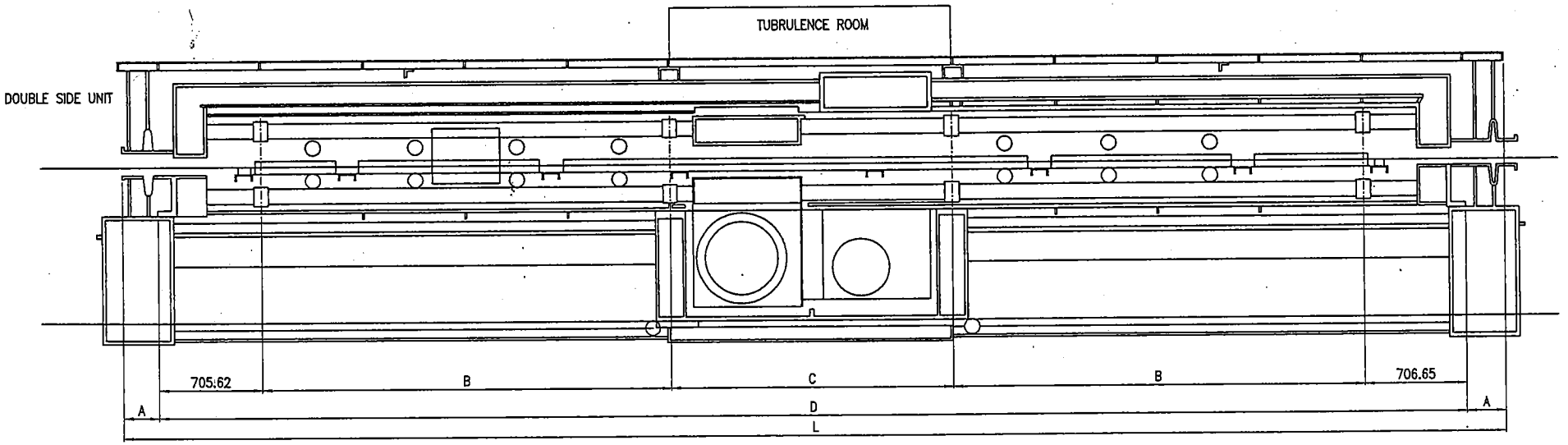
- Make sure all rollers are free to rotate.
- Clean the scrapers and empty the crumb collection pans.
- Final cleaning of the machine and total elimination of residual dough can be done using the compressed air gun that serves the processing line.
- Run the machine a few seconds after cleaning it to dump off any residual dough crumbs and to check the electric system.
- Check that the belt is not damaged, especially along its edges and at its joint.
- Make sure belt tracking and tensioning systems are in efficient condition.
- Check the unit for signs of oil leakage (oil stains on the floor).
- Check the efficency of ignition and detection electrodes. Ignition or flame detection failure can be due to wrong position of the electrode (its distance from the burner must be about 4 mm) or due to a short circuit in the connections.

WEEKLY

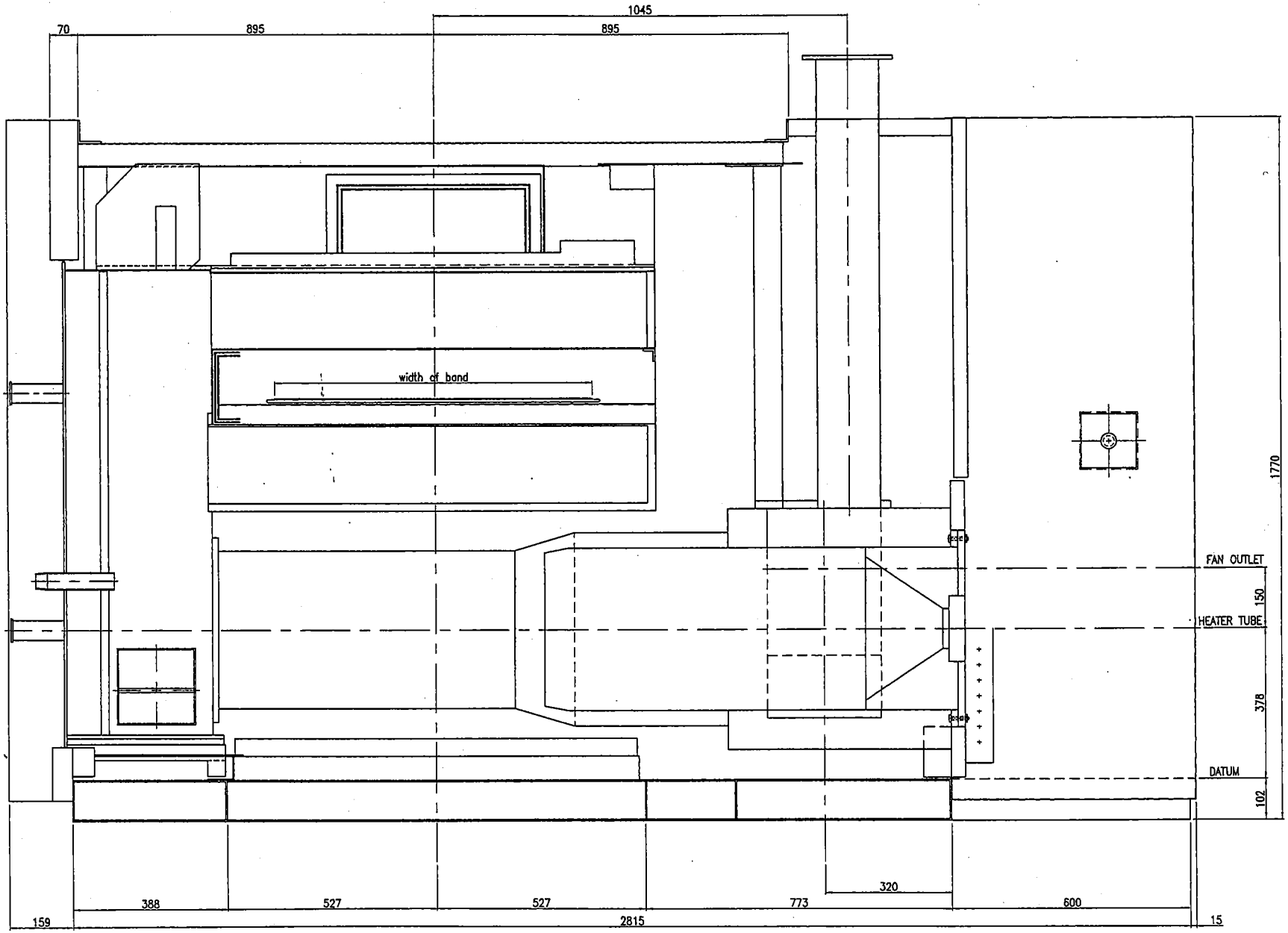
- Eliminate flour dust near the cooling air intake vents on the motors.
- Check that safety, warning and signal devices and systems are in proper working condition.
- Check the oil level in the reducer gears; top up as specified by its manufacturer.
- Check the chain drives and inspect for wear and tension; apply a small amount of chain lubricant to all links and sprockets.

MONTHLY

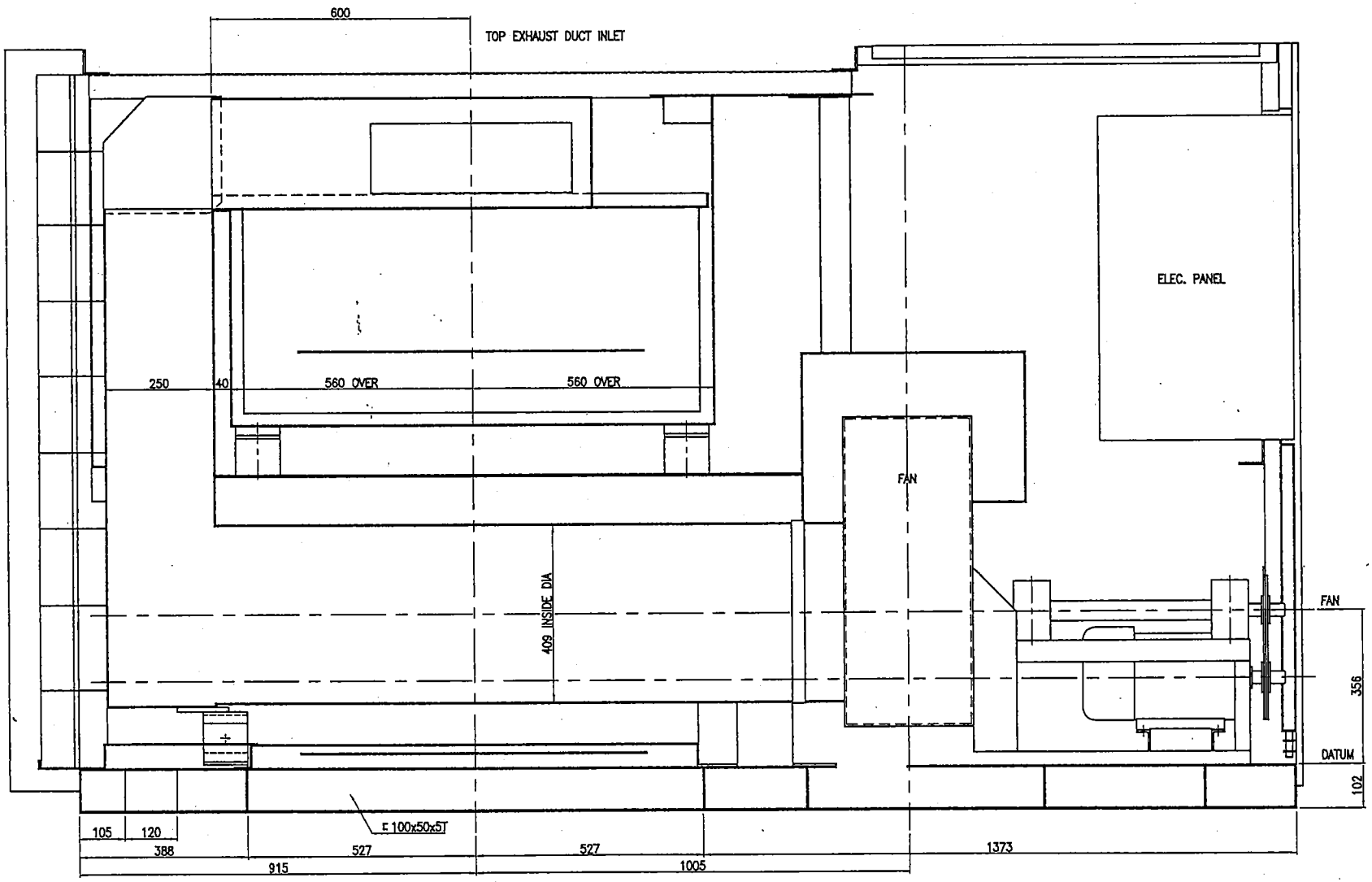
- Check the tension of the fume fan belts.
- Check the tension of drive chains.
- Clean the burner heads.
- Check the state of wear of the conveyor support mechanisms: drums, rollers, frames.
- Check that limit switches function properly and that the conveyor is properly stretched.
- Check the inside of the electric boards for eventual deposits of flour, sugar, water, etc.
  Carefully clean the insides of the boards.
- Check the combustion chamber for deformation or perforation.
  If it is clearly damaged it must be replaced.
- Check the condition of the wire-mesh selvage.
  If necessary slightly widen the centering rollers mounted on the table.
- Check the temperature of oven panels. Add insulation, when the oven is stopped, where you think it is necessary.
- Clean the direct burners; particulary check the holes are not stopped.
- Check the efficiency of the combustion air fan filter



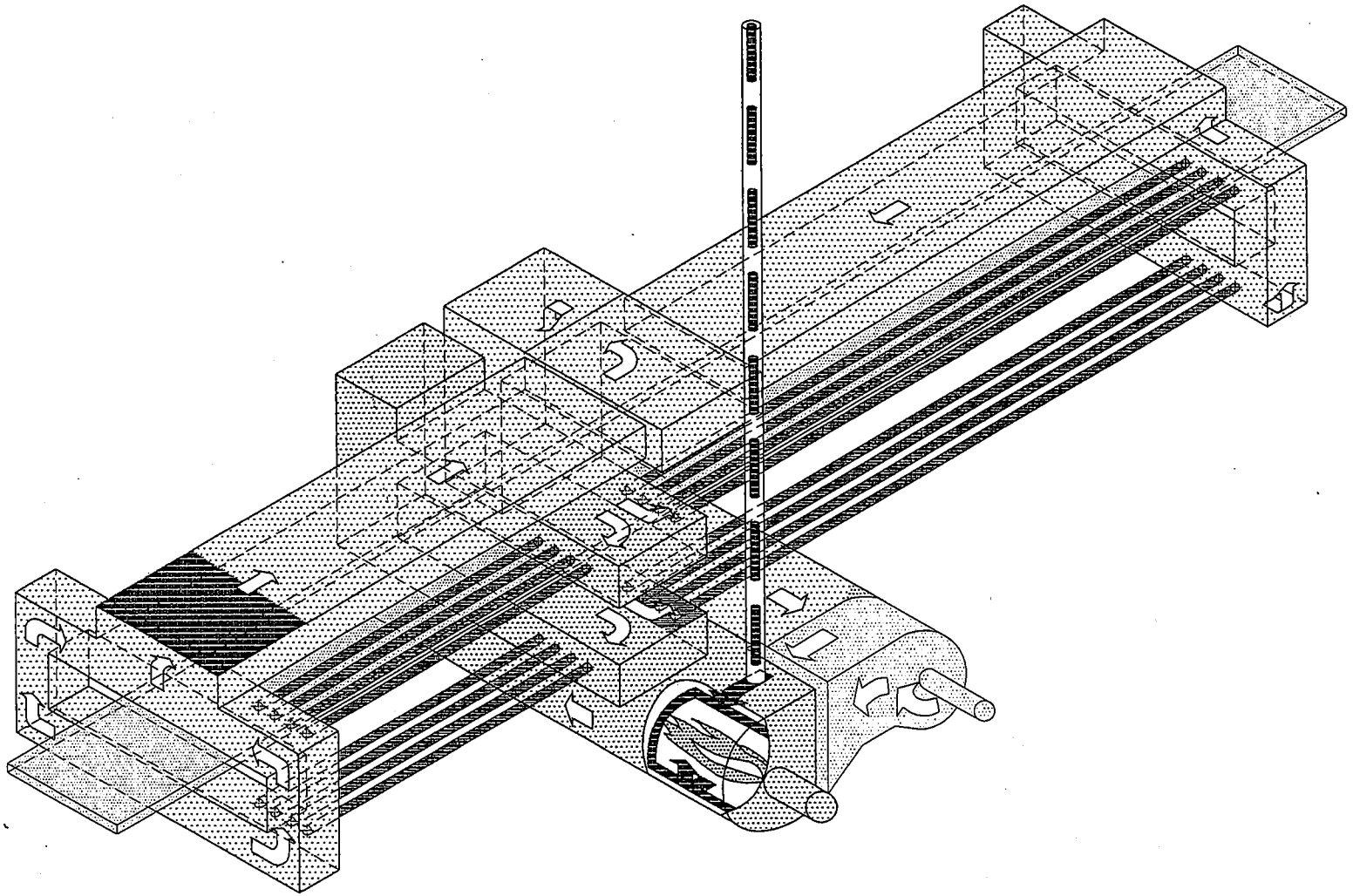
DONG YANG FOOD MACHINERY CO.,LTD	FINISH	DATE	06.01.27	QUANTITY		MATE.		DRAWING NAME	CYCLOTHERN TYPE INDIRECT BAKING OVEN 800W
		FILE NO		DESIGN	Y.S.CHOI	SCALE	1/10	DRAWING NO	



DONG YANG FOOD MACHINERY CO.,LTD	FINISH	DATE	06.01.27	QUANTITY		MATE.		DRAWING NAME	CYCLOTHERN TYPE (INDIRECT BAKING OVEN 800W
		FILE NO		DESIGN	Y.S.CHOI	SCALE	1/10	DRAWING NO	



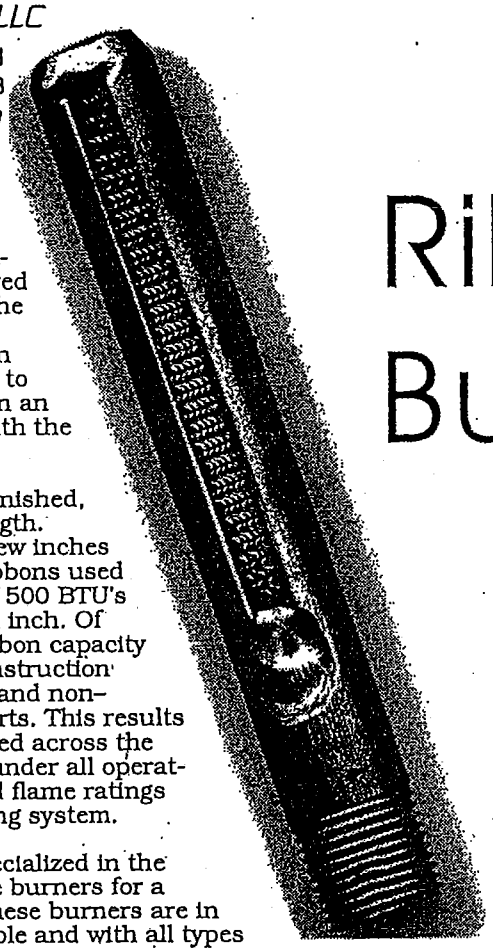
DONG YANG FOOD MACHINERY CO.,LTD	FINISH	DATE	06.01.27	QUANTITY		MATE.		DRAWING NAME	CYCLOTHERN TYPE (INDIRECT BAKING OVEN 800
		FILE NO		DESIGN	Y.S.CHOI	SCALE	1/10	DRAWING NO	



DONG YANG FOOD MACHINERY CO.,LTD	FINISH	DATE	06.01.27	QUANTITY		MATE.		DRAWING NAME	
		FILE NO		DESIGN	Y.S.CHOI	SCALE	1/10	DRAWING NO	

ENSIGN *ENSIGN RIBBON BURNERS LLC*
101 Secor Lane Pelham Manor NY 10803-2791
(914) 738-0600 Fax (914) 738-0928
A Subsidiary of Mondial International Corporation

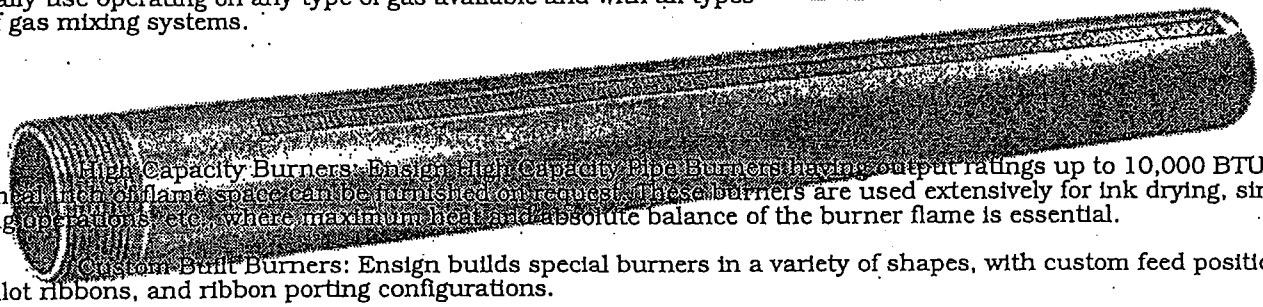
Pipe Ribbon Burners



These burners are adaptable to practically any type of heat application and are fabricated of extra-heavy pipe incorporating a range of ribbon constructions of improved design. They ignite instantaneously, retain the flame without the use of baffles, and will not flash back on any degree of turndown. Ensign Ribbon Pipe Burners readily lend themselves to automatic temperature control, will operate in an atmosphere of steam and may be installed with the flame projecting in any direction.

Any desirable flame space can be furnished, from 1 inch long, up to 21 feet in a single length. Individual burners range from 3/8" pipes a few inches long, up to 3" pipes a few yards long. The ribbons used in these burners allow for flame capacities of 500 BTU's per lineal inch, up to 10,000 BTU's per lineal inch. Of course, the combinations of pipe size and ribbon capacity must be considered. The patented ribbon construction used in all Ensign burners is non-corroding and non-oxidizing, forming a multiplicity of burner ports. This results in the port area of the burner being distributed across the entire flame space, allowing for consistency under all operating conditions. All capacities are for balanced flame ratings using Ensign Inspirators or any air-gas mixing system.

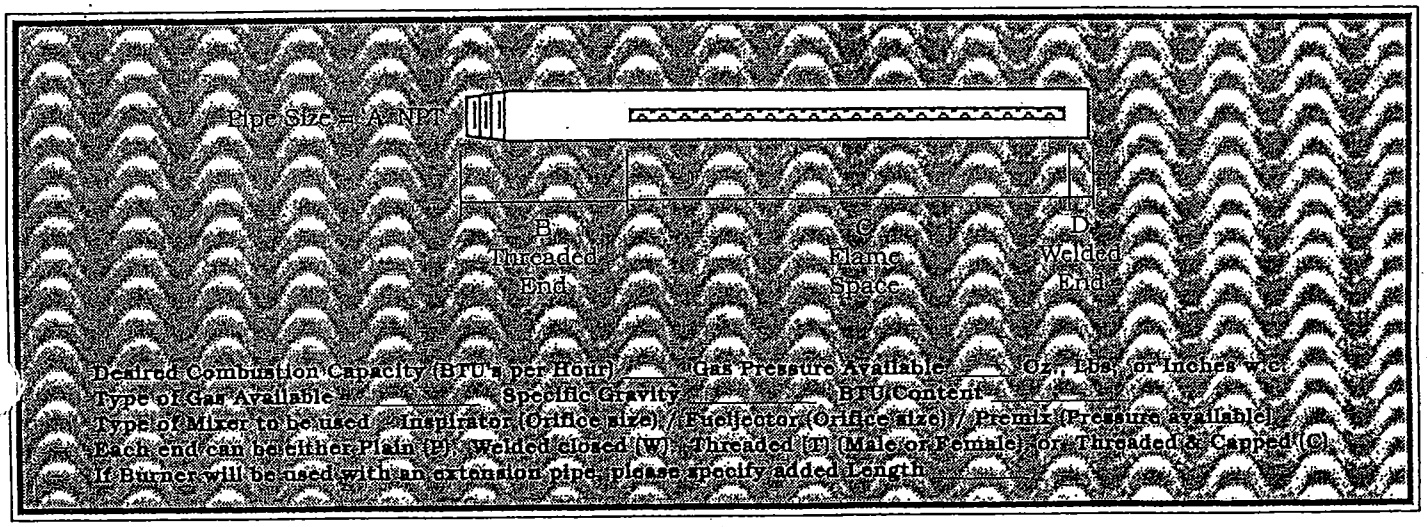
Ensign Ribbon Burners, Inc. has specialized in the development and manufacture of ribbon type burners for a variety of applications. Many thousands of these burners are in daily use operating on any type of gas available and with all types of gas mixing systems.



High Capacity Burners: Ensign High Capacity Pipe Burners having output ratings up to 10,000 BTU's per lineal inch of flame space can be furnished on request. These burners are used extensively for ink drying, singeing operations, etc., where maximum heat and absolute balance of the burner flame is essential.

Custom Built Burners: Ensign builds special burners in a variety of shapes, with custom feed positions, pilot ribbons, and ribbon porting configurations.

In order to properly quote a burner, we need to know some basic information which can be summarized as per the instructions below.

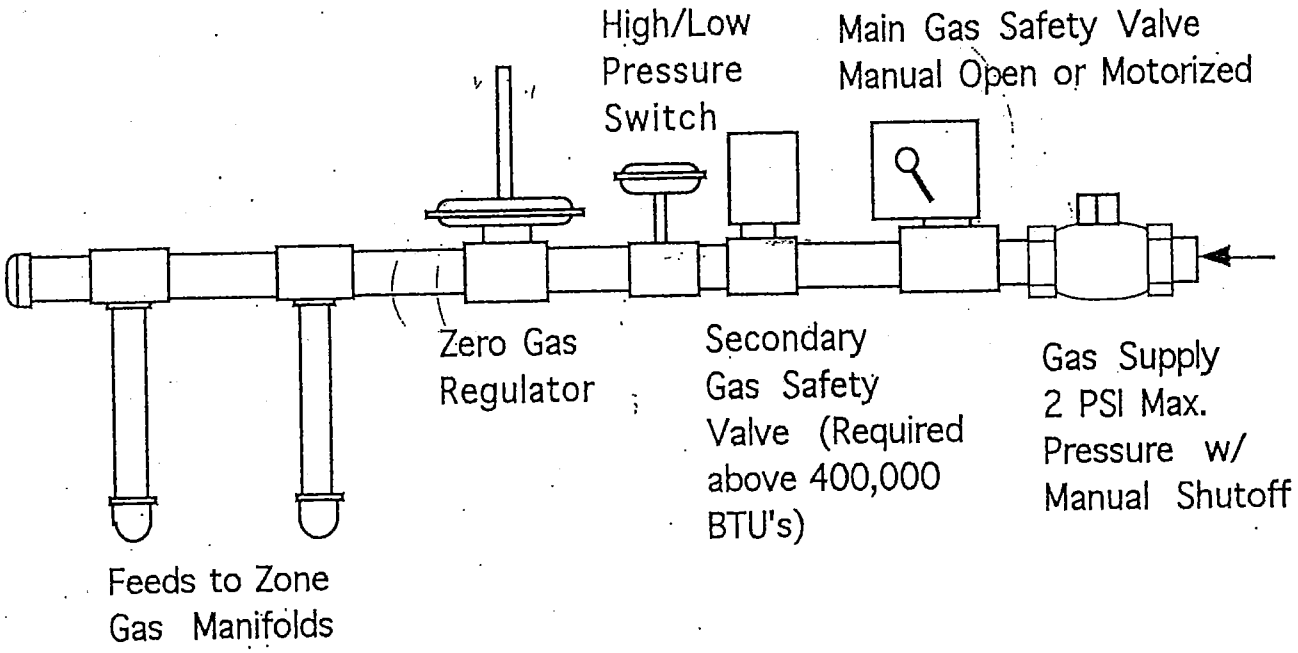


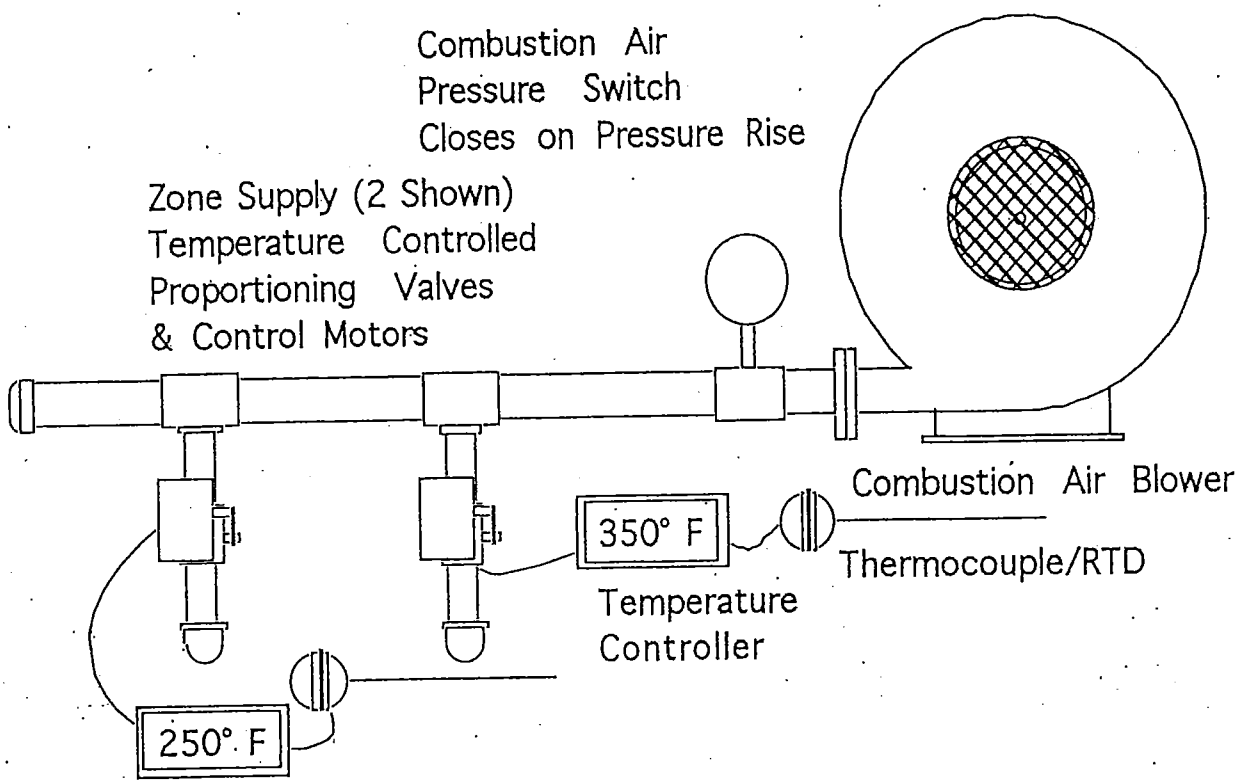
Design Originators and Manufacturers of Pipe Ribbon Burners Since 1940

ENSIGN *Ribbon Burners Inc.*
101 Secor Lane Pelham Manor NY 10803-2791
(914) 738-0600 Fax (914) 738-0928
A Subsidiary of Mondial International Corporation

Engineering

Air/Gas Supply Schematic





IGNITION CONTROL
FLAME SAFETY

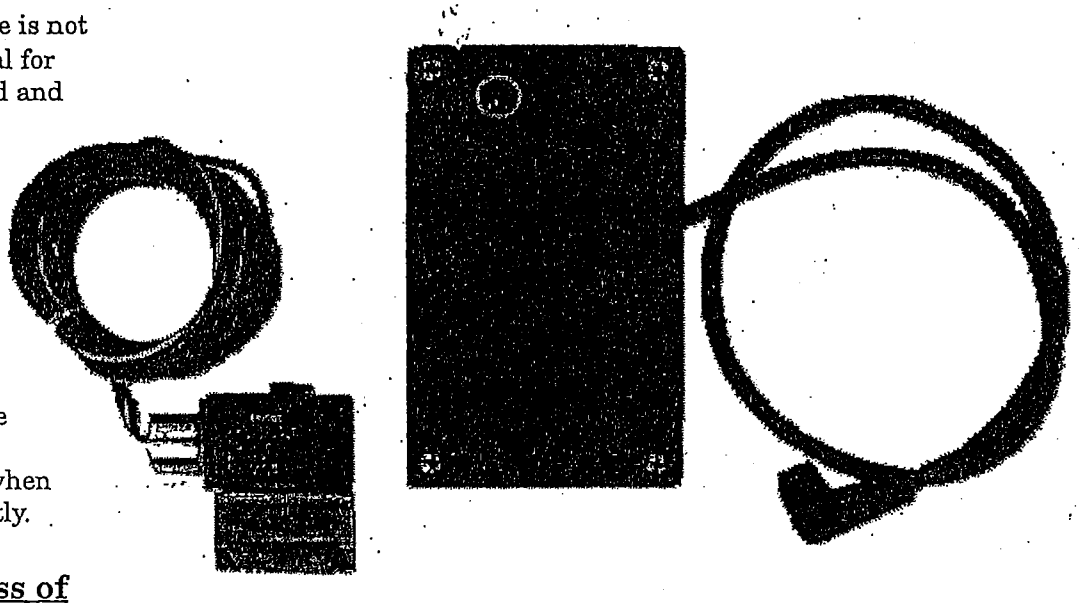
Ensign Ribbon Burners LLC
101 Secor Lane, Pelham Manor, NY 10803-2791/USA
(914) 738-0600 / Fax (914) 738-0928
E-Mail: Ensign @ Ensignrb.com
Web: www.ensignrb.com

SNS-120, SNS-122

Description - The SNS 120 single probe and SNS 122 double probe units are small, very economical direct spark ignition control designed for use in general heating applications. It is supplied with a polarized 6 (SNS 120) or 7 (SNS 122) pin connector for quick changeover of connections. The SNS 120 and SNS 122 are supplied with a case, potted, with externally mounted fuse, switch, terminal strip, and indicator light(s). The box is 3-3/4 inches wide by 6-1/4 inches high and 2-1/2 inches deep. See figures 1 and 2 for dimensions. Wiring diagrams for the SNS 120 an SNS 122 are shown in figures 3 and 4. Note that the SNS 120 model has a spark electrode which functions as both the ignition and the flame probe. The SNS 122 model has a separate probe to sense a flame. (Available Summer 1998)

Normal Operation - Heat Cycle - Upon a call for heat, the SNS 120 enters the purge. At the end of the specific purge period, the unit enters the trial for ignition (TFI). At the start of the TFI, the valve opens and the unit begins sparking at a synchronous rate of 60 sparks/second. Sparking continues until the desired trial time has elapsed. If the unit does sense a flame, the valve is held open, to commence heating, until the thermostat is satisfied.

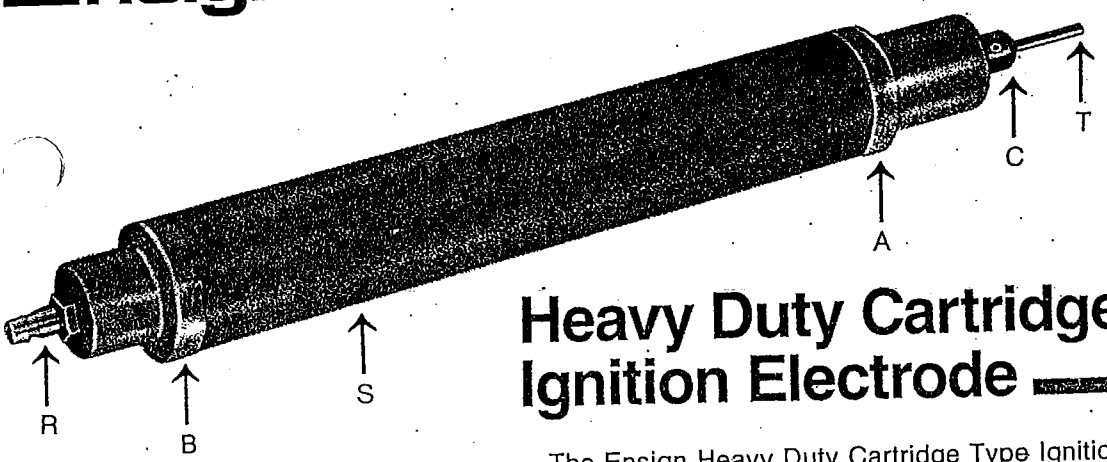
Lockout if a flame is not established - If a flame is not established during the trial for ignition, the valve is closed and the unit enters lockout. The thermostat must be opened and then closed again to provide another trial. The SNS 120 is equipped with quick reset circuitry so that the power interruption to restart the unit can be nearly instantaneous. The SNS 120 has an indicator lamp that is illuminated when the unit is working correctly.



Re-ignition after loss of flame or flame failure - If there is a loss of an established flame during a burn cycle, the valve remains open and the spark is re-established within 0.8 seconds. This immediate ignition attempt after loss of flame is called "spark restoration". The advantage of spark restoration is that an unstable flame will not cause valve clatter. Once the flame is re-established, usually shortly after the spark restoration trial begins, the burn cycle will continue until the thermostat is satisfied.

Power interruptions - The quick reset circuitry on the SNS 120 enables it to react very well to short power interruptions. A power loss of about 30 milliseconds or less is not recognized by the unit meaning that the purge, trial, or burn cycle will continue as if no interruptions had occurred. A longer power loss causes the unit to recycle. Therefore, a power interruption of any duration does not lead to lockout. Make sure that any loss of power results in a repurging of any closed space prior to the re- initiation of combustion. (ie: Power failure causes exhaust blower to stop, resulting in a system purge prior to power application to the SNS unit.)

Ensign Ribbon Burners, Inc.



Heavy Duty Cartridge Type Ignition Electrode

The Ensign Heavy Duty Cartridge Type Ignition Electrode was specifically designed in accordance with Underwriters' specifications, to meet the ignition requirements for gas burners used in bakery band ovens and other multiple burner type bake ovens.

The Ensign electrode has the following features:

The insulators (A) and (B) are made of the highest grade steatite having a dielectric strength of 240 volts per mil. They will withstand a current of 15,000 volts in a temperature of 1,700° F., without break-down. All insulators are heavily glazed to prevent moisture absorption.

The electrode spacer (S) is made of stainless steel tubing. The entire assembly is held together by means of a stainless steel rod and is completely non-corrosive, assuring long and trouble-free operation.

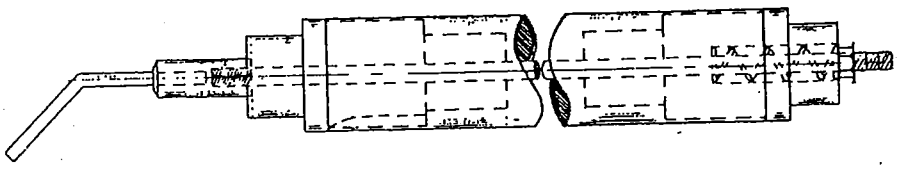
The electrode may be made any length desired and can, therefore, be adapted to any oven installation, without danger of short circuit, regardless of oven wall thickness or burner flame location.

The spark end of the electrode is arranged with a stainless steel connector (C) which holds the spark tip (T) in place and also allows for lateral adjustment of the tip. The tip can be readily and inexpensively replaced without replacing any other part of the electrode.

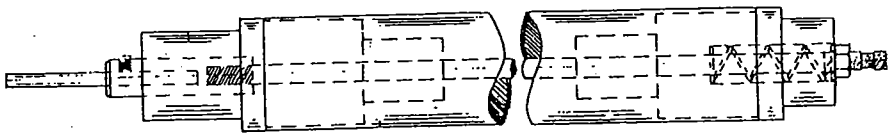
The oven plate end of the electrode is equipped with a Rajah stud (R). Rajah snap type connectors can be supplied for convenient connection between the high tension source and the electrode.

Ensign oven plates and electrode brackets are available for holding the electrodes securely in position and permitting the electrode to be withdrawn without disturbing the oven plates, burners, or piping. The oven plate is designed to allow full inspection of the burner flame and point of ignition.

All parts are interchangeable and may be replaced when necessary.



ASSEMBLY DRAWING IGNITION ELECTRODE
(BENT TIP TYPE) 1 1/8" O.D.

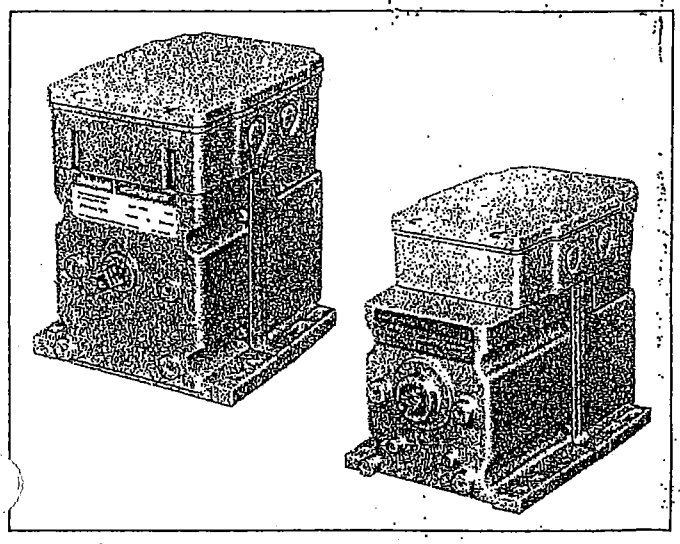


ASSEMBLY DRAWING IGNITION ELECTRODE
(STRAIGHT TIP) 1 1/8" O.D.

Honeywell

Series 72
Modutrol IV™ Motors

PRODUCT DATA



APPLICATION

The Series 72 Modutrol IV Motors are used to control dampers and valves. The motors accept a current or voltage signal from an electronic controller to position a damper or valve at any point between open and closed.

FEATURES

- Replaces M744S,T,Y and M745S,T,Y Motors.
- M7261, M7274, M7281, M7284, and M7294 are non-spring return motors; M7272, M7282, M7285, and M7286 are spring return motors.
- Oil immersed motor and gear train for reliable performance and long life.
- Wiring box provides NEMA 3 weather protection.
- Actuator motor and circuitry operate from 24 Vac. Models available with factory installed transformer or an internal transformer can be field added.
- Quick connect terminals standard—screw terminal adapter available.
- Adapter bracket for matching shaft height of older motors is standard with replacement motors.
- Nominal timing of 30 seconds for 90° stroke and 60 seconds for 160° stroke.
- Valve and damper linkages, explosion-proof housing, and auxiliary switches available as accessories.
- Spring return motors are rated for 25 lb.-in. and 60 lb.-in torque.
- Non-spring return motors are rated for 35 lb.-in., 75 lb.-in., 150 lb.-in., and 300 lb.-in. torque.
- Models available with adjustable start (zero) and span.
- Models available with 4 to 20 mA input signal.
- Models available with 2 to 10 Vdc input signal.
- Die-cast aluminum housing.

Contents

The New York Blower Company

Date: 11/8/2007
File: C01950
Sequence: 1
Revision:

Control: 100
Chg Order:
Processor: FTD

Customer: DONG YANG FOOD MACHINERY CO

Purchase Order:
Tagging:

Office Reference: DONG YANG

FAN INFORMATION

Quantity: 1
Product Line: Pressure Blower
Size: 2004A
Class/Wheel Type: 0 / Aluminum
Rotation: CCW
Arrangement: 4
Discharge: BH.
Motor Position:
Motor By: NYB
Mounting By: NYB
Bearing Mfg. & Model:

Total fan wt. With accessories: 379 lbs

DRIVE INFORMATION

QTY	DESCRIPTION	PART NUMBER
1	Motor Sheave	
	Motor Bushing	
1	Fan Sheave	
	Fan Bushing	
1	Belt	

SF: 1.3
Belt Tens:

Belt Centers: in

FAN PERFORMANCE DATA

Capacity	CFM	SP	RPM	BHP	TEMP	DENS	ALT	MAX SS
STANDARD	0	0	3500	0	70	0.075	0	3900
OPERATING								
FUTURE								
TEST								

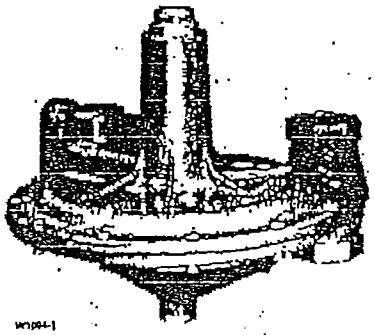
SALES MEMO INFORMATION

QTY	DESCRIPTION	Drawing#
1	CCW BH, SIZE 2004A5 PRESSURE BLOWER, ALUM-WHEEL, ARR-4 FLANGED INLET 06" FLANGED OUTLET 04"	C01950-100-02
1	5 HP, 3600 RPM, 3-60-230/460 V., TEFC ENCL., FRAME 184T MOTOR AND MOUNTING BY NYB	
1	MOTOR DATA SHEETS	
1	CERTIFIED VIBRATION REPORT	
1	INLET AND OUTLET SHIPPING COVERS	
1	WRAP FAN IN PLASTIC FOR SHIPMENT	
1	FAN INSTALLATION AND MAINTENANCE MANUAL REFERENCE NUMBER.	IM140.PDF

Type S200 Series

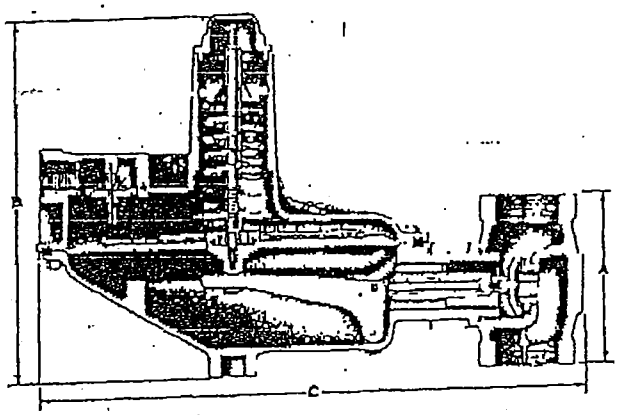
용 도

- 도시가스, 산업체 Main Station정압기
- 산업체 증기보일러



특 징

- 고정밀도
- 민감한 반응
- 급작스런 부하변동에도 빠른 응답성으로 하부기기 보호
- 최소한의 Lock-Up으로 양호한 기밀유지
- 수직 - 수평 배관가능 (360° 회전)
- In-Line 보수유지가능
- Internal Relief (S202)



TYPE S202

사 양

- 최대허용 입구압력 :

최대입구압력		Seat Ring Diameter, inches (mm)
Psig	Bar	
125	7.6	1/4 (6.4)
125	7.6	3/8 (9.5)
100	6.8	1/2 (12.7)
60	4.1	3/4 (19.1)
25	1.7	1 (25.4)
13	0.8	1-3/16 (30.2)

- 출구압력 조정범위 : 표참조
- 사 용 온 도 범 위 : -29℃~66℃

접 속 규 격	치 수						중 량	
	Inches			mm				
	A	B	C	A	B	C	Pounds	kg
1-1/2, 2	8.12	12.88	19.56	165	327	137	28 ~	12

D NGS®

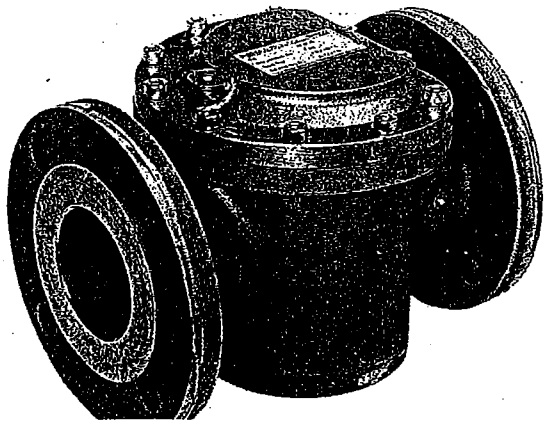
Gas- und Luftfilter Typ GF
nach DIN 3386
Gas and airfilter type GF
as per DIN 3386
Filtres pour gaz et air type GF
selon DIN 3386

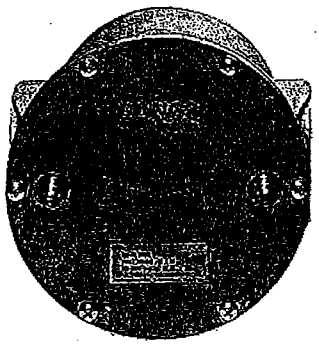
Mit extrem hoher Staubspeicherkapazität.
GF 5.../1 bis 0,5 bar (50 kPa)
GF 4.../1 bis 4,0 bar (400 kPa)
GF 4.../3 bis 4,0 bar (400 kPa)
GF 4... bis 4,0 bar (400 kPa)
EG-Baumusterprüfbescheinigung

With extremely high dust-storage capacity.
GF 5.../1 to 0.5 bar (50 kPa)
GF 4.../1 to 4.0 bar (400 kPa)
GF 4.../3 to 4.0 bar (400 kPa)
GF 4... to 4.0 bar (400 kPa)
EC-Type examination certificate

A très grande capacité d'accumulation des poussières.
GF 5.../1 à 0,5 bar (50 kPa)
GF 4.../1 à 4,0 bar (400 kPa)
GF 4.../3 à 4,0 bar (400 kPa)
GF 4... à 4,0 bar (400 kPa)
Certificat d'examen CE de type

Artikelbezeichnung Article designation Désignation de l'article	Anschluß/Connection/Raccord Gewinde / Thread / Filet	Flansch / Flange / Bride	Bestell-Nummer Ordering Number No. de commande
GF 505/1	Rp 1/2		066191
GF 507/1	Rp 3/4		066209
GF 510/1	Rp 1		066217
GF 515/1	Rp 1 1/2		066225
GF 520/1	Rp 2		066233
GF 4005/1	Rp 1/2		228073
GF 4007/1	Rp 3/4		228074
GF 4010/1	Rp 1		228075
GF 4015/1	Rp 1 1/2		228076
GF 4020/1	Rp 2		228077
GF 40 040/3		DN 40	222637
GF 40 050/3		DN 50	222638
GF 40 065/3		DN 65	222639
GF 40 080/3		DN 80	222640
GF 40 100/3		DN 100	222641
GF 40125		DN 125	218162
GF 40150		DN 150	218163
GF 40200		DN 200	218164





anlagen nach EN 1854
Overpressure switches for firing systems as per EN 1854
Pressostats pour surpression pour installations de chauffe selon EN 1854

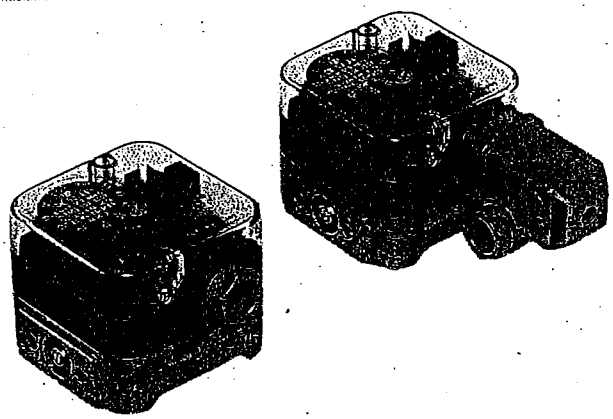
DUNGS®

Druckwächter sind geeignet zum Ein-, Aus- oder Umschalten eines Stromkreises bei sich änderndem Druck-Istwert zum eingestellten Sollwert.
GW...A4/...A4 Mini-Maxi Compact-doppeldruck-wächter
GW...A6/...A6
EG-Baumusterprüfbescheinigung

Pressure switches are suitable for switching a circuit on, off or over when the set setpoint is exceeded or not attained.
GW...A4/...A4 Mini-Maxi compact double-pressure switch
GW...A6/...A6
EC-Type examination certificate

Les pressostats sont appropriés pour ouvrir, fermer ou commuter un circuit électrique lors du changement de la pression préréglée.
GW...A4/...A4 Mini-Maxi presso-stat double compact
GW...A6/...A6
Certificat d'examen CE de type

Artikelbezeichnung Article designation Désignation de l'article	Einstellbereiche [mbar] Adjusting ranges [mbar] Plages de réglage [mbar]		Bestell-Nummer Ordering Number No. de commande
GW 3 A4/ 3 A4	0,4 - 3	0,4 - 3	209929
GW 3 A4/ 10 A4	0,4 - 3	1 - 10	208930
GW 10 A4/ 10 A4	1 - 10	1 - 10	208931
GW 10 A4/ 50 A4	1 - 10	2,5 - 50	208932
GW 10 A4/150 A4	1 - 10	30 - 150	208933
GW 50 A4/ 50 A4	2,5 - 50	2,5 - 50	208934
GW 50 A4/150 A4	2,5 - 50	30 - 150	208935
GW 150 A4/150 A4	30 - 150	30 - 150	208936
GW 500 A4/500 A4	100 - 500	100 - 500	208937
GW 3 A6/ 3 A6	0,7 - 3	0,7 - 3	229235
GW 3 A6/ 10 A6	0,7 - 3	2 - 10	229236
GW 10 A6/ 10 A6	2 - 10	2 - 10	229237
GW 10 A6/ 50 A6	2 - 10	5 - 50	229238
GW 10 A6/150 A6	2 - 10	10 - 150	229239
GW 50 A6/ 50 A6	5 - 50	5 - 50	229240
GW 50 A6/150 A6	5 - 50	10 - 150	229241
GW 150 A6/150 A6	10 - 150	10 - 150	229242
GW 500 A6/500 A6	100 - 500	100 - 500	229243



D'UNGS®

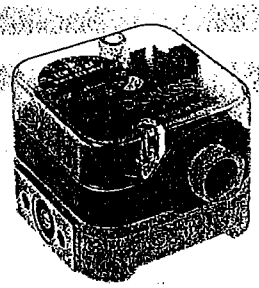
Differenzdruckwächter für Luft, Rauch- und Abgase in Feuerungsanlagen nach EN 1854
Differential pressure switches for air, waste and flue gases infiring systems as per EN 1854
Pressostat différentiels pour air et gaz brûlé dans installations de chauffe selon EN 1854

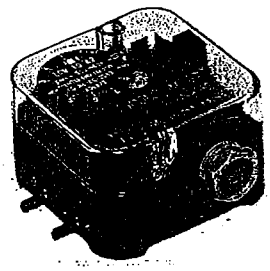
ifferenzdruckwächter sind geeignet zum in-, Aus- oder Umschalten eines Stromreises bei sich ändernden Druck-Istwert um eingestellten Sollwert.
GW...A1 werksseitig justiert nach Kundenwunsch
GW...A2/ mit Sollwerteinsteller
.4/C2
GW...A2 P zusätzlich mit Prüftaste
G-Baumusterprüfbescheinigung

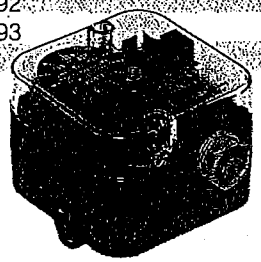
Differential Pressure switches are suitable for switching a circuit on, off or over when the set setpoint is exceeded or not attained.
LGW...A1 switchpoint is factory-set as per customers demand
LGW...A2/ with adjusting scale
A4/C2
LGW...A2 P test button incorporated
EC-Type examination certificate

Pressostats différentiels sont appropriés pour ouvrir, fermer ou commuter un circuit électrique lors du changement de la pression préréglée.
LGW...A1 préréglage en usine suivant demande client
LGW...A2/ avec disque de réglage
A4/C2
LGW...A2 P touche de contrôle add.
Certificat d'examen CE de type

rtikelbezeichnung rticle designation ésignation de l'article	Einstellbereich [mbar] Adjusting range [mbar] Plage de réglage [mbar]	Bestell-Nummer Ordering Number No. de commande
LGW 1,5 A1	0,3 - 1,5	nach Spezifikation
LGW 3 A1	0,4 - 3	as per specification
LGW 10 A1	1 - 10	selon spécification
LGW 50 A1	2,5 - 50	nach Spezifikation
LGW 150 A1	30 - 150	as per specification
Adapter LGW...A1		188590
LGW 3 A2	0,4 - 3	107409
LGW 10 A2	1 - 10	107417
LG 50 A2	2,5 - 50	107425
LG 150 A2	30 - 150	107433
LGW 3 A2P	0,4 - 3	120204
LGW 10 A2P	1 - 10	120212
LGW 50 A2P	2,5 - 50	221207
LGW 150 A2P	30 - 150	120238
LGW 1,5 C2	0,2 - 1,5	212200
LGW 3 C2	0,4 - 3	212571
LGW 10 C2	1 - 10	212572
LGW 3 A4	0,4 - 3	221590
LGW 10 A4	1 - 10	221591
LGW 50 A4	2,5 - 50	221592
LGW 150 A4	30 - 150	221593







einstufige Betriebsweise
GasMultiBloc
one-stage operation
GasMultiBloc
Fonctionnement à une allure

DUNGS®

GasMultiBlocs sind die Integration von Filter, Regler, Ventilen und Min. Druckwächter in einer Kompaktarmatur,
MB 403 0,2 bar (20 kPa)
MB 053 0,06 bar (6 kPa)
MB 405-420 0,36 bar (36 kPa)
EG-Baumusterprüfbescheinigung

GasMultiBloc are compact units combining filter, regulator, valves and min. pressure switch.
MB 403 0,2 bar (20 kPa)
MB 053 0,06 bar (6 kPa)
MB 405-420 0,36 bar (36 kPa)
EC-Type examination certificate

Le GasMultiBloc est l'intégration du filtre, régulateur, vannes et min. pressostat dans une armature compacte.
MB 403 0,2 bar (20 kPa)
MB 053 0,06 bar (6 kPa)
MB 405-420 0,36 bar (36 kPa)
Certificat d'examen CE de type

Artikelbezeichnung Article designation Désignation de l'article	Gewindeflansch Threaded flange Bride fileté	Ausgangsdruckbereich Regulating pressure range Plage de réglage [mbar]	Bestell-Nummer Ordering Number No. de commande
MB-DLE 403 B01 S20	Rp 3/8	4-20	226568
MB-DLE 405 B01 S20	Rp 1/2	4-20	226560
MB-DLE 407 B01 S20	Rp 3/4	4-20	226561
MB-DLE 410 B01 S20	Rp 1	4-20	226562
MB-DLE 412 B01 S20	Rp 1 1/4	4-20	226563
MB-DLE 415 B01 S20[1]	Rp 1 1/2	4-20	226799
MB-DLE 420 B01 S20[1]	Rp 2	4-20	226803
MB-DLE 405 B07 S22[2]	Rp 1/2	4-20	191370
MB-DLE 407 B07 S22[2]	Rp 3/4	4-20	191380
MB-DLE 410 B07 S22[2]	Rp 1	4-20	182270
MB-DLE 412 B07 S22[2]	Rp 1 1/4	4-20	182040
MB-DLE 405 B01 S50	Rp 1/2	4-50	226875
MB-DLE 407 B01 S50	Rp 3/4	4-50	226874
MB-DLE 410 B01 S50	Rp 1	4-50	226873
MB-DLE 412 B01 S50	Rp 1 1/4	4-50	226872
MB-DLE 415 B01 S50[1]	Rp 1 1/2	20-50	226801
MB-DLE 420 B01 S50[1]	Rp 2	20-50	226805
MB-DLE 053 B01 S20	Rp 3/8	4-20	226570

Stecker und Flansche sind separat zu bestellen (siehe Seite 38).
Unterschiedliche Gewindeflanschgrößen pro MB Type möglich.

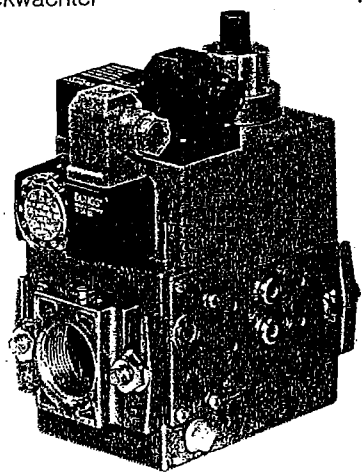
[1] mit Vorbaufilter
[2] ohne Druckwächter

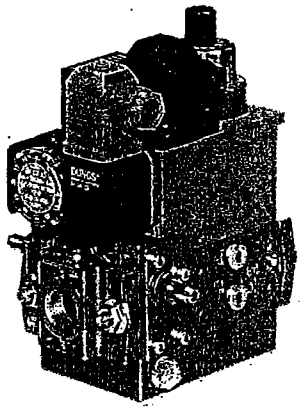
Plugs and flanges have to be ordered separately (see page 38).
Different sizes of threaded flanges possible per MB type.

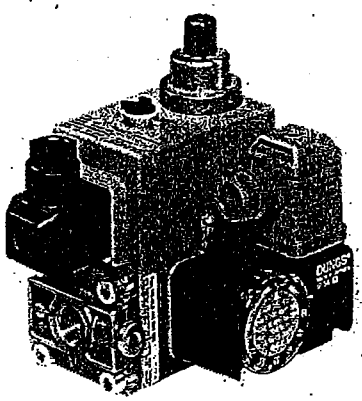
[1] with pre-mount filter
[2] without pressure switch

Prises et brides sont à commander séparément (voir page 38).
Différentes grandeurs de brides filetés par MB sont possibles.

[1] avec filtre poche
[2] sans pressostat







SGS

Test Report No. F690501/LF-CTSAYA07-18927

Issued Date: August 29, 2007

To: KOREA FINE CERAMIC CO., LTD.
5-3, Bangye-ri
Munmak-town
Wonju-city
KANGWON-DO
Korea

The following merchandise was submitted and identified by the client as :

Product Name	: CERAMICA
SGS File No.	: AYA07-18927
Received Date	: August 23, 2007
Test Performing Date	: August 24, 2007
Test Performed	: SGS Testing Korea tested the sample(s) selected by applicant with following results
Test Results	: For further details, please refer to following page(s)

SGS Testing Korea Co. Ltd.

Pluto Kim
Monet Jeong
Billy Oh / Testing Person

Jeff Jang / Chemical Lab Mgr

Sample No. : AYA07-18927.001

Sample Description : CERAMICA

Item No./Part No. : CRC-1500H

Heavy Metals

Test Items	Unit	Test Method	MDL	Results
Cadmium (Cd)	mg/kg	US EPA 3052(1996), US EPA 6010B(1996), ICP	0.5	N.D.
Lead (Pb)	mg/kg	US EPA 3052(1996), US EPA 6010B(1996), ICP	5	N.D.
Mercury (Hg)	mg/kg	US EPA 3052(1996), US EPA 6010B(1996), ICP	2	N.D.
Hexavalent Chromium (Cr VI)	mg/kg.	US EPA 3060A(1996), US EPA 7196A(1992), UV	1	N.D.

Flame Retardants-PBBs/PBDEs

Test Items	Unit	Test Method	MDL	Results
Monobromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Dibromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Tribromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Tetrabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Pentabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Hexabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Heptabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Octabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Nonabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Decabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Monobromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Dibromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Tribromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Tetrabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Pentabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Hexabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Heptabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Octabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Nonabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Decabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.

NOTE: (1) N.D. = Not detected.(<MDL)
(2) mg/kg = ppm
(3) MDL = Method Detection Limit
(4) - = No regulation
(5) ** = Qualitative analysis (No Unit)
(6) Negative = Undetectable / Positive = Detectable

Korea Merchandise Testing & Research Institute

459-28 KASAN-DONG, KUMCHON-GU, SEOUL, KOREA TEL:02)856-5615
FAX : 02)856-5618, 854-6667 http://www.komtri.re.kr

TEST REPORT

NO : 02135

DATE : MAR. 4. 2000
(IN : FEB. 25. 2000)

CLIENT : KOREA FINE CERAMIC CO., LTD

SAMPLE DESCRIPTION : CERAMIC NON-STICK PAINT

TEST RESULTS :

ITEMS		UNIT	LIMITATIONS	RESULTS
MATERIAL TEST	Lead(Pb)	%	Shall not exceed 10	0.0022
	Antimony(Sb)		Shall not exceed 5	0.0017
EXTRACTION TEST	Arsenic(As)	mg/ℓ	Shall not exceed 0.2	Less than 0.01
	Cadimium(Cd)		Shall not exceed 0.1	Less than 0.01
	Lead(Pb)		Shall not exceed 0.4	Less than 0.1
	Phenol		Shall not exceed 5.0	Conform
	Formaldehyde		Shall not exceed 4.0	Conform
	Extractable fraction in 4%-Acetic Acid		Shall not exceed 30	4

▶ TEST METHOD : KOREA FOOD AND DRUG ADMINISTRATION NOTICE NO. 98-60 FOR FOOD PACKAGES AND CONTAINERS.

Signed by C. M. Seo.

Chang Mo Seo, Manager
Env. & Welfare Dept.

KOREA FINE CERAMIC INC

Material Safety Data Sheet (MSDS)

Ceramica G-3000

Address 5-3 Bangyeri Moonmak-eup Wonju Kangwondo, Rep. Of Korea Code KFCTRI-02C-C107

Prepared and revised by the concerned department of the Technical Institute 02.MAR.2002

Tel : (8233)731-7441~3 Emergency contact : same as the above department

Fax : (8233)731-8741

1. Product Identification & Composition/Information on Ingredients

1. Distinction between the simple and mixture : mixture
2. Ingredients

Name of Chemicals	Product of reaction (Polysiloxane, alcohol, water, inorganic filler, inorganic pigment) Ceramic coatings, Ceramica G-3000
Contents(wt%)	Polysiloxane 18~25%, , for alcohol, water, inorganic filler and inorganic pigment are stated below
Structure	As stated below
CAS No.	NA

※ Informations on chemical name of composed monomer and Cermamica G-3000 are commercially protected. Its toxic effects are not studied thoroughly.

3. Contents of alcohol, water, inorganic filler and inorganic pigment

Trade name	Chemical name	content(wt%)	CAS No.
METHYL ALCOHOL	CH_3OH	3.0~4.8	67-56-1
BUTYL CELLOSOLVE	$C_4H_9OCH_2CH_2OH$	0.8~1.0	111-76-2
WATER	H_2O	23.5~30.7	7732-18-5
SILICA	SiO_2	20~21.5	67762-90-7

- May cause Irritation on a respiratory organ, skin and eyes

- Flammable liquid and vapor

- May cause explosion

- Should be isolated from all ignitions

- Avoid inhalation of vapor and dust

- Avoid eye, skin and clothing contact
- Should be used under proper vantilation
- To be handled with care

② Potential effect on health

· Inhalation

- Short term exposure

May cause irritation

May cause same effect as swallowed in short term

May cause tinnitus, indigestion, dizziness, hypesthesia, twitch, trouble in visual organ and harm nerve additionally

- Long term effect

same effect as swallowed in short term

May cause headache

· Skin contact

- Short term exposure

May cause irritation

May cause same effect as swallowed in short term

May cause dizziness and harm nerve additionally

- Long term effect

same effect as swallowed in short term

same effect as short term exposure

· Eye contact

Get medical attention immediately

② Skin Contact

· First aid treatment

Take off the polluted clothes and shoes immediately

Wash exposed parts with soap or mild detergent and large amount of water until no remaining trace of chemicals is found(at least 15-20 minutes)

③ Eye contact

· First aid treatment

Raise upper and lower eyelids immediately flushing with large amount of water or saline solution until no remaining trace of chemicals is found(at least 15-20 minutes)

Get medical attention immediately

④ Ingestion

· First aid treatment

Use emetics when found ingestion of G-3000 within 2 hours

Clean completely using water added with natrium ecarbonate

Get medical attention immediately

Gastrolavage must be performed by doctor or medical assistant

⑤ Information for doctors

· Antidote

The following antidotes are recommended ?usage of antidotes and the quantity should be judged by doctors or medical assistant

Methanol toxic : oral ingestion of ethanol, 50%, 1.5mL/kg. 5% deluted solution for the first step. 0.5-1.0mL/Kg for 4 days and every two hours by oral ingestion or venous injection to decrease and eliminate Methanol metabolism. Thickness of methanol in blood should be maintained below 1-1.5mg/mL.

Dosage should be done by doctors or medical assistants.

Using 4-methylpyrazole through mouth or dosing into venous hamper alcohol dehydrogenase and effectively act as antidote for methanol or ethylene glycol toxic.

④ Harmful combustion product

It may produce toxic carbon oxide when decomposed by heat

5. Spillage and Accidental Release Measures

① Direct spillage

Isolate igniter

Stop spillage if possible

Use water to diminish vapor

If spillage is not substantial, use sand or other absorbent and keep inside the container for post action

If substantial spillage occurs, make a hilly spot far from the front of the point of leakage to coop in for post action

No smoking, spark or fire in dangerous area

Stop access of unnecessary personnel and isolate dangerous area and restricted area

Keep in a dry, clean and proper container for further step after cleanup

Do not let the leaked material drain into sewer

② Soil leakage

Prepare a spot for cooping in such as lagoon, pond or drain pit

Cooping in the hilly spot using soil, sandbag or polyurethane or concrete.

6. Handling and Storage

Abide by all the regulations of central and local governments in storing this product

Isolate this product from materials which can not be in the same place

Store in a manner noted in the manual of G-3000

Keep in a cool and dry and dark place after sealing

7. Exposure controls and Personal protection

- Molecular weight: NA
- Molecular formula: NA
- Boiling point: over 65(149)
- Melting point : over ?94 (-137)
- Steam pressure: under 97.25 mmHg(at 20)
- Steam density: NA
- Gravity : 0.9-0.99
- PH: 4 ~6
- Evaporation rate: NA
- Viscosity : 4-6 cP (at 20)
- Solubility (water): good
- Solubility (solvent): Soluble with organic solvent such as alcohol, ketone ㄴ

9. Stability and Reactivity

① Reactivity

Exothermic reaction was noted when maturing(maturing G-3000 A liquid with B liquid)

Stable at room temperature and at atmospheric pressure after maturing

② Conditions to avoid

Prevent heat, spark or other things which might ignite

Vapor may explode

Avoid vapor ingestion or contact to skin

Avoid water pollution caused by leakage

③ Substance to avoid

- Asethyl Bromide: rapid reaction generating hydrogen bromide
- Alkylaluminium solvent : rapid reaction

· natrium methoxide+chloroform : rapid reaction

· sulfuric acid: ignitable and explosive

④ Harmful decomposite products

thermal cracking may emit harmful carbon oxide

⑤ Polymerization reaction

Polymerization reaction when aged(mixture of G-3000 A liquid and B liquid)

no dangerous polymerization reaction reported under normal temperature and pressure

polymerization reaction when vulcanized(dry and vulcanize after applying)

10. Information on toxicity

This information on toxicity is based on 100% methanol standard. Toxicity and irritation shall be referred as below the based standard for G-3000 with about 10% of methanol.

① Irritation information

-20mg/24hours, skin-rabbit : normal

-40mg, eye-rabbit : normal -40mg,

-100mg/24hours, eye-rabbit : normal

② toxicity information

-TCL0 : 86000mg/m3, inhalation-human being

-TCL0 : 300ppm, inhalation-human being

-LC50 : 64000ppm/4hours, inhalation-rat

-LCL0 : 1000ppm, inhalation-monkey

-LCL0 : 50gm/m3/2hours, inhalation-mouse

-LCL0 : 44gm/m3/6hours, inhalation-cat

-TCL0 : 50mg/m3/12hours/13week, intermittent inhalation-rat

-LD50 : 15800mg/kg, skin-rabbit

-LDL0 : 393mg/kg, skin-monkey

-LDL0 : 428mg/kg, oral-human being

repeated headache when chronically exposed on 600~1,125ppm

· Skin contact : irritant/anesthetic/tetanospamin

– acute exposure

on G-3000 liquid may cause irritation

may acidize metabolism, affect eye and central nervous system as inhaled acutely when absorbed by skin

– chronic exposure

repeated and continuous fat-removing effect with liquid may cause edema, dewetting and eczema dermatitis chronical absorption may acidize metabolism as inhaled acutely

· Eye contact: stimulant

– acute exposure

Vapor may cause irritation

it is reported that high concentration may cause acute conjunctivitis and defect on epithelium of cornea

diluted liquid may cause weak irritation

– chronic exposure

repeated and continuous exposure may cause conjunctivitis

Inhalation : anesthetic/tetanospamin

– acute exposure

may cause weak and impulse drowsiness and 12-48 hours of no symptoms will be followed

afterwards, caugh, difficulty in breathing, headache, dull condition, weakness, dizziness, misjudgement diarrhea from time to time, anorexia, acute pain in the belly and limbs, instability, insensibility or impulse mental storm, unusual stimulation and mania , low breathing, chill and wet skin caused by acidized metabolism may cause partial blindness or belated and temporary blindness

irreversable effect on central nervous system including continuous weakness and trouble when speaking, stiffness,tonic spasm and functional disease with decrease in sporting ability was reported

–chronic exposure

repeated inhalation may cause trouble in eyesight and also may cause affect overall body same as when acutely inhaled

Mainly riped liquid mixture of G-3000 is noted and rising problems during mix riping are also included

For inquiries regarding this content, please contact the Technical Institute of Korea Fine Ceramic Corporation at 8233-731-7441~3

Lubriplate® Lubricants

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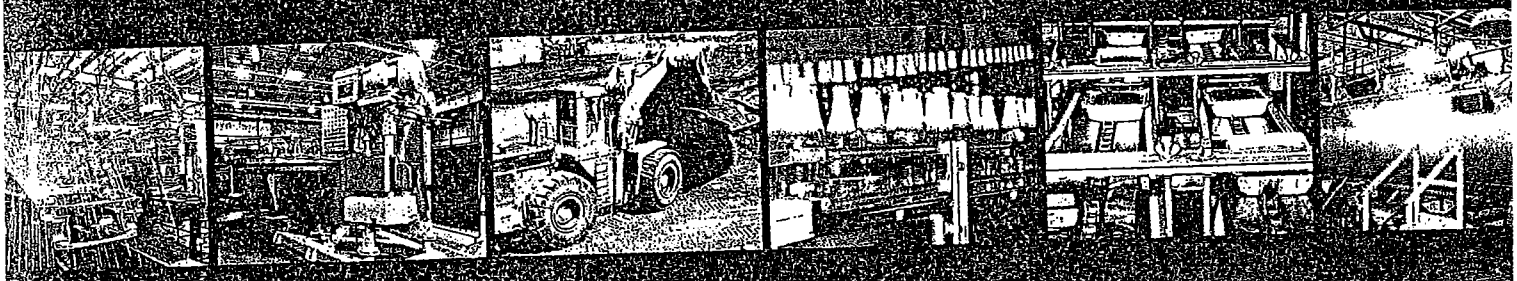

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- Gear, Bearing & Recirculating Oils
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Lubrication Data Book

ynthetic Multi-Purpose, Gear, Bearing, Chain & Recirculating Fluids

/n Lube 150-1000: Polyalphaolefin (PAO)-Based, 100% Synthetic Fluids.

ese multi-purpose polyalphaolefin (PAO) based, zinc-free fluids are formulated with state-of-the-art additives. These fluids provide outstanding rfor e over extended drain intervals. They are recommended for gearboxes, bearings, chains and recirculating systems.

UBRIPLATE RODUCT	PRODUCT PART NO.	ISO GRADE	AGMA NO.	SAE GEAR OIL NO.	VIS.cSt @40°C/100°C	VIS.SUS @100°F/210°F	VIS. INDEX	FLASH POINT	FIRE POINT	POUR POINT
'N LUBE 150	L0974-	150	4	80W-90	151 / 20	762 / 97	156	510°F / 266°C	555°F / 291°C	-60°F / -51°C
'N LUBE 220	L0975-	220	5	90	216 / 26	1088 / 128	155	510°F / 266°C	555°F / 291°C	-50°F / -46°C
'N LUBE 320	L0976-	320	6	80W-140	311 / 34	1557 / 161	155	505°F / 263°C	550°F / 288°C	-50°F / -46°C
'N LUBE 460	L0977-	460	7	140	446 / 45	2143 / 211	156	505°F / 263°C	550°F / 288°C	-45°F / -43°C
'N LUBE 680	L0978-	680	8	-	623 / 57	3289 / 275	157	500°F / 260°C	545°F / 285°C	-45°F / -43°C
'N LUBE 1000	L0979-	1000	8A	-	950 / 77	4900 / 372	157	500°F / 260°C	545°F / 285°C	-35°F / -37°C

Lube 150 through 1000 is available in Jugs, Pails, 1/4 Drums & Drums. See page 18 for package part number suffix.

/n Lube HD Series: Heavy-Duty, Extreme Pressure, Polyalphaolefin (PAO)-Based, 100% Synthetic Fluids.

ese heavy-duty, zinc free, extreme pressure, 100% synthetic based, fluid lubricants are designed for applications where an extreme essure synthetic fluid is required. They deliver outstanding extreme pressure protection, excellent anti-wear properties and very low efficients of friction, resulting in lower operating temperatures, reduced power consumption and longer equipment life. Excellent ther- al stability and oxidation resistance increases service life, providing extended drain intervals. Compatible with a broad range of seals. n Lube HD 220 and 460 pass 12 stages of the FZG Test.

UBRIPLATE RODUCT	PRODUCT PART NO.	ISO GRADE	AGMA NO.	SAE GEAR OIL NO.	VIS.cSt @40°C/100°C	VIS.SUS @100°F/210°F	VIS. INDEX	FLASH POINT	FIRE POINT	POUR POINT
N LUBE HD 150	L1000-	150	4 EP	80W-90	162 / 21	816 / -	154	540°F / 282°C	590°F / 310°C	-60°F / -51°C
N LUBE HD 220	L1001-	220	5 EP	90	199 / 25	988 / -	154	540°F / 282°C	580°F / 304°C	-55°F / -48°C
N LUBE HD 320	L1002-	320	6 EP	80W-140	310 / 35	1545 / -	157	540°F / 282°C	585°F / 307°C	-50°F / -46°C
N LUBE HD 460	L1003-	460	7 EP	140	440 / 47	2191 / -	164	550°F / 288°C	585°F / 307°C	-50°F / -46°C
N LUBE HD 680	L1004-	680	8 EP	-	705 / 68	3384 / -	170	555°F / 291°C	580°F / 304°C	-45°F / -43°C

Lube HD Series Lubricants are available in Jugs, Pails, 1/4 Drums & Drums. See page 18 for package part number suffix.

nth ic Worm Gear Lubricant: Polyalphaolefin (PAO)-Based, 100% Synthetic Fluid Lubricant.

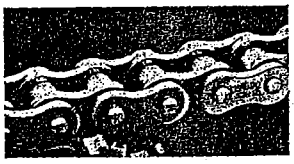
is h erformance, ISO 460 grade, synthetic gear lubricant is recommended for all types of worm gear reducers. Formulated with advanced ditives, this 100% synthetic-based fluid provides outstanding anti-wear and anti-friction properties ideal for the high sliding action of worm ars. It works well over a wide range of temperature extremes. It is compatible with a broad range of seal materials. Excellent oxidation istance insures long service life. Passes 12 stages of FZG Test.

UBRIPLATE RODUCT	PRODUCT PART NO.	ISO GRADE	AGMA NO.	SAE GEAR OIL NO.	VIS.cSt @40°C/100°C	VIS.SUS @100°F/210°F	VIS. INDEX	FLASH POINT	FIRE POINT	POUR POINT
n Wrm Gear	L0981-	460	7	140	440 / 47	2191 / -	164	550°F / 288°C	585°F / 307°C	-50°F / -46°C

thetic Worm Gear Lubricant is available in Bottles, Jugs, Pails, 1/4 Drums & Drums. See page 18 for package part number suffix.

/nthetic High Temp Fluids 68 and 220: 100% Ester-Based Fluids.

ese 100% ester based synthetic lubricants are recommended for use on bakery oven chains, drying oven ains, tenter frame chains, heat treating chains, paint curing oven chains and any other type of bearing/slide/ arbox applications where they are exposed to high operating temperatures and must maintain a clean lubricated rface. Available in ISO viscosity grades 68 and 220. Proven successful in applications in excess of 600°F / 316°C.



UBRIPLATE RODUCT	PRODUCT PART NO.	ISO GRADE	AGMA NO.	SAE GEAR OIL NO.	VIS.cSt @40°C/100°C	VIS.SUS @100°F/210°F	VIS. INDEX	FLASH POINT	FIRE POINT	POUR POINT
l High Temp 68	L0778-	68	2	80W	74 / 11	364 / 58	109	554°F / 290°C	640°F / 338°C	-25°F / -32°C
l High Temp 220	L0780-	220	5	90	220 / 19	1112 / 102	92	525°F / 274°C	580°F / 304°C	-5°F / -21°C

l High Temp 68 & 220 is available in Pails & Drums. See page 18 for more information and package part number suffix.

SO Synthetic Gear Fluids: 100% Polyalkylene Glycol (PAG)-Based Fluids.

ese 100% polyalkylene glycol fluids are designed to handle the most demanding operating conditions. These fluids deliver outstanding protec- n against micropitting, abrasion and wear. They deliver unsurpassed extreme pressure and anti-wear performance and provide outstanding ermal stability. They exceed 12 stages of the FZG test.

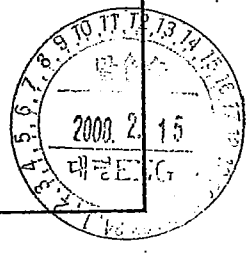
UBR ROD	PRODUCT PART NO.	ISO GRADE	AGMA NO.	SAE GEAR OIL NO.	VIS.cSt @40°C/100°C	VIS.SUS @100°F/210°F	VIS. INDEX	FLASH POINT	FIRE POINT	POUR POINT
O-220	L0838-	220	5	90	227 / 42	-	242	543°F / 284°C	-	-44°F / -42°C
O-460	L0839-	460	7	140	477 / 83	-	262	543°F / 284°C	-	-33°F / -36°C

O Synthetic Gear Fluids are available in Pails & Drums. See page 18 for more information and package part number suffix.

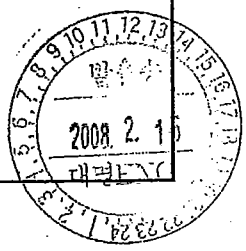
MA-American Gear Manufacturers Association ISO-International Standards Organization

INSPECTION TEST REPORT

FAN TYPE	TURBO FAN	AIRFOIL FAN	SIROCCO FAN
QT'Y	2 SET	2 SET	4 SET / 1SET
CUSTOMER	동양식품기계㈜		
USER	USA		
SUPPLIER	DAE-MYUNG E N G		



CONTENTS



TEST REPORT & PERFORMANCE CURVE

Item No.			Test No.	Customer	동양 식품 기계
Serial No.			Testing Method:Pitot Tube, Manometer, (In) Out Let Side	User	
Type AIRFOIL FAN			Test Tube:Dia. ø500 mm, Length 6ml Area 0.195m²	Test Date	2008.02.13.
Model DMLA-#3 1/2-S4			Nozzle:Inlet ø500 , 0.195m², Outlet 380X360, 0.1368m²	Witness	
Gas Quantity m³/min	136	136	MOTOR : Type TEFC Frame No. Insulation FClass	Test	KIM C.K.
Static Press. mmAq	71	138	7.5 kW, 4p, 1720rpm, 3 ø, 60Hz, 460/ Volt	Check	YOU Y.S.
Motor HP kW	7.5	7.5	13.7/ Amp, Serial No Maker HICO	Barometric Pressure	760 mmHg
Fan Speed rpm	2190	2190	Bearing Size : #6311, #6308	Test Temperature	20 °C
Efficiency %	56	56	Power Drive : Coupling- ,Belt 3V Type 5101 X 3 ea	Relative Humidity	65 %
Temperature °C	300	20	Pulley : Fan ø 6" ,Motor ø 7.5	Gas Test Weight	1.2 Kg/m³
Gas Spec. W. Kg/m³	0.616	1.2	Meterial : Impeller SS400 , Casing SS400 , Shaft SM45C		

Survey No.			1	2	3	(4)	5	6	7
BLOWER	Static Press. (Ps) mmAq		176.8	186.3	179.8	145	44.5		
	Velocity Press. (Pd) mmAq		0	0.7	2.9	8.1	18.4		
	Total Press. (Pt) mmAq		176.9	187	182.7	153.1	62.9		
	Gas Quantity (Q) m/min		6.8	40.7	81.5	136	204		
	Speed (N) rpm		–	–	–	2195	–		
	Static Air House P. (As) kW		0.19	1.24	2.39	3.22	1.48		
	Total Air House P. (At) kW		0.19	1.24	2.43	3.4	2.09		
	Static Efficiency (n) %		7.1	33.4	51.9	56	23.2		
	Total Efficiency (n) %		7.1	33.5	52.8	59.1	32.8		
MOTOR	Votage (E) V		460	460	460	460	460		
	Current (I) Amp		5.04	6.78	8.42	10.50	11.65		
	Input Power (La) kW		–	–	–	–	–		
	Efficiency (nm) %		–	–	–	–	–		
	Output Power (Lb) kW		2.76	3.71	4.61	5.75	6.38		
Reduced to 300°C 2190 rpm	Static Press. mmAq		90.8	95.6	92.2	74.4	22.8		
	Total Press. mmAq		90.8	96	93.8	78.6	32.3		
	Gas Quantity m³/min		6.8	40.7	81.5	136	204		
	Brake House Power kW		1.41	1.9	2.36	2.95	3.27		
Remarks	Sound Level dB(A)								
	Vibration (μm)		H	V	A	H	V	A	
			FAN SIDE			MOTOR SIDE			

Ref. Data

Ku – Ns –

U2 – Cm2 –

D2 – D1 –

B2 – B1 –

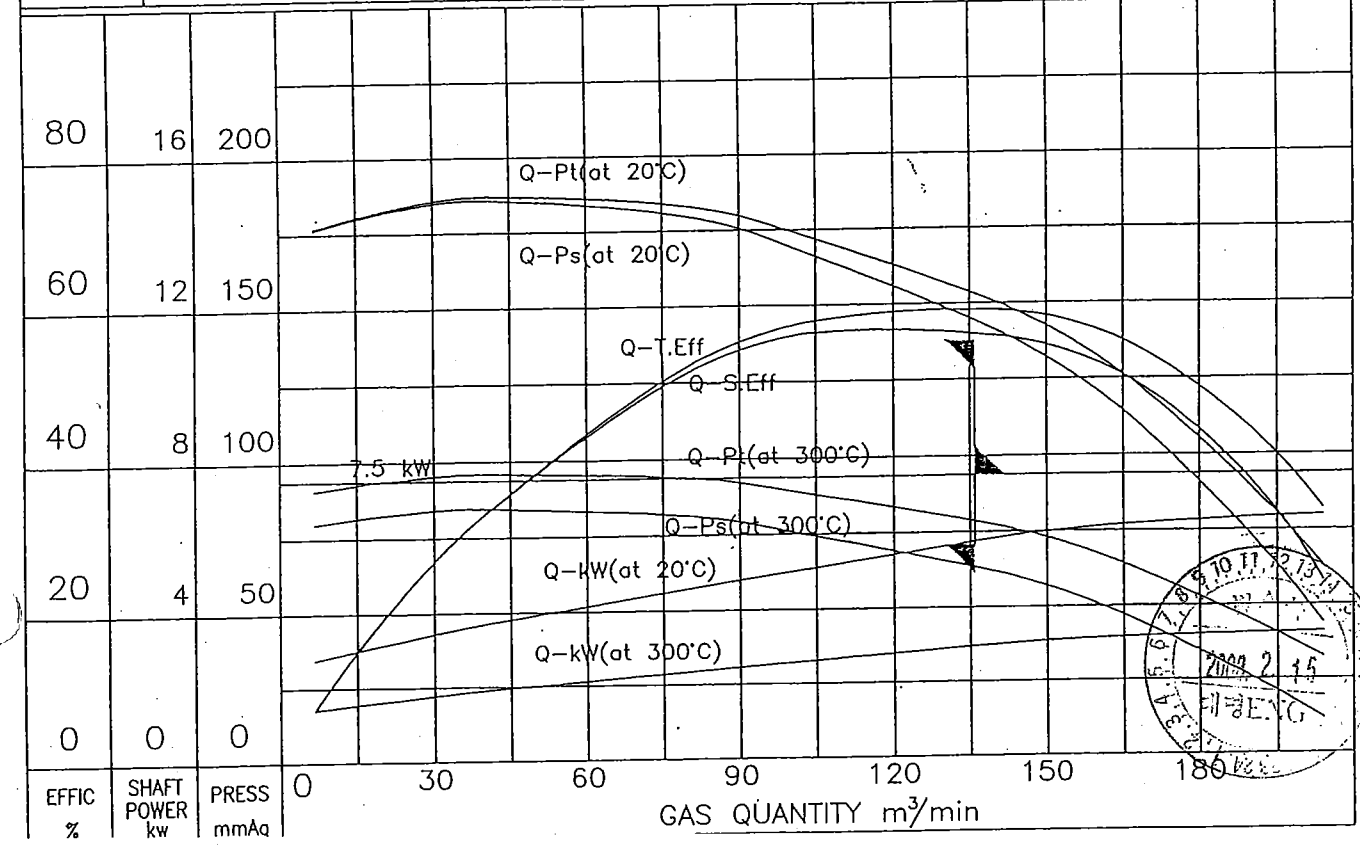
Bt2 – Bt1 –

Z –

Equations

$Q = 60Av$

$= 60A\sqrt{\frac{2g}{r}Pd}$



TEST REPORT & PERFORMANCE CURVE

Item No.			Test No.	Customer	풍양 식품 기계
Serial No.			Testing Method:Pitot Tube, Manometer, (In) Out Let Side	User	
Type TURBO FAN			Test Tube:Dia. ø350 mm, Length3.79ml Area 0.095 m²	Test Date	2008.0.2.13
Model DMTF-#3 1/4-S4			Nozzle:Inlet ø350 ,0.095 m², Outlet 300X 280 ,0.084 m²	Witness	
Gas Quantity m³/min	88	88	MOTOR : Type TEFC Frame No. 132S Insulation FClass	Test	KIM C.K.
Static Press. mmAq	113	220	5.5 kW, 4p, 1720 rpm, 3 ø, 60 Hz, 460/ Volt	Check	YOU Y.S.
Motor HP kW	5.5	5.5	10.1/ Amp, Serial No Maker HICO	Barometric Pressure	760 mmHg
Fan Speed rpm	2050	2050	Bearing Size : #6311, #6308	Test Temperature	20 °C
Efficiency %	58	58	Power Drive : Coupling- ,Belt 3V Type 5101 X 3 ea	Relative Humidity	65 %
Temperature °C	300	20	Pulley : Fan ø 6" ,Motor ø 7"	Gas Test Weight	1.2 Kg/m³
Gas Spec. W. Kg/m³	0.616	1.2	Meterial : Impeller SS400 , Casing SS400 , Shaft SM45C		

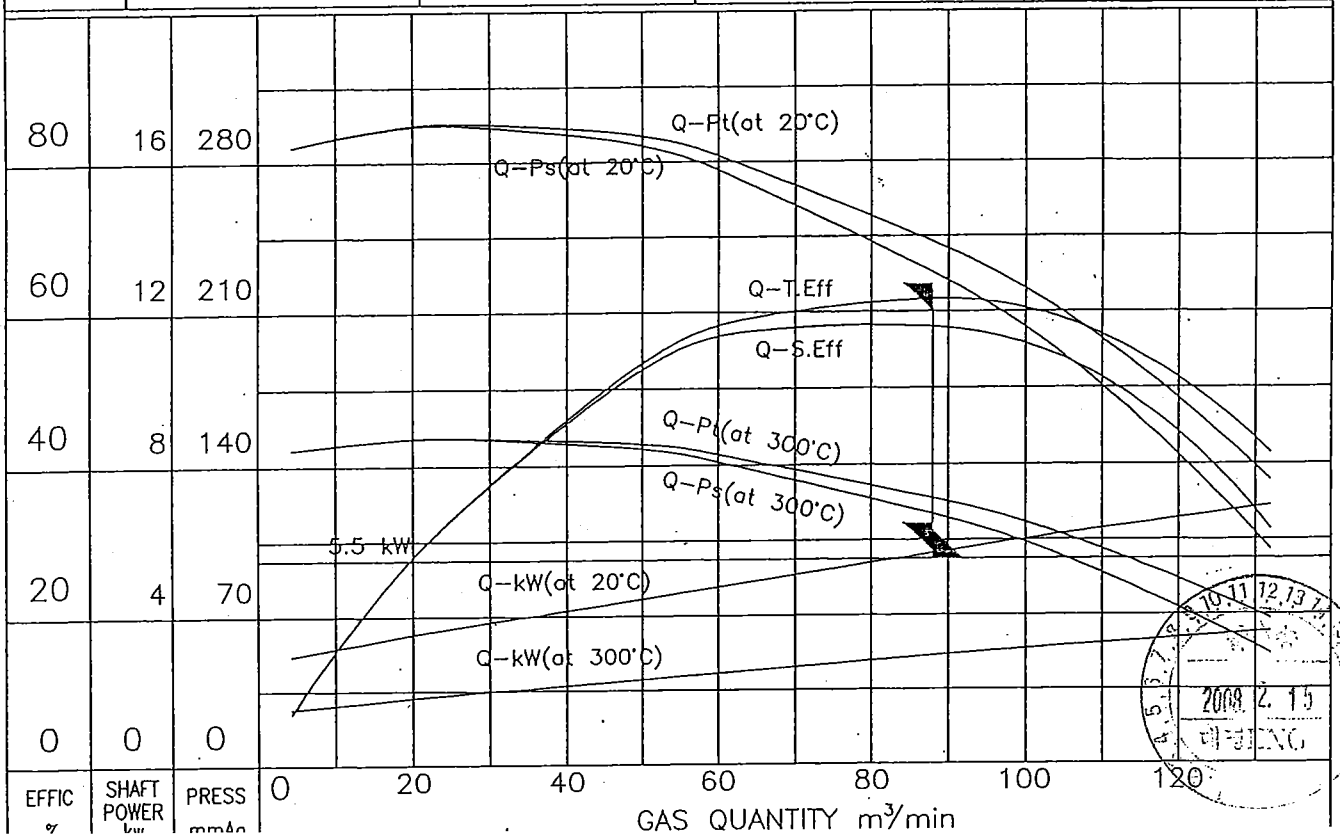
Survey No.			1	2	3	(4)	5	6	7
BLOWER	Static Press.	(Ps) mmAq	287.2	297	285.2	228	100.3		
	Velocity Press.	(Pd) mmAq	0	1.2	5.1	14.2	32.1		
	Total Press.	(Pt) mmAq	287.3	298.3	290.3	242.2	132.4		
	Gas Quantity	(Q) m³/min	4.4	26.3	52.7	88	132		
	Speed	(N) rpm	-	-	-	2053	-		
	Static Air House P.	(As) kW	0.2	1.28	2.46	3.27	2.16		
	Total Air House P.	(At) kW	0.2	1.28	2.5	3.48	2.85		
	Static Efficiency	(n) %	7	34.2	54.1	58	31.3		
	Total Efficiency	(n) %	7	34.3	55.1	61.6	41.4		
MOTOR	Votage	(E) V	220	220	220	220	220		
	Current	(I) Amp	5.38	6.87	8.33	10.37	12.65		
	Input Power	(La) kW	-	-	-	-	-		
	Efficiency	(nm) %	-	-	-	-	-		
	Output Power	(Lb) kW	2.93	3.74	4.54	5.65	6.89		
Reduced to 300°C 2050 rpm	Static Press.	mmAq	147.4	152.5	146.4	117	51.4		
	Total Press.	mmAq	147.4	153.1	149	124.3	68		
	Gas Quantity	m³/min	4.4	26.3	52.7	88	132		
	Brake House Power	kW	1.5	1.92	2.33	2.9	3.53		
Remarks	Sound Level	dB(A)							
	Vibration	(μm)	H	V	A	H	V	A	
			FAN SIDE			MOTOR SIDE			

Ref. Data	
Ku -	Ns -
U2 -	Cm2 -
D2 -	D1 -
B2 -	B1 -
Bt2 -	Bt1 -
Z -	

Equations

$Q = 60Av$

$= 60A\sqrt{\frac{2g}{r}Pd}$



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TEST REPORT & PERFORMANCE CURVE

Item No.			Test No.	Customer	동양식품기계
Serial No.			Testing Method:Pitot Tube, Manometer, (In) Out Let Side	User	
Type SIROCCO FAN			Test Tube:Dia. 400mm, Length 4.5ml Area 0.126m²	Test Date	2008.02.13.
Model DMSF-2.5-S4			Nozzle:Inlet 400 Q.126m², Outlet X , m²	Witness	
Gas Quantity m³/min	60		MOTOR : Type TEFC Frame No. Insulation F Class	Test	KIM C.K.
Static Press. mmAq	50		1.5kW, 4p, 1720rpm, 3 ø, 60Hz, 460/ Volt	Check	YOU Y.S
Motor HP kW	1.5		3.1/ Amp, Serial No Maker HICO	Barometric Pressure	760 mmHg
Fan Speed rpm	1060		Bearing Size : #6308 X 2EA	Test Temperature	20 °C
Efficiency %	42		Power Drive : Coupling ,Belt 3V Type 390 I' X 2 ea	Relative Humidity	65 %
Temperature °C	20		Pulley : Fan ø 6.5" ,Motor ø 4"	Gas Test Weight	1.2 Kg/m³
Gas Spec. W. Kg/m³	1.2		Meteriol : Impeller SS400 , Casing SS400 , Shaft SM45C		

Survey No.			1	2	3	(4)	5	6	7
BLOWER	Static Press.	(Ps) mmAq	63.1	57.5	58.7	52	34.5		
	Velocity Press.	(Pd) mmAq	0	0.3	1.3	3.8	7		
	Total Press.	(Pt) mmAq	63.1	57.8	60.1	55.8	41.6		
	Gas Quantity	(Q) m³/min	3	18	36	60	81		
	Speed	(N) rpm	–	–	–	1065	–		
	Static Air House P.	(As) kW	0.029	0.16	0.34	0.5	0.45		
	Total Air House P.	(At) kW	0.029	0.17	0.35	0.54	0.55		
	Static Efficiency	(n) %	3.9	20.3	35.5	42	25.4		
	Total Efficiency	(n) %	3.9	20.4	36.4	45.1	30.5		
MOTOR	Votage	(E) V	462	462	462	462	462		
	Current	(I) Amp	1.59	1.71	1.99	2.49	3.7		
	Input Power	(La) kW	–	–	–	–	–		
	Efficiency	(nm) %	–	–	–	–	–		
	Output Power	(Lb) kW	0.77	0.83	0.97	1.21	1.8		
Reduced to 20°C 1060 rpm	Static Press.	mmAq	63.1	57.5	58.7	52	34.5		
	Total Press.	mmAq	63.1	57.8	60.1	55.8	41.6		
	Gas Quantity	m³/min	3	18	36	60	81		
	Brake House Power	kW	0.77	0.83	0.97	1.21	1.8		
Remarks	Sound Level	dB(A)							
	Vibration	(μm)	H	V	A	H	V	A	
			FAN SIDE			MOTOR SIDE			

Ref. Data

Ku – Ns –

U2 – Cm2 –

D2 – D1 –

B2 – B1 –

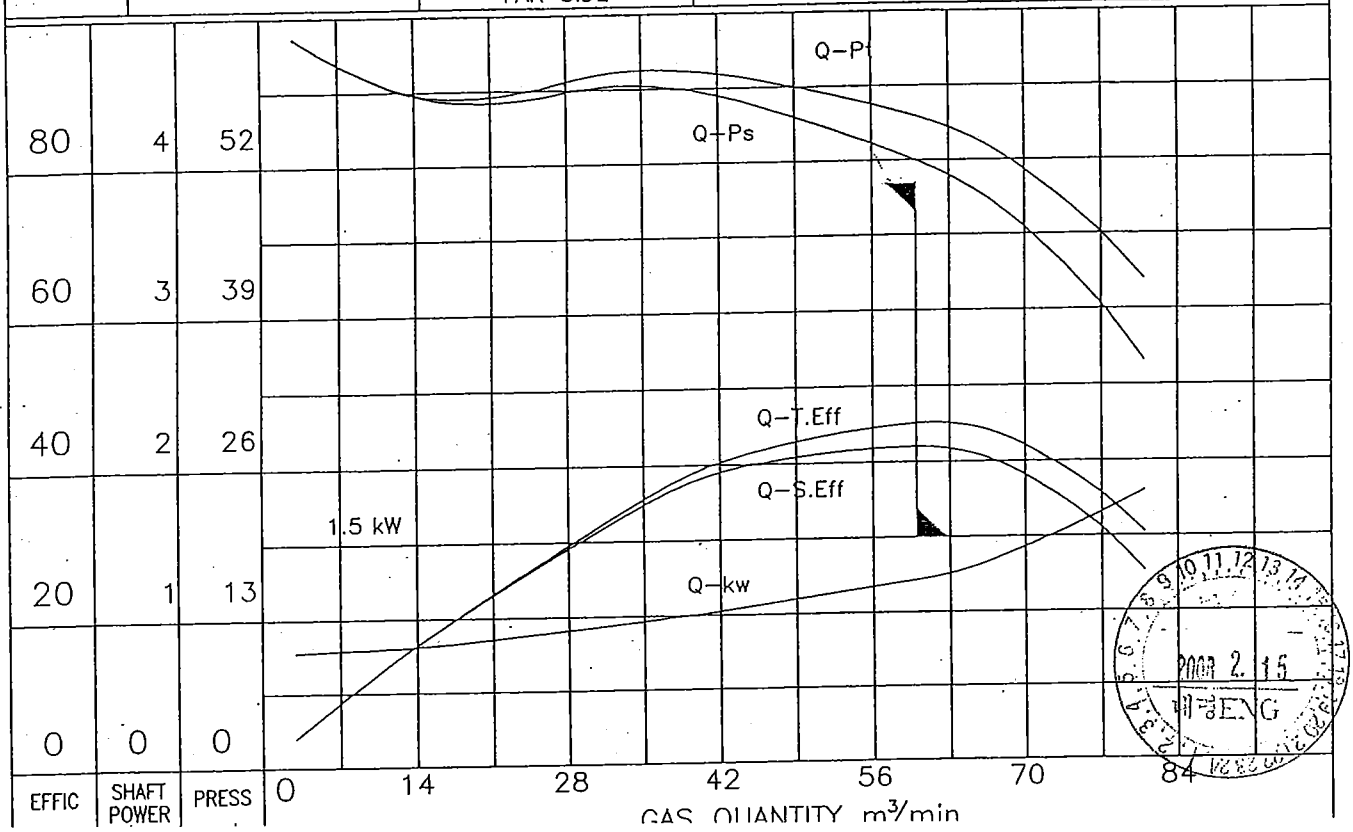
Bt2 – Bt1 –

Z –

Equations

$Q = 60Av$

$= 60A\sqrt{\frac{2g}{r}Pd}$



TEST REPORT & PERFORMANCE CURVE

Item No.	Test No.	Customer	동양 식품 기계
Serial No.	Testing Method:Pitot Tube, Manometer, (In) Out Let Side	User	
Type SIROCCO FAN	Test Tube:Dia. ø300 mm, Length 3.5ml Area 0.07 m²	Test Date	2008.02.13
Model DMSF--#2-S4	Nozzle:Inlet ø310 ,0.075m², Outlet X , m²	Witness	
Gas Quantity m³/min 40	MOTOR : Type TEFC Frame No. Insulation FClass	Test	KIM C.K.
Static Press. mmAq 30	0.75kW, 4p, 1720rpm, 3 ø, 60 Hz, 460/ Volt	Check	YOU Y.S.
Motor HP kW 0.75	1.6/ Amp, Serial No Maker HICO	Barometric Pressure	760 mmHg
Fan Speed rpm 1100	Bearing Size : #6306x2EA	Test Temperature	20 °C
Efficiency % 46.7	Power Drive : Coupling-- ,Belt 3V Type 350 I X 2 ea	Relative Humidity	65 %
Temperature °C 20	Pulley : Fan ø 5.5" ,Motor ø 3.5"	Gas Test Weight	1.2 Kg/m³
Gas Spec. W. Kg/m³ 1.2	Meterial : Impeller SS400 , Casing SS400 , Shaft SM45C		

Survey No.			1	2	3	(4)	5	6	7
BLOWER	Static Press.	(Ps) mmAq	38.8	35.3	36.1	32	21.2		
	Velocity Press.	(Pd) mmAq	0	0.4	1.9	5.3	9.8		
	Total Press.	(Pt) mmAq	38.8	35.8	38.1	37.3	31.1		
	Gas Quantity	(Q) m³/min	2	12	24	40	54		
	Speed	(N) rpm	–	–	–	1108	–		
	Static Air House P.	(As) kW	0.009	0.059	0.14	0.2	0.18		
	Total Air House P.	(At) kW	0.009	0.07	0.14	0.24	0.27		
	Static Efficiency	(n) %	3.7	19.3	33.8	40	24.1		
	Total Efficiency	(n) %	3.7	19.6	35.7	46.7	35.3		
MOTOR	Votage	(E) V	461	461	461	461	461		
	Current	(I) Amp	0.70	0.75	0.87	1.11	1.64		
	Input Power	(La) kW	–	–	–	–	–		
	Efficiency	(nm) %	–	–	–	–	–		
	Output Power	(Lb) kW	0.33	0.35	0.41	0.52	0.77		
Reduced to 20°C 1100 rpm	Static Press.	mmAq	38.8	35.3	36.1	32	21.2		
	Total Press.	mmAq	38.8	35.8	38.1	37.3	31.1		
	Gas Quantity	m³/min	2	12	24	40	54		
	Brake House Power	kW	0.33	0.35	0.41	0.52	0.77		
Remarks	Sound Level	dB(A)							
	Vibration	(μm)	H 28	V 25	A 22	H 15	V 24	A 20	
			FAN SIDE			MOTOR SIDE			

Ref. Data

Ku – Ns –

U2 – Cm2 –

D2 – D1 –

B2 – B1 –

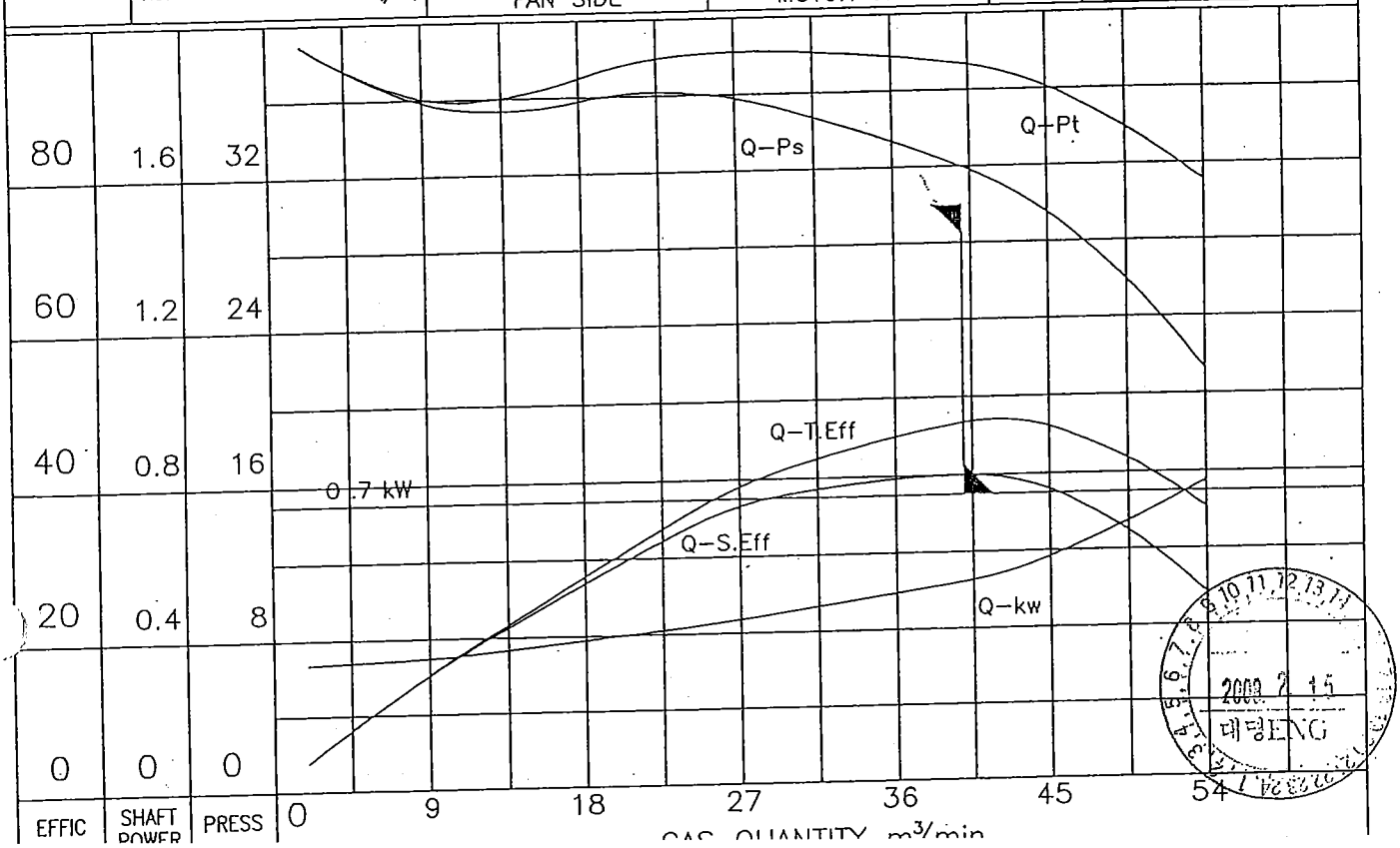
Bt2 – Bt1 –

Z –

Equations

Q=60Av

$=60A\sqrt{\frac{2g}{r}}$ Pd



DAE-MYUNG ENG	Vibration Test Report	Report No.: VIR-DP-0821 Sheet No. : 1 OF 5
Tech. Spec. No.: -	Equip Name/No. : AIRFOIL FAN / -	Customer : 동양 식품 기계 (주)
Part Name/No : FAN ASS'Y	QP No. : - / Procedure No.: -	Sequence No. : -

Design Conditions / Test Conditions

Test Item	Design Conditions	Test Conditions
Fan Type/ Model	AIRFOIL FAN/DMLA-3.5-S4	AIRFOIL FAN/DMLA-3.5-S4
Air Flow Rate(m^3/min)	136	136
RPM	2190	2195
Air Temp. (℃)	20	20
Static Pressure(mmAq)	138	145
Relative Humidity (%)	N/A	N/A
Rated Power Input (Kw)	7.5	5.75
Measuring Equipment (Type & Name)	VM-3304 (Serial No: 01-02220-009)	

Test Results

(Measuring Unit : mm/sec)

Measuring position		Acceptance Criteria (mm/sec)	Measuring value (mm/sec)		Results	Remark
Fan NO.	Position		Driving Side	Driven Side		
AIRFOIL FAN-1	Horizontal	6.3 Max.	2.2	2.7	O.K	
	Vertical		3.3	3.5		
	Axial		2.8	3.4		
AIRFOIL FAN-2	Horizontal	6.3 Max.	2.4	2.8	O.K	
	Vertical		3.1	3.7		
	Axial		2.4	2.9		

Prepared by : C.K.KIM
QC Inspector

Approved by : Y.S.YOU
QA Dept. MGR

Remarks :

2008. 2. 15
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DAE-MYUNG ENG	Vibration Test Report	Report No.: VIR-DP-0822 Sheet No. : 2 OF 5
Tech. Spec. No.: -	Equip Name/No. : TURBO FAN / -	Customer : 동양 식품 기계 (주)
Part Name/No : FAN ASS'Y	QP No. : - / Procedure No.: -	Sequence No. : -

Design Conditions / Test Conditions

Test Item	Design Conditions	Test Conditions
Fan Type/ Model	TURBO FAN/DMTF-3.25-S4	TURBO FAN/DMTF-3.25-S4
Air Flow Rate(m^3/min)	88	88
RPM	2050	2060
Air Temp. (℃)	20	20
Static Pressure(mmAq)	220	228
Relative Humidity (%)	N/A	N/A
Rated Power Input (Kw)	5.5	5.65
Measuring Equipment (Type & Name)	VM-3304 (Serial No: 01-02220-009)	

Test Results

(Measuring Unit : mm/sec)

Measuring position		Acceptance Criteria (mm/sec)	Measuring value (mm/sec)		Results	Remark
Fan NO.	Position		Driving Side	Driven Side		
TURBO FAN-1	Horizontal	6.3 Max.	2.2	2.7	O.K	
	Vertical		3.3	3.0		
	Axial		1.7	2.1		
TURBO FAN-2	Horizontal	6.3 Max.	2.5	2.4	O.K	
	Vertical		3.2	3.3		
	Axial		1.9	2.1		

Prepared by : C.K.KIM
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QA Dept. MGR

Remarks :

2003. 2. 15
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DAE-MYUNG ENG	Vibration Test Report	Report No.: VIR-DP-0823 Sheet No. : 3 OF 5

Tech. Spec. No.:	Equip Name/No. :	Customer :
-	SIROCCO FAN / -	동양 식품 기계 (주)

Part Name/No :	QP No. :	Procedure No.:	Sequence No. :
FAN ASS'Y	-	-	-

Design Conditions / Test Conditions

Test Item	Design Conditions	Test Conditions
Fan Type/ Model	SIROCCO FAN/DMSF-2.5-S4	SIROCCO FAN/DMSF-2.5-S4
Air Flow Rate(m^3/min)	60	60
RPM	1060	1065
Air Temp. (℃)	20	20
Static Pressure(mmAq)	50	52
Relative Humidity (%)	N/A	N/A
Rated Power Input (Kw)	1.5	1.21
Measuring Equipment (Type & Name)	VM-3304 (Serial No: 01-02220-009)	

Test Results

(Measuring Unit : mm/sec)

Measuring position		Acceptance Criteria (mm/sec)	Measuring value (mm/sec)		Results	Remark
Fan NO.	Position		Driving Side	Driven Side		
SIROCCO FAN	Horizontal	6.3 Max.	1.9	2.0	O.K	
	Vertical		1.7	1.5		
	Axial		1.8	1.5		
	Horizontal					
	Vertical					
	Axial					

Prepared by : C.K.KIM
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QA Dept. MGR

Remarks :

2008. 2. 15
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DAE-MYUNG ENG	Vibration Test Report	Report No.: VIR-DP-0824 Sheet No. : 4 OF 5
Tech. Spec. No.: -	Equip Name/No. : SIROCCO FAN / -	Customer : 동양 식품 기계 (주)

Part Name/No :	QP No. :	Procedure No.:	Sequence No. :
FAN ASS'Y	-	-	-

Design Conditions / Test Conditions

Test Item	Design Conditions	Test Conditions
Fan Type/ Model	SIROCCO FAN/DMSF-2-S4	SIROCCO FAN/DMSF-2-S4
Air Flow Rate(m^3/min)	40	40
RPM	1100	1108
Air Temp. (℃)	20	15
Static Pressure(mmAq)	30	32
Relative Humidity (%)	N/A	N/A
Rated Power Input (Kw)	0.75	0.52
Measuring Equipment (Type & Name)	VM-3304 (Serial No: 01-02220-009)	

Test Results

(Measuring Unit : mm/sec)

Measuring position		Acceptance Criteria (mm/sec)	Measuring value (mm/sec)		Results	Remark
Fan NO.	Position		Driving Side	Driven Side		
SIROCCO FAN-1	Horizontal	6.3 Max.	1.6	1.7	O.K	
	Vertical		1.4	1.5		
	Axial		1.4	1.45		
SIROCCO FAN-2	Horizontal	6.3 Max.	1.8	1.7	O.K	
	Vertical		1.3	1.6		
	Axial		1.2	1.5		

Prepared by : C.K.KIM
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QA Dept. MGR

Remarks :

2008. 2. 15
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DAE-MYUNG ENG	Vibration Test Report	Report No.: VIR-DP-0824 Sheet No. : 5 OF 5
Tech. Spec. No.: -	Equip Name/No. : SIROCCO FAN / -	Customer : 동양 식품 기계 (주)

Part Name/No :	QP No. :	Procedure No.:	Sequence No. :
FAN ASS'Y	-	-	-

Design Conditions / Test Conditions

Test Item	Design Conditions	Test Conditions
Fan Type/ Model	SIROCCO FAN/DMSF-2-S4	SIROCCO FAN/DMSF-2-S4
Air Flow Rate(m^3/min)	40	46
RPM	1100	1108
Air Temp. (℃)	20	15
Static Pressure(mmAq)	30	32
Relative Humidity (%)	N/A	N/A
Rated Power Input (Kw)	0.75	0.52
Measuring Equipment (Type & Name)	VM-3304 (Serial No: 01-02220-009)	

Test Results

(Measuring Unit : mm/sec)

Measuring position		Acceptance Criteria (mm/sec)	Measuring value (mm/sec)		Results	Remark
Fan NO.	Position		Driving Side	Driven Side		
SIROCCO FAN-3	Horizontal	6.3 Max.	1.2	1.6	O.K	
	Vertical		1.1	1.5		
	Axial		1.2	1.1		
SIROCCO FAN-4	Horizontal	6.3 Max.	1.3	1.4	O.K	
	Vertical		1.2	1.2		
	Axial		1.5	1.3		

Prepared by : C.K.KIM
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QA Dept. MGR

Remarks :

2000. 2. 15
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DAE-MYUNG ENG	SOUND LEVEL TEST REPORT	Report No. : SOU-DP-0821 Sheet No. : 1 OF 9
Tech. Spec. No.: -	Equip Name/No. : AIRFOIL FAN / -	Customer : 동양 식품 기 계 (주)
Part Name/No : FAN ASS'Y	QP No./ Seq No. : -	Procedure No.: -

Design Conditions / Test Conditions

Items	Design Conditions	Test Conditions
Fan Typel	AIRFOIL FAN-1/DMLA-3.5-S4	AIRFOIL FAN-1/DMLA-3.5-S4
Air Flow Rate(m^3/min)	136	136
RPM	2190	2195
Air Temp. (℃)	N/A	N/A
Static Pressure (mmAq)	138	145
Relative Humidity (%)	N/A	N/A
Rated Power (Kw)	7.5	5.75
Measuring Equipment (Type & Name)		
Tester & Test Date		

Test Results

(Measuring Unit : dBA)

Measuring position		Acceptance Criteria(dBA)	Sound Level dB(A)				Results
Number	Distance		Background Noise	Display value	Measuring value	Representative value	
1	1M	MAX	73	84	86	(Suction Side)	O.K
2	1M	MAX	71.5	88	88	(Discharge side)	O.K
3	1M	MAX	72	83	83	(Casing)	O.K
4	1M	MAX	72	83.5	83.5	(Motor)	O.K

Note: 1. The locations which are subject to air flow effect shall not consider asa easuring point

2.

Prepared by : C.K.KIM
QC Inspector

Approved by : Y.S.YOU
QA Dept. MGR

Remarks :

2008. 2. 15

DAE-MYUNG ENG	SOUND LEVEL TEST REPORT	Report No. : SOU-DP-0821 Sheet No. : 2 OF 9
Tech. Spec. No.: -	Equip Name/No. : AIRFOIL FAN / -	Customer : 동양 식품 기 계 (주)
Part Name/No : FAN ASS'Y	QP No./ Seq No. : -	Procedure No.: -

Design Conditions / Test Conditions

Items	Design Conditions	Test Conditions
Fan Typel	AIRFOIL FAN-2DMLA-3.5-S4	AIRFOIL FAN-2DMLA-3.5-S4
Air Flow Rate(m^3/min)	136	--
RPM	2190	--
Air Temp. (℃)	N/A	N/A
Static Pressure (mmAq)	138	--
Relative Humidity (%)	N/A	N/A
Rated Power (Kw)	7.5	--
Measuring Equipment (Type & Name)		
Tester & Test Date		

Test Results

(Measuring Unit : dBA)

Measuring position		Acceptance Criteria(dBA)	Sound Level dB(A)				Results
Number	Distance		Background Noise	Display value	Measuring value	Representa- tive value	
1	1M	MAX	74	85	87	(Suction Side)	O.K
2	1M	MAX	725	87	88	(Discharge side)	O.K
3	1M	MAX	71	85	83.5	(Casing)	O.K
4	1M	MAX	72	83	84	(Motor)	O.K

Note: 1. The locations which are subject to air flow effect shall not consider asa easuring point

2.

Prepared by : C.K.KIM
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QA Dept. MGR

Remarks :

2000. 2. 15
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DAE-MYUNG ENG	SOUND LEVEL TEST REPORT	Report No. : SOU-DP-0822 Sheet No. : 3 OF 9
Tech. Spec. No.: -	Equip Name/No. : TURBO FAN / -	Customer : 동양 식품 기 계 (주)
Part Name/No : FAN ASS'Y	QP No./ Seq No. : -	Procedure No.: -

Design Conditions / Test Conditions

Items	Design Conditions	Test Conditions
Fan Typel	TURBO FAN-1/DMTF-3.25-S4	TURBO FAN-1/DMTF-3.25-S4
Air Flow Rate(m^3/min)	88	88
RPM	2050	2053
Air Temp. (℃)	N/A	N/A
Static Pressure (mmAq)	220	228
Relative Humidity (%)	N/A	N/A
Rated Power (Kw)	5.5	5.65

Measuring Equipment (Type & Name)	
Tester & Test Date	

Test Results

(Measuring Unit : dBA)

Measuring position		Acceptance Criteria(dBA)	Sound Level dB(A)				Results
Number	Distance		Background Noise	Display value	Measuring value	Representa- tive value	
1	1M	MAX	72	82	82	(Suction Side)	O.K
2	1M	MAX	72	87	87	(Discharge side)	O.K
3	1M	MAX	72.5	83	83	(Casing)	O.K
4	1M	MAX	72	82	82	(Motor)	O.K

Note: 1. The locations which are subject to air flow effect shall not consider asa easuring point

2.

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Remarks :

2008. 2. 15

DAE-MYUNG ENG	SOUND LEVEL TEST REPORT	Report No. : SOU-DP-0822 Sheet No. : 4 OF 9
Tech. Spec. No.: -	Equip Name/No. : TURBO FAN / -	Customer : 동양 식품 기 계 (주)
Part Name/No : FAN ASS'Y	QP No./ Seq No. : -	Procedure No.: -

Design Conditions / Test Conditions

Items	Design Conditions	Test Conditions
Fan Typel	TURBO FAN-2/DMTF-3.25-S4	TURBO FAN-2/DMTF-3.25-S4
Air Flow Rate(m^3/min)	88	--
RPM	2050	--
Air Temp. (℃)	N/A	N/A
Static Pressure (mmAq)	220	--
Relative Humidity (%)	N/A	N/A
Rated Power (Kw)	5.5	--
Measuring Equipment (Type & Name)		
Tester & Test Date		

Test Results

(Measuring Unit : dBA)

Measuring position		Acceptance Criteria(dBA)	Sound Level dB(A)				Results
Number	Distance		Background Noise	Display value	Measuring value	Representa- tive value	
1	1M	MAX	71	84	85	(Suction Side)	O.K
2	1M	MAX	73	84	85	(Discharge side)	O.K
3	1M	MAX	73.5	84	83	(Casing)	O.K
4	1M	MAX	74	84	83	(Motor)	O.K

Note: 1. The locations which are subject to air flow effect shall not consider asa easuring point

2.

Prepared by : C.K.KIM
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QA Dept. MGR

Remarks :

2008. 2. 15

DAE-MYUNG ENG	SOUND LEVEL TEST REPORT	Report No. : SOU-DP-0823 Sheet No. : 5 OF 9
Tech. Spec. No.: -	Equip Name/No. : SIROCCO FAN / -	Customer : 동양 식품 기 계 (주)
Part Name/No : FAN ASS'Y	QP No./ Seq No. : -	Procedure No.: -

Design Conditions / Test Conditions

Items	Design Conditions	Test Conditions
Fan Typel	SIROCCO FAN/DMSF-2.5-S4	SIROCCO FAN/DMSF-2.5-S4
Air Flow Rate(m^3/min)	60	60
RPM	1060	1065
Air Temp. (℃)	N/A	N/A
Static Pressure (mmAq)	50	52
Relative Humidity (%)	N/A	N/A
Rated Power (Kw)	1.5	1.21
Measuring Equipment (Type & Name)		
Tester & Test Date		

Test Results

(Measuring Unit : dBA)

Measuring position		Acceptance Criteria(dBA)	Sound Level dB(A)				Results
Number	Distance		Background Noise	Display value	Measuring value	Representa- tive value	
1	1M	MAX	55	60.5	60.5	(Suction Side)	O.K
2	1M	MAX	54.5	63.5	63.5	(Discharge side)	O.K
3	1M	MAX	55	64	64	(Casing)	O.K
4	1M	MAX	55	63	63	(Motor)	O.K

Note: 1. The locations which are subject to air flow effect shall not consider asa easuring point

2.

Prepared by : C.K.KIM
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Remarks :

Approved by : Y.S.YOU
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2008. 2. 15
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DAE-MYUNG ENG	SOUND LEVEL TEST REPORT	Report No. : SOU-DP-0824 Sheet No. : 6 OF 9
Tech. Spec. No.: -	Equip Name/No. : SIROCCO FAN / -	Customer : 동양 식품 기 계 (주)
Part Name/No : FAN ASS'Y	QP No./ Seq No. : -	Procedure No.: -

Design Conditions / Test Conditions

Items	Design Conditions	Test Conditions
Fan Typel	SIROCCO FAN-1/DMSF-2-S4	SIROCCO FAN-1/DMSF-2-S4
Air Flow Rate(m^3/min)	40	46
RPM	1100	1108
Air Temp. (℃)	N/A	N/A
Static Pressure (mmAq)	30	32
Relative Humidity (%)	N/A	N/A
Rated Power (Kw)	0.75	0.52
Measuring Equipment (Type & Name)		
Tester & Test Date		

Test Results

(Measuring Unit : dBA)

Measuring position		Acceptance Criteria(dBA)	Sound Level dB(A)				Results
Number	Distance		Background Noise	Display value	Measuring value	Representa- tive value	
1	1M	MAX	65	70.5	70.5	(Suction Side)	O.K
2	1M	MAX	64.5	73.5	73.5	(Discharge side)	O.K
3	1M	MAX	65	74	74	(Casing)	O.K
4	1M	MAX	65	73	73	(Motor)	O.K

Note: 1. The locations which are subject to air flow effect shall not consider asa easuring point

2.

Prepared by : C.K.KIM
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Approved by : Y.S.YOU
QA Dept. MGR

Remarks :

2003. 2. 15
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DAE-MYUNG ENG	SOUND LEVEL TEST REPORT	Report No. : SOU-DP-0824 Sheet No. : 7 OF 9
Tech. Spec. No.: -	Equip Name/No. : SIROCCO FAN / -	Customer : 동양 식품 기 계 (주)
Part Name/No : FAN ASS'Y	QP No./ Seq No. : -	Procedure No.: -

Design Conditions / Test Conditions

Items	Design Conditions	Test Conditions
Fan Typel	SIROCCO FAN-2/DMSF-2-S4	SIROCCO FAN-2/DMSF-2-S4
Air Flow Rate(m^3/min)	40	--
RPM	1100	--
Air Temp. (℃)	N/A	N/A
Static Pressure (mmAq)	30	--
Relative Humidity (%)	N/A	N/A
Rated Power (Kw)	0.75	--
Measuring Equipment (Type & Name)		
Tester & Test Date		

Test Results

(Measuring Unit : dBA)

Measuring position		Acceptance Criteria(dBA)	Sound Level dB(A)				Results
Number	Distance		Background Noise	Display value	Measuring value	Representa- tive value	
1	1M	MAX	65	71.5	70.5	(Suction Side)	O.K
2	1M	MAX	64	73.5	72	(Discharge side)	O.K
3	1M	MAX	64	73	75	(Casing)	O.K
4	1M	MAX	65	73	74	(Motor)	O.K

Note: 1. The locations which are subject to air flow effect shall not consider asa easuring point

2.

Prepared by : C.K.KIM
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Remarks :

Approved by : Y.S.YOU
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2008. 2. 15

DAE-MYUNG ENG	SOUND LEVEL TEST REPORT	Report No. : SOU-DP-0824 Sheet No. : 8 OF 9
Tech. Spec. No.: -	Equip Name/No. : SIROCCO FAN / -	Customer : 동양 식품 기 계 (주)
Part Name/No : FAN ASS'Y	QP No./ Seq No. : -	Procedure No.: -

Design Conditions / Test Conditions

Items	Design Conditions	Test Conditions
Fan Typel	SIROCCO FAN-3/DMSF-2-S4	SIROCCO FAN-3/DMSF-2-S4
Air Flow Rate(m^3/min)	40	--
RPM	1100	--
Air Temp. (℃)	N/A	N/A
Static Pressure (mmAq)	30	--
Relative Humidity (%)	N/A	N/A
Rated Power (Kw)	0.75	--
Measuring Equipment (Type & Name)		
Tester & Test Date		

Test Results

(Measuring Unit : dBA)

Measuring position		Acceptance Criteria(dBA)	Sound Level dB(A)				Results
Number	Distance		Background Noise	Display value	Measuring value	Representa- tive value	
1	1M	MAX	65	71	70.5	(Suction Side)	O.K
2	1M	MAX	64.5	74	723.5	(Discharge side)	O.K
3	1M	MAX	64	74.5	74	(Casing)	O.K
4	1M	MAX	65	73.5	73	(Motor)	O.K

Note: 1. The locations which are subject to air flow effect shall not consider asa easuring point

2.

Prepared by : C.K.KIM
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Remarks :

Approved by : Y.S.YOU
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2000. 2. 15
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DAE-MYUNG ENG	SOUND LEVEL TEST REPORT	Report No. : SOU-DP-0824 Sheet No. : 9 OF 9
Tech. Spec. No.: -	Equip Name/No. : SIROCCO FAN / -	Customer : 동양 식품 기 계 (주)
Part Name/No : FAN ASS'Y	QP No./ Seq No. : -	Procedure No.: -

Design Conditions / Test Conditions

Items	Design Conditions	Test Conditions
Fan Typel	SIROCCO FAN-4/DMSF-2-S4	SIROCCO FAN-4/DMSF-2-S4
Air Flow Rate(m^3/min)	40	--
RPM	1100	--
Air Temp. (℃)	N/A	N/A
Static Pressure (mmAq)	30	--
Relative Humidity (%)	N/A	N/A
Rated Power (Kw)	0.75	--
Measuring Equipment (Type & Name)		
Tester & Test Date		

Test Results

(Measuring Unit : dBA)

Measuring position		Acceptance Criteria(dBA)	Sound Level dB(A)				Results
Number	Distance		Background Noise	Display value	Measuring value	Representa- tive value	
1	1M	MAX	62	71.5	71.5	(Suction Side)	O.K
2	1M	MAX	62.5	72.5	72.5	(Discharge side)	O.K
3	1M	MAX	64	73	73	(Casing)	O.K
4	1M	MAX	64	72	72	(Motor)	O.K

Note: 1. The locations which are subject to air flow effect shall not consider asa easuring point

2.

Prepared by : C.K.KIM
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Remarks :

Approved by : Y.S.YOU
QA Dept. MGR

2009. 2. 15
대명ENG

DAE-MYUNG ENG	BALANCING CHECK SHEET	Doc. No.: BA-DP-0821
		Sheet No : 1 of 9
계약번호. : N / A	Equip. Name/No.: AIRFOIL FAN	Customer : 동양 식품 기계 (주)
Part Name/ NO : AIRFOIL FAN - IMPELLER	구매규격서 번호 : N / A	Sequence No. : N / A

Descriptions	Dynamic Balancing		
Rotor Model	DMLA-#3.5-S4	Rotor Radius	Ø530 mm
Rotor Weight	32 Kg	Rotor Revolution	610 RPM
Testing Equip.	Dynamic Balancing M/C		

1) Dynamic Balancing Check Result ⇒ ☐ : Acceptable, ☐ : Unacceptable

Positions	Acceptable Residual Unbalancing mass (G6.3 , g-rad)	Initial Unbalancing		Residual Unbalancing	
		Angle(deg.)	Mass(g)	Angle(deg.)	Mass(g)
Left Side	6.31 (μm)	98	43.5	215	0.8
Right Side	6.31 (μm)	145	52	115	0.7

2) Overspeed Test (Customer Witness :)

Test Item	Design Conditions	Actual Conditions	Acceptance Criteria	Results
Revolutions	RPM	RPM	No deformation and No crack	
Duration	Min.	Min.		

Note : 1) Dynamic Balancing Acceptance Criteria : G 6.3
2) Calculation : - Balance quality(6.3 mm/sec) = $\varepsilon^* n/9550$.
- Unbalancing mass(mr: g-mm) = $\varepsilon^* M/2$(2면 평형) or M(1면 평형)
- Unbalancing mass(g-rad) = $1/2 \times 6.3 \times 9{,}550/n \times M/R$
Where, ε = Correction plane mass eccentricity(μm)
M = rotor weight(Kg)
n = rpm. R = rotor radius.

Prepared by : C.K.KIM
QC Inspector

Remarks :

Approved by : Y.S.YOU
QA Dept. MGR

2000. 2. 5

DAE-MYUNG ENG	BALANCING CHECK SHEET	Doc. No.: BA-DP-0821 Sheet No : 2 of 9
계약번호. : N / A	Equip. Name/No.: AIRFOIL FAN	Customer : 동양 식품 기계 (주)
Part Name/ NO : AIRFOIL FAN - IMPELLER	구매규격서 번호 : N / A	Sequence No. : N / A

Descriptions	Dynamic Balancing		
Rotor Model	DMLA-#3.5-S4	Rotor Radius	Ø530 mm
Rotor Weight	32 Kg	Rotor Revolution	605 RPM
Testing Equip.	Dynamic Balancing M/C		

1) Dynamic Balancing Check Result ⇒ ☐ : Acceptable, ☐ : Unacceptable

Positions	Acceptable Residual Unbalancing mass (G6.3 , g-rad)	Initial Unbalancing		Residual Unbalancing	
		Angle(deg.)	Mass(g)	Angle(deg.)	Mass(g)
Left Side	6.36 (μm)	112	38	95	1.3
Right Side	6.36 (μm)	252	58	88	1.1

2) Overspeed Test (Customer Witness :)

Test Item	Design Conditions	Actual Conditions	Acceptance Criteria	Results
Revolutions	RPM	RPM	No deformation and No crack	
Duration	Min.	Min.		

Note : 1) Dynamic Balancing Acceptance Criteria : G 6.3

2) Calculation :
- Balance quality(6.3 mm/sec) = $\varepsilon^* n/9550$.
- Unbalancing mass(mr: g-mm) = ε^* M/2(2면 평형) or M(1면 평형)
- Unbalancing mass(g-rad) = 1/2 × 6.3 × 9,550/n × M/R

Where, ε = Correction plane mass eccentricity(μm)
M = rotor weight(Kg)
n = rpm. R = rotor radius.

Prepared by : C.K.KIM
QC Inspector

Remarks :

Approved by : Y.S.YOU 4.7.06
QA Dept. MGR

2006. 4. 15
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DAE-MYUNG ENG	BALANCING CHECK SHEET	Doc. No.: BA-DP-0822
		Sheet No : 3 of 9
계약번호. : N / A	Equip. Name/No.: TURBO FAN	Customer : 동양 식품 기계 (주)
Part Name/ NO : TURBO FAN - IMPELLER	구매규격서 번호 : N / A	Sequence No. : N / A

Descriptions	Dynamic Balancing		
Rotor Model	DMTF-#3.25-S4	Rotor Radius	Ø490 mm
Rotor Weight	21 Kg	Rotor Revolution	607 RPM
Testing Equip.	Dynamic Balancing M/C		

1) Dynamic Balancing Check Result ⇒ ☐ : Acceptable, ☐ : Unacceptable

Positions	Acceptable Residual Unbalancing mass (G6.3 , g-rad)	Initial Unbalancing		Residual Unbalancing	
		Angle(deg.)	Mass(g)	Angle(deg.)	Mass(g)
Left Side	4.5 (μm)	74	42	42	1.0
Right Side	4.6 (μm)	118	50	265	1.3

2) Overspeed Test (Customer Witness :)

Test Item	Design Conditions	Actual Conditions	Acceptance Criteria	Results
Revolutions	RPM	RPM	No deformation and No crack	
Duration	Min.	Min.		

Note : 1) Dynamic Balancing Acceptance Criteria : G 6.3

2) Calculation :
- Balance quality(6.3 mm/sec) = ε*n/9550.
- Unbalancing mass(mr: g-mm) = ε* M/2(2면 평형) or M(1면 평형)
- Unbalancing mass(g-rad) = 1/2 × 6.3 × 9,550/n × M/R

Where, ε = Correction plane mass eccentricity(μm)
M = rotor weight(Kg)
n = rpm. R = rotor radius.

Prepared by : C.K.KIM
QC Inspector

Remarks :

Approved by : Y.S.YOU
QA Dept. MGR

대명ENG

DAE-MYUNG ENG	BALANCING CHECK SHEET	Doc. No.: BA-DP-0822 Sheet No : 4 of 9
계약번호. : N / A	Equip. Name/No.: TURBO FAN	Customer : 동양 식품 기계 (주)
Part Name/ NO : TURBO FAN - IMPELLER	구매규격서 번호 : N / A	Sequence No. : N / A

Descriptions	Dynamic Balancing		
Rotor Model	DMTF-#3.25-S4	Rotor Radius	Ø490 mm
Rotor Weight	21 Kg	Rotor Revolution	607 RPM
Testing Equip.	Dynamic Balancing M/C		

1) Dynamic Balancing Check Result ⇒ ☐ : Acceptable, ☐ : Unacceptable

Positions	Acceptable Residual Unbalancing mass (G6.3 , g-rad)	Initial Unbalancing		Residual Unbalancing	
		Angle(deg.)	Mass(g)	Angle(deg.)	Mass(g)
Left Side	4.5 (μm)	74	42	42	1.0
Right Side	4.6 (μm)	118	50	265	1.3

2) Overspeed Test (Customer Witness :)

Test Item	Design Conditions	Actual Conditions	Acceptance Criteria	Results
Revolutions	RPM	RPM	No deformation and No crack	
Duration	Min.	Min.		

Note : 1) Dynamic Balancing Acceptance Criteria : G 6.3

2) Calculation :
- Balance quality(6.3 mm/sec) = $\varepsilon^* n/9550$.
- Unbalancing mass(mr: g-mm) = $\varepsilon^* M/2$(2면 평형) or M(1면 평형)
- Unbalancing mass(g-rad) = $1/2 \times 6.3 \times 9{,}550/n \times M/R$

Where, ε = Correction plane mass eccentricity(μm)
M = rotor weight(Kg)
n = rpm. R = rotor radius.

Prepared by : C.K.KIM
QC Inspector

Remarks :

Approved by : Y.S.YOU
QA Dept. MGR

대평ENG

DAE-MYUNG ENG	BALANCING CHECK SHEET	Doc. No.: BA-DP-0823
		Sheet No : 5 of 9
계약번호. : N / A	Equip. Name/No.: SIROCCO FAN	Customer : 동양 식품 기계 (주)
Part Name/ NO : SIROCCO FAN - IMPELLER	구매규격서 번호 : N / A	Sequence No. : N / A

Descriptions	Dynamic Balancing		
Rotor Model	DMSF-#2.5-S4	Rotor Radius	ø380 mm
Rotor Weight	11 Kg	Rotor Revolution	580 RPM
Testing Equip.	Dynamic Balancing M/C		

1) Dynamic Balancing Check Result ⇒ ☐ : Acceptable, ☐ : Unacceptable

Positions	Acceptable Residual Unbalancing mass (G6.3 , g-rad)	Initial Unbalancing		Residual Unbalancing	
		Angle(deg.)	Mass(g)	Angle(deg.)	Mass(g)
Left Side	3.2 (μm)	132	15	122	1.0
Right Side	3.2 (μm)	95	12	245	0.8

2) Overspeed Test (Customer Witness :)

Test Item	Design Conditions	Actual Conditions	Acceptance Criteria	Results
Revolutions	RPM	RPM	No deformation and No crack	
Duration	Min.	Min.		

Note : 1) Dynamic Balancing Acceptance Criteria : G 6.3

2) Calculation :
- Balance quality(6.3 mm/sec) = ε*n/9550.
- Unbalancing mass(mr: g-mm) = ε* M/2(2면 평형) or M(1면 평형)
- Unbalancing mass(g-rad) = 1/2 × 6.3 × 9,550/n × M/R

Where, ε = Correction plane mass eccentricity(μm)
M = rotor weight(Kg)
n = rpm. R = rotor radius.

Prepared by : C.K.KIM
QC Inspector

Approved by : Y.S.YOU
QA Dept. MGR

Remarks :

2009. 2. 16
대명ENG

DAE-MYUNG ENG	BALANCING CHECK SHEET	Doc. No.: BA-DP-0824 Sheet No : 6 of 9
계약번호. : N / A	Equip. Name/No.: SIROCCO FAN	Customer : 동양 식품 기계 (주)
Part Name/ NO : SIROCCO FAN - IMPELLER	구매규격서 번호 : N / A	Sequence No. : N / A

Descriptions	Dynamic Balancing		
Rotor Model	DMSF-#2-S4	Rotor Radius	Ø305 mm
Rotor Weight	7.5 Kg	Rotor Revolution	582 RPM
Testing Equip.	Dynamic Balancing M/C		

1) Dynamic Balancing Check Result ⇒ ☐ : Acceptable, ☐ : Unacceptable

Positions	Acceptable Residual Unbalancing mass (G6.3 , g-rad)	Initial Unbalancing		Residual Unbalancing	
		Angle(deg.)	Mass(g)	Angle(deg.)	Mass(g)
Left Side	2.8 (μm)	38	15	42	1.0
Right Side	2.8 (μm)	132	12	105	0.8

2) Overspeed Test (Customer Witness :)

Test Item	Design Conditions	Actual Conditions	Acceptance Criteria	Results
Revolutions	RPM	RPM	No deformation and No crack	
Duration	Min.	Min.		

Note : 1) Dynamic Balancing Acceptance Criteria : G 6.3

2) Calculation : - Balance quality(6.3 mm/sec) = $\varepsilon^* n/9550$.

- Unbalancing mass(mr: g-mm) = $\varepsilon^* M/2$(2면 평형) or M(1면 평형)
- Unbalancing mass(g-rad) = $1/2 \times 6.3 \times 9{,}550/n \times M/R$

Where, ε = Correction plane mass eccentricity(μm)

M = rotor weight(Kg)

n = rpm. R = rotor radius.

Prepared by : C.K.KIM
QC Inspector

Remarks :

Approved by : Y.S.YOU
QA Dept. MGR

2000. 2. 15
대명ENG

DAE-MYUNG ENG	BALANCING CHECK SHEET	Doc. No.: BA-DP-0824
		Sheet No : 7 of 9
계약번호. : N / A	Equip. Name/No.: SIROCCO FAN	Customer : 동양 식품 기계 (주)
Part Name/ NO : SIROCCO FAN - IMPELLER	구매규격서 번호 : N / A	Sequence No. : N / A

Descriptions	Dynamic Balancing		
Rotor Model	DMSF-#2-S4	Rotor Radius	Ø305 mm
Rotor Weight	7.5 Kg	Rotor Revolution	582 RPM
Testing Equip.	Dynamic Balancing M/C		

1) Dynamic Balancing Check Result ⇒ ☐ : Acceptable, ☐ : Unacceptable

Positions	Acceptable Residual Unbalancing mass (G6.3 , g-rad)	Initial Unbalancing		Residual Unbalancing	
		Angle(deg.)	Mass(g)	Angle(deg.)	Mass(g)
Left Side	2.8 (μm)	85	18	115	0.8
Right Side	2.8 (μm)	25	10	285	0.7

2) Overspeed Test (Customer Witness :)

Test Item	Design Conditions	Actual Conditions	Acceptance Criteria	Results
Revolutions	RPM	RPM	No deformation and No crack	
Duration	Min.	Min.		

Note : 1) Dynamic Balancing Acceptance Criteria : G 6.3

2) Calculation : - Balance quality(6.3 mm/sec) = ε*n/9550.

- Unbalancing mass(mr: g-mm) = ε* M/2(2면 평형) or M(1면 평형)
- Unbalancing mass(g-rad) = 1/2 × 6.3 × 9,550/n × M/R

Where, ε = Correction plane mass eccentricity(μm)

M = rotor weight(Kg)

n = rpm. R = rotor radius.

Prepared by : C.K.KIM
QC Inspector

Remarks :

Approved by : Y.S.YOU
QA Dept. MGR

2002. 2. 15
대명ENG

DAE-MYUNG ENG	BALANCING CHECK SHEET	Doc. No.: BA-DP-0824
		Sheet No : 8 of 9
계약번호. : N / A	Equip. Name/No.: SIROCCO FAN	Customer : 동양 식품 기계 (주)
Part Name/ NO : SIROCCO FAN - IMPELLER	구매규격서 번호 : N / A	Sequence No. : N / A

Descriptions	Dynamic Balancing		
Rotor Model	DMSF-#2-S4	Rotor Radius	Ø305 mm
Rotor Weight	7.4 Kg	Rotor Revolution	580 RPM
Testing Equip.	Dynamic Balancing M/C		

1) Dynamic Balancing Check Result ⇒ ☐ : Acceptable, ☐ : Unacceptable

Positions	Acceptable Residual Unbalancing mass (G6.3 , g-rad)	Initial Unbalancing		Residual Unbalancing	
		Angle(deg.)	Mass(g)	Angle(deg.)	Mass(g)
Left Side	2.8 (μm)	320	11	115	0.8
Right Side	2.8 (μm)	75	9.5	48	1.1

2) Overspeed Test (Customer Witness :)

Test Item	Design Conditions	Actual Conditions	Acceptance Criteria	Results
Revolutions	RPM	RPM	No deformation and No crack	
Duration	Min.	Min.		

Note : 1) Dynamic Balancing Acceptance Criteria : G 6.3

2) Calculation :
- Balance quality(6.3 mm/sec) = $\varepsilon^* n/9550$.
- Unbalancing mass(mr: g-mm) = ε^* M/2(2면 평형) or M(1면 평형)
- Unbalancing mass(g-rad) = $1/2 \times 6.3 \times 9{,}550/n \times M/R$

Where, ε = Correction plane mass eccentricity(μm)
M = rotor weight(Kg)
n = rpm. R = rotor radius.

Prepared by : C.K.KIM
QC Inspector

Remarks :

Approved by : Y.S.YOU
QA Dept. MGR

2008. 2. 15
대명ENG

DAE-MYUNG ENG	BALANCING CHECK SHEET	Doc. No.: BA-DP-0824 Sheet No : 9 of 9
계약번호. : N / A	Equip. Name/No.: SIROCCO FAN	Customer : 동양 식품 기계 (주)
Part Name/ NO : SIROCCO FAN - IMPELLER	구매규격서 번호 : N / A	Sequence No. : N / A

Descriptions	Dynamic Balancing		
Rotor Model	DMSF-#2-S4	Rotor Radius	ø305 mm
Rotor Weight	7.5 Kg	Rotor Revolution	583 RPM
Testing Equip.	Dynamic Balancing M/C		

1) Dynamic Balancing Check Result ⇒ ☐ : Acceptable, ☐ : Unacceptable

Positions	Acceptable Residual Unbalancing mass (G6.3 , g-rad)	Initial Unbalancing		Residual Unbalancing	
		Angle(deg.)	Mass(g)	Angle(deg.)	Mass(g)
Left Side	2.8 (μm)	183	14	77	0.8
Right Side	2.8 (μm)	98	15	112	0.5

2) Overspeed Test (Customer Witness :)

Test Item	Design Conditions	Actual Conditions	Acceptance Criteria	Results
Revolutions	RPM	RPM	No deformation and No crack	
Duration	Min.	Min.		

Note : 1) Dynamic Balancing Acceptance Criteria : G 6.3
2) Calculation :
- Balance quality(6.3 mm/sec) = ε*n/9550.
- Unbalancing mass(mr: g-mm) = ε* M/2(2면 평형) or M(1면 평형)
- Unbalancing mass(g-rad) = 1/2 × 6.3 × 9,550/n × M/R

Where, ε = Correction plane mass eccentricity(μm)
M = rotor weight(Kg)
n = rpm. R = rotor radius.

Prepared by : C.K.KIM
QC Inspector

Approved by : Y.S.YOU
QA Dept. MGR

Remarks :

2000. 2. 15
대명ENG

E-Plus

TEST REPORT FOR THREE PHASE INDUCTION MOTOR

삼상 유도 전동기 시험 성적서

CUSTOMER 주문처: 효성기전판매 | DATE: 2008년 02월

PROJECT No. 제번: SH19038401 | TYPE 형식: TEFC | SERIAL No.: 19038401001

OUTPUT 출력	7.5 kW	POLE 극수	4 P	VOLT 전압	460 V	FREQUENCY 주파수	60 Hz
RATING 정격	CONT	INSUL. CLASS 절연계급	F	PHASE 상수	3 Φ	FRAME No.	215T

* MEASUREMENT OF WINDING RESISTANCE (at 15 ℃)

STATOR 고정자	1.005	Ω

* NO LOAD TEST

VOLTAGE 전압	460 V	CURRENT 전류	6.18 A	LOSS 손실	331 W	FREQUENCY 주파수	60 Hz

* LOCKED ROTOR TEST

VOLTAGE 전압	94.5 V	CURRENT 전류	13.27 A	LOSS 손실	830 W	FREQUENCY 주파수	60 Hz
VOLTAGE 전압	- V	CURRENT 전류	- A	LOSS 손실	- W	FREQUENCY 주파수	- Hz

* LOAD TEST

LOAD FACTOR 부하율	CURRENT 전류(A)	EFFICIENCY 효율(%)	POWER FACTOR 역률(%)	SPEED 회전수(r/min)	TORQUE 회전력(kgf · m)
25%	6.77	85.84	40.52	1792	1.02
50%	8.28	90.94	62.50	1783	2.05
75%	10.42	91.43	74.09	1773	3.09
100%	13.02	90.47	79.91	1762	4.15
125%	16.03	88.73	82.72	1750	5.22

START CURRENT 기동전류	77.50	A
START TORQUE 기동회전력	233.20	%
MAX. TORQUE 최대회전력	278.40	%

* TEMPERATURE RISE TEST

TIME 시간	STATOR 고정자권선	ROTOR 회전자권선	BEARING 축 수 Drive 부하측	BEARING 축 수 Non-Drive 반부하측	AMB. TEMP 주위온도
3.5 h	66 K	- K	42 K	- K	15 ℃

* INSULATION & HIGH VOLTAGE TEST

	INSULATION TEST 절연저항 500 V		HIGH VOLTAGE TEST 절연내력 1 min	
STATOR 고정자	500	MΩ	1920 V	GOOD
ROTOR 회전자	-	MΩ	- V	GOOD

* REMARKS *

High Eff. Motor (고효율 전동기) / IP54

TESTED BY 김 MI-11 성규

HYOSUNG CORPORATION
기 전 품 질 보 증 팀

E-Plus

TEST REPORT FOR THREE PHASE INDUCTION MOTOR

삼상 유도 전동기 시험 성적서

CUSTOMER 주문처: 효성기전판매 | DATE: 2008년 02월

PROJECT No. 제번: SH19038401 | TYPE 형식: TEFC | SERIAL No.: 19038401002

OUTPUT 출력	7.5 kW	POLE 극수	4 P	VOLT 전압	460 V	FREQUENCY 주파수	60 Hz
RATING 정격	CONT	INSUL.CLASS 절연계급	F	PHASE 상수	3 Φ	FRAME No.	215T

* MEASUREMENT OF WINDING RESISTANCE (at 15 ℃)

STATOR 고정자	1.005	Ω

* NO LOAD TEST

VOLTAGE 전압	460 V	CURRENT 전류	6.18 A	LOSS 손실	331 W	FREQUENCY 주파수	60 Hz

* LOCKED ROTOR TEST

VOLTAGE 전압	94.5 V	CURRENT 전류	13.27 A	LOSS 손실	829 W	FREQUENCY 주파수	60 Hz
VOLTAGE 전압	- V	CURRENT 전류	- A	LOSS 손실	- W	FREQUENCY 주파수	- Hz

* LOAD TEST

LOAD FACTOR 하중	CURRENT 전류(A)	EFFICIENCY 효율(%)	POWER FACTOR 역률(%)	SPEED 회전수(r/min)	TORQUE 회전력(kgf · m)
25%	6.76	85.83	40.58	1792	1.02
50%	8.27	90.94	62.59	1782	2.05
75%	10.41	91.42	74.20	1773	3.09
100%	13.00	90.47	80.04	1762	4.15
125%	16.01	88.73	82.85	1750	5.22

START CURRENT 기동전류	77.50	A
START TORQUE 기동회전력	233.10	%
MAX. TORQUE 최대회전력	278.40	%

* TEMPERATURE RISE TEST

TIME 시간	STATOR 고정자권선	ROTOR 회전자권선	BEARING 축수 Drive 부하측	BEARING 축수 Non-Drive 반부하측	AMB. TEMP 주위온도
3.5 h	66 K	- K	42 K	- K	15 ℃

* INSULATION & HIGH VOLTAGE TEST

	INSULATION TEST 절연저항 500 V		HIGH VOLTAGE TEST 절연내력 1 min	
STATOR 고정자	500	MΩ	1920 V	GOOD
ROTOR 회전자	-	MΩ	- V	GOOD

* REMARKS *

High Eff. Motor (고효율 전동기) / IP54

TESTED BY 김 MI-11 성규

HYOSUNG CORPORATION
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TEST REPORT FOR THREE PHASE INDUCTION MOTOR

삼상 유도 전동기 시험 성적서

CUSTOMER 주문처: 흐성기전판매 | DATE: 2008년 02월

PROJECT No. 제번: SH19038402 | TYPE 형식: TEFC | SERIAL No.: 19038402001

OUTPUT 출력	5.5 kW	POLE 극수	4 P	VOLT 전압	460 V	FREQUENCY 주파수	60 Hz
RATING 정격	CONT	INSUL.CLASS 절연계급	F	PHASE 상수	3 Φ	FRAME No.	213T

* MEASUREMENT OF WINDING RESISTANCE (at 15 ℃)

STATOR 고정자	1.468	Ω

* NO LOAD TEST

VOLTAGE 전압	460 V	CURRENT 전류	4.2 A	LOSS 손실	291 W	FREQUENCY 주파수	60 Hz

* LOCKED ROTOR TEST

VOLTAGE 전압	94.4 V	CURRENT 전류	9.62 A	LOSS 손실	589 W	FREQUENCY 주파수	60 Hz
VOLTAGE 전압	- V	CURRENT 전류	- A	LOSS 손실	- W	FREQUENCY 주파수	- Hz

* LOAD TEST

LOAD FACTOR 부하율	CURRENT 전류(A)	EFFICIENCY 효율(%)	POWER FACTOR 역률(%)	SPEED 회전수(r/min)	TORQUE 회전력(kgf · m)
25%	4.78	83.69	43.16	1792	0.75
50%	5.99	89.91	64.05	1784	1.50
75%	7.65	90.88	74.50	1776	2.26
100%	9.62	90.19	79.56	1766	3.03
125%	11.89	88.62	81.89	1755	3.81

START CURRENT 기동전류	55.92	A
START TORQUE 기동회전력	222.32	%
MAX. TORQUE 최대회전력	272.82	%

* TEMPERATURE RISE TEST

TIME 시간	STATOR 고정자권선	ROTOR 회전자권선	BEARING 측 수 Drive 부하측	BEARING 측 수 Non-Drive 반부하측	AMB. TEMP 주위온도
3.5 h	62 K	- K	40 K	- K	15 ℃

* INSULATION & HIGH VOLTAGE TEST

	INSULATION TEST 절연저항 500 V		HIGH VOLTAGE TEST 절연내력 1 min	
STATOR 고정자	500	MΩ	1920 V	GOOD
ROTOR 회전자	-	MΩ	- V	GOOD

* REMARKS *

High Eff. Motor (고효율 전동기) / IP54

TESTED BY

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TEST REPORT FOR THREE PHASE INDUCTION MOTOR

삼상 유도 전동기 시험 성적서

CUSTOMER 주문처: 효성기전판매 | DATE: 2008년 02월

PROJECT No. 제번: SH19038402 | TYPE 형식: TEFC | SERIAL No.: 19038402002

OUTPUT 출력	5.5	kW	POLE 극수	4	P	VOLT 전압	460	V	FREQUENCY 주파수	60	Hz
RATING 정격	CONT		INSUL CLASS 절연계급	F		PHASE 상수	3	Φ	FRAME No.	213T	

* MEASUREMENT OF WINDING RESISTANCE (at 15 ℃)

STATOR 고정자	1.468	Ω

* NO LOAD TEST

VOLTAGE 전압	460	V	CURRENT 전류	4.2	A	LOSS 손실	292	W	FREQUENCY 주파수	60	Hz

* LOCKED ROTOR TEST

VOLTAGE 전압	94.4	V	CURRENT 전류	9.62	A	LOSS 손실	588	W	FREQUENCY 주파수	60	Hz
VOLTAGE 전압	-	V	CURRENT 전류	-	A	LOSS 손실	-	W	FREQUENCY 주파수	-	Hz

* LOAD TEST

LOAD FACTOR 하율	CURRENT 전류(A)	EFFICIENCY 효율(%)	POWER FACTOR 역률(%)	SPEED 회전수(r/min)	TORQUE 회전력(kgf · m)
25%	4.78	83.71	43.14	1792	0.75
50%	5.99	89.96	64.01	1784	1.50
75%	7.65	90.94	74.44	1776	2.26
100%	9.62	90.27	79.49	1766	3.03
125%	11.89	88.70	81.82	1755	3.81

START CURRENT 기동전류	55.90	A
START TORQUE 기동회전력	222.73	%
MAX. TORQUE 최대회전력	272.36	%

* TEMPERATURE RISE TEST

TIME 시간	STATOR 고정자권선	ROTOR 회전자권선	BEARING 축 수 Drive 부하측	BEARING 축 수 Non-Drive 반부하측	AMB. TEMP 주위온도
3.5 h	62 K	- K	40 K	- K	15 ℃

* INSULATION & HIGH VOLTAGE TEST

	INSULATION TEST 절연저항 500 V		HIGH VOLTAGE TEST 절연내력 1 min	
STATOR 고정자	500	MΩ	1920 V	GOOD
ROTOR 회전자	-	MΩ	- V	GOOD

* REMARKS *

High Eff. Motor (고효율 전동기) / IP54

TESTED BY

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HYOSUNG CORPORATION
기 전 품 질 보 증 팀

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TEST REPORT FOR THREE PHASE INDUCTION MOTOR

삼상 유도 전동기 시험 성적서

CUSTOMER 주문처: 효성기전판매 | DATE: 2008년 02월

PROJECT No. 제번: SH19038405 | TYPE 형식: TEFC | SERIAL No.: 19038405001

OUTPUT 출력	1.5 kW	POLE 극수	4 P	VOLT 전압	460 V	FREQUENCY 주파수	60 Hz
RATING 정격	CONT	INSUL. CLASS 절연계급	F	PHASE 상수	3 Φ	FRAME No.	145T

* MEASUREMENT OF WINDING RESISTANCE (at 15 ℃)

STATOR 고정자	7.565	Ω

* NO LOAD TEST

VOLTAGE 전압	460	V	CURRENT 전류	1.94	A	LOSS 손실	131.2	W	FREQUENCY 주파수	60	Hz

* LOCKED ROTOR TEST

VOLTAGE 전압	79.4	V	CURRENT 전류	3.02	A	LOSS 손실	190.8	W	FREQUENCY 주파수	60	Hz
VOLTAGE 전압	-	V	CURRENT 전류	-	A	LOSS 손실	-	W	FREQUENCY 주파수	-	Hz

* LOAD TEST

LOAD FACTOR 부하율	CURRENT 전류(A)	EFFICIENCY 효율(%)	POWER FACTOR 역률(%)	SPEED 회전수(r/min)	TORQUE 회전력(kgf · m)
25%	1.96	73.00	32.98	1788	0.20
50%	2.16	82.43	52.85	1776	0.41
75%	2.48	85.11	66.91	1763	0.62
100%	2.89	85.62	76.09	1749	0.84
125%	3.38	85.09	81.89	1733	1.05

START CURRENT 기동전류	18.40	A
START TORQUE 기동회전력	245.50	%
MAX. TORQUE 최대회전력	302.00	%

* TEMPERATURE RISE TEST

TIME 시간	STATOR 고정자권선	ROTOR 회전자권선	BEARING 축 수		AMB. TEMP 주위온도
			Drive 부하측	Non-Drive 반부하측	
3.5 h	36.9 K	- K	20 K	- K	15 ℃

* INSULATION & HIGH VOLTAGE TEST

	INSULATION TEST 절연저항 500 V		HIGH VOLTAGE TEST 절연내력 1 min	
STATOR 고정자	500	MΩ	1920 V	GOOD
ROTOR 회전자	-	MΩ	- V	GOOD

* REMARKS *

High Eff. Motor (고효율 전동기) / IP54

TESTED BY

김 MI-11 성규

HYOSUNG CORPORATION
기 전 품 질 보 증 팀

E-Plus

TEST REPORT FOR THREE PHASE INDUCTION MOTOR

삼상 유도 전동기 시험 성적서

CUSTOMER 주문처: 효성기전판매 | DATE: 2008년 02월

PROJECT No. 제번: SH19038403 | TYPE 형식: TEFC | SERIAL No.: 19038403001

OUTPUT 출력	0.75	kW	POLE 극수	4	P	VOLT 전압	460	V	FREQUENCY 주파수	60	Hz
RATING 정격	CONT		INSUL CLASS 절연계급	F		PHASE 상수	3	Φ	FRAME No.	143T	

* MEASUREMENT OF WINDING RESISTANCE (at 15 ℃)

STATOR 고정자	16.02	Ω

* NO LOAD TEST

VOLTAGE 전압	460	V	CURRENT 전류	0.9	A	LOSS 손실	83.2	W	FREQUENCY 주파수	60	Hz

* LOCKED ROTOR TEST

VOLTAGE 전압	90.3	V	CURRENT 전류	1.59	A	LOSS 손실	110.9	W	FREQUENCY 주파수	60	Hz
VOLTAGE 전압	-	V	CURRENT 전류	-	A	LOSS 손실	-	W	FREQUENCY 주파수	-	Hz

* LOAD TEST

LOAD FACTOR 하율	CURRENT 전류(A)	EFFICIENCY 효율(%)	POWER FACTOR 역률(%)	SPEED 회전수(r/min)	TORQUE 회전력(kgf · m)
25%	0.95	68.35	36.36	1788	0.10
50%	1.07	79.33	55.61	1775	0.21
75%	1.25	82.78	68.49	1762	0.31
100%	1.47	83.71	76.50	1747	0.42
125%	1.73	83.39	81.35	1730	0.53

START CURRENT 기동전류	9.11	A
START TORQUE 기동회전력	282.30	%
MAX. TORQUE 최대회전력	335.30	%

* TEMPERATURE RISE TEST

TIME 시간	STATOR 고정자권선	ROTOR 회전자권선	BEARING 축 수 Drive 부하측	BEARING 축 수 Non-Drive 반부하측	AMB. TEMP 주위온도
3.5 h	19 K	- K	11 K	- K	15 ℃

* INSULATION & HIGH VOLTAGE TEST

	INSULATION TEST 절연저항 500 V		HIGH VOLTAGE TEST 절연내력 1 min	
STATOR 고정자	500	MΩ	1920 V	GOOD
ROTOR 회전자	-	MΩ	- V	GOOD

* REMARKS *

High Eff. Motor (고효율 전동기)/IP54

TESTED BY 김 MI-11 성규

HYOSUNG CORPORATION
기 전 품 질 보 증 팀

E-Plus

TEST REPORT FOR THREE PHASE INDUCTION MOTOR

삼상 유도 전동기 시험 성적서

CUSTOMER 주문처: 효성기전판매 | DATE: 2008년 02월

PROJECT No. 제번: SH19038403 | TYPE 형식: TEFC | SERIAL No.: 19038403002

OUTPUT 출력	0.75	kW	POLE 극수	4	P	VOLT 전압	460	V	FREQUENCY 주파수	60	Hz
RATING 정격	CONT		INSUL. CLASS 절연계급	F		PHASE 상수	3	Φ	FRAME No.	143T	

* MEASUREMENT OF WINDING RESISTANCE (at 15 ℃)

STATOR 고정자	16.02	Ω

* NO LOAD TEST

VOLTAGE 전압	460	V	CURRENT 전류	0.91	A	LOSS 손실	83.1	W	FREQUENCY 주파수	60	Hz

* LOCKED ROTOR TEST

VOLTAGE 전압	90.2	V	CURRENT 전류	1.59	A	LOSS 손실	111	W	FREQUENCY 주파수	60	Hz
VOLTAGE 전압	-	V	CURRENT 전류	-	A	LOSS 손실	-	W	FREQUENCY 주파수	-	Hz

* LOAD TEST

LOAD FACTOR 부하율	CURRENT 전류(A)	EFFICIENCY 효율(%)	POWER FACTOR 역률(%)	SPEED 회전수(r/min)	TORQUE 회전력(kgf · m)
25%	0.95	68.38	36.14	1788	0.10
50%	1.07	79.35	55.40	1775	0.21
75%	1.25	82.79	68.38	1762	0.31
100%	1.47	83.71	76.50	1747	0.42
125%	1.73	83.39	81.44	1731	0.53

START CURRENT 기동전류	9.10	A
START TORQUE 기동회전력	282.50	%
MAX. TORQUE 최대회전력	335.20	%

* TEMPERATURE RISE TEST

TIME 시간	STATOR 고정자권선	ROTOR 회전자권선	BEARING 축 수 Drive 부하측	BEARING 축 수 Non-Drive 반부하측	AMB. TEMP 주위온도
3.5 h	19 K	- K	11 K	- K	15 ℃

* INSULATION & HIGH VOLTAGE TEST

	INSULATION TEST 절연저항 500 V		HIGH VOLTAGE TEST 절연내력 1 min	
STATOR 고정자	500	MΩ	1920 V	GOOD
ROTOR 회전자	-	MΩ	- V	GOOD

* REMARKS *

High Eff. Motor (고효율 전동기)/IP54

TESTED BY

김 MI-11 성규

HYOSUNG CORPORATION

기 전 품 질 보 증 팀

E-Plus

TEST REPORT FOR THREE PHASE INDUCTION MOTOR

삼상 유도 전동기 시험 성적서

DATE 2008년 02월

CUSTOMER 주문처 효성기전판매 | TYPE 형식 TEFC | SERIAL No. 19038404001

PROJECT No. 제번 SH19038404

OUTPUT 출력	0.75 kW	POLE 극수	4 P	VOLT 전압	460 V	FREQUENCY 주파수	60 Hz
RATING 정격	CONT	INSUL.CLASS 절연계급	F	PHASE 상수	3 Φ	FRAME No.	143T

* MEASUREMENT OF WINDING RESISTANCE (at 15 ℃)

STATOR 고정자	16.02	Ω

* NO LOAD TEST

VOLTAGE 전압	460 V	CURRENT 전류	0.9 A	LOSS 손실	83.1 W	FREQUENCY 주파수	60 Hz

* LOCKED ROTOR TEST

VOLTAGE 전압	90.2 V	CURRENT 전류	1.59 A	LOSS 손실	111 W	FREQUENCY 주파수	60 Hz
VOLTAGE 전압	- V	CURRENT 전류	- A	LOSS 손실	- W	FREQUENCY 주파수	- Hz

* LOAD TEST

LOAD FACTOR 하중	CURRENT 전류(A)	EFFICIENCY 효율(%)	POWER FACTOR 역률(%)	SPEED 회전수(r/min)	TORQUE 회전력(kgf · m)
25%	0.94	68.52	36.51	1788	0.10
50%	1.06	79.52	55.85	1776	0.21
75%	1.24	82.97	68.80	1762	0.31
100%	1.46	83.89	76.85	1747	0.42
125%	1.72	83.58	81.73	1731	0.53

START CURRENT 기동전류	9.10	A
START TORQUE 기동회전력	282.90	%
MAX. TORQUE 최대회전력	335.50	%

* TEMPERATURE RISE TEST

TIME 시간	STATOR 고정자권선	ROTOR 회전자권선	BEARING 축 수 Drive 부하측	BEARING 축 수 Non-Drive 반부하측	AMB. TEMP 주위온도
3.5 h	19 K	- K	11 K	- K	15 ℃

* INSULATION & HIGH VOLTAGE TEST

	INSULATION TEST 절연저항 500 V		HIGH VOLTAGE TEST 절연내력 1 min	
STATOR 고정자	500	MΩ	1920 V	GOOD
ROTOR 회전자	-	MΩ	- V	GOOD

* REMARKS *

High Eff. Motor (고효율 전동기)/IP54

TESTED BY 김 MI-11 성규

HYOSUNG CORPORATION
기 전 품 질 보 증 팀

E-Plus

TEST REPORT FOR THREE PHASE INDUCTION MOTOR

삼상 유도 전동기 시험 성적서

CUSTOMER 주문처: 효성기전판매 | DATE: 2008년 02월

PROJECT No. 제번: SH19038404 | TYPE 형식: TEFC | SERIAL No.: 19038404002

OUTPUT 출력	0.75	kW	POLE 극수	4	P	VOLT 전압	460	V	FREQUENCY 주파수	60	Hz
RATING 정격	CONT		INSUL CLASS 절연계급	F		PHASE 상수	3	Φ	FRAME No.	143T	

* MEASUREMENT OF WINDING RESISTANCE (at 15 ℃)

STATOR 고정자	16.02	Ω

* NO LOAD TEST

VOLTAGE 전압	460	V	CURRENT 전류	0.9	A	LOSS 손실	83	W	FREQUENCY 주파수	60	Hz

* LOCKED ROTOR TEST

VOLTAGE 전압	90.1	V	CURRENT 전류	1.59	A	LOSS 손실	111	W	FREQUENCY 주파수	60	Hz
VOLTAGE 전압	-	V	CURRENT 전류	-	A	LOSS 손실	-	W	FREQUENCY 주파수	-	Hz

* LOAD TEST

LOAD FACTOR 하율	CURRENT 전류(A)	EFFICIENCY 효율(%)	POWER FACTOR 역률(%)	SPEED 회전수(r/min)	TORQUE 회전력(kgf · m)
25%	0.94	68.69	36.41	1788	0.10
50%	1.06	79.70	55.72	1775	0.21
75%	1.24	83.16	68.64	1762	0.31
100%	1.46	84.08	76.68	1747	0.42
125%	1.72	83.76	81.55	1731	0.53

START CURRENT 기동전류	9.00	A
START TORQUE 기동회전력	282.20	%
MAX. TORQUE 최대회전력	335.60	%

* TEMPERATURE RISE TEST

TIME 시간	STATOR 고정자권선	ROTOR 회전자권선	BEARING 축 수 Drive 부하측	BEARING 축 수 Non-Drive 반부하측	AMB. TEMP 주위온도
3.5 h	19 K	- K	11 K	- K	15 ℃

* INSULATION & HIGH VOLTAGE TEST

	INSULATION TEST 절연저항 500 V		HIGH VOLTAGE TEST 절연내력 1 min	
STATOR 고정자	500	MΩ	1920 V	GOOD
ROTOR 회전자	-	MΩ	- V	GOOD

* REMARKS *

High Eff. Motor (고효율 전동기)/IP54

TESTED BY

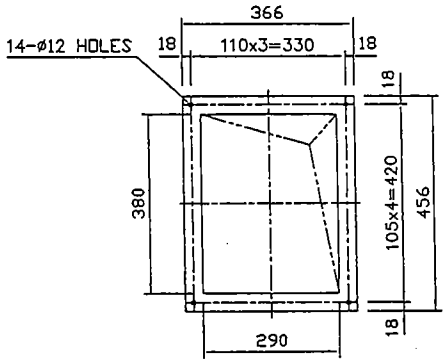
김 MI-11 성규

HYOSUNG CORPORATION
기 전 품 질 보 증 팀

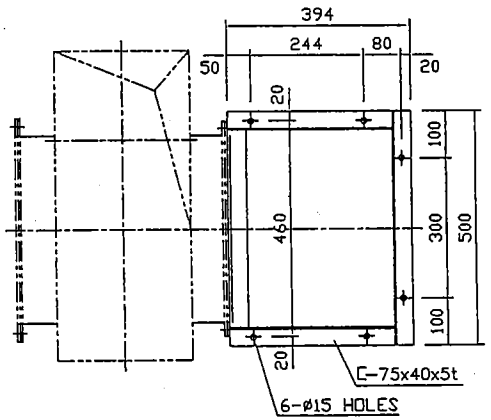
FILE NAME	DYF-18

DYF-09
DYF-06R3

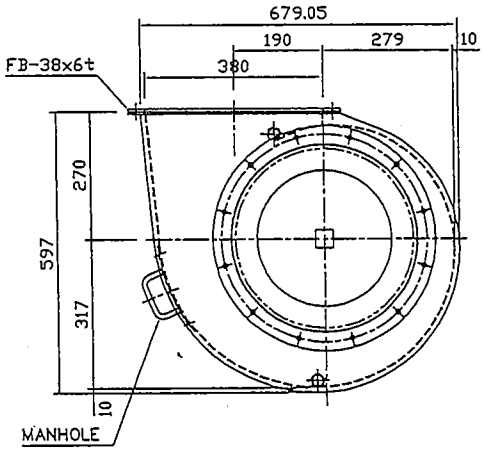
TYPE	SIROCCO FAN (DWSF – #2 1/2 – S4)	
SPECIFICATION	AIR VOLUME 60 m³/min	STATIC PRESS 50 mmAq
	REV. 1060 r.p.m	TEMP. 20 (MAX300) °C
HANDLING GAS	HOT AIR	
DRIVER UL MARK	1.5 Kw 460 V 60 Hz 3 ph.	
	4 P 1720 r.p.m maker HICO	
ACCESSORIES	FAN PULLEY	3Vty – 2P – ø6 1/2"
	MOTOR PULLEY	3Vty – 2P – ø4"
	COUPLING	–
BEARING	NO. #6308x2EA LUB. GREASE	
PAINT	MUNSELL NO.	
MATERIAL	CASING SS400 IMPELLER SS400 SHAFT SM45C	
NET WEIGHT	FAN Kg MOTOR Kg TOTAL Kg	
INSTALLATION	□ IN DOOR □ OUT DOOR	

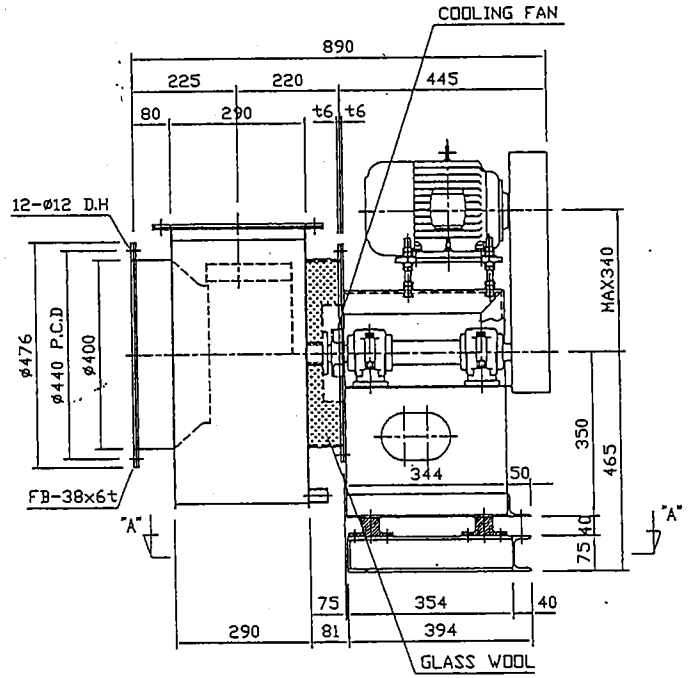


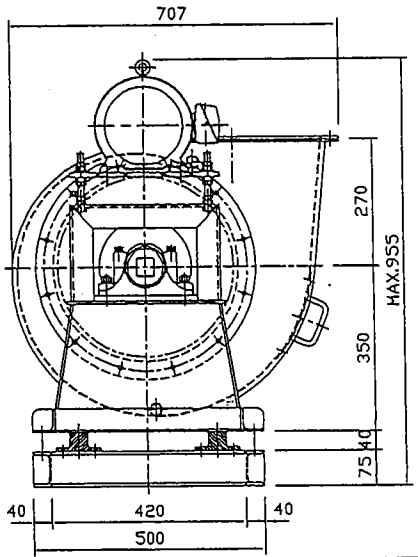
DETAIL OF OUTLET

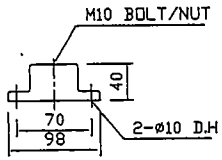


SECTION : A-A'









MODEL : MSV-40
Q'TY : 6EA
MAKER : MOUNG SIN

DETAIL OF VIB.ISOLATOR

FOR APPROVAL

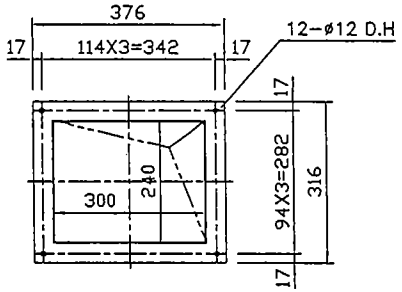
흡입 & 토출 FLANGE 각 1EA 공급요망
방진고무-6EA + SPARE 4EA 공급요망
내열 구리이스 공급 할것

MFG.NO.	Q'TY	CUSTOMER	동양 식품 기계
	1 SET		
DATE	SCALE	USER	미국 수출용
2008.01.05.	1 / 11		
APPR'D CH'D	DR'G	TITTLE	LAYOUT OF SIROCCO FAN – #2 1/2 – S4)
Yoo J.S.	Kim S.H.		
DAE MYUNG ENGINEERING & MFG.CO.		DWG.NO.	DYF-18

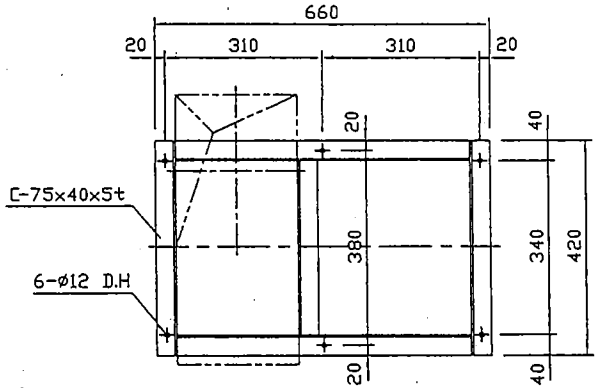
REV.	MFG.	DESCRIPTION	DATE	REVISED	APPROVED
⚠ X					
⚠ X					
REF. DWG.					

PROJECTION

FILE NAME
DYF-17
DYF-10
DYF-07
DH-14

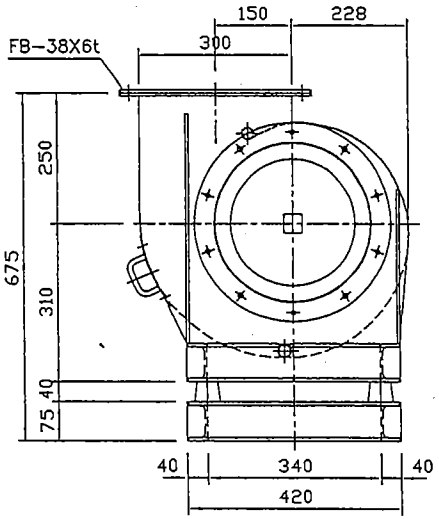


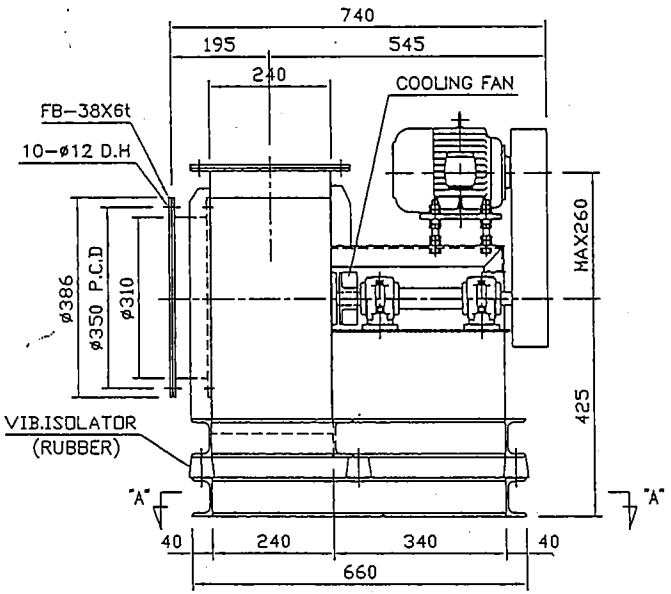
DETAIL OF OUTLET

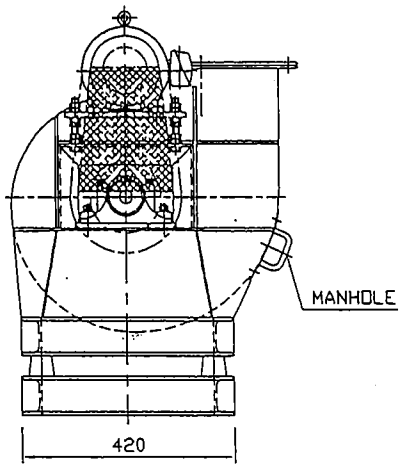


SECTION : A-A'

TYPE	SIROCCO FAN (DMSF - # 2 - S4)	
SPECIFICATION	AIR VOLUME 40 m³/min	STATIC PRESS 30 mmAq
	REV. 1100 r.p.m	TEMP. 20 (MAX300) °C
HANDLING GAS	AIR	
DRIVER (UL MARK)	0.75 Kw 460 V 60 Hz 3 ph.	
	4 P 1720 r.p.m Maker HICO	
ACCESSORIES	FAN PULLEY	3V - 2P - ø5 1/2"
	MOTOR PULLEY	3V - 2P - ø3 1/2"
	COUPLING	-
BEARING	NO. #6306 x 2 EA	LUB. GREASE
PAINT	MUNSELL NO.	
MATERIAL	CASING SS400 / IMPELLER SS400 / SHAFT SM45C	
NET WEIGHT	FAN Kg / MOTOR Kg / TOTAL Kg	
INSTALLATION	□ IN DOOR	□ OUT DOOR







FOR APPROVAL

흡입 FLANGE-3EA, 토출 FLANGE-1EA 공급 할것

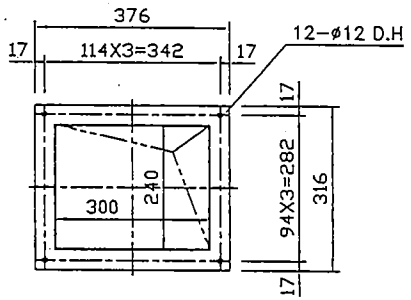
내열 구리이스 공급할것

방진고무 SPARE로 4EA 공급할것

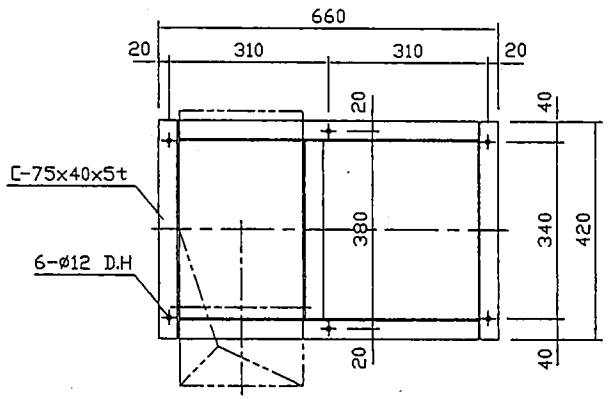
MFG.NO.	Q'TY	CUSTOMER	동양 식품 기계 (주)
	2 SETS		
DATE	SCALE	USER	미국 수출용
2008.01.05.	1 / 10		
APPR'D / CH'D	DR'G	TITLE	LAYOUT OF SIROCCO FAN (DMSF - #2 - S4)
YOU / Y.S.	KIM / S.M.		
DAE MYUNG ENGINEERING & MFG.CO.		DWG.NO.	DYF-17

REV.	DESCRIPTION	DATE	REVISED	APPROVED
⚠ X				
⚠ X				
REF. DWG.			PROJECTION	

FILE NAME DYF-17-1
DYF-10
DYF-07
DH-14

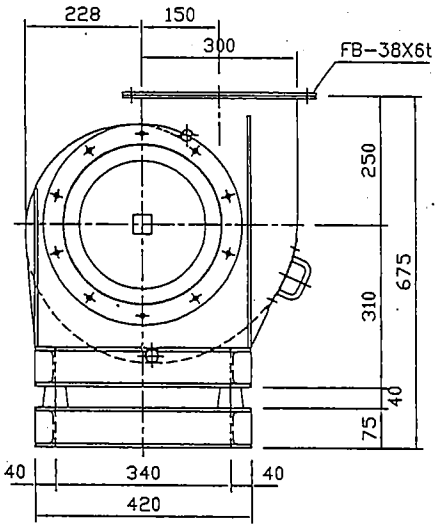


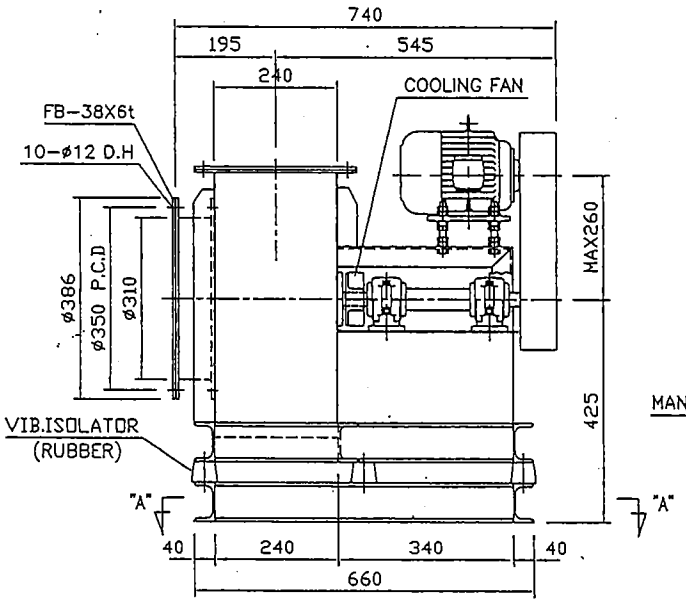
DETAIL OF OUTLET

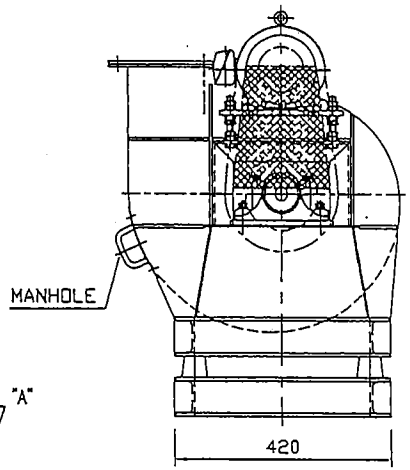


SECTION : A-A'

TYPE	SIROCCO FAN (DMSF - # 2 - S4)	
SPECIFICATION	AIR VOLUME 40 m³/min	STATIC PRESS 30 mmAq
	REV. 1100 r.p.m	TEMP. 20 (MAX300) °C
HANDLING GAS	AIR	
DRIVER (UL MARK)	0.75 Kw 460 V 60 Hz 3 ph.	
	4 P 1720 r.p.m Maker HICO	
ACCESSORIES	FAN PULLEY	3V - 2P - #5 1/2"
	MOTOR PULLEY	3V - 2P - #3 1/2"
	COUPLING	-
BEARING	NO. #6306 x 2 EA	LUB. GREASE
PAINT	MUNSELL NO.	
MATERIAL	CASING SS400 IMPELLER SS400 SHAFT SM45C	
NET WEIGHT	FAN Kg MOTOR Kg TOTAL Kg	
INSTALLATION	□ IN DOOR	□ OUT DOOR







FOR APPROVAL

MFG.NO.	Q'TY	CUSTOMER	동양 식품 기계 (주)
	2 SETS		
DATE	SCALE	USER	미국 수출용
2008.01.05.	1 / 10		
APPR'D / CH'D	DR'G	TITLE	LAYOUT OF SIROCCO FAN (DMSF - #2 - S4)
YOU / Y.S.	KIM / S.M.		
DAE MYUNG ENGINEERING & MFG.CO.		DWG.NO.	DYF-17-1

REV.	MFG.NO	DESCRIPTION	DATE	REVISED	APPROVED
⚠ X					
⚠ X					
REF. DWG.				PROJECTION	

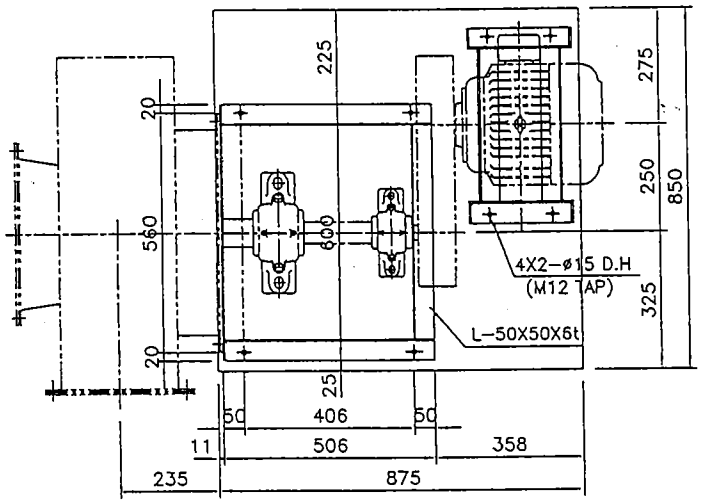
흡입 FLANGE-3EA, 토출 FLANGE-1EA 공급 할것

구리이스 공급할것

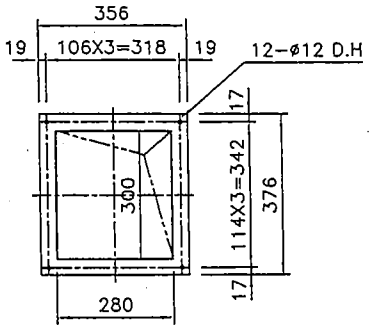
고무 SPARE로 4EA 공급할것

FILE NAME DYF-16

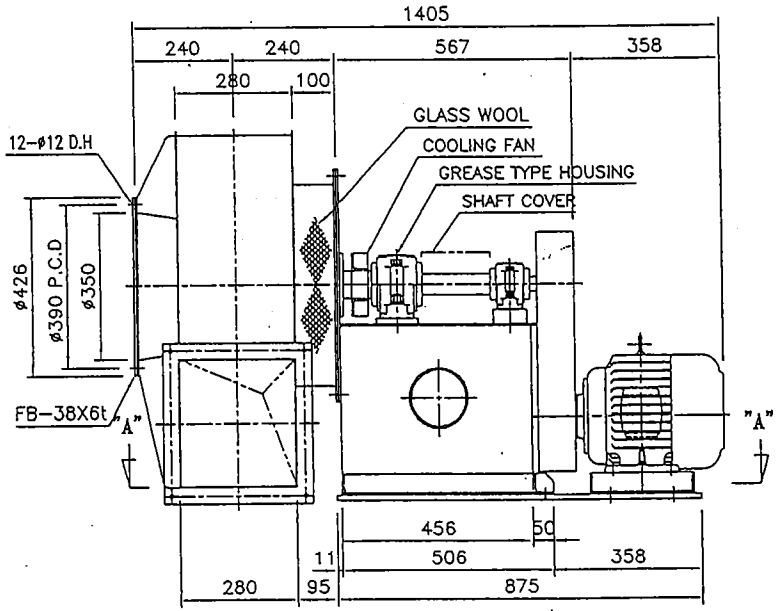
DH-17
DYF-02

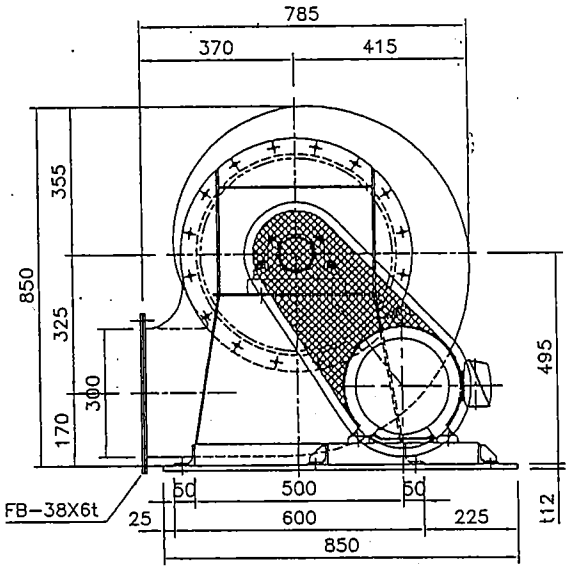


SECTION : A-A'



DETAIL OF OUTLET





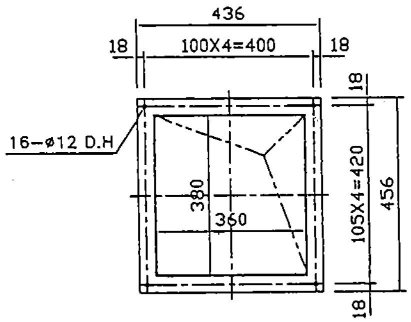
TYPE	TURBO FAN (DMTF - ∮ 3 1/4 - S4)	
SPECIFICATION	AIR VOLUME 88 m³/min	STATIC PRESS 220 mmAq
	REV. 2050 r.p.m	TEMP. 20 (MAX300) °C
HANDLING GAS	AIR	
DRIVER (UL MARK)	5.5 Kw 460 V 60 Hz 3 ph.	
	4 P 1750 r.p.m Maker HICO	
ACCESSORIES	FAN PULLEY	3V - 3P - ø6"
	MOTOR PULLEY	3V - 3P - ø7"
	COUPLING	-
BEARING	NO. ∮6311, ∮6308	LUB. GREASE
PAINT	MUNSELL NO.	
MATERIAL	CASING SS400	IMPELLER SS400 SHAFT SM45C
NET WEIGHT	FAN Kg	MOTOR Kg TOTAL Kg
INSTALLATION	□ IN DOOR	□ OUT DOOR

REV.	MFG.NO.	DESCRIPTION	DATE	REVISED	APPROVED
⚠ X					
⚠ X					
REF. DWG.			PROJECTION		

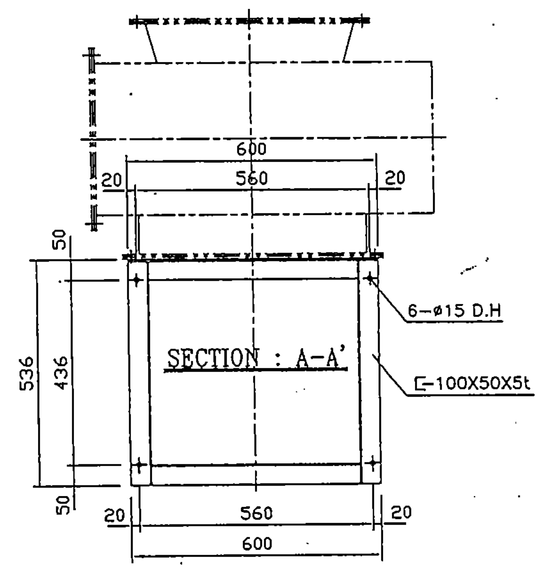
상대 플랜지 홀입 볼츠 1EA 먼저 납품요
내열 구리이스 공급 할것

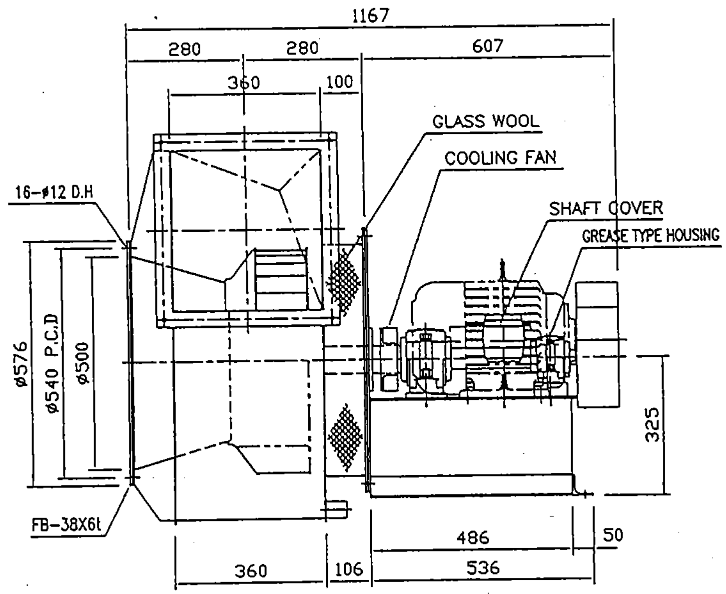
MFG.NO.	Q'TY	CUSTOMER	동양 식품 기계 (주)
	1 SETS		
DATE	SCALE	USER	미국 수출용
2008.01.05.	1 / 12		
APPR'D CH'D	DR'G	TITLE	LAYOUT OF TURBO FAN (DMTF - ∮3 1/4 - S4)
YOU Y.S.	KIM S.M.		
DAE MYUNG ENGINEERING & MFG.CO.		DWG.NO.	DYF-16

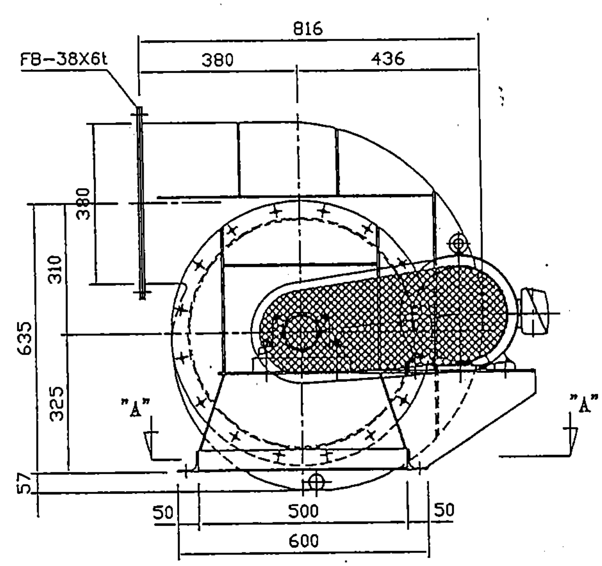
T Y P E	AIRFOIL FAN (DMLA - #3 1/2 - S4)			
SPECIFICATION	AIR VOLUME 136 m³/min		STATIC PRESS 138 mmAq	
	REV. 2190 r.p.m		TEMP. 20 (MAX300) °C	
HANDLING GAS	HOT AIR			
DRIVER (UL MARK)	7.5 Kw 460 V 60 Hz 3 ph.			
	4 P 1750 r.p.m maker HICO			
ACCESSORIES	FAN PULLEY	3V - 3P - ø6"		
	MOTOR PULLEY	3V - 3P - ø7 1/2"		
	COUPLING	-		
BEARING	NO. #6311, #6308 LUB. GREASE			
PAINT	MUNSELL NO.			
MATERIAL	CASING SS400	IMPELLER SS400	TOTAL SM45C	
NET WEIGHT	CASING Kg	IMPELLER Kg	TOTAL Kg	
INSTALLATION	☐ IN DOOR	☐ OUT DOOR		



DETAIL OF OUTLET







상대 플랜지 흡입, 토출 1EA 먼저 공급

내열 구리스 공급 할것

MFG.NO.	Q'TY	CUSTOMER	동양 식품 기계
	1 SET		
DATE	SCALE	USER	미국 수출용
2008.01.05.	1 / 12		
APPR'D CH'D	DR'G	TITLE	LAYOUT OF AIRFOIL FAN (DMLA - #3 1/2 - S4)
You y.s.	Kim s.m.		
DAE MYUNG ENGINEERING & MFG.CO.		DWG.NO.	DYF-15

△ X					
△ X	SN310	CHANGED BEARING HOUSING	2005.09.14.	S.M.KIM	Y.S.YOU
REV.	MFG.NO.	DESCRIPTION	DATE	REVISED	APPROVED
REF.					

PROJECTION

FILE NAME DYF-15

DYF-01
DH-16
DH-08R

SPECIFICATION & DRAWING
OF
MAXON GAS BURNER

A. GENERAL

1. PROJECT NAME : SHPP-415 OVENPAK BURNER

2. CUSTOMER :

3. DESIGN CONDITION
   BURNER CAPACITY (MAX.) : 375,000 KCAL/HR

4. ELECTRIC POWER
   MAIN : AC 460 V/ Ψ 3/ 60HZ
   CONTROL : AC 110 V/ Ψ 1/ 60HZ

5. UTILITY
   PROPANE : 23,500 Kcal/NM^3
   PRESSURE : 5,000mmAq

6. SCOPE OF SUPPLY
   -SHPP-415 BURNER (2SETS)
   -COMPACT GAS TRAIN UNIT (2SETS)
   -BURNER START-UP PANEL (2SETS)
   -PRE-WIRING
   -ENGINEERING

B. EQUIPMENT LIST

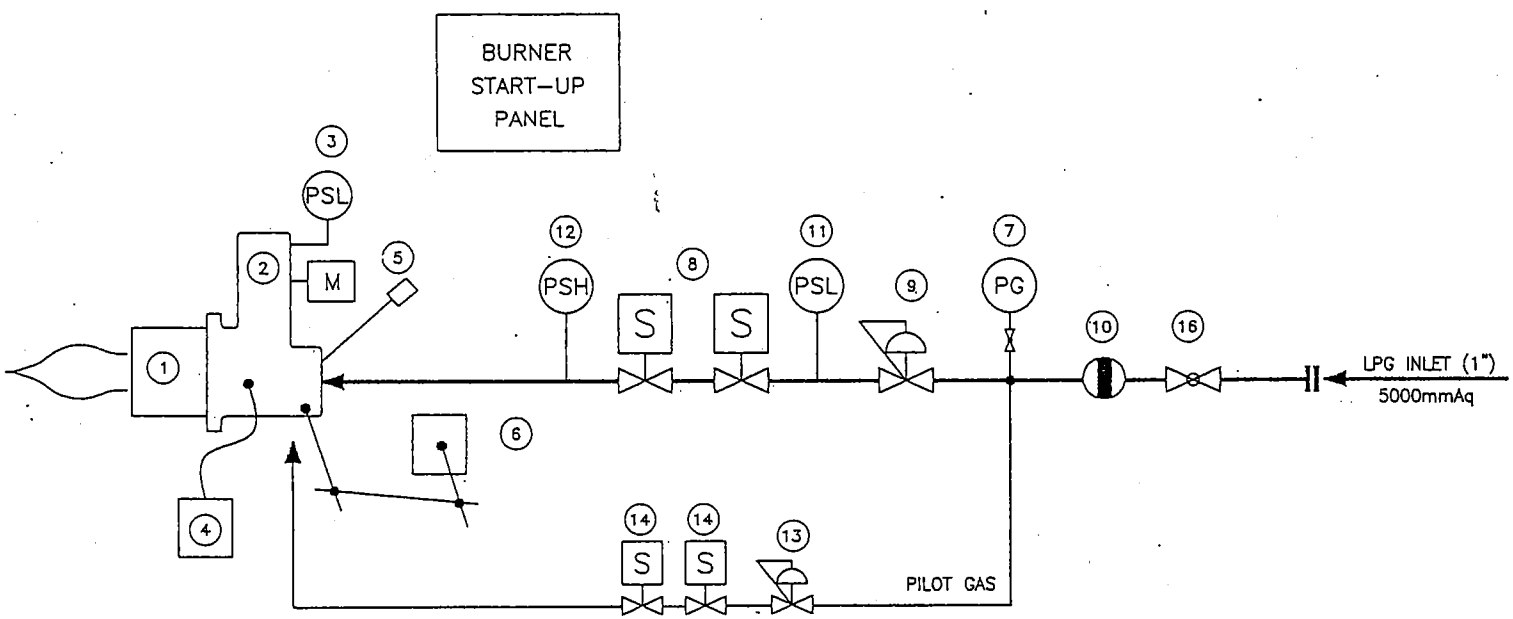
(1) OVEN BURNER SPECIFICATION

QTY	2 SETS
BURNER TYPE	415 OVENPAK
MAKER	MAXON
BURNER CAPACITY	375,000 Kcal/Hr
TURN DOWN RATIO	20:1 OR ABOVE
ACCESSORIES	CONTROL MOTOR (M7284Q1009)
	UV FLAME DETECTOR
	SPARK IGNITOR

B. EQUIPMENT LIST

B-1. SHPP-415 OVENPAK BURNER EQUIPMENT SPECIFICATION : 2 SETS

NO	DESCRIPTION	MODEL	MAKER	SPECIFICATION	Q'TY	REMARK
1	BURNER	415	MAXON	SEE BURNER SPEC.	1	
2	BURNER BLOWER	INCLUDE BURNER	MAXON	AC460V/60Hz/3Ph 1/3HP	1	
3	AIR PRESSURE SWITCH(LOW)	C6097A1004	HONEYWELL	0.4"~5"W.C	1	
4	IGNITION TRANSFORMER	A06	DONGAN	AC 110V/60HZ HIGH VOLTAGE	1	
5	UV DETECTOR	PC-II	PROTECTION CONTROLS	w/LENS	1	
6	CONTROL MOTOR	M7284Q1009	HONEYWELL	4~20mA INPUT	1	
7	GAS PRESSURE GAUGE		KONICS	0~1Kg/Cm2	1	
8	GAS SOLENOID VALVE	8215B50	ASCO	1" PT, N.C AC110V/60Hz	2	
9	GAS REGULATOR	143-80-1	SENSUS	1", ORI.: 1/4" SPR. : 3.5"~6.5"	1	
10	GAS FILTER	SJG-03	SUNGJIN	1", 1Bar	1	
11	GAS PRESSURE SWITCH(LOW)	C6097A1004	HONEYWELL	0.4"~5"W.C	1	
12	GAS PRESSURE SWITCH(HIGH)	C6097A1053	HONEYWELL	3"~21"W.C	1	
13	PILOT GAS REGULATOR	325-3	MAXITROL	3/8" PT	1	
14	PILOT GAS SOLENOID VALVE	8215G10	ASCO	3/8" PT, N.C AC110V/60Hz	2	
15	BALL VALVE	1" PT	KOREA	KS 10K/SCR'D BRASS	1	



NO.	DESCRIPTION	DIMENSIONS	Q'TY	REMARK
1	BURNER	415 OVENPAK	1	MAXON
2	BURNER BLOWER	AC460/60Hz/3PH, 1/3HP	1	MAXON
3	AIR PRESS. S/W	C6097A1004	1	HONEYWELL
4	IGNITION TRANSFORMER	AC110V, A06	1	DONGAN
5	UV DETECTOR	PC-II	1	PROTECTION
6	CONTROL MOTOR	M7284Q1009	1	HONEYWELL
7	GAS PRESS. GAUGE	0~1Kg/Cm2	1	KONICS
8	GAS SOLENOID VALVE	8215B50, 1", 110V	2	ASCO
9	GAS REGULATOR	1", 143-80-1	1	SENSUS
10	GAS FILTER	SJG-03, 1"	1	SUNGJIN
11	GAS PRESS. S/W(LOW)	C6097A1004	1	HONEYWELL
12	GAS PRESS. S/W(HIGH)	C6097A1053	1	HONEYWELL
13	PILOT GAS REGULATOR	1/2", 325-3	1	MAXITROL
14	PILOT GAS SOL. VALVE	8215G20, 1/2",110V	2	ASCO
15	BALL VALVE	1", SCR'D	1	KOREA

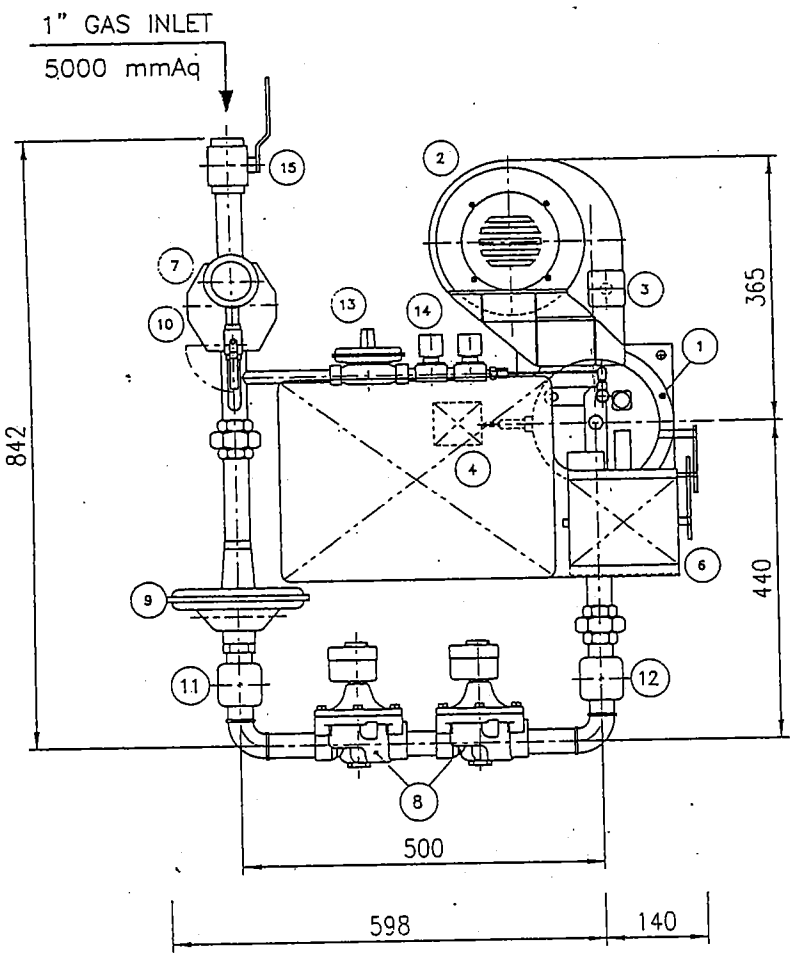
*NOTE

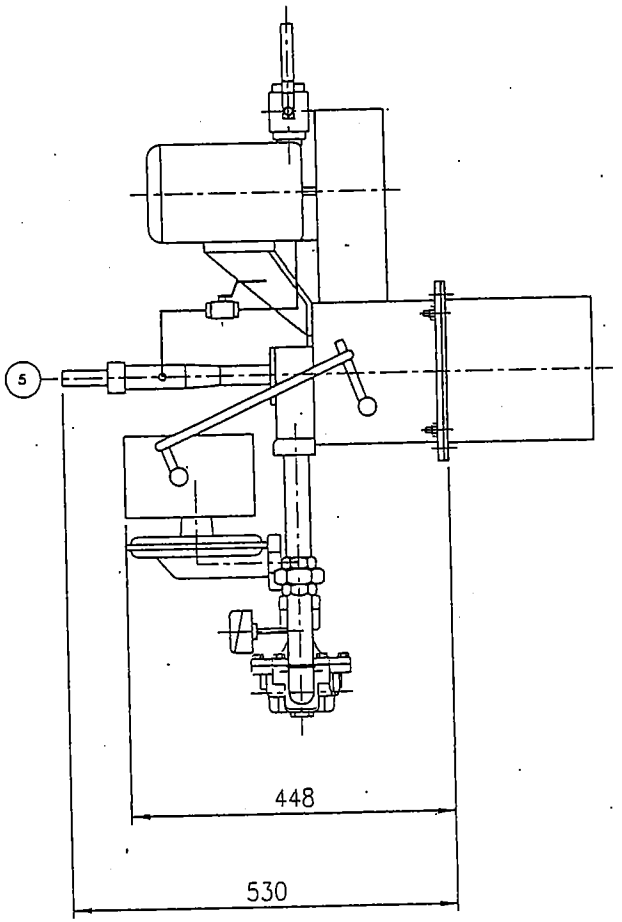
1. Q'TY : 2 SETS
2. CAPA. : 375,000Kcal/Hr
4. FUEL : PROPANE
5. POWER : MAIN - AC460V/60Hz/3Ph
   CONTROL - AC110V/60Hz/1Ph

NO.	DATE	DESCRIPTION	DWN	CHK	API
⚠	2008.01.16	FOR APPROVAL	S.H.K	S.H.Y	S.H.

SEOUL ENERGY
ENGINEERING & SALES CO.,LTD.

PROJECT: SHPP-415	CUSTOMER: 동양식품기계(주
PJT NO: PJ-2008-6906	END USER: USA
SCALE: NONE	TITLE: FLOW DIAGRAM FOR 415 OVENPAK BURNER
DATE: 2008.01.16	
DWN: S.H.K	
CHK: S.H.Y	DWG. NO.: M6906-001
APP: S.H.Y	REV.: ⚠





NO.	DESCRIPTION	DIMENSIONS	Q'TY	REMAI
1	BURNER	415 OVENPAK	1	MAXO
2	BURNER BLOWER	AC460/60Hz/3PH, 1/3HP	1	MAXO
3	AIR PRESS. S/W	C6097A1004	1	HONEYW
4	IGNITION TRANSFORMER	AC110V, A06	1	DONG/
5	UV DETECTOR	PC-II	1	PROTEC
6	CONTROL MOTOR	M7284Q1009	1	HONEYW
7	GAS PRESS. GAUGE	0~1Kg/Cm2	1	KONIC
8	GAS SOLENOID VALVE	8215B50, 1", 110V	2	ASC(
9	GAS REGULATOR	1", 143-80-1	1	SENSI
10	GAS FILTER	SJG-03, 1"	1	SUNG.
11	GAS PRESS. S/W(LOW)	C6097A1004	1	HONEYW
12	GAS PRESS. S/W(HIGH)	C6097A1053	1	HONEYW
13	PILOT GAS REGULATOR	1/2", 325-3	1	MAXITF
14	PILOT GAS SOL. VALVE	8215G20, 1/2",110V	2	ASCI
15	BALL VALVE	1", SCR'D	1	KORE

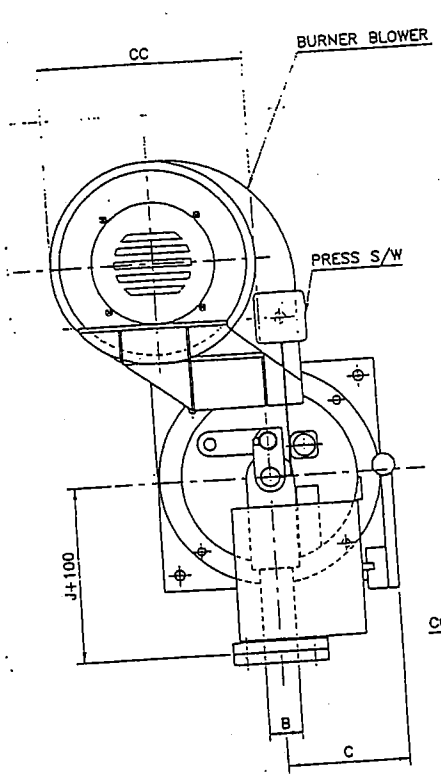
UTILITY & EQUIPMENT DATA

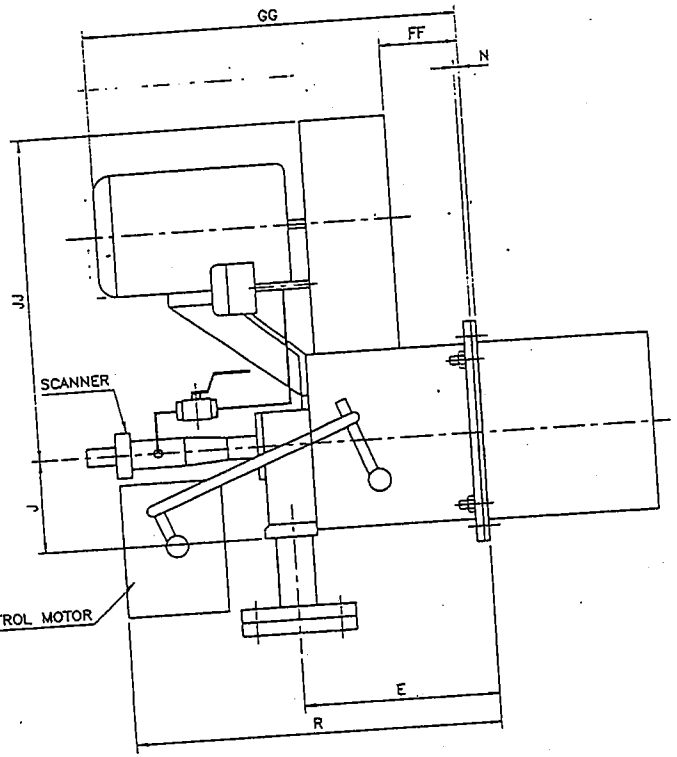
NO	DESCRIPTION		SPECIFICATION
1	BURNER MODEL		415 OVENPAK
2	MAX. CAPACITY		375,000Kcal/Hr
3	QUANTITY		2 SET
4	POWER	CONTROL	
		MAIN	
5	FUEL		■ LPG □ LNG
6	FLAME DETECTOR		PC-II

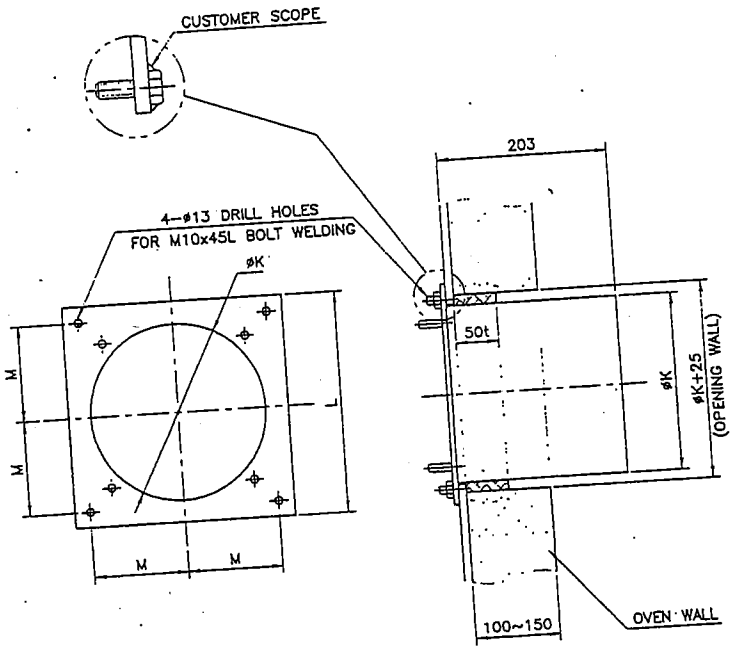
NO.	DATE	DESCRIPTION	DWN	CHK
◬	2008.01.16	FOR APPROVAL	S.H.K	S.H.Y

SEOUL ENERGY
ENGINEERING & SALES CO.,LTD.

PROJECT: SHPP-415	CUSTOMER: 동양식품기
PJT NO: PJ-2008-6906	END USER: USA
SCALE: 1./7	TITLE: GAS TRAIN UNIT FOR 415 OVENPAK BURNER
DATE: 2008.01.16	
DWN: S.H.K	
CHK: S.H.Y	DWG. NO. ...06-002
APP: S.H.Y	REV.







*NOTE

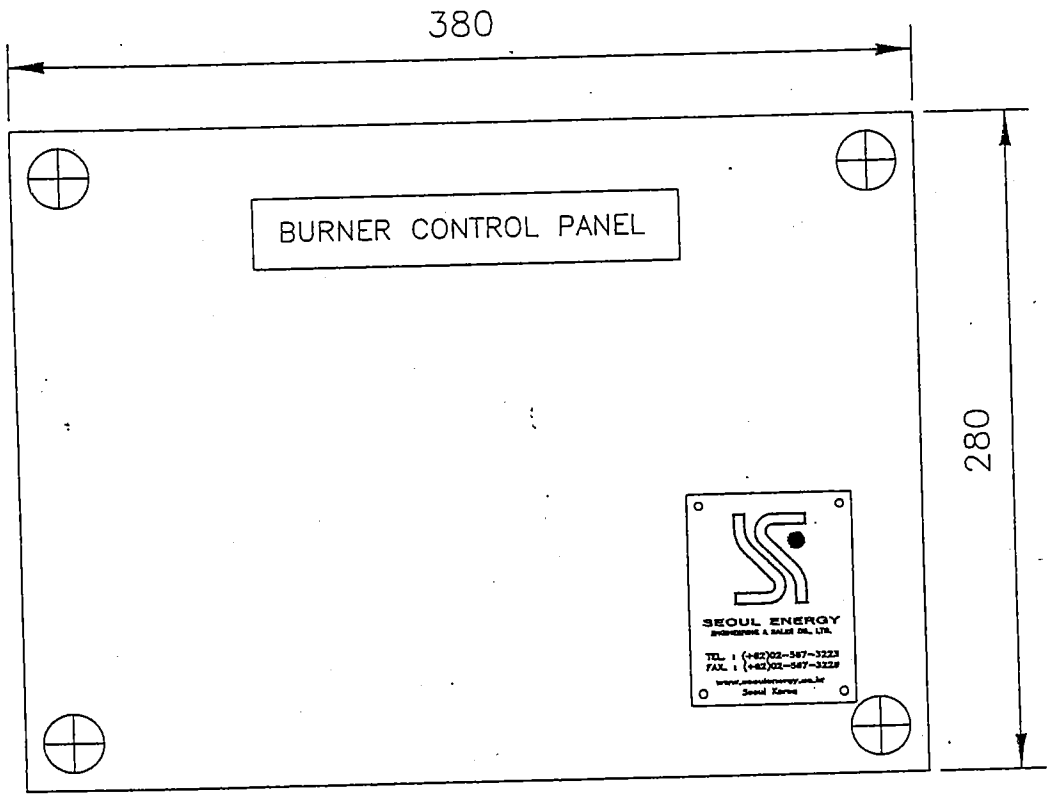
1. "B" : MAIN FUEL GAS INLET NPT.
2. FILTER의 치수및 기입하지 않은 치수는 CATALOGUES 참조.
3. " : " 부분은 로내압이 "+" 일 경우에만 CERAMIC 으로 충진한다.
4. 만약, OVEN WALL이 150mm 이상일 경우에는 서울에너지와 협의한다.

MODEL	B	C	E	J	K	L	M	N	R	CC	FF	GG	JJ
405	1"	138	225	111	160	214	92	6	448	224	93	440	365
407M										387	119		551
408										224	93	486	365
408M										387	119	440	551
412M												486	
413M									446	224	91	440	365
415	1-1/4"		224		210	263	112.8			387			551
422M										308	100	464	514
425	1-1/2"	154	255	138	260	318	142.8	9	484	387	71		598
432M										308	100		514
435	2"										71		598
442M										387		572	597
445			365	165	311	375	170		611		136		
456M										451		910	659
470M	3"												
487M													

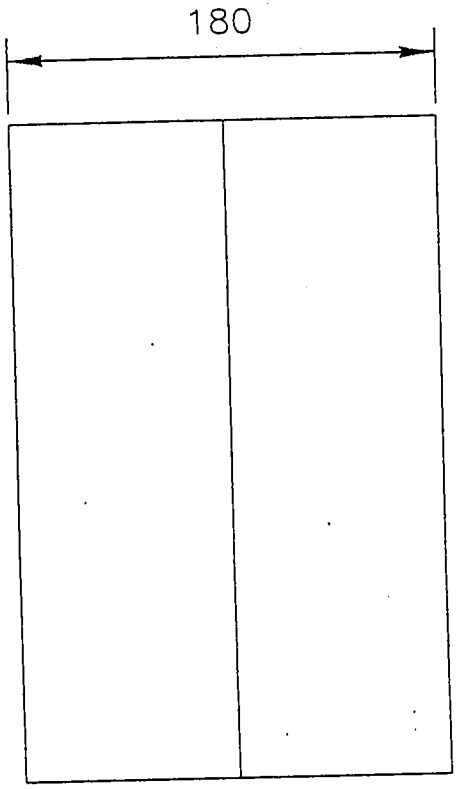
NO.	DATE	DESCRIPTION	DWN	CHK	APP
0	2008.01.16	FOR APPROVAL	S.H.K	S.H.Y	S.H.Y

SEOUL ENERGY
ENGINEERING & SALES CO.,LTD.

PROJECT SHPP-415	CUSTOMER 동양식품기계(주
PJT NO PJ-2007-6906	END USER USA
SCALE NONE	TITLE 400 OVENPAK BURNER ASS'Y DRAWING
DATE 2002.04.10	
DWN S.H.K	
CHK S.H.Y	DWG. NO. M6906-003 REV. 0
APP S.H.Y	



FRONT VIEW



SIDE VIEW

*NOTE

1. Q'TY : 2SETS
2. "UL" 인증품사용

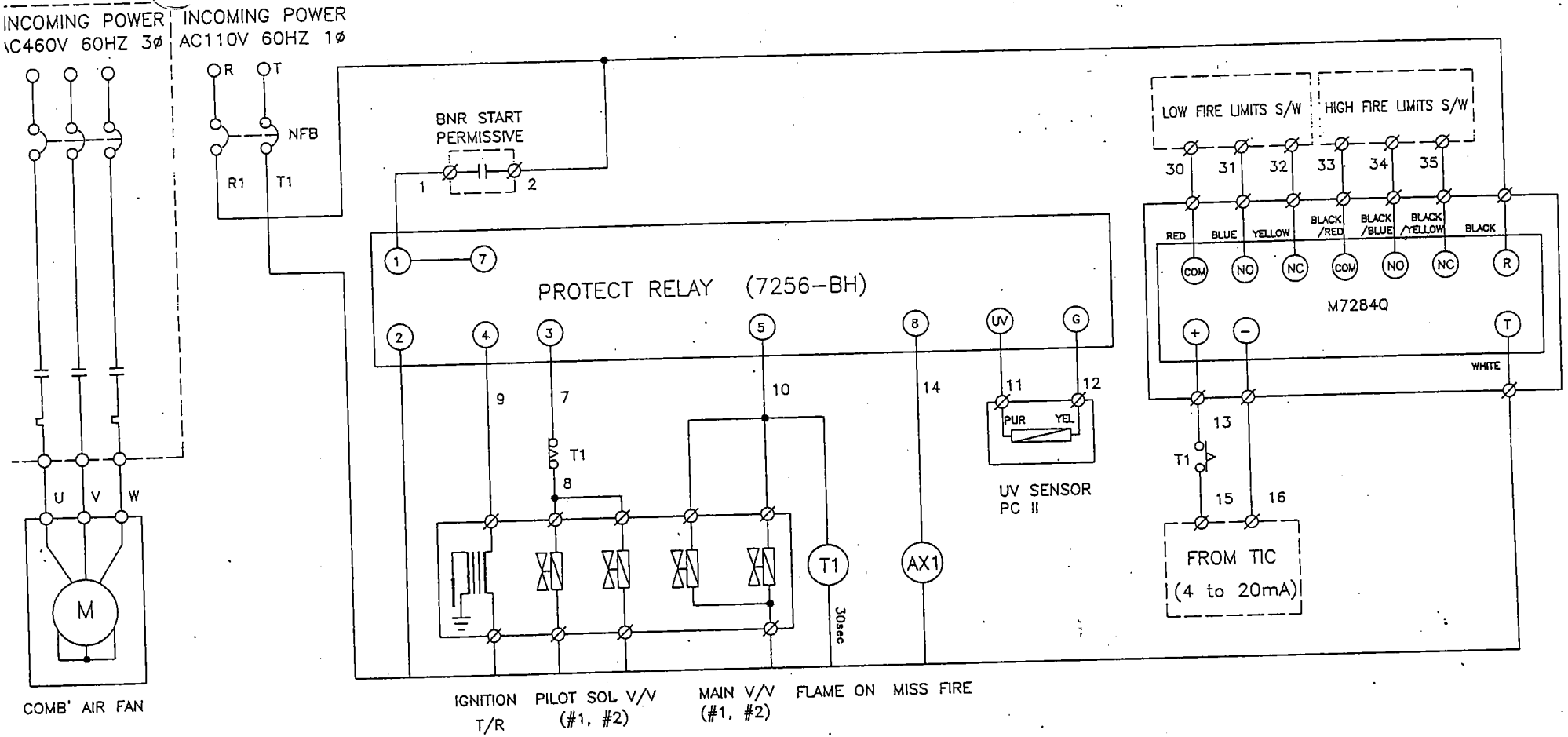
REV.	DATE	CONTENTS	REV.D BY	CHK.D BY	APP.D BY
3					
2					
1					
0	2007.01.15	APPROVAL	seo	seo	hong

TITLE

BURNER CONTROL PANEL

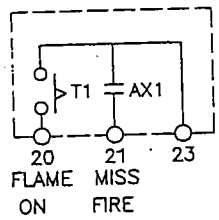
SEOUL ENERGY ENGINEERING & SALES CO.

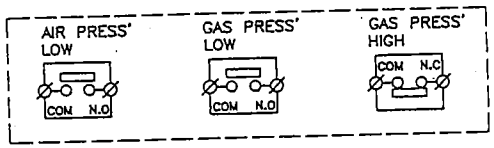
PROJECT SHPP-415	PJT NO. PJ-2008-6906
CUSTOMER 동양식품기계(주)	DWG NO. E690600
END USER USA	SHEET NO. 00



MAIN PANEL

LOCAL





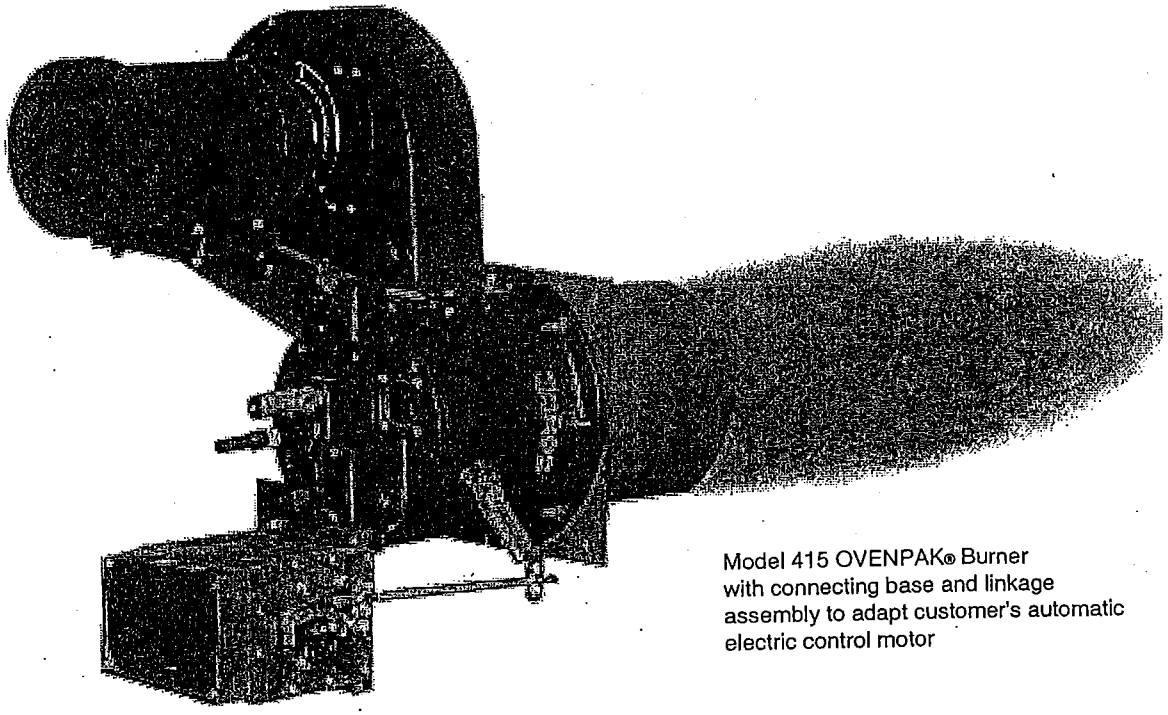
LOCAL INSTRUMENT

Q'TY : 2SET
UL 인증제품사용

					TITLE		
7.01.15	FOR APPROVAL	seo	seo	hong	BURNER CONTROL PANEL	SEOUL ENERGY ENGINEERING & SALES CO.	
DATE	CONTENTS	REV.D BY	CHK.D BY	APP.D BY			

PROJECT SHPP-415	PJT NO. PJ-2008-6906
CUSTOMER 동양식품기계(주)	DWG NO. E690601
END USER USA	SHEET NO. 01

Maxon Model "400" OVENPAK® Gas Burners



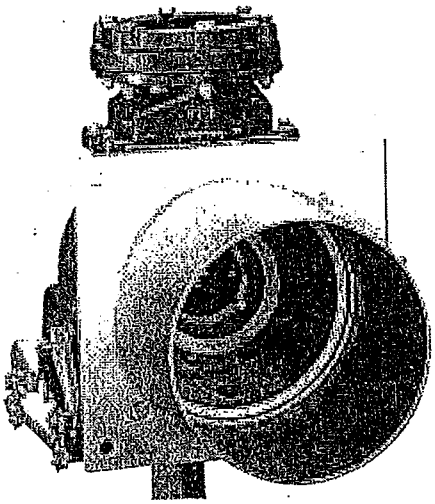
Model 415 OVENPAK® Burner with connecting base and linkage assembly to adapt customer's automatic electric control motor

- Burns any clean fuel gas
- Fires into passing air streams
- Requires only low pressure gas
- Provides clean combustion with low NOx levels
- Compact burner design provides quick and easy installation
- Simple field adjustment and maintenance

Model "400" OVENPAK® Burner applications have included:
Air heating in ovens and dryers, paint finishing lines, paper and textile machines, food baking ovens, coffee roasters, grain dryers, and fume incinerators. Manufactured under U.S. patent #3,574,508; Canadian and European patents granted and pending.

MAXON® CORPORATION 201 East 18th Street, P.O. Box 2068, Muncie, Indiana, 47307-0068. Phone: (765) 284-3304. Fax (765) 286-8394

Maxon Model "400" OVENPAK® Gas Burners

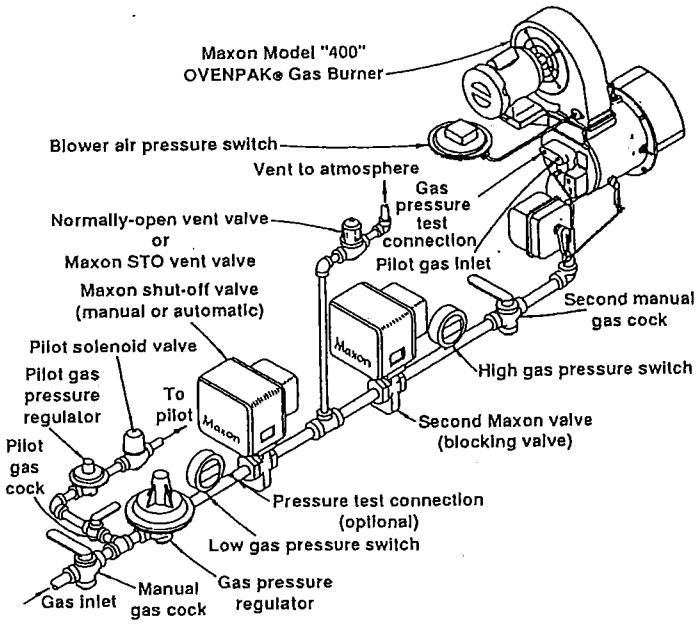


Model EB-3 OVENPAK® Burner with connecting base and linkage assembly

Provide application flexibility with:

- 40:1 turndown or more
- Over 90 different styles and sizes
- Heat releases to 16,500,000 Btu/hr
- Cost-effective external blower (EB) version

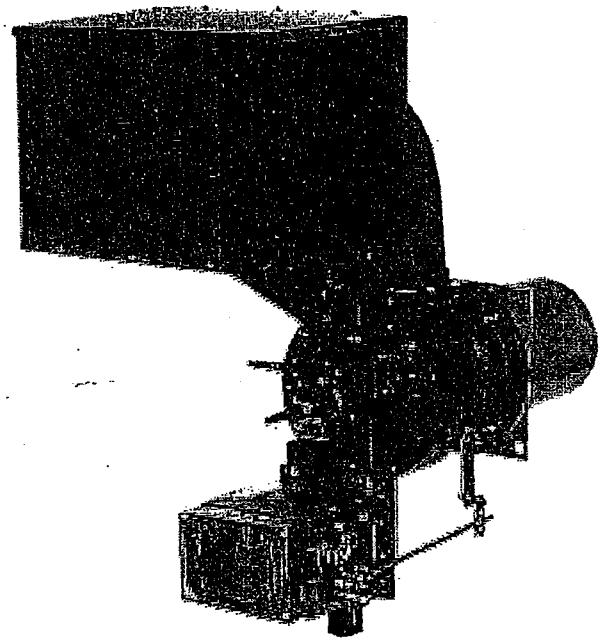
Typical piping layout with "Block and Bleed" gas train arrangement



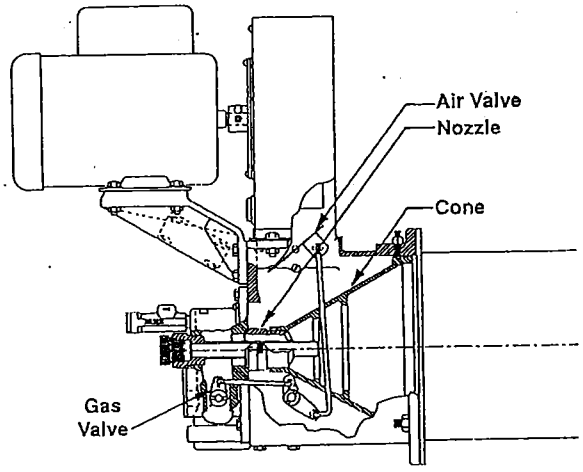
Design and Application Details

OVENPAK® Burners are nozzle-mixing gas burners for many industrial direct-fired applications where clean combustion and high turndown are required. They are simple and versatile for use on a variety of heating applications.

The Model "400" OVENPAK® Burner (shown at right) includes a combustion air blower with non-sparking paddle wheel-type impeller, pilot, spark ignitor, stainless steel discharge sleeve, mixing cone, self-contained internal air and gas proportioning valves, and provision for your flame safeguard sensor.



Right: Model 415 OVENPAK® Gas Burner with optional:
- combustion air filter
- connecting base and linkage assembly
- electrical control motor (by others)



Cross sectional view of a Model "400" OVENPAK® Gas Burner

Principle of operation (illustrated at left)

The OVENPAK® Burner is designed for industrial air heating applications. It is available in two basic versions: 1) packaged with integral combustion air blower, or 2) for use with an external blower. Both versions include a gas and air valve, internally linked together to control the gas-air ratio over the full operating range. The gas flows through the nozzle, then along the inside of the burner cone where combustion air is progressively and tangentially mixed with the gas. This produces a very wide turndown range and a highly stable flame under a variety of operating conditions.

Capacities and Specifications – 60 Hertz

Standard Model “400” OVENPAK® Burner includes a combustion air blower with motor.

Maximum capacity of Model “400” OVENPAK® Burner is affected by the static pressure within the combustion chamber. Data shown assumes firing in the open, or into an airstream with enough oxygen to complete the combustion process. If burner is fired into an oxygen-starved chamber or airstream, capacities may be reduced as much as 25-30%. Do not attempt to operate beyond the duct static pressure range shown. For higher back pressure applications, select from Model “EB” or “EB-MRV” OVENPAK® Burner options.

All gas pressures are differential pressures and are measured at the gas pressure test connection on the backplate of each OVENPAK® Burner. Differential pressures shown are approximate.

60 Hz Motor Voltages Available

Horsepower	Type	115/208-230/1/60	208-230/460/3/60	575/3/60
1/3 & 1/2	Totally Enclosed	X	X	X
3/4 & 1	Totally Enclosed	X	X	X
1-1/2, 2 & 3	Totally Enclosed	Not Available	X	X

Capacities and Operating Data – Model 405 through 422M

Burner Model		405	407M	408	408M	412M	413M	415	422M
Motor Specification	Horsepower:	1/3	1/2	1/3	3/4	1/2	3/4	1/3	3/4
	Frame Number:	48	48	48	56	48	56	48	56
Maximum Capacities (1000's Btu/hr) *with Natural Gas Pressures ("wc)* — DUCT STATICS	-5.0 to -0.5" wc	550 *2.8"*	---	880 *3.4"*	--	---	---	1650 *1.7"*	---
	±0" wc	500 *2.3"*	750 *2.5"*	800 *2.8"*	790 *2.7"*	1200 *2.8"*	1300 *3.3"*	1500 *1.4"*	2150 *2.9"*
	+1.0" wc	475 *2.1"*	700 *2.2"*	760 *2.6"*	750 *2.5"*	1100 *2.4"*	1190 *2.8"*	1425 *1.3"*	2000 *2.5"*
	+2.0" wc	450 *1.9"*	600 *1.6"*	720 *2.3"*	640 *1.8"*	925 *1.7"*	1100 *2.4"*	1350 *1.1"*	1725 *1.9"*
	+3.0" wc	---	510 *1.1"*	---	550 *1.3"*	800 *1.3"*	1000 *2.0"*	---	1610 *1.6"*
	+4.0" wc	---	450 *0.9"*	---	495 *1.1"*	750 *1.1"*	900 *1.6"*	---	1500 *1.4"*
	+5.0" wc	---	---	---	475 *1.0"*	---	800 *1.3"*	---	1420 *1.3"*
Minimum Capacities (1000's Btu/hr)	Main plus pilot	15			20			37	
	Pilot only	10			15			20	
Required natural gas differential pressure to burner inlet ("wc)		3.0		3.5	4.1	4.5	5.2	4.2	7.2
Approximate flame length in still air		1/2 to 1 ft.		1 to 1-1/2 ft.	1/2 to 1 ft.	1 to 2-1/2 ft.		2-1/2 to 3-1/2 ft.	1-1/2 to 2 ft.

연소실 압력

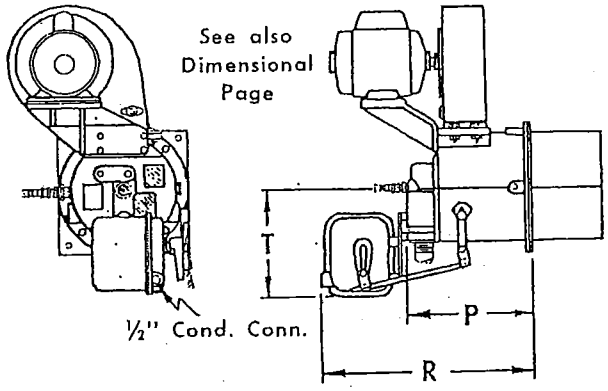
GAS 필요 ΔP = 1.3"WC x 25.4 ≒ 33 mmAq

열량 = 1425 x 1000 BTU/HR = 1,425,000 BTU/HR

결과적으로 발휘하여야 하는 가스 압력 = 연소실압력 + 33 mmAq
(at 버너 MAX 상태)

Accessory Options

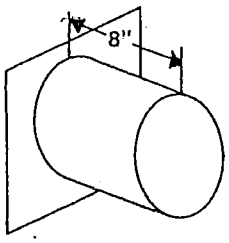
Hi/Lo Control Motor Sets for high or low firing. Optional set includes 2-position unidirectional 11-second 120v 50/60 Hz motor and connecting base with mounting linkage. See table below for dimensions which differ from standard burner.



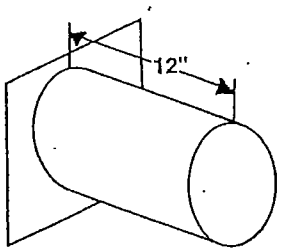
Burner Model		Dimensions in Inches		
		P	R	T
EB-1, 2	405 - 413M	10.25	17.63	7.75
EB-3	415 - 422M	10.19	17.56	7.75
EB-4, 5	425 to 442M	11.69	19.06	8.75
EB-6, 7	445 - 487M	16.69	24.06	8.75

Discharge Sleeves are available in 3 versions:

- **Standard sleeve** is 8" long, made of #310 SS, and is suitable for downstream temperatures up to 1000°F (538°C).
- **For higher velocities**, specify 12" long sleeve made of #310 SS for downstream temperatures up to 1000°F (538°C).
- **For higher downstream temperatures** between 1000°F (538°C) and 1500°F (816°C), specify 8" long, #RA 330 SS sleeve.



310 SS (std.) or RA 330 (Hi Temp.)

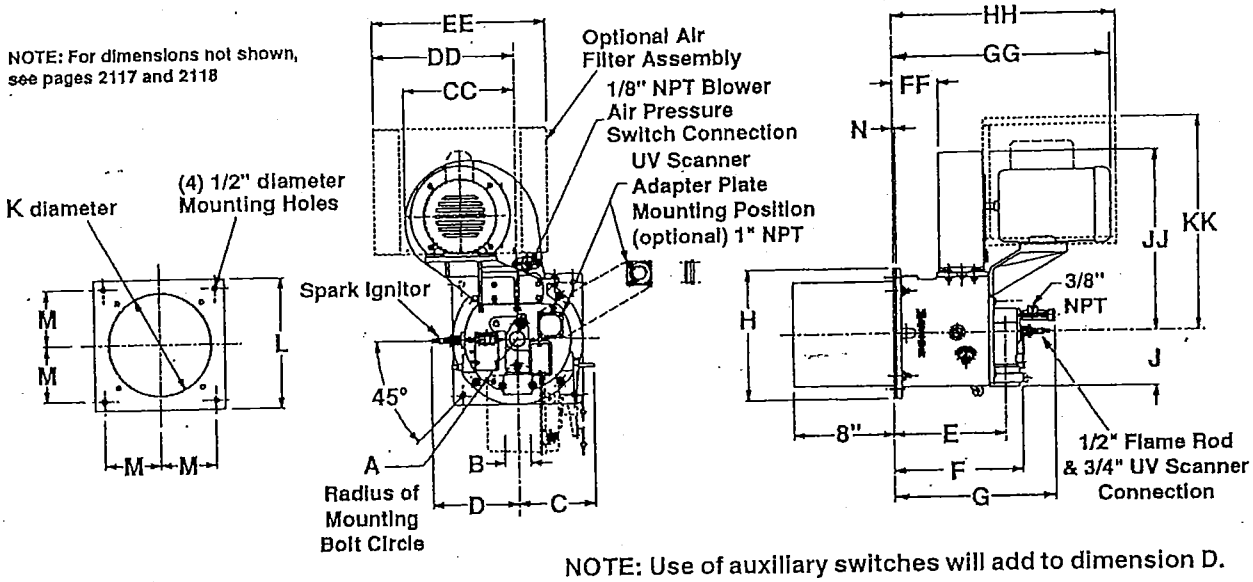


310 SS

Dimensions (in Inches)

Model "400" and "400-MA" OVENPAK® Burners

NOTE: For dimensions not shown, see pages 2117 and 2118



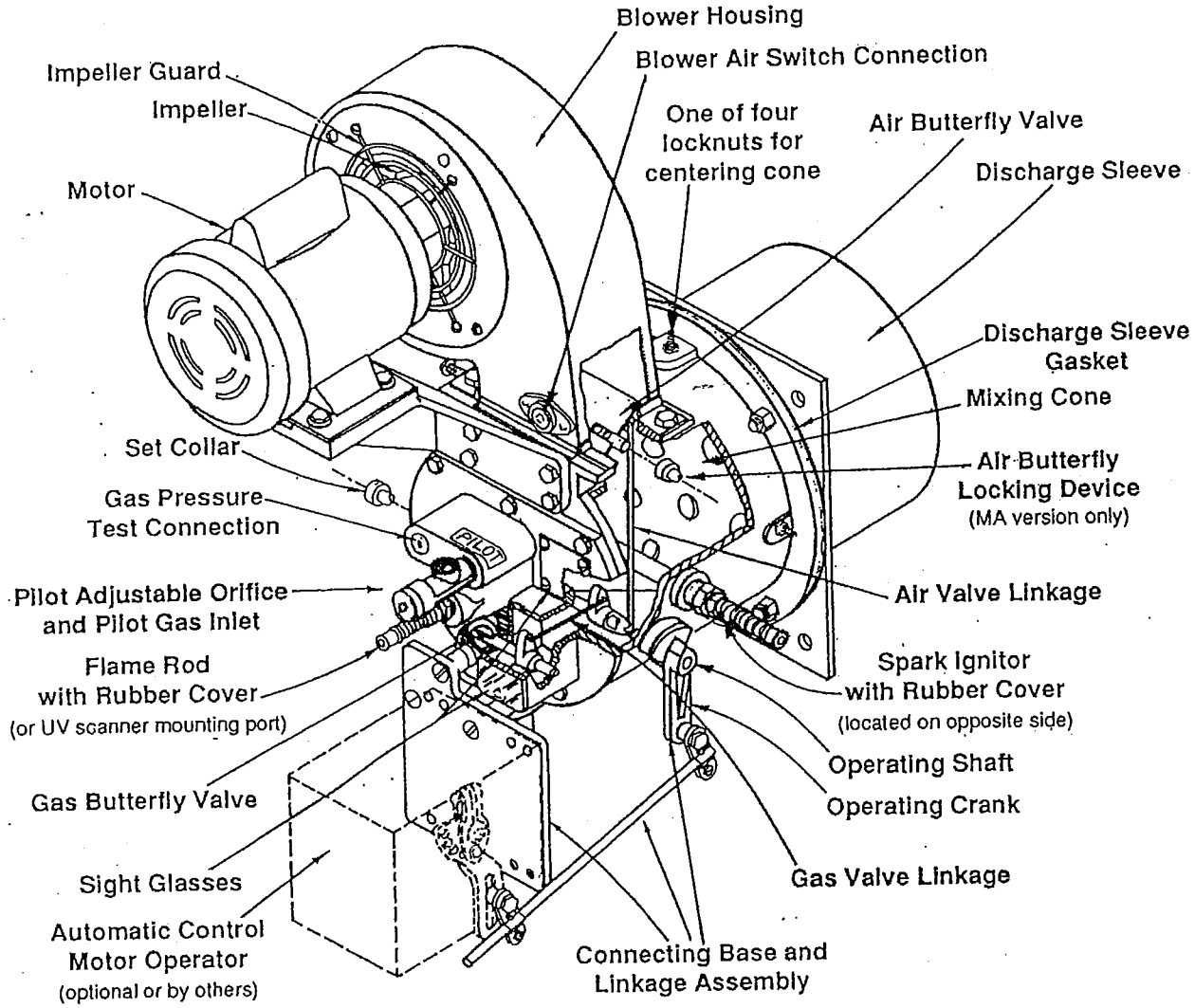
NOTE: Use of auxiliary switches will add to dimension D.

Model	A	B*	C	D	E	F	G	H	J	K	L	M	N	CC	DD	EE	FF	GG	HH	JJ	KK
405	3.75	1	5.44	6.62	8.87	10.30	13.19	8.44	4.37	6.31	8.44	3.62	0.25	8.81	11.37	14	3.66	17.31	17.81	14.37	17.06
407M														15.25	15.87	18	4.69		19.69	21.69	18.62
408														8.81	11.37	14	3.66	19.12	17.81	14.37	17.06
408M														15.25	15.87	18	4.69	17,31	19.69	21.69	18.62
412M																		19.12			
413M																					
415	4.75	1-1/4		7.69	8.81	10.25		10.37		8.25	10.37	4.44		8.81	11.37	14	3.59	17.31	17.75	14.37	17.06
422M														15.25	15.87				19.56	21.69	18.62
425	5.75	1-1/2	6.06	8.62	10.06	11.88	14.69	12.50	5.44	10.25	12.5	5.62	0.37	12.12	14.44	18	3.94	18.25	20.5	20.25	19.75
432M		2												15.25	15.87		2.81		21.25	23.56	29.62
435														12.12	14.44		3.94		20.5	20.25	19.75
442M														15.25	15.87		2.81		21,25	23.56	29.62
445	6.81				14.38	16.88	19.31	14.62	6.5	12.25	14.75	6.69					5.37	22.5	25	23.5	
456M																		24			
470M		3												17.75	17.79	19			26.81	25.94	
487M																					

*Main fuel gas inlet NPT

Pipe threads on this page conform to NPT (ANSI Standard B2.1)

Component Identification



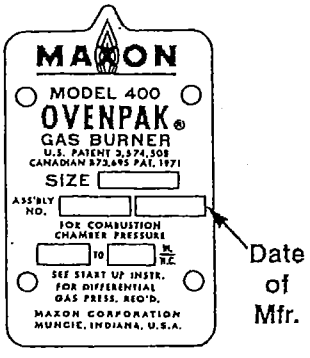
Suggested spare parts

- Spark Ignitor
- Flame Rod, if used
- Filter Elements, if used
- Mixing Cone
- Discharge Sleeve and Gasket
- Motor
- Impeller
- Gas/Air Valve Linkage Kit

To order parts for an existing OVENPAK® Burner assembly, list:

1. Name(s) of part(s) from above illustration
2. Quantity of each required
3. OVENPAK® Burner nameplate information:
   - size and model number of burner
   - assembly number
   - date of manufacture
   - if available, serial number of Maxon fuel shut-off valve in-line to OVENPAK® Burner (This serial number is on Maxon valve's nameplate.)

Nameplate



Date of Mfr.

Suggested Maintenance/Inspection Procedures

Discharge sleeve and cone alignment

Centering of the mixing cone provides a small annular opening for the flow of some cooling combustion air along the discharge sleeve wall. We SUGGEST periodic inspection from the discharge side of the burner to assure that this alignment is maintained.

Caution: Tightening can lead to cone distortion and greatly reduce cone and discharge sleeve life. Cone should be free to move and allow for thermal expansion.

If re-adjustment is necessary, back out the four lock nuts and re-center mixing cone with adjusting screws handtight. Back each screw out one-half turn before re-locking. This allows for thermal expansion as cone gets hot.

Filters should be inspected regularly and cleaned, using a vacuum to remove loose/dry accumulations, then washing and/or degreasing as appropriate for the filter type used.

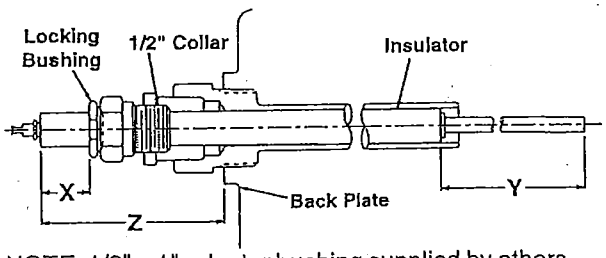
To replace flame rod or spark ignitor:

1. Check Table 1 at right for dimension "Y" and cut tip to length shown.
2. Insert 1/2" NPT collar into burner and snug into position.
3. Insert insulator through collar into burner.
4. Check table for dimension "X", position accordingly, and tighten locking bushing until insulator is held firmly.

WARNING: Over-tightening locking bushing may damage insulator.

NOTE: A full-wave 6000 volt spark ignition transformer is suggested for use with Maxon burner equipment.

Flame Rod



NOTE: 1/2" x 1" adapter bushing supplied by others

Table 1: Flame rod and spark ignitor dimensions for all Model "400" OVENPAK® Burners manufactured after 1/1/91 ①

Burner Model		Spark Ignitor Dimensions		Flame Rod Dimensions		
		X	Y	X	Y	Z
EB-1 EB-2	405	1.3	.4	.4	6	2.9
	407M					
	408M					
	408					
	412M					
	413M					
EB-3	415	1.5	.4			
	422M					
EB-4 EB-5	425	1.2	.4	.8	10.8	3.5
	432M					
	435					
	442M					
EB-6 EB-7	445	1.3	.4	.4	12.8	2.9
	456M					
	470M					
	487M					

① Manufactured date is stamped on metal nameplate of Model "400" OVENPAK® Burner. For specifics relative to units manufactured prior to 1/1/91, see Product Information Sheet 2100-3.

Installation Instructions

General Instructions

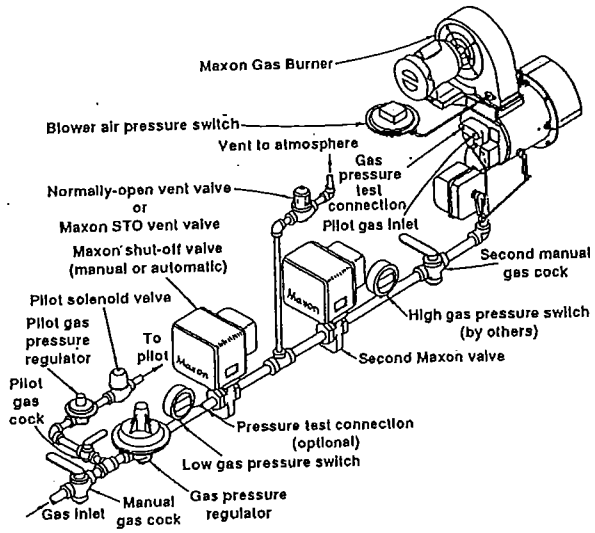
Important: Do not discard packing material until all loose items are accounted for.

To prevent damage in transit, the spark ignitor, discharge sleeve, mounting gaskets, flame rod and connecting linkage components may be packed separately and shipped loose with your new Maxon OVENPAK® Burner.

The burner itself is normally only a part of your complete combustion system. Additional pipe train accessories and control components will be required for a complete system installation. The sketch below shows a typical gas train as might be used with OVENPAK® gas fired burners.

Piping Layout as sometimes required by insurance and standards groups

Block and Bleed gas train arrangement illustrated with Model "400" OVENPAK® Burner



Model "400" OVENPAK® Burners provide the air supply (except for EB versions, which require a separate combustion air blower). They also serve as a fuel flow control and fuel/air mixing device. Model "200" OVENPAK® Burners serve as a mixing device and usually have an externally-mounted gas control valve.

Burner should not be exposed to direct radiant heat or positioned where it might draw in inert gases. If such conditions exist, consider filters, relocation and/or use of the EB version and external air supply.

Electrical service must match the voltage, phase and cycle of all electrical system components and be compatible with burner nameplate ratings. Insure that all normal control safeguards are satisfied. Combustion air blower should continue to run after shutdown to allow burner to cool.

Gas supply piping must be large enough to maintain the required fuel pressures cataloged for the particular burner size used with burner operating at full rated capacity.

Anything more than minimal distance or piping turns may necessitate oversizing piping runs to keep pressure drops within acceptable ranges.

Inlet pipe leading to any burner should be at least four pipe diameters in length. If multiple burners are fed from a single gas train, care should be taken to minimize pressure drop and give maximum uniformity.

Clean fuel lines are essential to prevent blockage of pipe train components or burner gas ports.

Main Shut-Off Cock should be upstream of both the main gas regulator and pilot line take-off. Use it to shut off fuel to both pilot and main burner during shut-down periods of more than a few hours.

The fuel throttling valve contained within a Maxon burner is not intended for tight shut-off.

Main gas regulator is essential to maintain a uniform system supply pressure. If one pipe train supplies multiple burners, provide a separate regulator in the branch leading to each burner system.

Size the regulator for full system capacity at the required pressure, carefully considering pipe train losses. Follow the instructions attached to the regulator during installation and be sure to remove any shipping pin or block.

Pilot take-off should be upstream of the main gas regulator, but downstream of the main gas cock. It should normally include its own pilot gas regulator, a solenoid valve and shut-off cock. A pilot adjustable orifice at the pilot inlet simplifies adjustment.

Pilot piping must be large enough to provide for the full flow and pressures shown in the catalog for your particular burner size.

Fuel Shut-Off Valves (when properly connected to a control system) shut the fuel supply off when a hazardous operating condition is sensed. Manual reset valves require operator attendance each time the system is started up (or restarted after a trip-out). Motorized shut-off valves permit automatic start-restart when used with an appropriate control system.

Test connections are essential for burner adjustment. They should be provided immediately downstream of the regulator and are included in the burner itself. **Test connections must be plugged except when readings are being taken.**

Installation Instructions

Horizontal mounting is preferred, but burner may be mounted in any position suitable for automatic control motor and UV scanner (if used).

OVENPAK® Burners will typically be installed through an oven wall or insulated air duct. Cut opening approximately 1" larger in diameter than discharge sleeve to allow for thermal expansion of sleeve.

Burner mounting requires four studs and a flat mounting surface perfectly centered on the discharge sleeve.

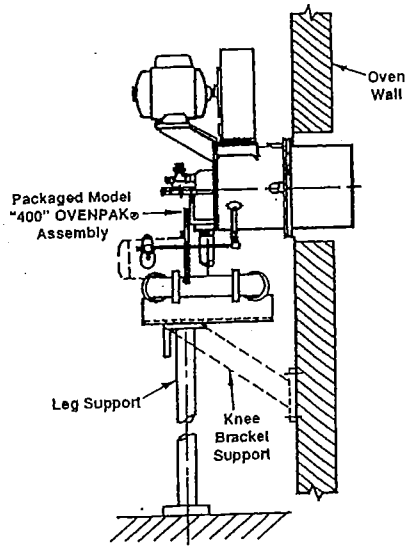
After placing burner in position over studs, add lock washers and nuts, then draw up hand-tight only. Check that burner is seated evenly all around the flange, filling any gaps to prevent air leakage, then tighten all nuts firmly.

For proper performance of any burner, air inlet and motor should be surrounded by clean, fresh, cool air.

Burner and pipe manifold support will be required to support weight of the burner and connected pipe train components. Air control motors, in particular, require additional support. Maxon connecting base and linkage assemblies are designed to position the control motors to work with the burner, **not** to support their weight.

The Packaged Model "400" OVENPAK® Burner requires external auxiliary support provided by the user. The support configuration may be similar to the leg support or knee bracket support illustrated below.

Suggested supporting arrangements for Packaged Model "400" OVENPAK® Burners:

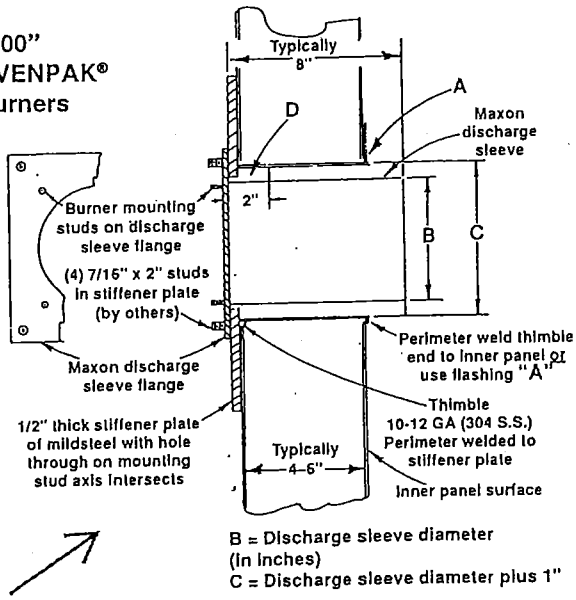


Additional burner support may be required in conjunction with a stiffener plate when mounting OVENPAK® Burner (weighing 100-350 pounds) through typical thin wall of heater/oven panels.

For push-through systems, use Maxon special back pressure gasket between stiffener plate and discharge sleeve flange and use (2) ring gaskets between discharge sleeve flange and burner casting to prevent back flow of high temperature air. Fill area **D** (see sketch below) with **no more than 2"** of high temperature packing (too little will overheat mounting; too much will overheat sleeve).

Typical discharge sleeve mounting recommendations

"400" OVENPAK® Burners



For pull-through systems, spacers may be installed on stud bolts and area **D** left empty to admit cooling air past the sleeve.

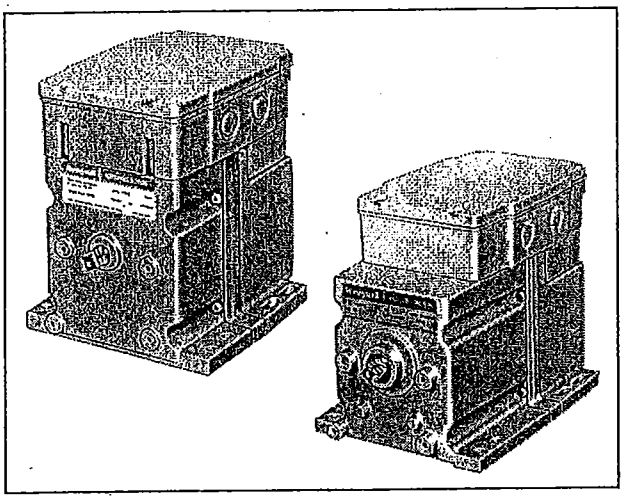
WARNING: Welding of burner flange to stiffener plate may cause warpage of burner flange and require additional seal material to prevent leakage.

Four lock screws permit centering of mixing cone within burner body and sleeve.

Honeywell

Series 72
Modutrol IV™ Motors

PRODUCT DATA



APPLICATION

The Series 72 Modutrol IV Motors are used to control dampers and valves. The motors accept a current or voltage signal from an electronic controller to position a damper or valve at any point between open and closed.

FEATURES

- Replaces M744S,T,Y and M745S,T,Y Motors.
- M7261, M7274, M7281, M7284, and M7294 are non-spring return motors; M7272, M7282, M7285, and M7286 are spring return motors.
- Oil immersed motor and gear train for reliable performance and long life.
- Wiring box provides NEMA 3 weather protection.
- Actuator motor and circuitry operate from 24 Vac. Models available with factory installed transformer or an internal transformer can be field added.
- Quick connect terminals standard—screw terminal adapter available.
- Adapter bracket for matching shaft height of older motors is standard with replacement motors.
- Nominal timing of 30 seconds for 90° stroke and 60 seconds for 160° stroke.
- Valve and damper linkages, explosion-proof housing, and auxiliary switches available as accessories.
- Spring return motors are rated for 25 lb.-in. and 60 lb.-in torque.
- Non-spring return motors are rated for 35 lb.-in., 75 lb.-in., 150 lb.-in., and 300 lb.-in. torque.
- Models available with adjustable start (zero) and span.
- Models available with 4 to 20 mA input signal.
- Models available with 2 to 10 Vdc input signal.
- Die-cast aluminum housing.

Contents

63-2202-4

SPECIFICATIONS

Models: TRADELINE models are selected and packaged to provide ease of stocking, ease of handling and maximum replacement value. TRADELINE model specifications are the same as those of standard models unless specified otherwise. TRADELINE models have auxiliary switch cams.

NOTE: Auxiliary switches can only be added to motors that include auxiliary switch cams. (These cams cannot be field-added.)

IMPORTANT

The specifications given in this publication do not include normal manufacturing tolerances. Therefore, an individual unit may not exactly match the listed specifications. Also, this product is tested and calibrated under closely controlled conditions and some minor differences in performance can be expected if those conditions are changed.

Modutrol IV Order Number Guide: See Table 1.

Dimensions: See Fig. 1.

Table 1. Modutrol IV Order Number Guide.

M	Motor						
	72	4-20 mA or 2-10 Vdc Control[a]					
		6	—		35 lb-in. Non-Spring Return		
		7	25 lb-in. Spring Return		75 lb-in. Non-Spring Return		
		8	60 lb-in. Spring Return		150 lb-in. Non-Spring Return		
		9	—		300 lb-in. Non-Spring Return		
			1	Single-ended shaft		Non-Spring Return	
			2			Normally Closed[b] Spring Return	
			4	Dual-ended shaft		Non-Spring Return	
			5			Normally Closed[b] Spring Return	
			6			Normally Open[c] Spring Return	
				A	0 Auxiliary Switches	Fixed Stroke	Normally Closed[b]
				B	1 Auxiliary Switch		
				C	2 Auxiliary Switches		
				D	0 Auxiliary Switch	Adjustable Stroke	
				F	2 Auxiliary Switches		
				G	0 Auxiliary Switch	Fixed Stroke	Normally Open[c]
				L	1 Auxiliary Switch	Adjustable Stroke	
				Q	2 Auxiliary Switches	Fixed Stroke	Normally Closed[b]
M	61	8	4	A	XXXX	See Catalog for Complete O.S. Number	

[a] Adjustable zero and span.

[b] Electrically normally closed. Shaft rotates clockwise (viewed from the power end) with increase in control signal. Motor drives to normally closed position when powered with control wiring not connected.

[c] Electrically normally open. Shaft rotates counterclockwise (viewed from the power end) with increase in control signal. Motor drives to normally open position when powered with control wiring not connected.

ORDERING INFORMATION

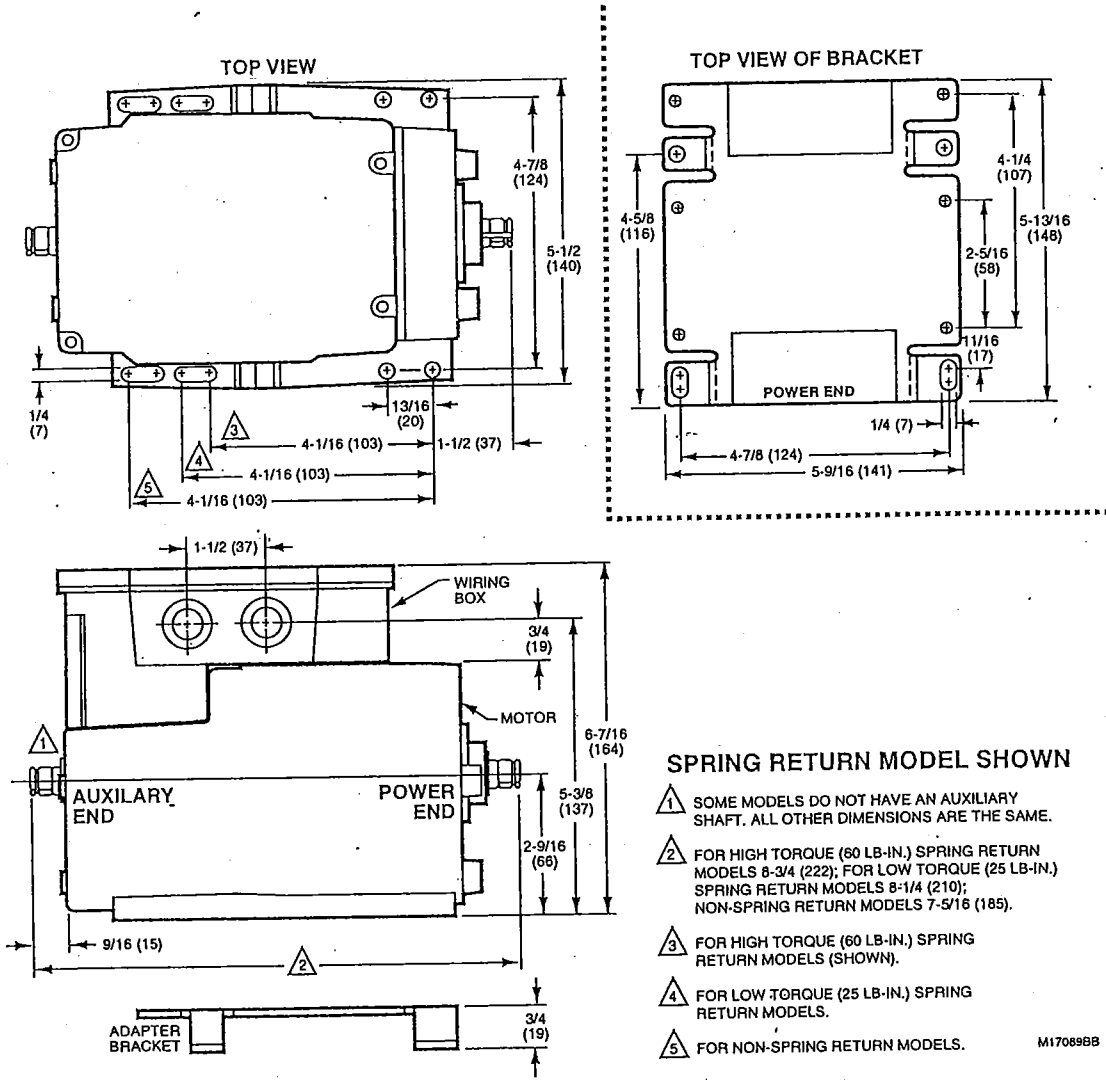
When purchasing replacement and modernization products from your TRADELINE® wholesaler or distributor, refer to the TRADELINE® Catalog or price sheets for complete ordering number.

If you have additional questions, need further information, or would like to comment on our products or services, please write or phone:

1. Your local Home and Building Control Sales Office (check white pages of your phone directory).
2. Home and Building Control Customer Relations
   Honeywell, 1885 Douglas Drive North
   Minneapolis, Minnesota 55422-4386 (800) 328-5111

Canada—Honeywell Limited/Honeywell Limitée, 35 Dynamic Drive, Scarborough, Ontario M1V 4Z9.

International Sales and Service Offices in all principal cities of the world. Manufacturing in Australia, Canada, Finland, France, Germany, Japan, Mexico, Netherlands, Spain, Taiwan, United Kingdom, U.S.A.



SPRING RETURN MODEL SHOWN

1. SOME MODELS DO NOT HAVE AN AUXILIARY SHAFT. ALL OTHER DIMENSIONS ARE THE SAME.
2. FOR HIGH TORQUE (60 LB-IN.) SPRING RETURN MODELS 8-3/4 (222); FOR LOW TORQUE (25 LB-IN.) SPRING RETURN MODELS 8-1/4 (210); NON-SPRING RETURN MODELS 7-5/16 (185).
3. FOR HIGH TORQUE (60 LB-IN.) SPRING RETURN MODELS (SHOWN).
4. FOR LOW TORQUE (25 LB-IN.) SPRING RETURN MODELS.
5. FOR NON-SPRING RETURN MODELS.

M17089BB

Fig. 1. Series 72 Modutrol IV Motor dimensions in in. (mm).

Controller: These motors can be used with any electronic controller that provides a stable noise-free proportional current output as specified in Electrical Ratings, Input Range below.

Electrical Ratings:

Power Consumption: See Table 2.

Input Range:

- Current, Nonadjustable: 4 to 20 mA nominal, 25 mA maximum.
- Current, Adjustable: 4 to 20 mA adjustable, 50 mA maximum.
- Zero/Null (Motor Closed): 0.08 to 18 mA.
- Span: 1.8 to 18 mA.
- Voltage, Nonadjustable: 2 to 10 Vdc.

Input Impedance:

- 4 to 20 mA Input: 100 ohms.
- 2 to 10 Vdc Input: 400K ohms.

Table 2. Series 72 Modutrol IV Motor Power Consumption Ratings (at 120 Vac, 50/60 Hz).

Model	Power Consumption	
	Watts	Amps
M7261	19	0.20
M7272	26	0.26
M7274	15	0.71
M7281	23	0.24
M7282	28	0.28
M7284	23	0.24
M7285	28	0.28
M7286	23	1.00
M7294	23	0.24

Auxiliary Switch Ratings (in Amps): See Table 3.

Table 3. Auxiliary Switch Ratings (in Amps).

One Contact Rating[a]	120V	240V
Full Load	7.2	3.6
Locked Rotor	43.2	21.6

[a] 40 VA pilot duty, 120/240 Vac on opposite contact.

Stroke: Fixed 90° or 160° models available. Other models available with field adjustable strokes from 90° to 160°. Stroke adjusted by means of cams located in the wiring compartment.

Timing: Nominal 30 seconds for 90° stroke and 60 seconds for 160° stroke.

Dead Weight Load On Shaft: 200 lb (91 kg) on motor power or auxiliary end; maximum combined load of 300 lb (136 kg).

Motor Rotation:
Closed: Counterclockwise rotation limit as viewed from motor power end.
Open: Clockwise rotation limit as viewed from motor power end.
Mechanically Normally Closed: Spring return. Normally closed motors rotate to closed position on power loss.
Mechanically Normally Open: Spring return. Normally open motors rotate to open position on power loss.
Electrically Normally Closed: Both spring return and non-spring motors return to closed position on minimum signal.
Electrically Normally Open: Both spring return and non-spring return motors return to open position on minimum signal.

Ambient Temperature Ratings: -40 to 150°F (-40 to 66°C).

Shaft: 3/8 in. [9.5 mm] square.

Approvals:
Underwriters Laboratories Inc. Listed: File No. E4436; Guide No. XAPX.
Canadian Standards Association Certified: General listed File No. LR1620; Guide No. 400-E.

Accessories:
198162AA Internal Transformer 120/208/240 Vac 50/60 Hz primary, 24 Vac secondary.
198162EA Internal Transformer; 120 Vac 50/60 Hz primary, 24 Vac secondary.
198162GA Internal Transformer; 220 Vac 50/60 Hz primary, 24 Vac secondary.
198162JA Internal Transformer; 24 Vac 50/60 Hz primary, 24 Vac secondary (for electrical isolation).
220736A Internal Auxiliary Switch Kit; one switch, can be field-installed on TRADELINE models.
220736B Internal Auxiliary Switch Kit; two switches, can be field-installed on TRADELINE models.
220738A Adapter Bracket raises motor shaft height by 19 mm to match that of previous Modutrol® Motor models.
220741A Screw Terminal Adapter converts the standard quick-connect terminals to screw terminals.
221455A Infinitely Adjustable Crank Arm, can rotate through downward position and clear motor base without requiring an adapter bracket.
4074ERU Weatherproofing Kit provides NEMA 3 rating for Modutrol IV Motors mounted in position other than upright.
4074EZE Bag Assembly with parts that can provide CE compliance.
7617ADW Crank Arm, can rotate through downward position and clear motor base without requiring an adapter bracket.
ES650-117 Explosion-Proof Housing encloses motor for use in explosive atmospheres. Not for use with Q5001 (or any other valve linkages). Order separately from O-Z/Gedney Inc. To order, contact: O-Z/Gedney, Nelson Enclosures and Controls,
(918) 641-7381 or (918) 641-7374; or write to:
O-Z/Gedney, Nelson Enclosures and Controls
P.O. Box 471650
Tulsa, OK 74147-1650
(Requires Honeywell 7617DM Coupling.)
Q100 Linkage connects Modutrol® Motor to V51 Butterfly Valve. Requires the 220738A Adapter Bracket.
Q181 Auxiliary Potentiometer for sequence or unison control of 1 to 4 additional modulating (Series 90) motors.
Q5001 Bracket and Linkage Assembly connects Modutrol IV Motor to water or steam valve.
Q605 Damper Linkage connects motor to damper. Includes motor crank arm.
Q607 External Auxiliary Switch controls auxiliary equipment as a function of motor position.

INSTALLATION

When Installing this Product...

1. Read these instructions carefully. Failure to follow them could damage the product or cause a hazardous condition.
2. Check the ratings given in the instructions and on the product to make sure the product is suitable for your application.
3. Installer must be a trained, experienced service technician.
4. After installation is complete, check out product operation as provided in these instructions.

⚠ CAUTION

Electrical Shock or Equipment Damage Hazard.
Can shock individuals or short equipment circuitry.
Disconnect all power supplies before installation. Motors with auxiliary switches can have more than one disconnect.

⚠ CAUTION

Equipment Damage Hazard.
Can damage the motor beyond repair.
Never turn the motor shaft by hand or with a wrench. Forcibly turning the motor shaft damages the gear train and stroke limit contacts.

IMPORTANT

Always conduct a thorough checkout when installation is complete.

Location

Allow enough clearance for accessory installation and motor servicing when selecting a location (see Fig. 1). If located outdoors, use liquid-tight conduit connectors with the junction box to provide NEMA 3 weather protection. If mounted outdoors in a position other than upright, install a 4074ERU Weatherproofing Kit and liquid-tight connectors to provide NEMA 3 protection.

⚠ CAUTION

Motor Damage Hazard.
Deteriorating vapors and acid fumes can damage metal parts.
Install motor in areas free of acid fumes and other deteriorating vapors.

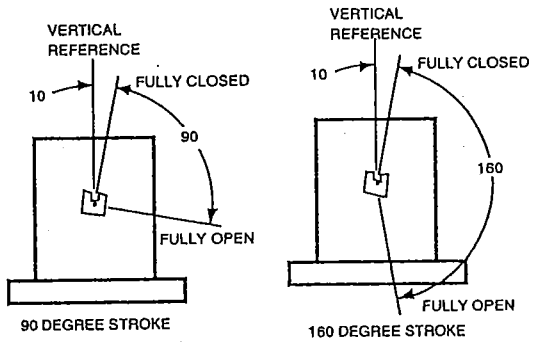
In excessive salt environments, mounting base and screws should be zinc or cadmium plated, not stainless steel or brass. Use the 220738A Adapter Bracket for mounting on these surfaces.

Mounting

Use the following guidelines for proper motor mounting:

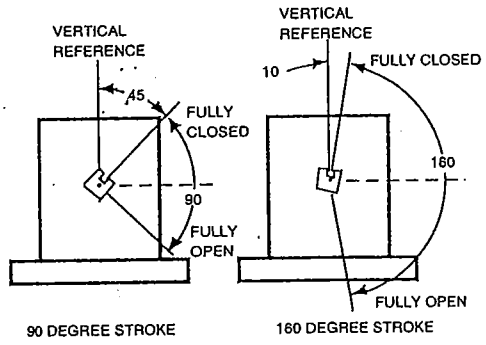
- Always install motors with the crankshaft horizontal.
- Mounting flanges extending from motor housing base are drilled for 1/4 inch (6.4 mm) machine screws or bolts.
- Non-Spring Return Motors are shipped from the factory in the closed position (at the counterclockwise rotation limit, as viewed from the motor power end).
- Spring Return Motors are shipped from the factory in their normal position.
- Normally closed models are shipped at the counterclockwise rotation limit, as viewed from the motor power end.
- Normally open models are shipped at the clockwise rotation limit, as viewed from the motor power end.

M7272, M7282, M7285, M7286



SPRING RETURN MOTORS

M7261, M7274, M7281, M7284, M7294



NON-SPRING RETURN MOTORS M5509

Fig. 2. Motor shaft position at limit of rotation (viewed from motor power end).

Adapter Bracket

The 220738A Adapter Bracket, positioned between the motor and the equipment, raises motor shaft height by 0.75 in. (19 mm) to match that of previous Modutrol® Motor models.

The following applications require this bracket:

- Q607 External Auxiliary Switch.
- Damper linkage applications requiring added clearance to allow:
  - — Crank arm rotation through the downward position.
  - — Sufficient damper linkage to reach the motor shaft.
- All valve linkages except the Q5001.

NOTE: When the bracket is not used in a replacement application, the damper linkage requires adjustment for the new shaft position.

To mount the motor with the bracket:

1. Mount the bracket to the equipment with existing or standard bolts.
2. Using the provided bolts, mount the motor to the bracket threaded holes. See Fig. 3.

For valve linkage applications (other than the Q5001):

1. Mount the bracket to the linkage.
2. Position the motor on the bracket to align the motor shaft with the linkage.
3. Attach the motor to the bracket with the four bolts provided. See Fig. 4.

Damper Linkages

The motor does not include a crank arm. Order the crank arm separately (see Accessories in the Specifications section). For detailed instructions on the assembly of specific linkages, refer to the Installation Instructions packed with the linkage.

⚠ CAUTION

Equipment Damage Hazard.
Stalling a motor can damage the drive shaft.
Ensure installation of motors and linkages allows the motor to drive through full stroke without obstruction.

Valve Linkages

The Q100 Linkage requires a 220738A Adapter Bracket for all valve applications. Applications with the Q5001 Valve Linkage do not require the 220738A Adapter Bracket (see Fig. 4).

For detailed instructions on specific linkage assemblies, refer to the instruction sheet packed with the linkage. In general, check the following points when installing a motor and linkage:

- Adjust valve and louver-type damper linkages so the damper or valve moves through only the maximum required distance while the motor moves through its full stroke.
- With modulating control, maximum damper opening should be no more than 60 degrees. Little additional airflow is provided beyond this point.
- Do not exceed load and torque ratings in any application.

Junction Box

When used with liquid-tight conduit connectors, the junction box provides NEMA 3 weather protection for the motor. The junction box, standard with replacement motors, encloses the terminals and provides knockouts for wiring conduits. Housing an internal transformer or internal auxiliary switches requires using a junction box.

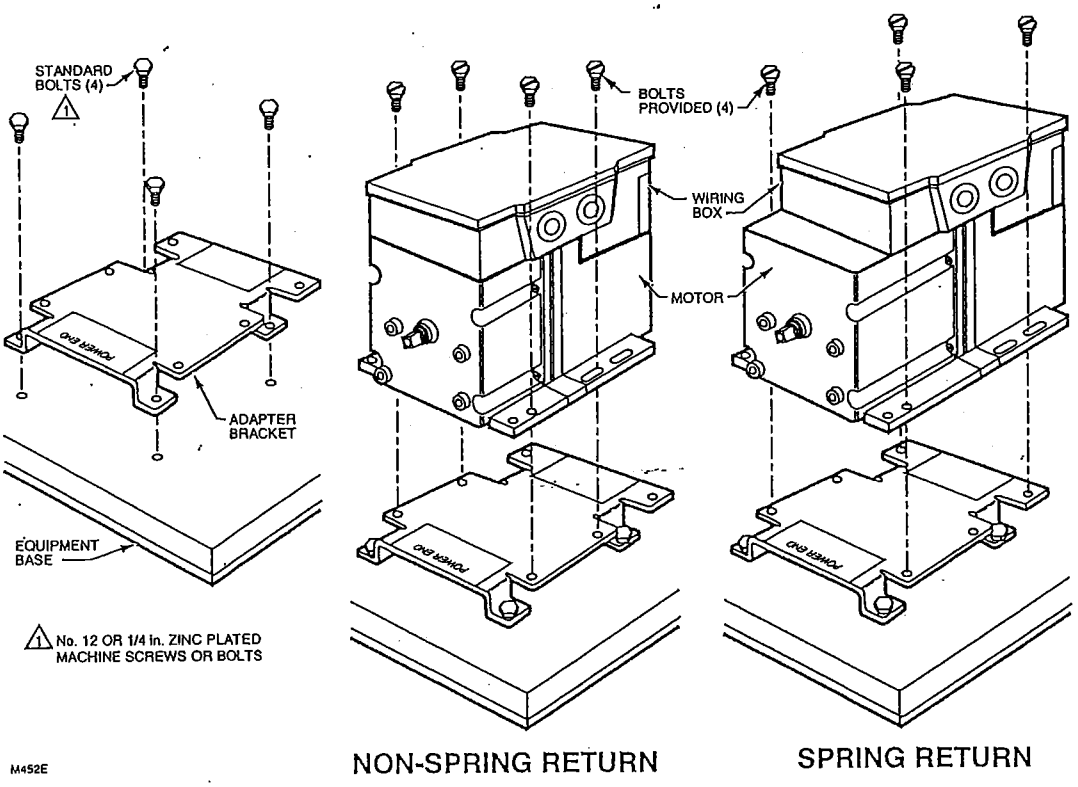


Fig. 3. Mounting the motor with an adapter bracket.

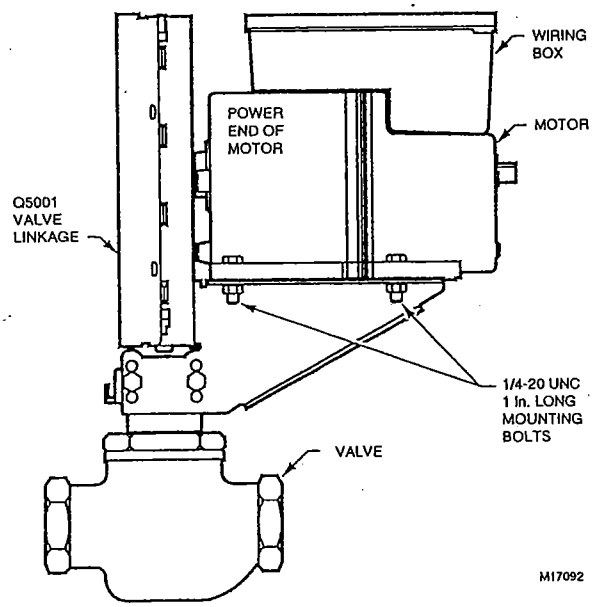


Fig. 4. Mounting the motor on a Q5001 Valve Linkage.

Wiring

⚠ CAUTION

Electrical Shock or Equipment Damage Hazard. Can shock individuals or short equipment circuitry.
Disconnect all power supplies before installation. Motors with auxiliary switches can have more than one disconnect.

IMPORTANT:

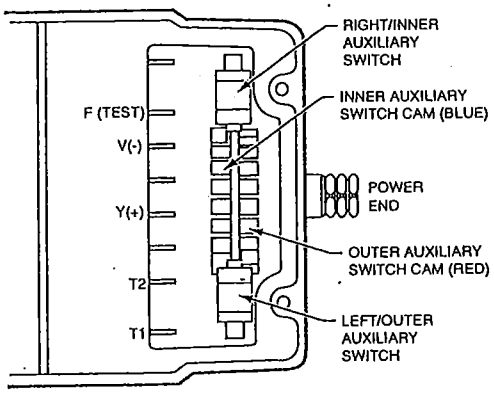
All wiring must agree with applicable codes, ordinances and regulations.

1. Ensure that the voltage and frequency stamped on the motor correspond with the power supply characteristics.
2. When connecting several motors in parallel, ensure that the power supply VA rating is large enough to provide power to all motors used without overloading.
3. Fig. 5 shows that motor terminals are quick-connects located on top of the printed circuit board.
4. To access the wiring compartment:
   a. Remove the four screws from the junction box top.
   b. Lift off the cover.
5. Fig. 6 shows the internal wiring schematic.
6. Refer to Fig. 7 and 8 for typical wiring.

Wire the motor as follows:

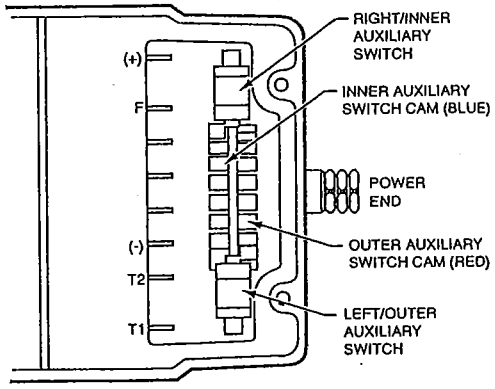
1. Remove the wiring box cover by removing the four screws holding the cover to the motor.
2. Wire motor to system using quick-connect terminals in wiring box.
3. Replace wiring box cover.

A



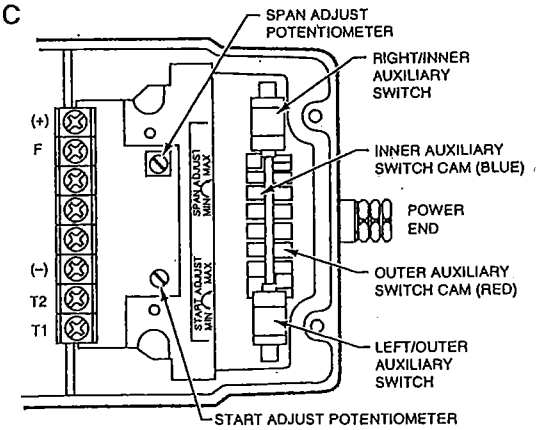
NOTE: FEATURES AVAILABLE ON SOME MODELS ONLY.
2 TO 10 VDC INPUT MOTORS

B



NOTE: FEATURES AVAILABLE ON SOME MODELS ONLY.
4 TO 20 mA NONADJUSTABLE INPUT MOTORS

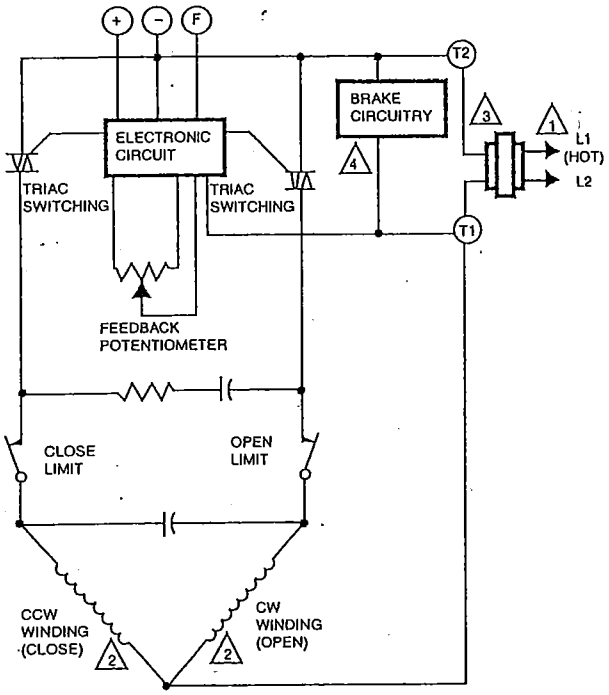
C



NOTE: FEATURES AVAILABLE ON SOME MODELS ONLY.
4 TO 20 mA ADJUSTABLE INPUT MOTORS

M5777

Fig. 5. Terminals and adjustments.



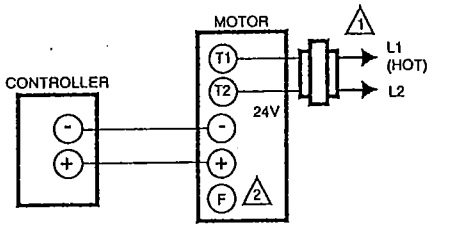
1 POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

2 DIRECTION OF MOTOR TRAVEL AS VIEWED FROM POWER END.

3 INTERNALLY MOUNTED TRANSFORMER. DO NOT CONNECT POWER SUPPLY TO T1 AND T2.

4 BRAKE CIRCUITRY ONLY ON SPRING RETURN MODELS. M5511

Fig. 6. Series 72 motor internal wiring schematic.

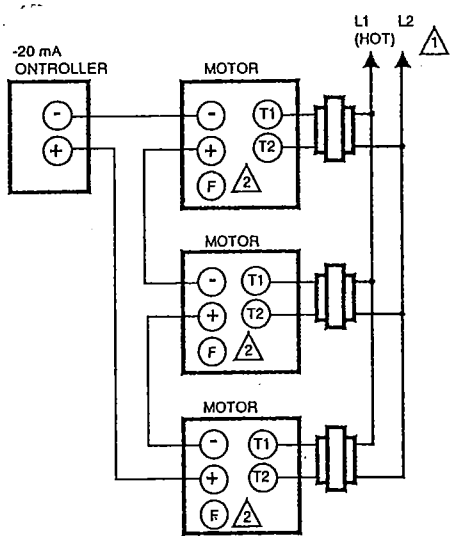


1 POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

2 CONNECTING F TO – WILL DRIVE MOTOR TO FULLY OPEN.

M5778

Fig. 7. Typical system wiring.



1 POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

2 CONNECTING F TO – WILL DRIVE MOTOR TO FULLY OPEN.

M5774

Fig. 8. Driving up to six motors from one 4 to 20 mA controller.

SETTINGS AND ADJUSTMENTS

Zero and Span Adjustment for M7284Q and M7285Q Motors (Fig. 5.)

1. Adjust the start potentiometer fully clockwise (maximum zero) and the span potentiometer fully counterclockwise (minimum span).
2. Set the controller current to the value required to drive the motor to the closed position.
3. Turn the start potentiometer slowly counterclockwise until the motor begins to open. This is defined as the start or zero setting.
4. Set the controller current to the value required to drive the motor to the fully open position. The motor will open.
5. Turn the span potentiometer clockwise until the motor starts to close. The difference between the fully open span position current and the zero position current is defined as the operating span.
6. Recheck the start and readjust the span potentiometer P1 if necessary. Turn the start potentiometer clockwise to increase the zero position.
7. Recheck the span and readjust the span potentiometer if necessary. Turn it clockwise to increase the full span position.
8. For sequential operation, as shown in Fig. 9, repeat the above steps for each motor.

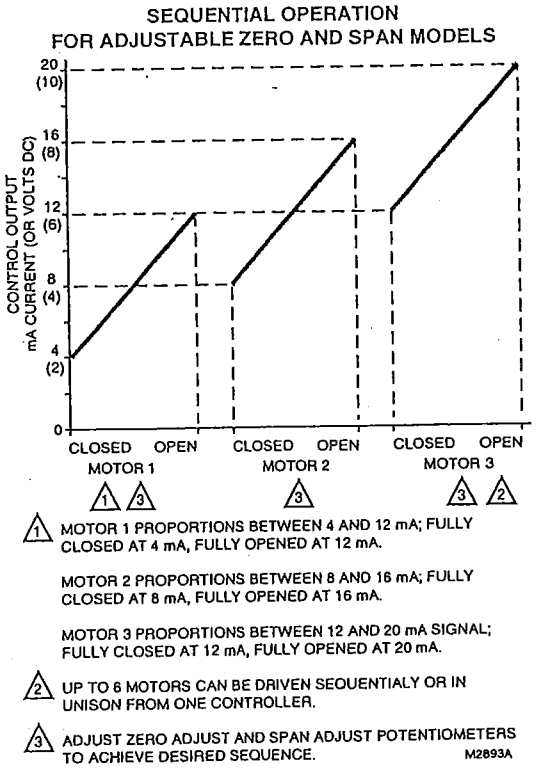


Fig. 9. Sequential operation of motors.

Auxiliary Switches

⚠ CAUTION

Electrical Shock or Equipment Damage Hazard.
Can shock individuals or short equipment circuitry.
Disconnect all power supplies before installation. Motors with auxiliary switches can have more than one disconnect.

⚠ CAUTION

Equipment Damage Hazard.
Can damage the motor beyond repair.
Never turn the motor shaft by hand or with a wrench. Forcibly turning the motor shaft damages the gear train and stroke limit contacts.

Adjustable cams actuate the auxiliary switches. These cams can be set to actuate the switches at any angle within the motor stroke. Select switch differential of 1° or 10°.

Motors with factory added auxiliary switches are shipped in the closed position (fully counterclockwise, as viewed from the motor power end) with auxiliary cams set to actuate switches 30° from the closed position and to provide 1° degree differential. With the motor in the closed (fully counterclockwise) position, the auxiliary switch breaks contacts R-B. See Fig. 10 for auxiliary switch wiring.

TRADELINE Motors are shipped with auxiliary switch cams that permit acceptance of 220736A,B Internal Auxiliary Switch Kits. Refer to form 63-2228 for 220736A,B Installation Instructions.

Auxiliary Switch Adjustment

IMPORTANT

When adjusting the auxiliary switch cams use the following procedure:

1.Insert 1/8 in. screwdriver blade into a slot on cam and move the screwdriver top as far as possible in the required direction. See Fig. 10.

2.Repeat step 1 in successive cam slots until the cam is in the required position.

Use the following procedure to obtain the desired auxiliary switch settings:

1. Remove the top cover from the motor to gain access to the motor terminals and auxiliary cams.
2. Disconnect the controller from the motor.
3. Connect a current source to the positive and negative terminals.
4. Drive the motor to the position where the auxiliary equipment is to be switched by increasing or decreasing the current.
5. For a switch differential of 1°, check continuity of auxiliary switch contacts R-B and rotate the cam as follows:
   a. If the contacts are open, rotate the cam clockwise until the R-B contacts close.
   b. If the contacts are closed, rotate the cam counterclockwise until the R-B contacts open.
6. For a switch differential of 10° rotate the cam approximately 180° so the slow-rise portion of the cam actuates the switch.
7. Check continuity of the auxiliary switch contacts R-B.
8. Rotate the cam as follows:
   a. If the contacts are open, rotate the cam counterclockwise until the R-B contacts close.
   b. If the contacts are closed, rotate the cam clockwise until the R-B contacts open.
   c. Make final adjustment in the proper direction to obtain contact make or break at the desired position.
9. Check for the proper differential and switching of the auxiliary equipment by driving the motor though the full stroke in both directions.
10. Disconnect power, remove current source, reconnect the controller, and replace the top cover on the motor.

NOTE: Changing the differential from 1° to 10° reverses the switching action. For example, with a 10° differential, switch contacts R-B make and R-W break on a counterclockwise (closed) rotation. With a 1° differential, switch contacts R-W make and R-B break on a counterclockwise (closed) rotation.

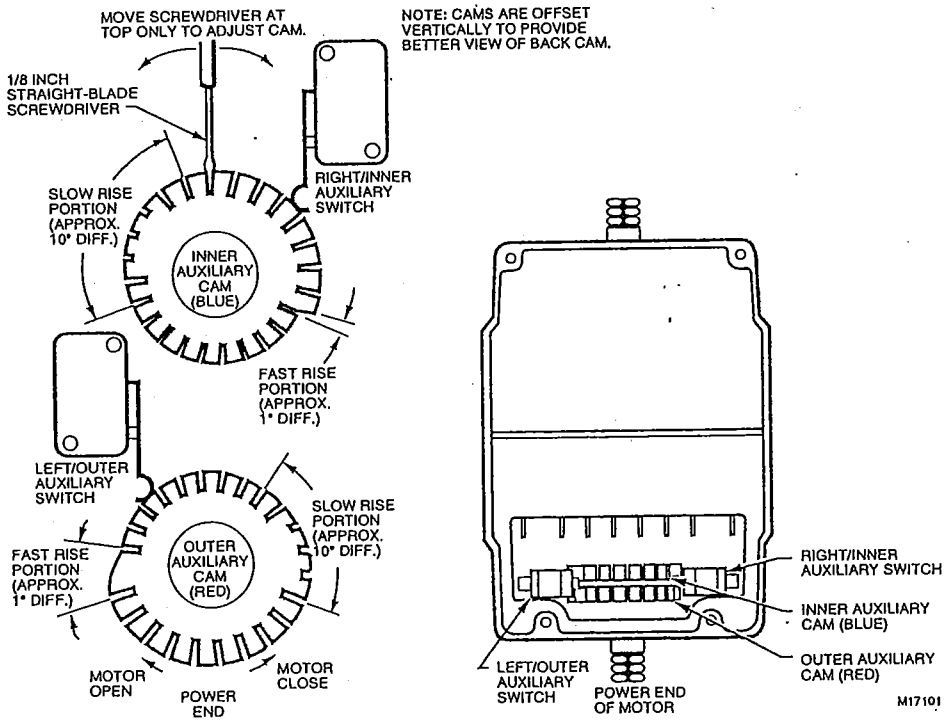


Fig. 10. Auxiliary switch adjustment.

OPERATION AND CHECKOUT

Operation

The motor feedback potentiometer and control current input circuit form a bridge circuit. As long as the final control element remains at the position proportional to the input current from the controller, the circuit is balanced, and the motor does not run. When the value of the controlled medium changes, the current from the controller changes, and unbalance is amplified to energize the Triac switching to run the motor in the proper direction to correct the change in the temperature or the pressure. The motor turns the feedback potentiometer to rebalance the circuit and stop the motor.

Checkout

After installation and linkage adjustment, operate the motor through the controller. Make sure that:

- The motor properly operates the damper or valve.
- The motor responds properly as the input is varied.
- The auxiliary switch, if used, operates at the desired point of motor rotation.

Inspect the motor, linkage, and valve or damper to see that all mechanical connections are correct and secure.

In damper installations, the pushrod should not extend more than a few inches past the ball joints. Check to see that there is adequate clearance for the linkage to move through its stroke without binding or striking other objects.

See controller or system instructions for additional checkout procedures.

Motor Operation Checkout

Check motor operation as follows:

1. To close the motor, open terminals +, -, and F.
2. To open the motor, connect terminal F to the negative (-) motor terminal.

Honeywell

Home and Building Control
neywell
5 Douglas Drive North
olden Valley, MN 55422

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Honeywell Limited-Honeywell Limitée
35 Dynamic Drive
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Honeywell Asia Pacific Inc.
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Honeywell Latin American Region
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■ 사양(Specification)

■ 제품구성
HUF 시리즈(배관경 1/2"에서 DN100까지)

■ 외관사이즈
5페이지 참조

■ 배관경
1/2"~2" 나사타입(암나사 -ISO 7-1에 따름)
DN50 ~ DN100

■ 최대 입구압
2bar ~ 6bar

■ 사용 온도범위
-15~80℃

■ 압력 측정구 접속
RP1/4"

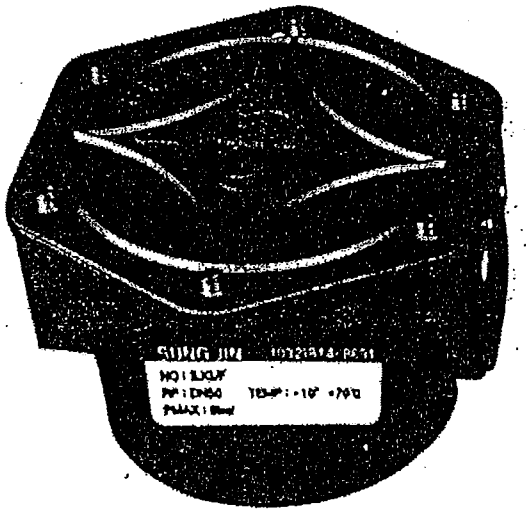
■ 용량
7페이지 용량곡선 참조

■ 비틀림 및 굽힘 응력
배관연결은 EN161의 규격을
충족한다.

■ 실 및 가스켓
내탄화수소계 NBR 고무(DIN3535/1)

■ 바디재질
알루미늄 합금 다이캐스팅(UNI 5076/3051)

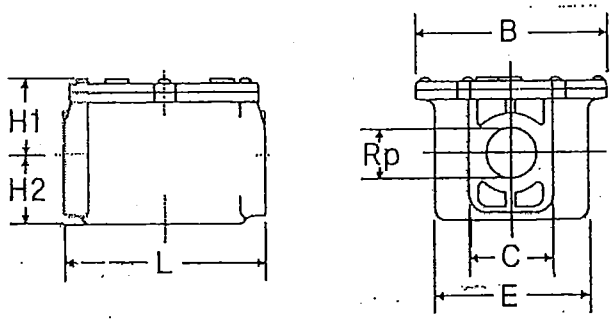
■ 필터
DVGW-G260/1 규격의 가스용 Self-estinguishing 합성섬유



적용(APPLICATION)
모든 가스기기의 연료 가스 및
연소용 가스 공급라인에 적용된다.
사용가능한 가스 : - 제조가스(Town Gas)
- 천연가스(LNG)
- LPG 가스
- 공기

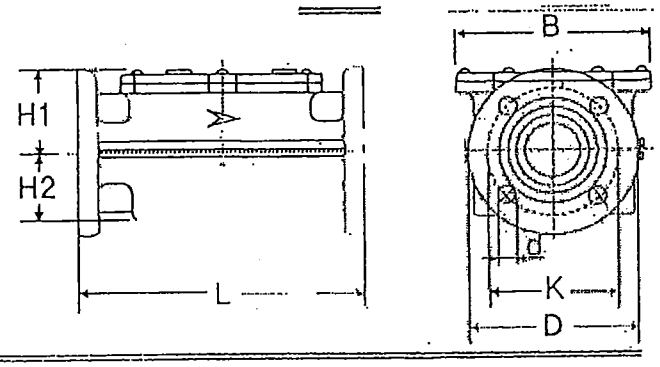
본 필터는 DIN3386의 기준은 충족한다.

▼ 외관사이즈 및 배관경(나사 타입)



Model	Connection (inch)	Max.Operating Pressure	Overall Dimensions (mm)						Weight
	Rp	(bar)	L	B	H1	H2	E	C	(kg)
SJG-01	1/2	2	121	132	38	51	93	44	0.70
SJG-02	3/4	2	121	132	38	51	93	44	0.68
SJG-03	1	2	121	132	38	51	93	44	0.66
SJG-04	1 1/4	2	173	187	52	61	134	61	1.29
SJG-05	1 1/2	2	173	187	52	61	134	61	1.23
SJG-06	2	2	199	218	73	73	162	81	2.08

▼ 외관사이즈 및 배관경(플랜지 타입)



Model	Connection (inch)	Max.Operating Pressure	Overall Dimensions (mm)							Weight
		(bar)	L	B	H1	H2	D	K	d	(kg)
SJG-DN 50	DN 50	6	230	196	96	97	160	125	18	6.37
SJG-DN 65	DN 65	6	290	210	97	104	170	145	18	7.77
SJG-DN 80	DN 80	6	320	244	112	103	200	160	18	9.23
SJG-DN100	DN100	6	380	273	134	107	228	180	18	12.24

설치(INSTALLATION)

■ 개요

매뉴얼을 주의 깊게 읽으시기 바랍니다. 본 매뉴얼을 따르지 않았을 경우, 제품의 손상을 유발하거나, 위험한 상황을 초래할 수 있습니다.

본 제품의 설치는 자격을 갖춘 숙련된 기술자에 의해 이루어 져야만 합니다.

설치가 완료되었을 때는, 점검을 수행하시기 바랍니다.

⚠

■ 경고

설치전에 모든 가스공급을 차단하시요.

배관을 연결하기 직전까지, 제품 입출구의 마개를 제거하지 마시요.

본 필터는 제품의 화살표기가 가스공급 방향과 일치하게 설치되어야 합니다.

■ 설치위치

검사나 청소를 위해 뚜껑을 분리할 수 있는 위치여야 합니다.

카트리지 교환을 위해, 뚜껑을 분리할 수 있는 위치에 설치되어야 하며, 고온 벽면(또는 물체)에서 30mm이상 떨어져야 합니다.

■ 나사타입

작업중 이물질이 필터에 들어가지 않도록 주의하시요.

본 필터 외관의 화살표 방향과 가스 공급 방향이 반드시 일치하도록 하시오.

배관 작업시는 ISO-1(BS21, DIN2999)을 따르며, 가공 잔존물이 남지 않도록 잘 가공된 테이퍼진 피팅을 사용하시요.

배관연결시 배관이나 배관용자재를 너무 많이 깊이 조이지 마시요. 그렇지 않을 경우, 제품의 변형(뒤틀림)이나 기능상의 결함을 초래 할 수 있습니다.

■ 플랜지 버전

■ 작업중 이물질이 필터에 들어가지 않도록 주의하시요.
■ 본 필터 외관의 화살표 방향과 가스 공급 방향이 반드시 일치하도록 하시요.
■ 연결시 플랜지를 배관선상에 정렬시키고, 가스킷의 손상없이 필터를 위치시킬 수 있도록 적정한 간격을 유지하시요.
■ 가스킷을 필터와 플랜지 사이에 위치 시키시요.
이때, 필요하다면, 약간의 구리스(Greese)를 칠하는 것도 좋습니다.
■ 필터를 양측 플랜지의 나사를 조용 고정시키시오.

유지(MAINTENANCE)

필터 전후단 압력손실이 10mbar 이상이 될 경우, 내부의 필터 부품(필터)을 교체하시요. 적어도 일년에 한 번 이상의 교체가 바람직합니다.

■ 필터부품의 교체

필터부품의 교체가 요구될 시에는,

1. 교체전 반드시 가스공급을 차단하시요.
2. 스크류를 풀의 뚜껑을 분리 하시요. 이때, 필터 내부에 가스압이 차 있지 않도록 주의하시요.
3. 카트리지를 분리하고, 하우지 내부를 청소하시요.
4. 새 카트리지로 교환하시요.
5. 카트리지를 제품내부에 적절히 설치하시요. 이때, 내부의 멈치에 완전히 안착시키고, 카드리지의 오목한 부분의 INLET이란 스탬프가 찍힌 부분이 필터의 입구측에 가도록 방향에 주의하시요.
6. 천천히 입구측 가스밸브를 연 후, 필터 뚜껑에서의 가스 누설 여부를 반드시 점검하시요.

⚠
경고

■ 설치후 누설 검사

양질의 가스누설 검사용 스프레이를 이용하여, 배관사이 모든 연결부위 및 가스켓 부분에 스프레이를 뿌리시요.
기기를 작동시킨 후, 거품이 생기는지 검사하시요.
이때, 배관 연결 부에서, 거품이 발견되면, 다시 완전히 연결하시요.
가스켓 부분의 누설은 통상 연결 나사의 조임에 의해서 중단되며, 그래도 누설이 계속될 시에는 가스켓을 교체한 뒤 다시 연결하시요.

용량곡선(CAPCITY CURVE)

■ 개요

용량곡선을 읽을 때에는. 운전 유량을 적용하시요. 압력손실 △P은 bar 단위의 절대압과 더해져야 합니다. 이는 온도의 변동(Fluctuation)을 고려하기 때문입니다. 압력손실은 10mbar를 넘어서는 안됩니다.

■ 계산예

과 가스압(Excess Gas Pressure)
4bar

■ 운전유량

150m³/h LNG

■ 필터선정

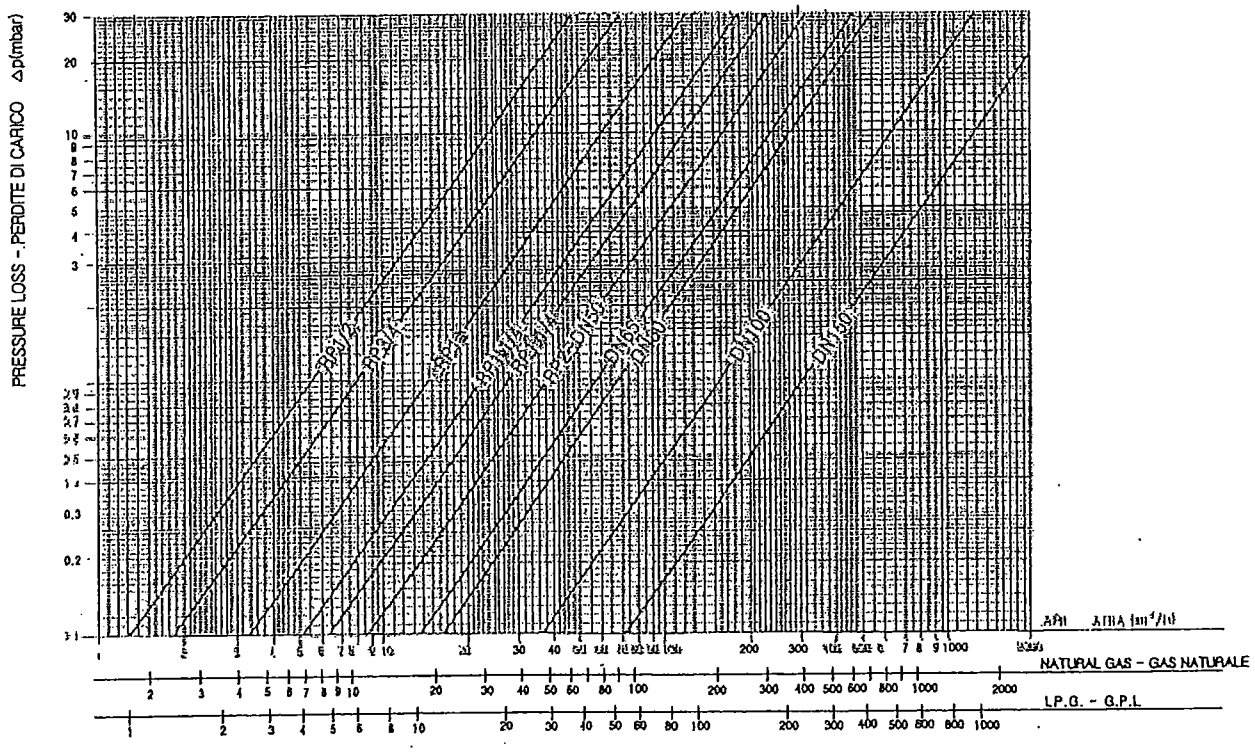
SJG.DN65(플랜지 타입)

■ 압력손실

1.7mbar

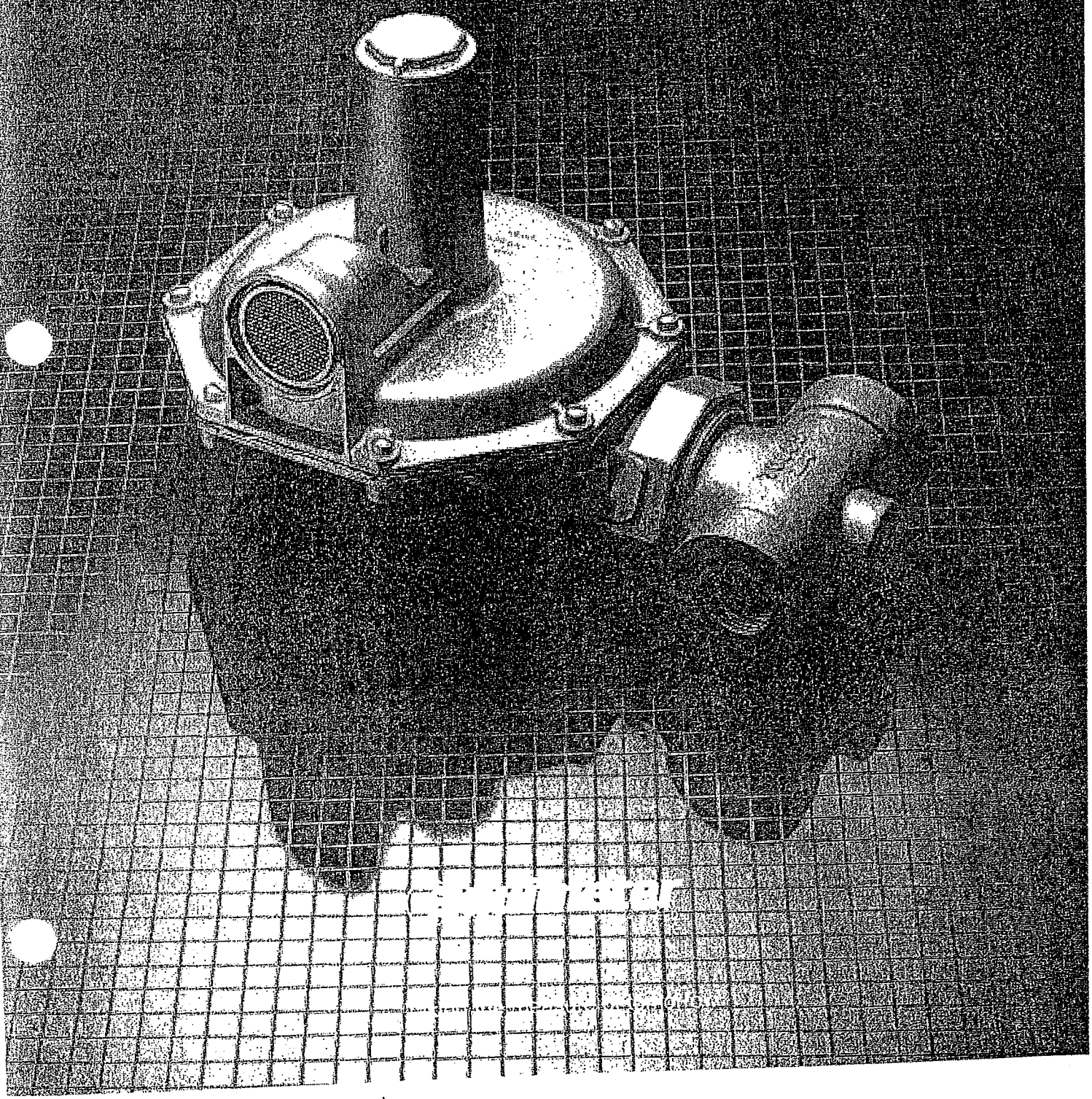
■ 실제 압력손실

△P=5(과압+1)×1.7mbar=8.6mbar
실제 압력손실은 10mbar 이하이므로 적절한 크기의 필터가 선정되었습니다.



R-1301
Rev. 5

Model 143-80
Service Regulators



Model 143-80 Service Regulators

The 143-80 is designed and built for domestic gas service, as well as for commercial and industrial applications; burners, furnaces, ovens, heaters, gas engines, etc. It can also be used for air, LPG, nitrogen, dry CO_2 and other gases.

Simple, rugged construction means dependability. Yet, it provides precise pressure control over an amazing range of pressure and load conditions.

It is simple to install and adjust. The union nut connection makes it easy to locate the regulator in the best installed position, and servicing is easy and convenient.

Equimeter's Model 143-80 Service Regulator...outstanding performance, utility, and dependability at an economical price...

Basic Models

Basic Models	Description	High Pressure Models
143-80-1	Standard Regulator	143-80-1HP
143-80-2	Regulator with Internal Relief Valve (IRV)	143-80-2HP

Spring Ranges

Outlet Pressure Ranges	Spring Color	Spring Part Number
3½" to 6½" w.c.	Red	143-62-021-15
5" to 8½" w.c.	Blue	143-62-021-16
6" to 14" w.c.	Green	143-62-021-17
12" w.c. to 1 psi	Orange	143-62-021-18
½ psi to 2 psi	Black & White	143-62-021-22
½ psi to 3 psi	Cadmium*	173-62-021-02
2 psi to 6 psi	Black*	139-16-021-01

*Only use these springs in high pressure models (143-80-1HP and 143-80-2HP)

Maximum Inlet Pressures–Standard IRV Models and High-Pressure Models

Orifice Sizes	5/8"	1/2"	3/8"	5/16"	1/4"	3/16"	1/8"
Max Inlet Pressure	10 psi	20 psi	40 psi	40 psi	60 psi	125 psi	125 psi

Pipe Sizes

Inlet x Outlet NPT
3/4" x 3/4"
3/4" x 1"
3/4" x 1 1/4"
1" x 1"
1" x 1 1/4"
1 1/4" x 1 1/4"

Temperature Limits

143-80 Service Regulators can be used for temperatures from -20°F. to 150°F.

Buried Service

143-80 Regulators are not recommended for buried service.

Construction and Design Features

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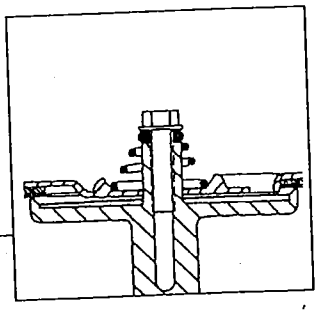
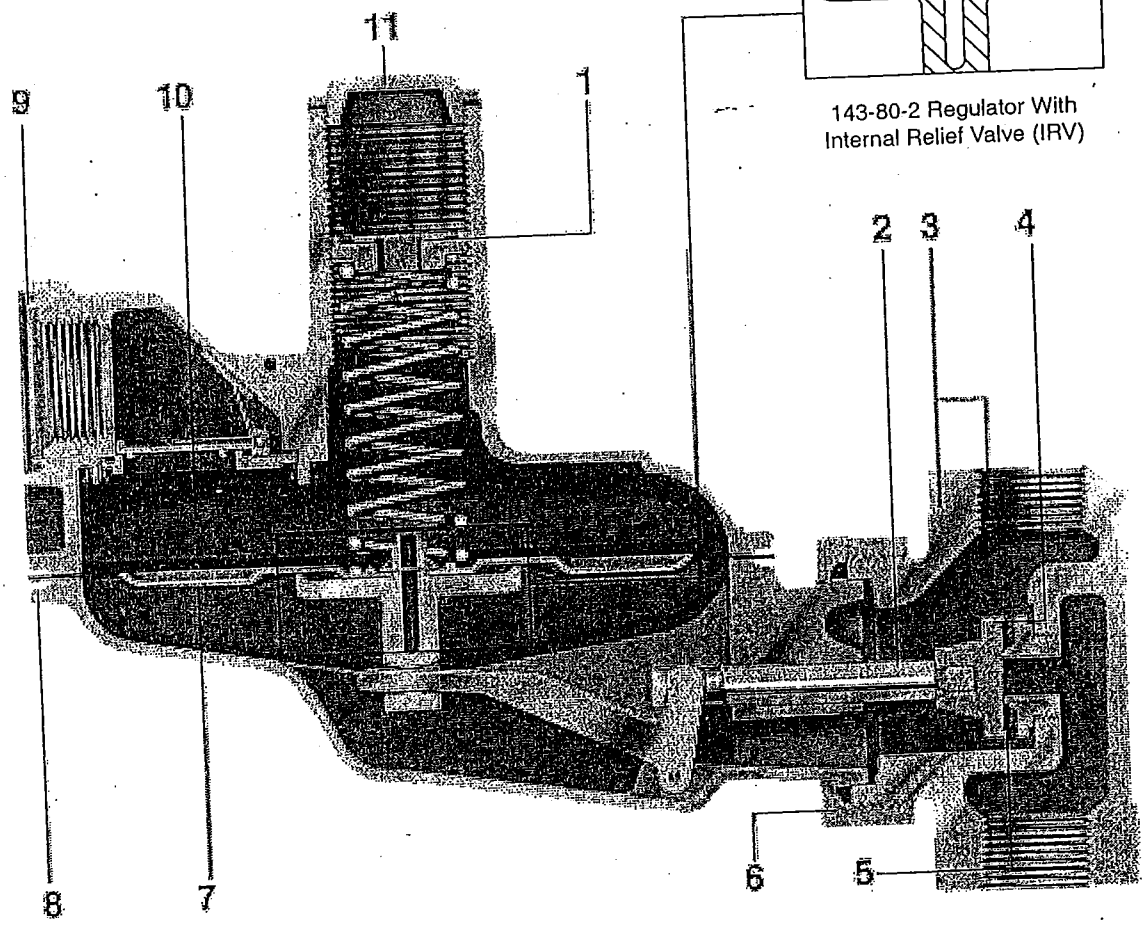


143-80-2 Regulator With Internal Relief Valve (IRV)



143-80-1 Standard Regulator Construction Features

1. Spring Adjustment
2. Fiberglass Reinforced Nylon Valve Stem
   Minimum friction, minimum dimensional changes over operating temperature range.
3. Cast Iron Body
   (ASTM A 126 Class B)
   (Test Connections 1/8" NPT Available on inlet and outlet)
4. Buna-N Soft Seat
   Positive tight lock-up
5. Aluminum Orifices
   interchangeable between 1/8" thru 1/2"
6. Union Nut Connection
   Full 360° rotation...easy servicing
7. Buna-N Diaphragm
   Nylon fabric reinforced
   Full 26 in.² effective area
8. Die Cast Aluminum Alloy Diaphragm Case
   High strength, light-weight corrosion resistant.
9. Vent
   3/4" or 1" NPT Screened
10. Vent Valve
11. Seal Cap

Service Regulator Capacity Tables

Models 143-80-1HP, 143-80-2HP, 143-80-1, 143-80-2

Capacity* in SCFH natural gas (0.6 specific gravity–14.65 psia–60° F.)

Pipe Size (inches)	Inlet Pressure (psig)	Orifice Size (inches)						
		1/8"	3/16"	1/4"	5/16"	3/8"	1/2"	5/8"
3/4" x 3/4"	1/2	250	420	530	480	340	450	510
	1	310	560	600	560	500	510	530
	2	370	700	700	620	570	580	600
	3	530	830	840	720	630	650	670
	5	860	1200	950	860	730	770	790
	7 1/2	1200	1570	1220	970	880	900	900
	10	1500	1660	1330	1240	1000	1020	1020
	20	1800	1710	1520	1340	1250	1270	
	40		1900			1450		
	60							
	80							
	125							
3/4" x 1"	1/2	250	420	530	480	350	460	520
1" x 1"	1	310	580	650	700	550	600	650
	2	370	700	890	870	840	880	780
	3	530	840	1140	1120	1000	920	810
	5	860	1230	1360	1340	1160	950	970
	7 1/2	1200	1700	2000	1500	1270	1140	1060
	10	1540	1900	2000	1600	1330	1200	1180
	20	2100	2000	2000	1640	1480	1400	
	40		2100			1900		
	60							
	80							
	125							
3/4" x 1 1/4"	1/2	250	420	530	480	350	460	520
1" x 1 1/4"	1	310	580	650	700	550	680	760
1 1/4" x 1 1/4"	2	370	700	890	870	840	1020	1030
	3	630	840	1140	1180	1030	1200	1050
	5	860	1230	1360	1500	1350	1490	1060
	7 1/2	1200	1800	1600	1700	1610	1580	1060
	10	1550	2100	2200	1800	1710	1800	1180
	20	2250	2200	2400	1900	1900	1900	
	40		2400		2000	2000		
	60							
	80							
	125							

*Capacities are based on the following maximum variations in outlet pressure:
RED and BLUE SPRINGS: 1" w.c. droop
GREEN SPRING: 2" w.c. droop
ORANGE SPRING: 3" w.c. droop
BLACK/WHITE AND CADMIUM SPRINGS: 1/4 psig droop
BLACK SPRING: 10% droop

Capacities for 1/2, 1 and 2 psig pressures apply only to RED and BLUE springs. Note carefully these capacities do not apply to the green, orange and black springs.

NOTE: Last figure in each column is the maximum capacity for each orifice at recommended pressure within the optimum performance range.

Models 143-80-4, 143-80-6 Low Pressure Cut-Off

Capacity* In SCFH natural gas (0.6 specific gravity–14.65 psia–60°F.)

Pipe Size (Inches)	Inlet Pressure (psig)	Outlet Pressures Red Spring* 4 1/2" to 7 1/2" w.c. Blue Spring* 6 1/2" to 9 1/2" w.c.				Outlet Pressures Green Spring* 7 1/2" to 15" w.c.			
		Orifice Size (inches)				Orifice Size (inches)			
		7/16"	3/8"	5/16"	1/4"	7/16"	3/8"	5/16"	1/4"
3/4" x 3/4"	1/2	240	180	90	100	140	120	90	90
	1	400	300	200	140	250	200	160	140
	2	580	420	300	230	370	320	240	220
	5	800	750	600	380	580	530	460	370
	10	1050	990	740	460	780	720	700	480
	15	1140	1050	950	640	920	860	800	660
	25		1100	1100	870		900	1000	910
	40			1300	1160			1300	1160
	60								
3/4" x 1"	1/2	270	210	90	100	160	120	90	90
1" x 1"	1	430	310	210	140	260	230	160	140
	2	650	420	300	230	410	350	270	220
	5	1100	750	610	380	800	730	470	370
	10	1300	1120	760	460	1220	1090	740	480
	15	1300	1300	960	640	1300	1300	930	660
	25		1300	1300	870		1300	1160	910
	40			1300	1160			1300	1160
	60								
1 1/4" x 1 1/4"	1/2	270	210	90	100	160	120	90	90
	1	430	310	210	140	260	230	160	140
	2	650	420	300	230	430	350	270	220
	5	1100	750	510	380	870	730	470	370
	10	1300	1120	760	460	1300	1090	740	480
	15	1300	1300	960	640	1300	1300	930	660
	25		1300	1300	870		1300	1160	910
	40			1300	1160			1300	1160
	60								

NOTE: Last figure in each column is the maximum capacity for each orifice at recommended inlet pressure within the optimum performance range.
*RED Spring is Part No. 143-62-021-15, BLUE Spring is Part No. 143-62-021-16, GREEN Spring is Part No. 143-62-021-17.

Note: The above performance data is based on normal testing at 70°F flowing temperature. Changes in performance can occur at extreme low flowing temperatures.

Internal Relief Valve

The Internal Relief Valve begins to open when outlet pressure exceeds regulator set-point by approximately 7" w.c. At lower pressures, it is closed.

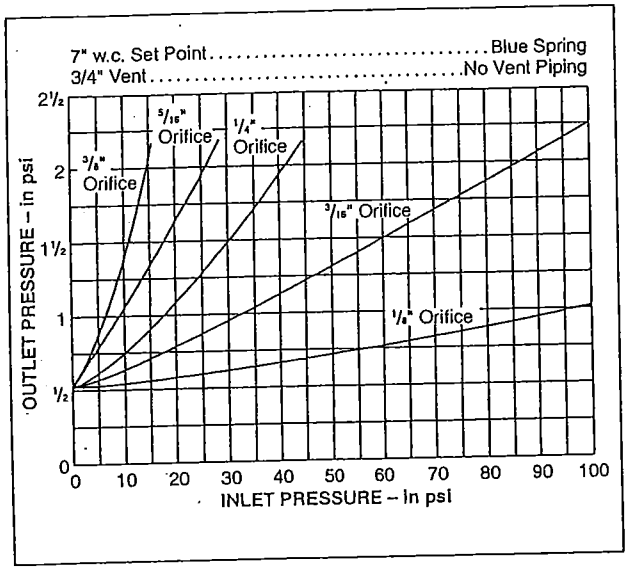
Internal Relief Valves, like all relief valves, must be carefully checked for adequate capacity. IRV's only have full capacity relief capability when the inlet pressure to the regulator is low enough and the regulator orifice is small enough. If either one, or both, are too large, the IRV will not have full capacity relief capability and will not be able to prevent the outlet pressure from exceeding the maximum allowable limit.

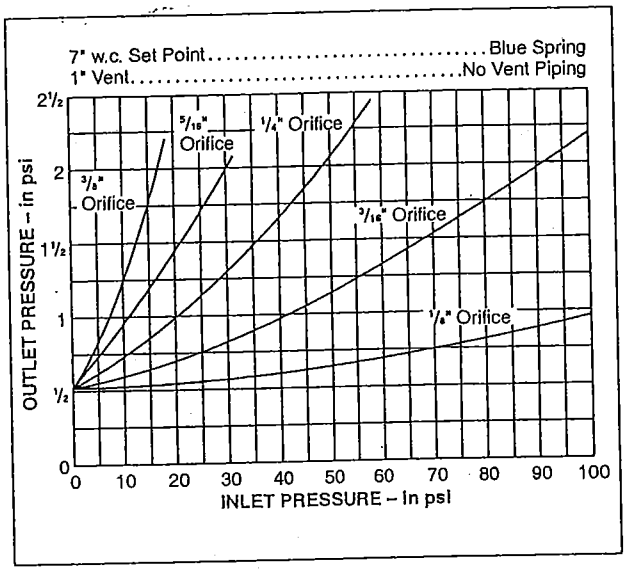
The curves below are for checking this condition. They are based on the regulator blocked open to simulate a failure in which the valve goes wide open.

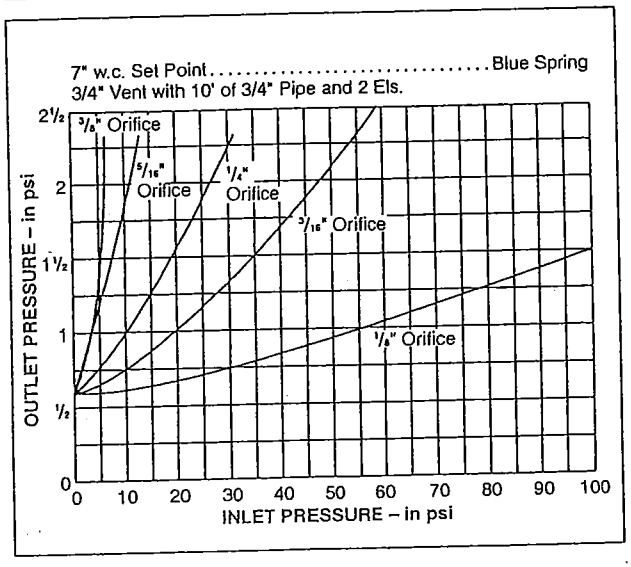
Find the maximum inlet pressure on the horizontal scale. Trace it vertically upwards to the curve for the size orifice used. Trace that point horizontally leftward to the vertical scale and read the outlet pressure. If it is below the maximum allowable outlet pressure for the application, the IRV has full capacity relief capability for a wide open regulator failure.

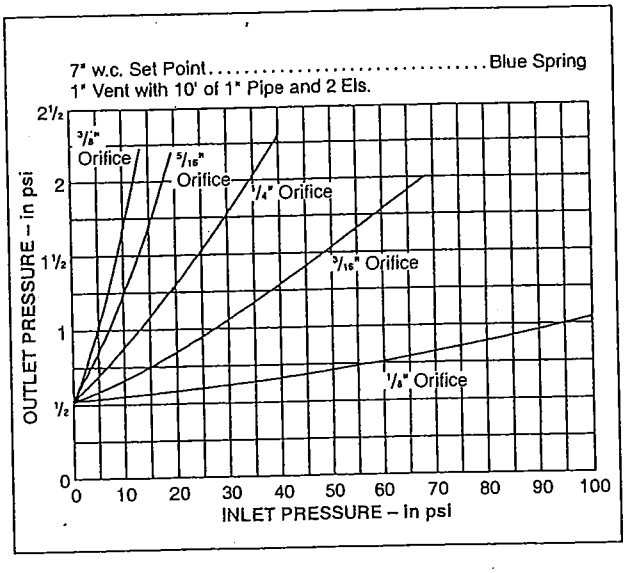
Note that the curves are based upon a 7" w.c. setpoint and a 5" - 8½" (blue) spring. Curves are presented showing the ¾" and 1" vent configurations, with and without vent piping. The curves based on vent piping assume 10 ft. of vent piping plus two elbows. If additional vent piping is used it must be carefully sized to avoid restricting the capacity of the IRV.

For conditions other than those covered by the curves contact your Equimeter representative.



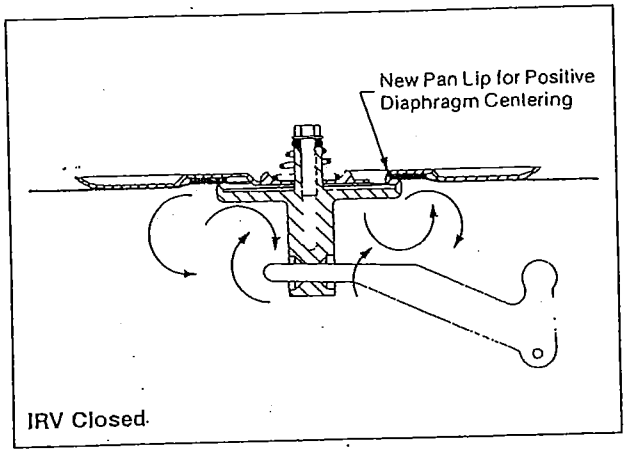


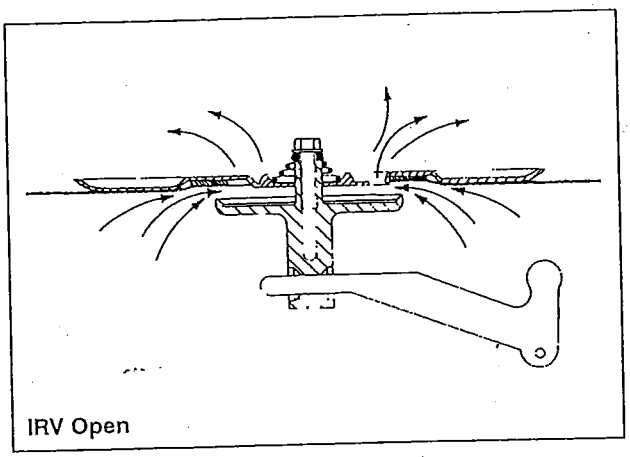




Caution: It is the user's responsibility to assure that a service regulator vents and/or vent lines exhaust to a non-hazardous location away from any potential sources of ignition. **Refer to Equimeter Bulletin RM-1301 for more detailed information.**

Operation of the Internal Relief Valve





Maximum Emergency Pressures

The maximum outlet pressure to which the 143-80 diaphragm case can be subjected under abnormal conditions without causing damage to the regulator internals is set-point +3 psi. If the outlet pressure exceeds this pressure, the regulator must be removed from service and carefully inspected. Damaged or otherwise unsatisfactory parts must be replaced before returning the regulator to service.

The maximum outlet pressure that can be safely contained in the 143-80 diaphragm case is 10 psi. Safely contained means "no leakage" and "no bursting".

143-80-1 143-80-21 143-80-1HP	143-80-2 143-80-2HP	...Maximum Inlet Pressure +50 psi
143-80-4 143-80-6		...Maximum Inlet Pressure +10 psi

Overpressurization Protection

Protect the downstream piping system and the regulator's low pressure chambers against overpressurization due to the possible regulator malfunction or failure to achieve complete lockup. The allowable outlet pressure is the lowest of the maximum pressures permitted by federal codes, state codes, Equimeter Bulletin RDS-1498, or other applicable standards. The method of protection can be a relief valve, monitor regulator, shutoff device, or similar mechanism.

Periodic Inspection: Regulators are pressure control devices with numerous moving parts subject to wear that is dependent upon particular operating conditions. To assure continuous satisfactory operation, a periodic inspection schedule must be adhered to with the frequency of inspection determined by the severity of service and applicable laws and regulations. **See bulletin RM-1301 for field service instructions.**

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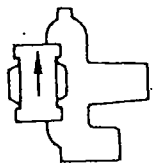
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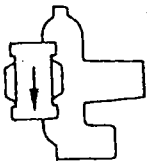
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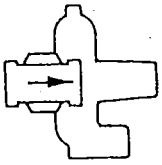
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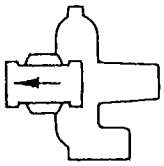
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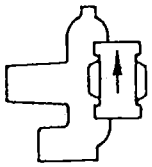
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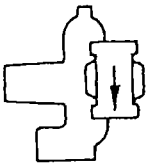
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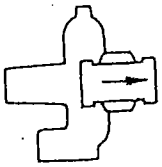
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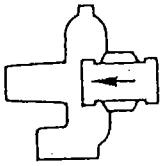
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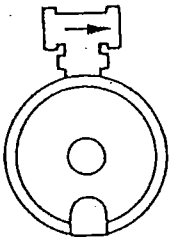
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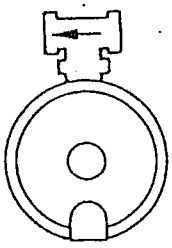
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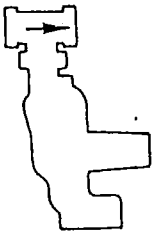
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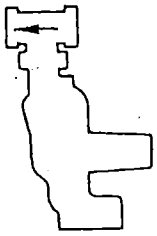
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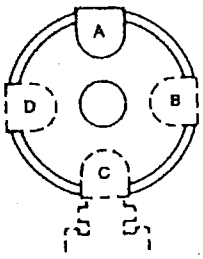
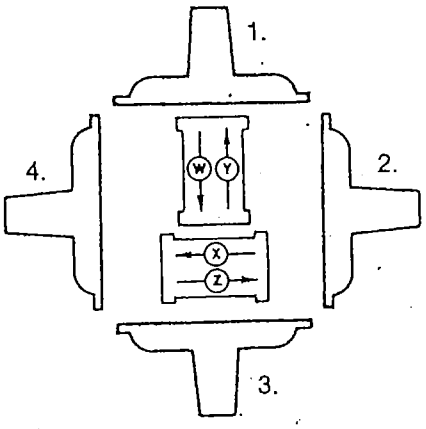
NOTE: If desired position is not shown, use these diagrams to specify vent, diaphragm case, and body arrangements. Example: Position 105 would be D-4-Y.





CAUTION

The diaphragm case vent must be positioned to protect against flooding, drain water, ice formation, traffic, tampering, etc. The vent must be protected against nest building, animals, bees, insects, etc. to prevent vent blockage and minimize the chances of foreign material from collecting in the vent side of the regulator diaphragm.

Standard Construction:

The following items will be considered standard construction for the 143-80 regulator (options are available at additional charge):

1. Body - no pressure taps
2. Orifice - aluminum
3. Valve & stem assembly -plastic w/Buna-N valve
4. Seal wire - none
5. Vent - 1" side vent
6. Cover.cap - plastic
7. Spring ferrule - plastic
8. External nuts and bolts - plated steel
9. Identification - stamped on diaphragm cover (no badge)
10. Paint - AGA gray
11. Packaging - six per carton
12. Position - 105

Standard Testing:

The following will be considered standard testing for the 143-80 regulator (optional testing at additional charge):

1. Set point adjustment at customer specified:
   A. Inlet pressure
   B. Outlet pressure (set point)
   C. Minimum and maximum rate of flow within 50 to 350 SCFH
2. Lock-up test (will not exceed 1 ½" w.c. above set point)
3. Leak test
4. Internal relief valve test
   A. Initial relief at 7" w.c. ±2" above set point
   B. Reseat at 20% below initial relief pressure (10" w.c., minimum)

Full Open Capacity:

Use the following formulae for the full open capacity of 143-80 regulators.

1. $Q = K\sqrt{P_O(P_I - P_O)}$ ..... (for $\frac{P_I}{P_o}$ less than 1.894)

2. $Q = \frac{K P_I}{2}$ ..... (for $\frac{P_I}{P_o}$ greater than 1.894)

Q = maximum capacity of the regulator (in SCFH of 0.6 specific gravity natural gas).
K = the "K" factor, the regulator constant (from the table below).
P_I = absolute inlet pressure (psia).
P_O = absolute outlet pressure (psia).

ORIFICE	5/8"	1/2"	3/8"	5/16"	1/4"	3/16"	1/8"
K	820	520	292	206	132	74	33

When sizing relief valves for use with 143-80 regulators, *use full open capacity*, except for LPCO models.

Other Gases

143-80 Regulators are mainly used on natural gas. However, they perform equally well on LP gas, nitrogen, dry CO_2, air and others.

OTHER GASES	CORRECTION FACTOR
Air (Specific Gravity 1.0)	0.77
Propane (Specific Gravity 1.53)	0.63
1350 BTU Propane-Air Mix (1.20)	0.71
Nitrogen (Specific Gravity 0.97)	0.79
Dry Carbon Dioxide (Specific Gravity 1.52)	0.63
For other noncorrosive gases: CORRECTION FACTOR =	$\sqrt{\frac{0.6}{\text{Specific Gravity of the Gas}}}$

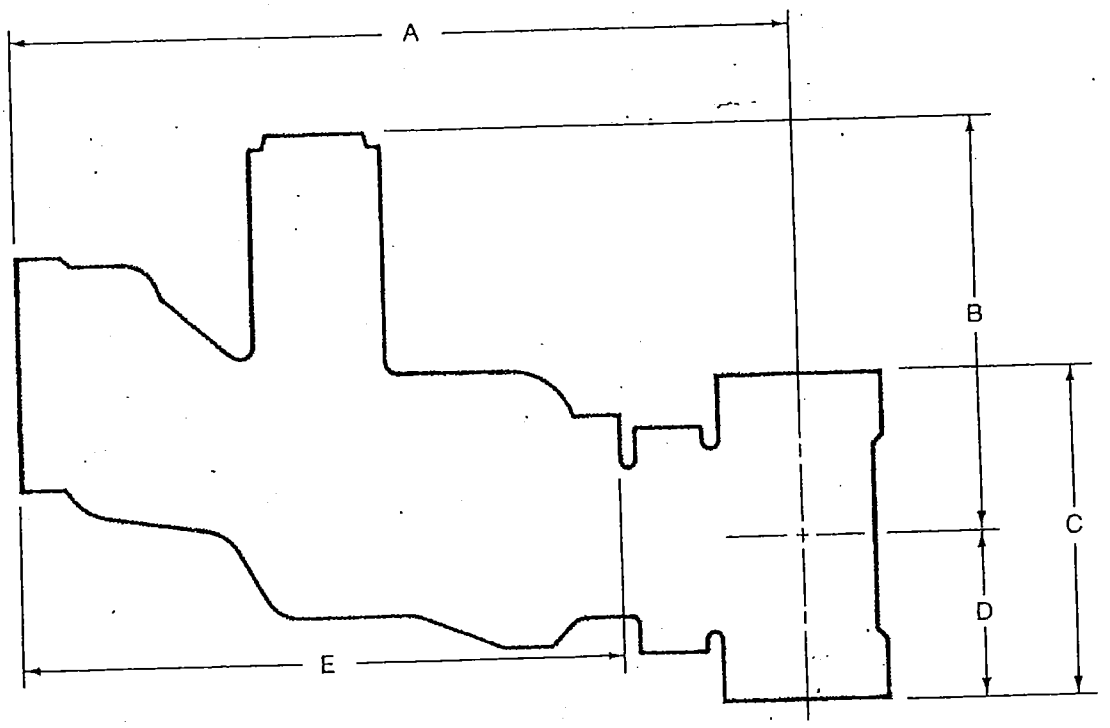
For use with gases not listed above, please contact your Equimeter representative or Industrial Distributor for recommendations.

How to Order

Specify:

1. Pipe size and model number
2. Mounting position
3. Orifice Size
4. Inlet pressure (also maximum and minimum if available)
5. Outlet Pressure set-point
6. Capacity required (scfh)
7. Type of gas (natural gas, propane, etc.)
8. Spring part number
9. Vent Size

Dimensions



Regulator	A	B	C	D	E
143-80	9 3/8"	5 3/4"	3 15/16"	1 31/32"	6 7/8"

Caution: Turn gas on slowly. If an outlet stop valve is used, it should be opened first. Do not overload the diaphragm with a sudden surge of inlet pressure. Monitor the outlet pressure during start-up to prevent an outlet pressure overload.
See bulletin RM-1301 for more detailed start-up procedures.

143-80 Service Regulator With Low Pressure Cut-Off

This is the low pressure, cut-off version of the 143-80 residential service regulator.

It is a safety device which stops the inlet gas supply if the outlet pressure drops below a certain point.

Hazardous conditions sometimes develop as a result of a loss in service pressure. A good example of this would be flame or pilot outage resulting from a line break, an interruption in the gas supply, or an excessive demand. The low pressure "cut-off" acts as a safety device for the gas service.

The cut-off unit consists of an extra valve which seats against the inlet side of the orifice. As the main valve moves away from its seat to increase flow, in response to a decreasing outlet pressure signal, the cut-off valve moves toward its seat. If the main valve movement becomes excessive, the cut-off valve will take over and go closed. At this point the gas supply is shut off and cannot be resumed until the cut-off unit is manually reset.

Basically, "cut-off" is triggered by an excessive drop in outlet pressure. However, the specific outlet pressure at which "cut-off" occurs also depends on the size of the orifice and the inlet pressure.

As mentioned previously, once the cut-off valve closes, it must be manually opened to put the regulator back into operation. It must also be manually opened when put into service initially or when returned to service after being shut down. This is easily done by removing the cover cap and pulling upwards on the diaphragm post extension.

Installation is simple and quick. It is the same as for other standard types of self-contained domestic service regulators.

Adjustment for the outlet pressure set point is accomplished by removing the cover cap and screwing the adjustment ferrule down or up to raise or lower pressure.

The 143-80 regulator with low pressure cut-off can be furnished WITH OR WITHOUT INTERNAL RELIEF. It is used on LP and manufactured gas as well as natural gas. In addition it can also be used on air, CO_2, nitrogen and other industrial gases.

Maximum Inlet Pressure

ORIFICE SIZE	1/4"	5/16"	3/8"	7/16"
Maximum Inlet Pressure	60 psig	40 psig	25 psig	15 psig

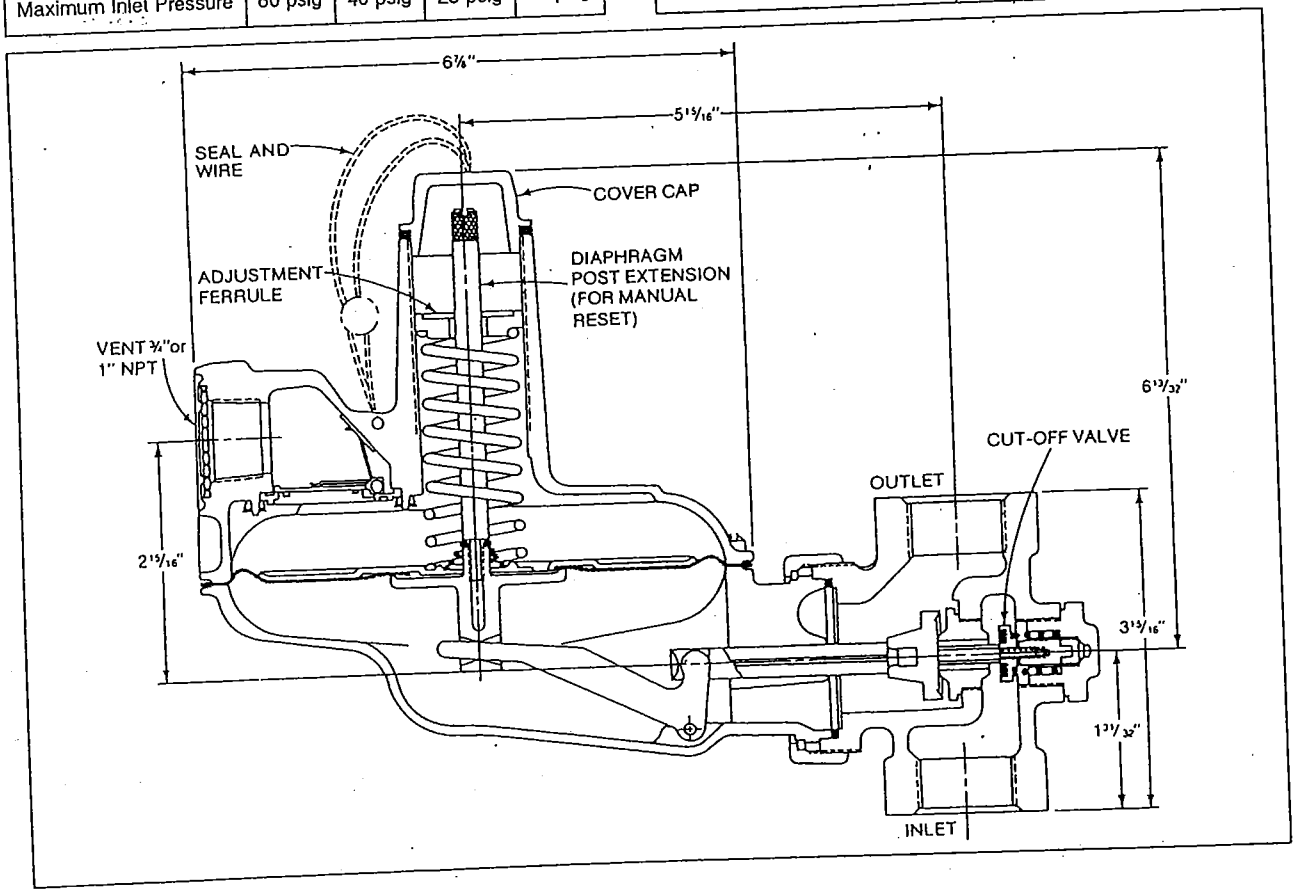
Basic LPCO Models

143-80-4	Regulator with Low Pressure Cut-off (LPCO)
143-80-6	Regulator with IRV and LPCO.

Inlet Pressure Range...in. w.c. to 60 psi
Outlet Pressure Range 4½" to 15" w.c.
Orifices...aluminum, 1/4"–5/16"–3/8"–7/16"

Spring Ranges LPCO Models

Outlet Pressure Ranges	Spring Color
4½" to 7½" w.c.	Red Spring
6½" to 9½" w.c.	Blue Spring
7½" to 15" w.c.	Green Spring



Other Equimeter Gas Pressure Regulators

Equimeter produces a broad product line of Gas Pressure Regulators which are widely used throughout the natural gas industry. These regulators are also suitable for non-corrosive industrial gas applications such as propane, butane, air, nitrogen, dry CO_2 etc. For additional detailed information on a particular model, please request the indicated bulletin from the local Equimeter sales office.

Multi-Purpose Service Regulators

Model 043
Bulletin: R-1300
3/8", 1/2", 3/4", 1" pipe size
Inlet pressures . . . . . to 125 psi
Outlet pressures . . . . . 5" w.c. to 2 psi
Capacity to 2000 CFH
Available with 90° body.
Also available with internal relief valve.

Model 143-6
Bulletin: R-1303
3/4", 1", 1 1/4" pipe size
Inlet pressures . . . . . to 125 psi
Outlet pressures . . . . . 3 1/2" w.c. to 6 psi
Capacity to 2000 CFH
Available with 90° angle or straight-through body.
Also available: internal relief valve and low pressure cut-off.

Industrial Service Regulators

Models 243-8, 243-12, 243-8HP
Bulletin: R-1306
1 1/4", 1 1/2" and 2" pipe size
Inlet pressures . . . . . to 125 psi
Outlet pressures . . . . . 3 1/2" w.c. to 10 psi
Capacity to 25,000 CFH
Also available: internal relief valve, low pressure cut-off, external control line, back pressure regulator, relief valve, vacuum regulator and vacuum breaker.

Field Regulators

For intermediate to high pressure applications. Ideal on pipeline taps servicing plants and buildings. Appropriate for double stage reduction ahead of service regulators, and for high pressure burners and compressed air systems.

046
Bulletin: R-1312
3/4", 1" and 1 1/4" pipe size
Inlet pressures . . . . . to 1000 psi
Outlet pressures. . . . . 3 to 200 psi
Capacity to 40,000 SCFH
Also available: monitor and pressure loaded versions and internal relief valve.

141-A
Bulletin: R-1311
2" pipe size
Inlet pressures . . . . . to 1500 psi
Outlet pressures . . . . . .5 to 400 psi
Capacity to 55,000 SCFH

Pilot Loaded Regulators

For intermediate and high-pressure applications requiring precise pressure reduction with minimal droop. Ideal for standard and high capacity flows on burners, driers, dehydrators and compressor lines. Appropriate for fixed factor billing.

243-RPC
Bulletin: R-1343
1 1/4", 1 1/2" and 2" pipe size
Inlet pressures . . to 150 psi
Outlet pressures
. . . . . 3 1/2" w.c. to 35 psi
Capacity to 76,000 SCFH

1100
Bulletin: R-1341
Pipe size: 2"
(screwed or flanged)
Inlet pressures . . to 400 psi
Outlet pressures
. . . . . 3" w.c. to 100 psi
Capacity to 414,000 SCFH

1200
Bulletin: R-1342
Pipe size: 2" (flanged)
Inlet pressures
. . . . . to 1200 psi
Outlet pressures
. . . . . 20 to 600 psi
Capacity to 789,000 SCFH

Equimeter also produces Industrial and Combustion Regulators; High Pressure, High Capacity Regulators; and Safety Relief Valves. Detailed information available on request.

ASCO® Red-Hat®

Direct Acting or Piloted

Aluminum Body Solenoid Valves

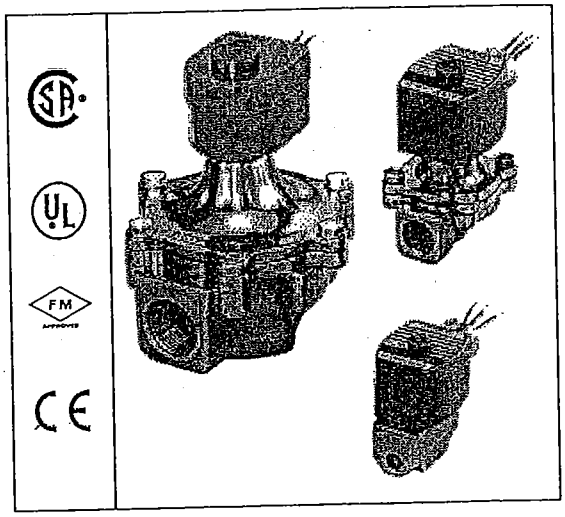
3/8" to 3" NPT

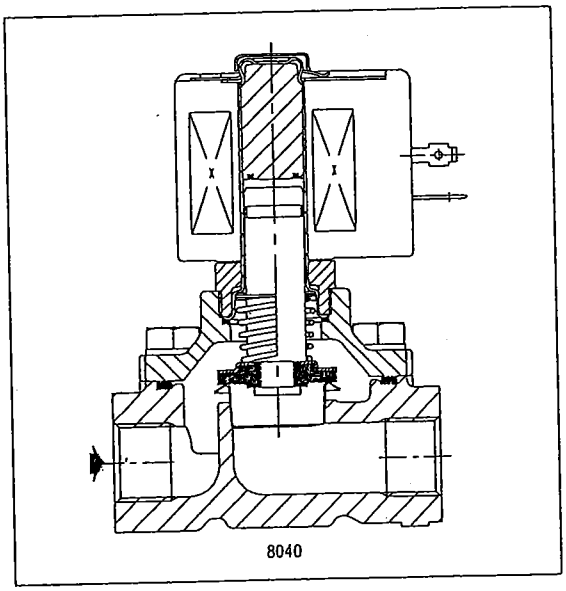
NC NC NO NO

2/2 SERIES 8040 8215

Features

- Lightweight, low-cost valves for air service.
- Ideal for low pressure applications.
- Provides high flow, Cv up to 138 (Kv 118).
- Air and vacuum service.





Construction

Valve Parts in Contact with Fluids	
Body	Aluminum
Seals, Diaphragms, Disc	NBR
Disc-Holder	PA (10.1 and 11.6 watt Normally Open only)
Core Guide	CA
Core Tube	305 Stainless Steel
Rider Rings	PTFE
Core and Plugnut	430F Stainless Steel
Springs	302 Stainless Steel
Shading Coil	Copper

Electrical

Standard Coil and Class of Insulation	Watt Rating and Power Consumption				Spare Coil Part No.			
		AC			General Purpose		Explosionproof	
	DC Watts	Watts	VA Holding	VA Inrush	AC	DC	AC	DC
F	-	6.1	16	40	238210	-	238214	-
F	11.6	10.1	25	70	238610	238710	238614	238714
B	14.9	-	-	-	-	62691	-	-
F	-	15.4	27	160	99257	-	99257	-
F	-	28.2	50	385	206409	-	206409	-

Standard Voltages: 24, 120, 240, 480 volts AC, 60 Hz (or 110, 220 volts AC, 50 Hz), 6, 12, 24, 120, 240 volts DC. Must be specified when ordering. Other voltages available when required.

Solenoid Enclosures

Standard: Red-Hat II - Watertight, Types 1, 2, 3, 3S, 4, and 4X; Red-Hat - Type I.

Optional: Red-Hat II - Explosionproof and Watertight, Types 3, 3S, 4, 4X, 6, 6P, 7, and 9; Red-Hat - Explosionproof and Raintight, Types 3, 7, and 9. (Except EF8215A40 and EF8215A90, which are suitable for Types 3 and 7 (C and D) only and have a T2B temperature rating code.) To order, add prefix "EF" to catalog number.

See Optional Features Section for other available options.

Nominal Ambient Temperature Ranges:

Red-Hat II/
Red-Hat AC: 32°F to 125°F (0°C to 52°C)
Red-Hat II DC: 32°F to 104°F (0°C to 40°C)
Red-Hat DC: 32°F to 77°F (0°C to 25°C)
(104°F/40°C occasionally)

Refer to Engineering Section for details.

Approvals:

CSA certified. UL listed, as indicated. FM approved (Normally Closed only, except Catalog Numbers 8215A90 and 8215A40). Red-Hat II meets applicable CE directives.

Refer to Engineering Section for details.

ASCO®

Specifications (English units)

Pipe Size (ins.)	Orifice Size (ins.)	Cv Flow Factor	Operating Pressure Differential (psi) Min.	Max. AC Air-Fuel Gas	Max. DC Air-Fuel Gas	Max. Fluid Temp. °F AC	DC	Aluminum Body Catalog Number	Constr. Ref. No	UL ⑤ Listing	Watt Rating/ Class of Coil Insulation ② AC	DC
NORMALLY CLOSED (Closed when de-energized)												
1/8	5/16	1.0	0	15	-	125	-	8040H6	11	○	6.1/F	-
1/4	5/16	1.1	0	15	-	125	-	8040H7	11	○	6.1/F	-
3/8	5/16	1.2	0	15	-	125	-	8040H8	11	○	6.1/F	-
3/8	3/4	3.4	0	50	25	125	104	8215G10	2	○	10.1/F	11.6/F
3/8	3/4	3.5	5	125	125	125	104	8215G1 ①	1	○	6.1/F	11.6/F
1/2	3/4	5.4	0	2	-	125	-	8040G22	13A	○	10.1/F	-
1/2	3/4	4.4	0	50	25	125	104	8215G20	2	○	10.1/F	11.6/F
1/2	3/4	4.8	5	125	125	125	104	8215G2 ①	1	○	6.1/F	11.6/F
3/4	3/4	9.5	0	2	-	125	-	8040G23	13B	○	10.1/F	-
3/4	3/4	5.1	0	50	25	125	104	8215G30	4	○	10.1/F	11.6/F
3/4	3/4	5.1	5	125	125	125	104	8215G3 ①	3	○	6.1/F	11.6/F
1	1 5/8	21	0	25	25	125	77	8215B50 ③	6	○	15.4/F	14.9/B
1 1/4	1 5/8	32	0	25	25	125	77	8215B60 ③	6	○	15.4/F	14.9/B
1 1/2	1 5/8	35	0	25	25	125	77	8215B70 ③	6	○	15.4/F	14.9/B
2	2 3/32	60	0	25	15	125	77	8215B80 ③	7	○	15.4/F	14.9/B
2 1/2	3	117	0	5	-	125	-	8215A90	8	○	28.2/F	-
3	3	138	0	5	-	125	-	8215A40	8	○	28.2/F	-
NORMALLY OPEN (Open when de-energized)												
3/8	3/4	3.2	0	125	125	125	104	8215G13	9	●	10.1/F	11.6/F
1/2	3/4	4	0	125	125	125	104	8215G23	9	●	10.1/F	11.6/F
3/4	3/4	4.6	0	125	125	125	104	8215G33	10	●	10.1/F	11.6/F
1	1 5/8	22	0	25	15	125	77	8215C53	12	●	15.4/F	14.9/B
1 1/4	1 5/8	33	0	25	15	125	77	8215C63	12	●	15.4/F	14.9/B
1 1/2	1 5/8	37	0	25	15	125	77	8215C73	13	●	15.4/F	14.9/B
2	2 3/32	58	0	25	15	125	77	8215C83	14	●	15.4/F	14.9/B
2 1/2	3	117	0	5	-	125	-	8215B93 ④	15	●	28.2/F	-

Notes: ① Do not use for Fuel Gas.
② On 50 hertz service, the watt rating for the 6.1/F solenoid is 8.1 watts.
③ FM Approved Process Control Valves. See Engineering Section (Approvals) for details.
④ Type 1 enclosure only.
⑤ ○ = Safety Shutoff Valve; ● = General Purpose Valve. Refer to Engineering Section (Approvals) for details.

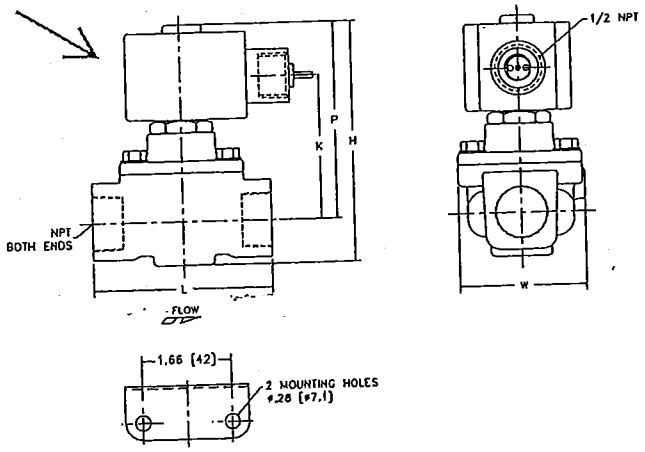
ASCO®

Dimensions: inches (mm)

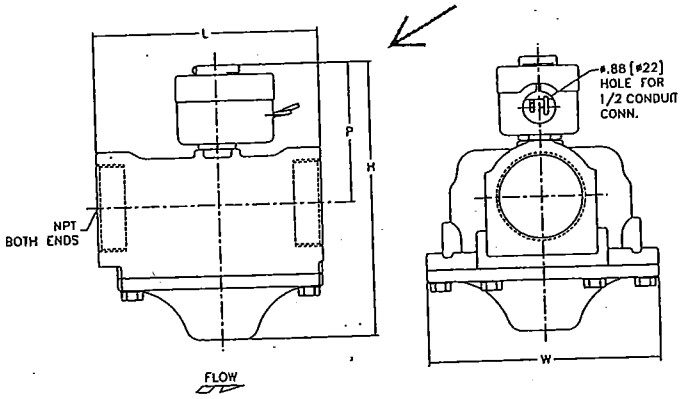
Constr. Ref. No.		H	K	L	P	W
1	ins.	3.42	2.00	2.75	2.87	2.46
	mm	87	51	70	73	63
2	ins	4.02	2.49	2.75	3.46	2.46
	mm	102	63	70	88	63
3	ins.	3.87	2.19	3.31	3.05	2.33
	mm	98	56	84	77	59
4	ins.	4.46	2.68	3.31	3.64	2.33
	mm	113	68	84	92	59
6 ①	ins.	6.84	x	5.00	5.59	5.38
	mm	174	x	127	142	137
7 ①	ins.	7.47	x	6.09	5.94	6.31
	mm	190	x	155	151	160
8 ①	ins.	10.25	x	7.79	7.91	7.94
	mm	260	x	198	201	202
9	ins.	4.42	2.72	2.75	3.86	2.36
	mm	112	69	70	98	60
10	ins.	4.86	2.72	3.31	4.04	2.36
	mm	123	69	84	103	60
11	ins.	2.74	1.44	2.00	2.30	1.69
	mm	69	36	51	58	43
12	ins.	6.84	x	5.00	3.63	5.38
	mm	174	x	127	92	137
13	ins.	6.84	x	5.00	3.56	5.38
	mm	174	x	127	90	137
13A	ins.	4.05	2.46	2.75	3.44	2.42
	mm	103	63	70	87	62
13B	ins.	4.49	2.65	3.31	3.63	2.39
	mm	114	67	84	92	61
14 ②	ins.	7.44	x	6.09	3.81	6.31
	mm	189	x	155	97	160
15 ②	ins.	10.25	x	7.80	5.22	7.94
	mm	260	x	198	133	202

IMPORTANT: Valves may be mounted in any position except all DC constructions and those marked ①, which must be mounted with the solenoid vertical and upright. Constructions marked ② must be mounted with the solenoid vertical and upright or horizontal only.

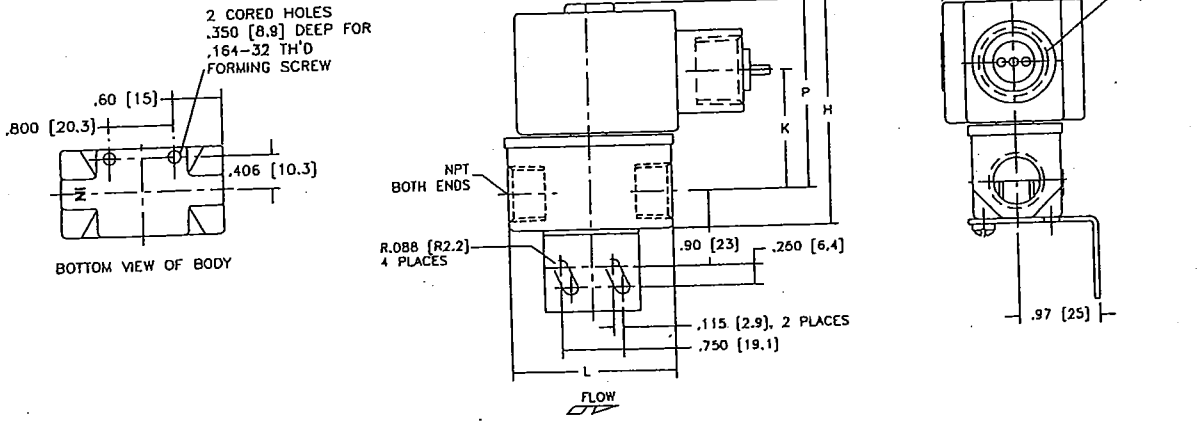
Constr. Refs. 1-4, 9, 10, 13a, 13b



Constr. Refs. 6, 7, 8, 12-15



Constr. Refs. 11



BULLETIN MS2055-08/02
REPLACED MS2024

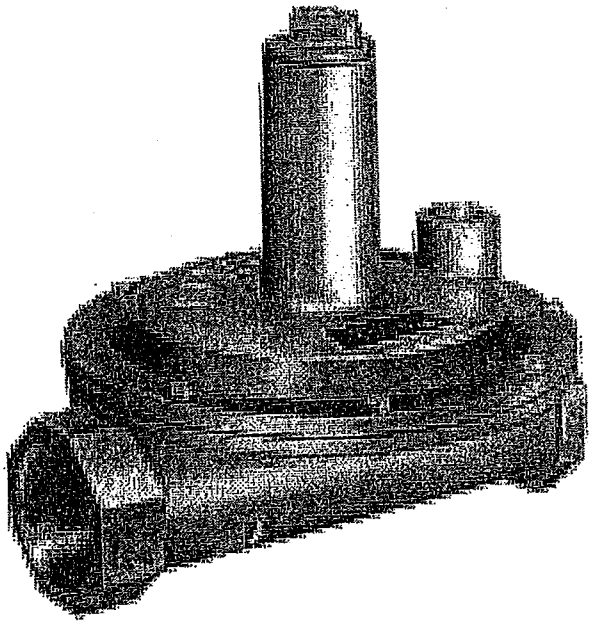
Gas Appliance Pressure Regulators

Lever Acting Design

325-3*, 325-5A* & 325-7

3/8", 1/2", 3/4", 1", 1 1/4" & 1 1/2"

C US *design certified
(325-3 & 325-5A)



325 Series

Maximum Inlet Pressure

CSA Certified 325-3 & 325-5A.....{2 psi (140 mbar) / 5 psi (345 mbar)

Maxitrol-tested: all models.....10 psi (690 mbar)

With 12A09 or 12A39:

Max. inlet pressure (LP).....2 psi (140 mbar)

Max. inlet pressure (natural).....5 psi (345 mbar)

Emergency Exposure Limits

All models (inlet side only).....65 psi (4.5 bar)

Ambient Temperature Limits

All models.....-40° to 205°F (-40° to 96°C)

DVGW.....32° to 140°F (0° to 60°C)

EN.....5° to 176°F (-15° to 80°C)

Venting

325-3 model.....1/8" NPT

325-5A model.....3/8" NPT

325-7 model.....1/2" NPT

Gases: natural, manufactured, mixed, liquefied petroleum, or LP gas-air mixture.

Note: All Maxitrol gas appliance regulators must be installed and operated in accordance with Maxitrol's 'Safety Warning' bulletin.

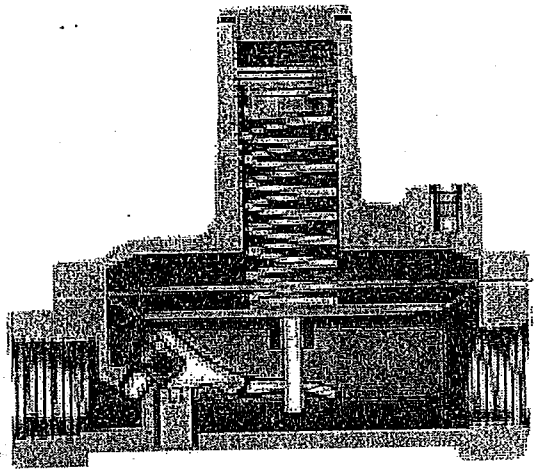
The 325 Series is suitable for multi-poise mounting. But when using the vent limiting device, the regulator (325-3, 325-5A) must be mounted in a horizontal upright position for best performance. Install the regulator properly with gas flowing as indicated by the arrow on the casting (also see the Safety Warning Instructions bulletin).

Upright

MAXITROL® company

Lever Acting Design

325 series



325-3*, 325-5A* & 325-7

FEATURES:

- Designed for multi-poise mounting...
- Self-aligning valve with lever action for dead end lockup...
- Durable, corrosion-resistant construction...
- High performance type for pounds to inches reduction...
- Available in six pipe sizes from 3/8" to 1-1/2"...

BENEFITS:

- Ease of installation...
- Longer life, less maintenance...
- Can be used as a single stage regulator or a first-stage on two-stage system...
- May be used for both 2 psi and 5 psi flexible tubing house piping systems...
- Precise regulation from pilot flows to full regulator capacity...
- Meets many utility specifications.

The 325 Series is a pounds to inches regulator, meeting utility specifications, for use on residential, commercial, and industrial applications where adequate inlet pressures are available.

They are a high performance type and can be used as a single stage regulator - reducing pounds pressure to normal burner pressure. They can also be used as a line regulator on equipment already fitted with an appliance regulator.

The 325-3 and 325-5A models are CSA certified and widely accepted with 2 psig and 5 psig house piping systems. In fact, the entire concept (using semi-rigid copper or flexible stainless steel tubing) would not have been possible without the development of the compact 325 series regulators.

The 325-7, designed especially for the growing segment of electronic ignition equipment, permits the utilization of greater capacities without sacrificing performance. All 325 Series models are also certified through DVGW to European EN 88.

To deliver positive dead-end lock up, the 325 Series feature a high leverage valve linkage assembly. Lockup pressure can vary with the speed of the solenoid valve and its location. The regulators are capable of precise regulating control from full flow down to pilot flows.

As an optional accessory, the 325-3 and 325-5A offer automatic vent limiting devices. The 12A09 and 12A39 vent limiters eliminate the need to run vent piping to a safe area - in the event of a diaphragm rupture, gas escapement is limited to within the ANSI standards level.

The 325 Series regulators are Maxitrol-tested for inlet pressures up to 10 psi (CSA certified for 2 psi and 5 psi), and withstand emergency exposure inlet pressure up to 65 psi. With the 12A09 or 12A39 installed, maximum inlet pressure is 2 psi (LP) and 5 psi (natural). Inlet pressures exceeding 2 psi (LP), or 5 psi (natural) require a vent line.

The self-aligning valve is made of nitrile rubber. Housings are durable aluminum die castings and all internal parts are carefully selected and corrosion resistant. The diaphragms are of high quality supported synthetic rubber compounds.

The 325 Series regulators are suitable for multi-poise mounting. But when using the vent limiting device, the regulator (325-3, 325-5A) must be mounted in a horizontal upright position for best performance. Install the regulator properly with gas flowing as indicated by the arrow on the casting.

These regulators provide no downstream over-pressure protection in the event of failure. At supply pressures in excess of 2 psi they should not be used unless downstream appliance controls are rated for supply pressure or protected by some other means. Consult Maxitrol Company for additional assistance.

** CSA design certified*

Capacities and Pressure Drop

PRESSURE DROP - 0.64 sp gr gas expressed in CFH (m^3/h)

Model Number	7.0" w.c. (17 mbar)	1/2 psi (34 mbar)	3/4 psi (52 mbar)	1 psi (69 mbar)	2 psi (138 mbar)
325-3	145 (4.0)	204 (5.8)	250 (7.0)	289 (8.2)	-
325-5A	338 (9.6)	476 (13.5)	583 (16.5)	673 (19.1)	-
325-7	690 (19.5)	972 (27.6)	1191 (33.8)	1375 (39.0)	1975 (55.9)

CAPACITIES - based on 1" w.c. pressure droop, from set point[♦]. 0.64 sp gr gas expressed in CFH (m^3/h).

Model Number	Outlet Pressure Set Point	Operating Inlet Pressure					
		1/2 psi (34 mbar)	3/4 psi (52 mbar)	1 psi (69 mbar)	2 psi (138 mbar)	5 psi (345 mbar)	10 psi (690 mbar)
325-3*	4.0" w.c.	160 (4.5)	190 (5.4)	220 (6.2)	220 (6.2)	300 (8.5)	320 (9.1)
	7.0" w.c.	120 (3.4)	150 (4.2)	180 (5.1)	220 (6.2)	290 (8.2)	320 (9.1)
	10.0" w.c.	100 (2.8)	120 (3.4)	150 (4.2)	220 (6.2)	280 (7.9)	320 (9.1)
325-5A*	4.0" w.c.	300 (8.5)	340 (9.6)	416 (11.8)	500 (14.2)	600 (17.0)	680 (19.3)
	7.0" w.c.	245 (6.9)	315 (8.9)	340 (9.6)	480 (13.6)	600 (17.0)	680 (19.3)
	10.0" w.c.	225 (6.4)	270 (7.6)	312 (8.8)	430 (12.2	560 (15.9)	680 (19.3)
325-7	4.0" w.c.	670 (19.0)	900 (25.5)	1050 (29.7)	1450 (41.1)	1750 (49.6)	2000 (56.6)
	7.0" w.c.	590 (16.7)	760 (21.5	900 (25.5)	1250 (35.4)	1750 (49.6)	2000 (56.6)
	10.0" w.c.	470 (13.3)	650 (18.4)	800 (22.7)	1250 (35.4)	1750 (49.6)	2000 (56.6)

*NOTE: CSA maximum approved capacity for 325-3 is 150 CFH (4.2 m^3/h). 300 CFH (8.5 m^3/h) for the 325-5.
Approval based on use as an appliance regulator. ♦ Set points (in CFH): 325-3 = 50, 325-5A = 150, 325-7 = 500.

Sizing Instructions

Occasionally 325 Series regulators are used on 2 psig piping systems - oftentimes the 2 psig residential systems are sized with a 1-1/2 psi pressure drop through the copper or stainless steel tubing. This means there will be 2 psi at the inlet of the regulator under no flow conditions, and 1/2 psi at the regulator inlet under maximum flow conditions.

To select a 325 series appliance regulator of ample flow - one must know:

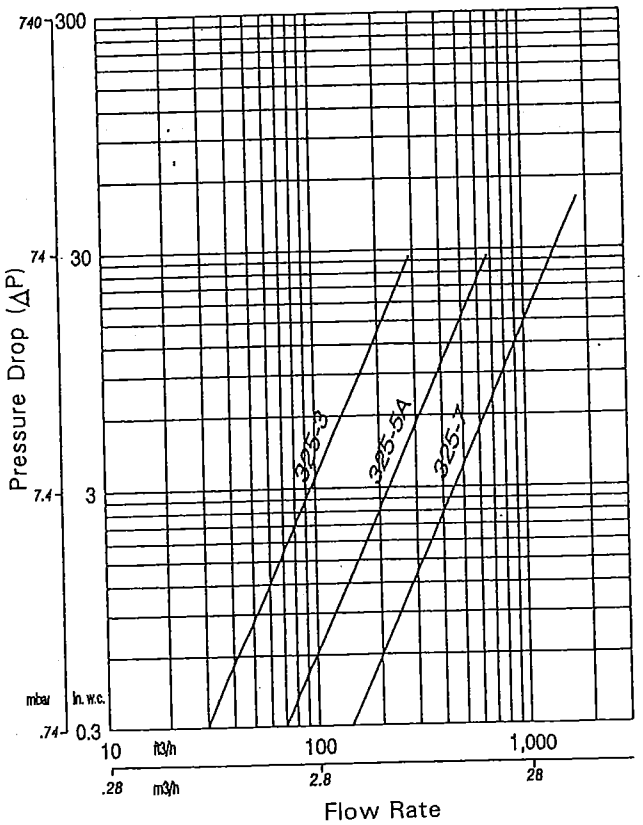
1. Available inlet pressure (maximum static/minimum operating)
2. Desired outlet pressure.
3. Required maximum flow rate.
4. Pipe size.

Example: To select a 325 series regulator of ample capacity to handle flow. . .

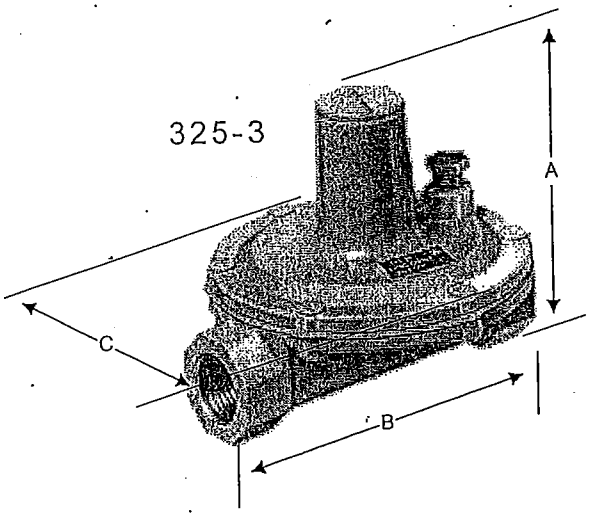
KNOWN:
Desired flow rate 145 CFH; pipe size 1/2"; operating inlet pressure 2 psi; outlet pressure 7" w.c.; lockup required.

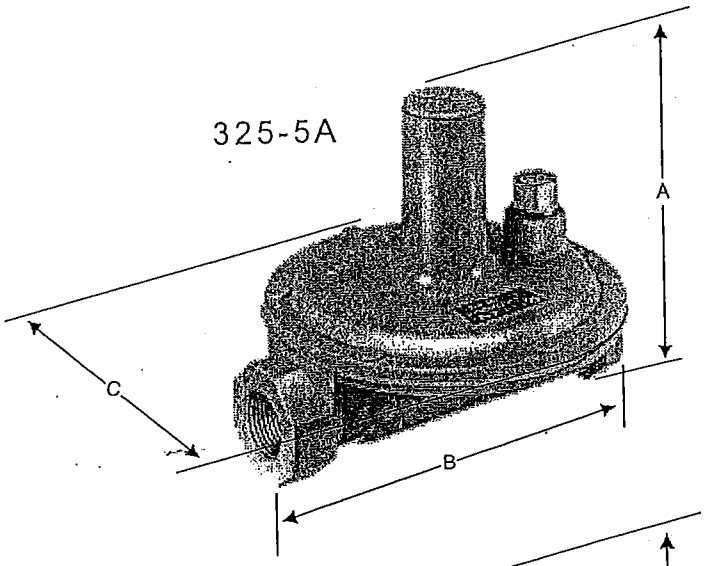
SOLUTION:
Check pressure drop chart above - the 325-3's pressure drop at a flow rate of 145 CFH is 7" w.c. - well below the available differential of 1.75 psi. The 325-3 (1/2") used with a 4" to 12" spring, set at 7", is the correct regulator to use for this application.

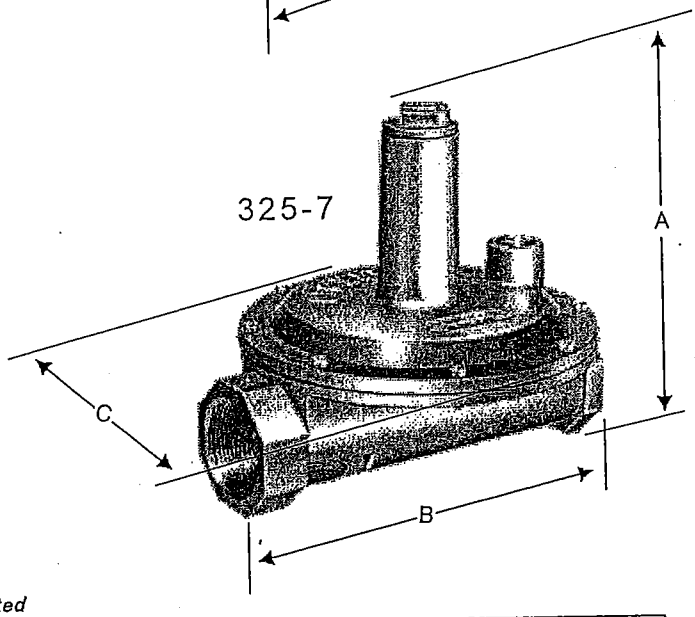
Pressure Drop Chart



Dimensions and Spring Ranges







DIMENSIONS - inches (millimeters)

Model Number	Pipe Size*	Swing Radius	Call-Outs A	B	C
325-3	3/8 x 3/8 1/2 x 1/2	3 (76)	3 1/2 (89)	4 1/4 (108)	3 7/8 (98)
325-5A	1/2 x 1/2 3/4 x 3/4 1 x1	4 7/8 (124)	5 1/4 (133)	5 7/8 (149)	5 7/16 (138)
325-7	1 1/4 x 1 1/4 1 1/2 x 1 1/2	6 1/8 (156)	7 1/4 (184)	8 (203)	7 (178)

* standard models NPT, 'M' models available with BSP threads

SPRING SELECTION CHART - inches w.c. (mbar) unless noted

Model Number	Standard Spring	CSA Certified 2 psi (138 mbar)		CSA Certified 5 psi (345 mbar)		Other Springs Available			
325-3	4 to 12 (10 to 30)	5 - 9 (12.5 -22.5)	7 - 11 (17 - 27)	6 - 10 (15 - 25)	7 - 11 (17 - 27)	2 - 6 (5 - 15)	10 - 22 (25 - 55)	15 - 30 (37 - 75)	1 - 2 psi (69 - 139)
325-5A	4 to 12 (10 to 30)	5 - 9 (12.5 - 22.5)	7 - 11 (17 - 27)	6 - 10 (15 - 25)	7 - 11 (17 - 27)	2 - 6 (5 - 15)	10 - 22 (25 - 55)	15 - 30 (37 - 75)	1 - 2 psi (69 - 139)
325-7	4 to 12 (10 to 30)	-	-	-	-	2 - 5 (5 - 12)	10 - 22 (25 - 55)	15 - 30 (37 - 75)	20 - 42 (50 - 104)

MAXITROL® company

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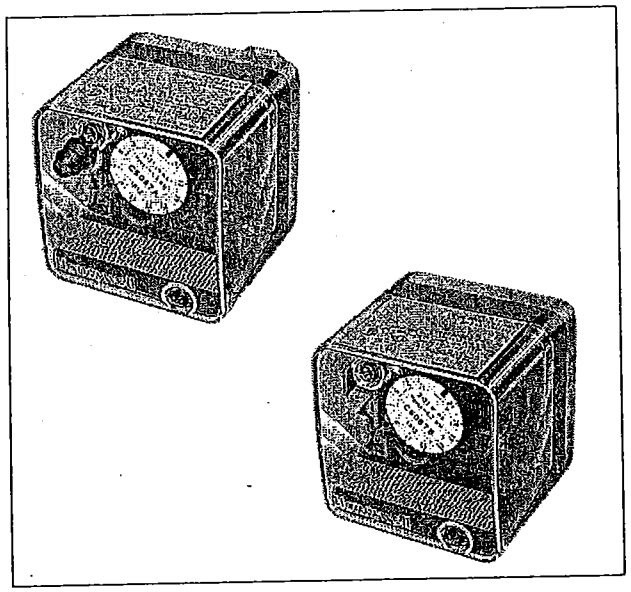
Honeywell

C6097A,B Pressure Switches

PRODUCT DATA



APPLICATION

The C6097 Pressure Switches are safety devices used in positive-pressure or differential-pressure systems to sense gas or air pressure changes.

FEATURES

- For use with natural gas, liquid propane (LP) gas, or air.
- Diaphragm-actuated safety-limit switch.
- Switch can be wired to turn on alarm.
- C6097A models break control circuit at setpoint on pressure fall.
- C6097B models break control circuit at setpoint on pressure rise.
- Lockout with manual reset and recycle options.
- Lockout models have external manual reset button.
- Removable transparent cover protects scaleplate and adjusting knob.
- Pipe tappings allow selection of positive pressure, differential pressure (air only) or venting connections (NPT mount only).
- 1/4 in. NPT or flange mount models for direct mounting to Honeywell Integrated Valve Train.
- Optional switch position indicator lamp available.
- IP54 enclosure standard.
- Ranges: 0.4 to 5 in. wc, 3 to 21 in. wc, 12 to 60 in. wc or 1.5 to 7 psi.
- Surge orifice.

Contents

65-0237-2

SPECIFICATIONS

Models:
C6097A Pressure Switch: Breaks a circuit when pressure falls to scale setting. See Table 1.
C6097B Pressure Switch: Breaks a circuit when pressure rises to scale setting. See Table 1.
Table 2 shows switch ratings and Table 3 shows alternate electrical ratings when used with Honeywell Flame Safeguard Programmers.

Minimum Ambient Temperature: -40°F (-40°C).

Maximum Ambient Temperature: 140°F (60°C).

Connections (Depending on Model):
1/4-18 NPT tapping for main or high-pressure connection.
1/8-27 NPT tapping for vent or low-pressure connection (air only).
Flange mount for connection to Honeywell Integrated Valve Train (internal vent only, no external connections).

Scale Range:
0.4 to 5 in. wc (0.10 kPa to 1.25 kPa).
3 to 21 in. wc (0.75 to 5.23 kPa).
12 to 60 in. wc (3.0 kPa to 15 kPa).
1.5 to 7 psi (10.3 kPa to 48 kPa).

Approvals:
Underwriters Laboratories Inc. listed.
Canadian Standards Association listed.
Factory Mutual: Approved.
Industrial Risk Insurers: Acceptable.
CSD-1 AFB: Acceptable.

Accessories:
32003041-001 C6097 Cover for manual reset models.
32003040-001 C6097 Cover for recycle models.
32003039-001 Position Indication Lamp Kit.

Dimensions: See Fig. 1 and 2.

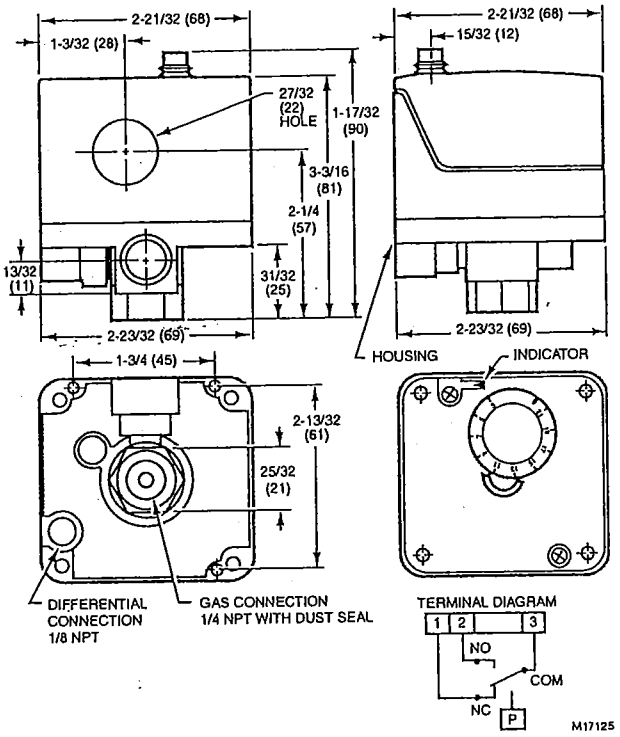


Fig. 1. C6097 1/4 in. NPT Mount dimensions in in. (mm).

ORDERING INFORMATION

When purchasing replacement and modernization products from your TRADELINE® wholesaler or distributor, refer to the TRADELINE® Catalog or price sheets for complete ordering number.

If you have additional questions, need further information, or would like to comment on our products or services, please write or phone:

1. Your local Home and Building Control Sales Office (check white pages of your phone directory).
2. Home and Building Control Customer Relations
   Honeywell, 1885 Douglas Drive North
   Minneapolis, Minnesota 55422-4386 (800) 328-5111

Canada—Honeywell Limited/Honeywell Limitée, 35 Dynamic Drive, Scarborough, Ontario M1V 4Z9.
International Sales and Service Offices in all principal cities of the world. Manufacturing in Australia, Canada, Finland, France, Germany, Japan, Mexico, Netherlands, Spain, Taiwan, United Kingdom, U.S.A.

Table 1. Pressure Switch Model Selection.

Model	Operating Pressure Range	Manual Reset Differential		Non-Manual Reset Differential		Differential Type	Maximum Rated Pressure (continuous) (psi)	Manual Reset	Media[a]	Switch Action at Setpoint	Comments
		Maximum at Minimum Setpoint	Maximum at Maximum Setpoint	Nominal	Maximum						
C6097A1004	0.4 to 5 in. wc	—	—	0.16 in. wc	0.24 in. wc	Additive	2.9	No	Air/Gas	Breaks N.O. to C. connection on pressure fall.	1/4 in. NPT Mount
C6097A1012	3 to 21 in. wc	2.4 in. wc	4.2 in. wc	—	—		5.0	Yes	Air/Gas		1/4 in. NPT Mount
C6097A1020	3 to 21 in. wc	2.4 in. wc	4.2 in. wc	—	—		5.0	Yes	Air/Gas		Flange Mount
C6097A1038	12 to 60 in. wc	10 in. wc	12 in. wc	—	—		5.0	Yes	Air/Gas		1/4 in. NPT Mount
C6097A1046	12 to 60 in. wc	10 in. wc	12 in. wc	—	—		5.0	Yes	Air/Gas		Flange Mount
C6097A1053	3 to 21 in. wc	—		0.24 in. wc	0.48 in. wc		5.0	No	Air/Gas		1/4 in. NPT Mount
C6097A1061	3 to 21 in. wc	—	—	0.24 in. wc	0.48 in. wc		5.0	No	Air/Gas		Flange Mount
C6097A1079	12 to 60 in. wc	—	—	1.1 in. wc	2.4 in. wc		5.0	No	Air/Gas		1/4 in. NPT Mount
C6097A1087	12 to 60 in. wc	—	—	1.1 in. wc	2.4 in. wc		5.0	No	Air/Gas		Flange Mount
C6097A1095	0.4 to 5 in. wc	0.6 in. wc	1.0 in. wc	—	—		2.9	Yes	Air/Gas		1/4 in. NPT Mount
C6097A1103	1.5 to 7 psi	1.1 psi	1.4 psi	—	—		9.3	Yes	Air/Gas		Flange Mount
C6097A1111	1.5 to 7 psi	1.1 psi	1.4 psi	—	—		9.3	Yes	Air/Gas		14 in. NPT Mount
C6097A1129	1.5 to 7 psi	—	—	0.1 psi	0.3		9.3	No	Air/Gas		Flange Mount
C6097A1137	1.5 to 7 psi	—	—	0.1 psi	0.3		9.3	No	Air/Gas		1/4 in. NPT Mount
C6097A1210	0.4 to 5 in. wc	—	—	0.16 in. wc	0.24 in. wc		2.9	No	Air/Gas		Flange Mount
C6097A1228	0.4 to 5 in. wc	—	—	—	—		2.9	Yes	Air/Gas		Flange Mount
C6097B1002	12 to 60 in. wc	10 in. wc	12 in. wc	—	—	Subtractive	5.0	Yes	Air/Gas	Breaks N.C. to C. connection on pressure rise.	1/4 in. NPT Mount
C6097B1010	12 to 60 in. wc	10 in. wc	12 in. wc	—	—		5.0	Yes	Air/Gas		Flange Mount
C6097B1028	3 to 21 in. wc	2.4 in. wc	4.2 in. wc	—	—		5.0	Yes	Air/Gas		1/4 in. NPT Mount
C6097B1036	3 to 21 in. wc	2.4 in. wc	4.2 in. wc	—	—		5.0	Yes	Air/Gas		Flange Mount
C6097B1044	1.5 to 7 psi	1.1 psi	1.4 psi	—	—		9.3	Yes	Air/Gas		Flange Mount
C6097B1051	1.5 to 7 psi	1.1 psi	1.4 psi	—	—		9.3	Yes	Air/Gas		1/4 in. NPT Mount
C6097B1069	3 to 21 in. wc	—	—	0.24 in. wc	0.48 in. wc		5.0	No	Air/Gas		Flange Mount
C6097B1077	12 to 60 in. wc	—	—	1.1 in. wc	2.4 in. wc		5.0	No	Air/Gas		Flange Mount
C6097B1085	12 to 60 in. wc	—	—	1.1 in. wc	2.4 in. wc		5.0	No	Air/Gas		1/4 in. NPT Mount
C6097B1093	1.5 to 7 psi	—	—	0.1 psi	0.3 psi		9.3	No	Air/Gas		Flange Mount
C6097B1101	1.5 to 7 psi	—	—	0.1 psi	0.3 psi		9.3	No	Air/Gas		1/4 in. NPT Mount
C6097B1119	3 to 21 in. wc	—	—	0.24 in. wc	0.48 in. wc		5.0	No	Air/Gas		1/4 in. NPT Mount

[a] Acceptable media: Natural gas, liquid propane (LP) gas, and air.

Table 2. Switch Ratings (Amperes).

120/240 Vac, 50/60 Hz		
Inductive	Full Load	3.0
	Locked Rotor	18.0
Resistive		5.0

Table 3. Alternate Electrical Ratings when used with Honeywell Flame Safeguard Programmers.

Device	Rating
Ignition Transformer	540 VA
Pilot Valve	50 VA
Main Valve	400 VA with 2-1/2 times inrush.

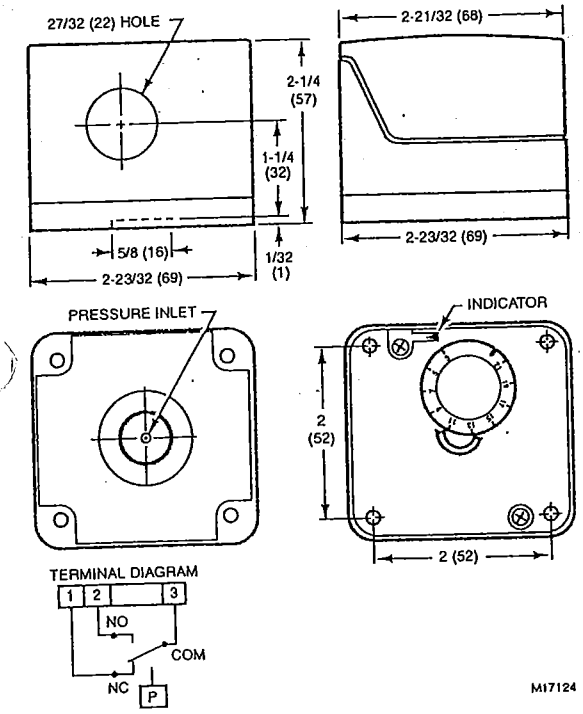


Fig. 2. C6097 Flange Mount dimensions in In. (mm).

INSTALLATION

⚠ WARNING

Explosion or Fire Hazard.
Can cause severe personal injury, death or property damage.
Observe all safety requirements each time a control is installed on a burner.

When Installing this Product...

1. Read these instructions carefully. Failure to follow them can damage the product or cause a hazardous condition.
2. Check the ratings given in the instructions and on the product to make sure that the product is suitable for your application.
3. Installer must be a trained, experienced service technician.
4. After installation is completed, check out product operation as provided in these instructions.

⚠ WARNING

Electrical Shock Hazard.
Can cause serious personal injury or death.
Disconnect power supply before beginning installation. More than one disconnection can be involved.

Mounting

NOTE: On flange models, remove the label holding the O-ring in place and make sure O-ring seal is in place before mounting the pressure switch on the valve.

The C6097 models allow NPT or flange (directly to valve) mounting. The NPT models have a hexagonal fitting with a 1/4 in. NPT tapping, which is the high pressure connection, in differential applications. The bleed fitting is 1/8 in. NPT tapped. In differential pressure control applications using air only, connect the lower pressure to the bleed fitting. See Fig. 1 and Table 1. In applications using combustible gases, vent the bleed tapping according to applicable standard code or jurisdictional authority.

C6097 models with flange mount can be fitted directly to Honeywell Integrated Valve Train (model specific). See Fig. 2 and Table 1. The flange mount models vent internally, with no external tap.

Mount the C6097A,B in any position.

Leak Check

After installation, perform a leak check on the pressure switch:

1. Turn on main gas. Make sure gas has reached the pressure switch (e.g., high gas pressure switch)
2. Check installation for gas leaks using a gas leak detector or a soap solution.

WIRING

⚠ WARNING

Electrical Shock Hazard.
Can cause serious personal injury or death.
Disconnect power supply before beginning installation.
More than one disconnection can be involved.

Make sure that all wiring agrees with all applicable local codes, ordinances and regulations. An opening is provided to accommodate rigid conduit or armored cable for line voltage operation (see Fig. 3 and 4). Do not overload the switch contacts (see Switch Ratings in the Specifications section). The switching schematic is shown in Fig. 5.

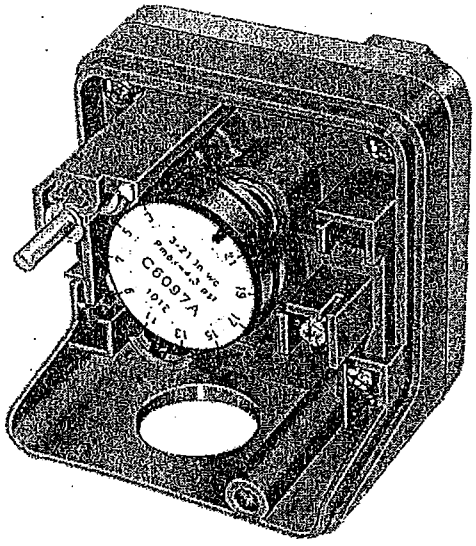


Fig. 3. C6097 (manual reset switch model) with cover removed.

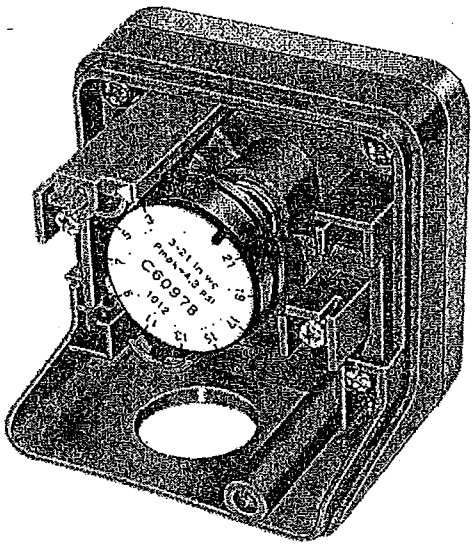
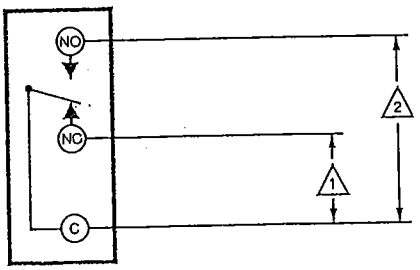


Fig. 4. C6097 (recycle model) with cover removed.

SETTINGS AND ADJUSTMENTS

Pressure Setpoint Adjustment

To adjust the pressure setting, turn the setpoint adjustment dial (Fig. 3, 4 and 5) clockwise ↷ to increase the pressure setting and counterclockwise ↶ to decrease the pressure setting.



1 C6097A BREAKS C-NO, MAKES C-NC ON PRESSURE FALL. MANUAL RESET MODELS LOCK OUT.

2 C6097B BREAKS C-NC, MAKES C-NO ON PRESSURE RISE AND LOCKS OUT.

M17123

Fig. 5. C6097 schematic.

OPERATION AND CHECKOUT

Operation

The manual reset C6097A diaphragm actuates the snap-acting switch to break a control circuit and lock out when pressure falls to the scale setting. The recycle C6097A models recycle automatically when the control circuit returns to scale setting plus differential.

The manual reset C6097B diaphragm actuates the snap-acting switch that breaks a control circuit and locks out when the pressure rises to the scale setting. The recycle C6097B models recycle automatically when the control pressure falls to the scale setting minus differential.

Manual Resetting

The C6097A manual reset models lock out when pressure falls to the scale setting and require manual resetting after the pressure rises to scale setting plus differential to resume normal operation.

The C6097B manual reset models lock out when pressure rises to the scale setting and require manual resetting after the pressure falls to scale setting minus the differential to resume normal operation.

To reset, once normal operating pressure is restored, push the reset button in as far as it goes, then release.

IMPORTANT

Lockout models cannot be made to recycle automatically by permanently holding in the reset lever.

Checkout

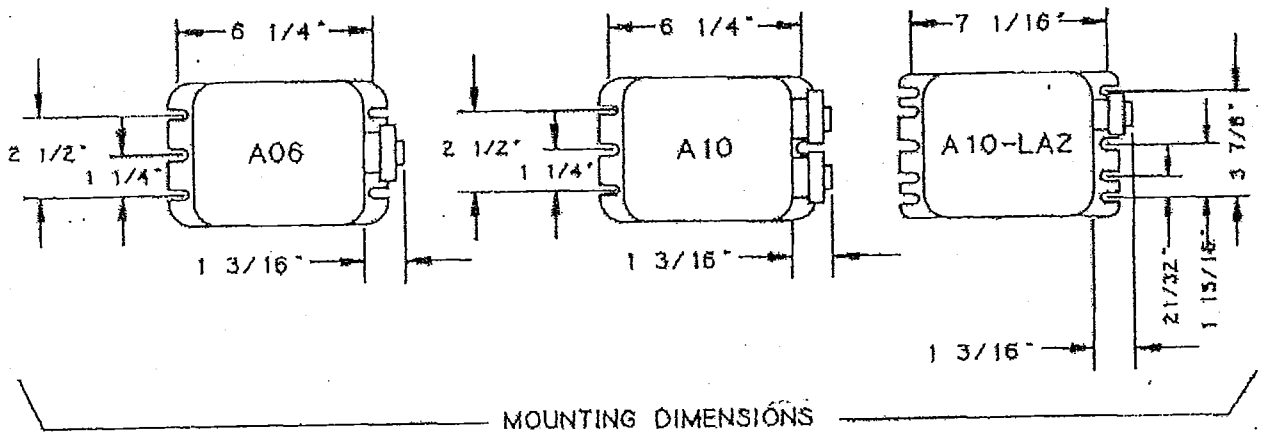
C6097 Gas Fuel Application

1. Set cutoff pressure.
2. Open main supply line. Depress reset lever on lockout models until switch makes control circuit.
3. Set controller and limit switch to call for heat.
4. For C6097A: Close the manual gas shutoff valve. C6097 should open control circuit when pressure reaches cutoff point.
   For C6097B: Open the manual gas shutoff valve, wait a few minutes for the pressure to rise; then lower the scale setting until the switch breaks control circuit and locks out.
5. For C6097A: Open the shutoff valve, return the pressure switch to its original setting and press the reset button (if necessary).
   For C6097B: raise setting to normal and press reset button (if necessary).
6. Allow system to operate through at least one complete cycle to make sure all components are functioning properly.

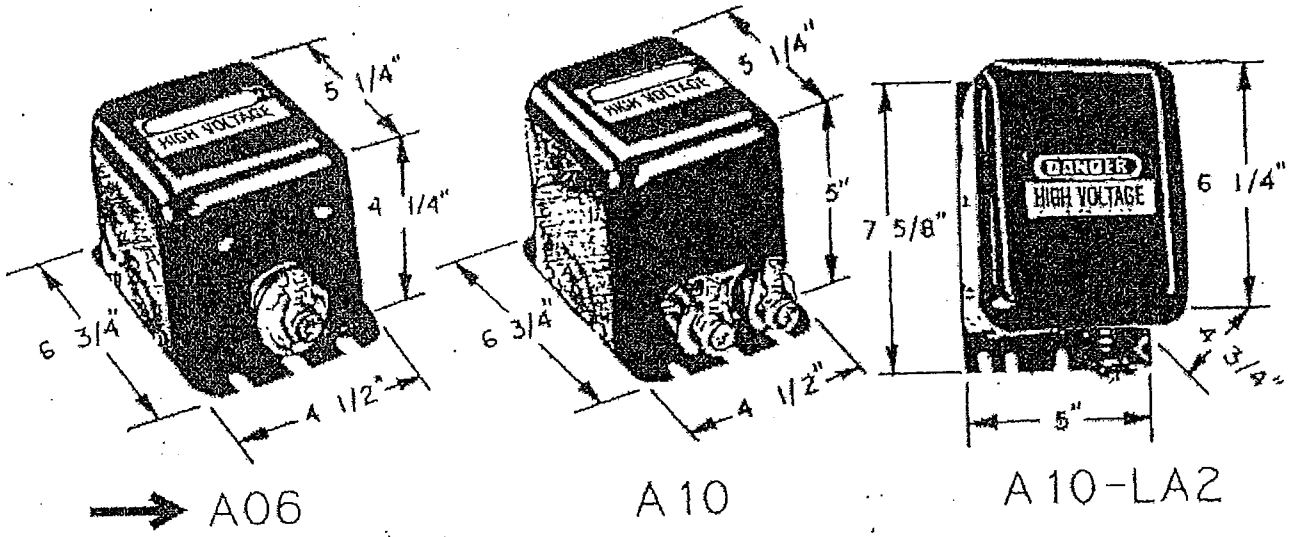
C6097A Air Application

1. Set cutoff pressure.
2. Turn on fan.
3. Block fan inlet or filter area. Switch should break control circuit when pressure drops to cutoff point. Manual reset models lock out.
4. Remove obstruction. Press reset lever (manual reset models) and allow system to operate through at least one complete cycle to be sure all components are functioning properly.

SPEC - IGN TRANS



MOUNTING DIMENSIONS



→ A06 A10 A10-LA2

* FROM HIGH VOLTAGE TERMINAL TO CASE GROUND.

IGNITION TRANSFORMERS	→ A06	A10	A10-LA2
PRIMARY VOLTAGE	115V. 60HZ.	115V. 60HZ.	115V. 60HZ.
SECONDARY VOLTAGE	1 - 6000V. - TAP*	2 - 5000V.-TAPS*	1 - 10000V.-TAP*
POWER CONSUMPTION	175VA.	250VA.	250VA.
MAXIMUM TEMPERATURE	120°F	120°F	120°F
MAXIMUM SPARK GAP	1/16"	1/16"	1/8"
DIMENSIONS	6 3/4HX4 1/2WX4 1/4D	6 3/4HX4 1/2WX 5D	7 5/8HX 5WX4 3/4D

PROTECTION CONTROLS, INC.

NOTE:
IGNITION SYSTEMS SHALL NOT BE USED IN LIEU OF COMBUSTION SAFEGUARDS.

INSTALLATION, OPERATION AND MAINTENANCE SHALL CONFORM WITH NATIONAL FIRE PROTECTION ASSOCIATION STANDARDS, NATIONAL AND LOCAL CODES, AND AUTHORITIES HAVING JURISDICTION. ANY MODIFICATION VOIDS APPROVALS.

PRINTED IN USA 10-98

PROTECTION CONTROLS, INC.
SKOKIE, ILLINOIS

PROTECTOFIER

FORM 7256

WIRINGDIAGRAMS

FORM 7256-AH DRAWING X-340

FORM 7256-BH DRAWING X-341

FORM 7256-BNRH DRAWING X-342

FORM 7256-BT-*NRH DRAWING X-343

PROTECTOFIER

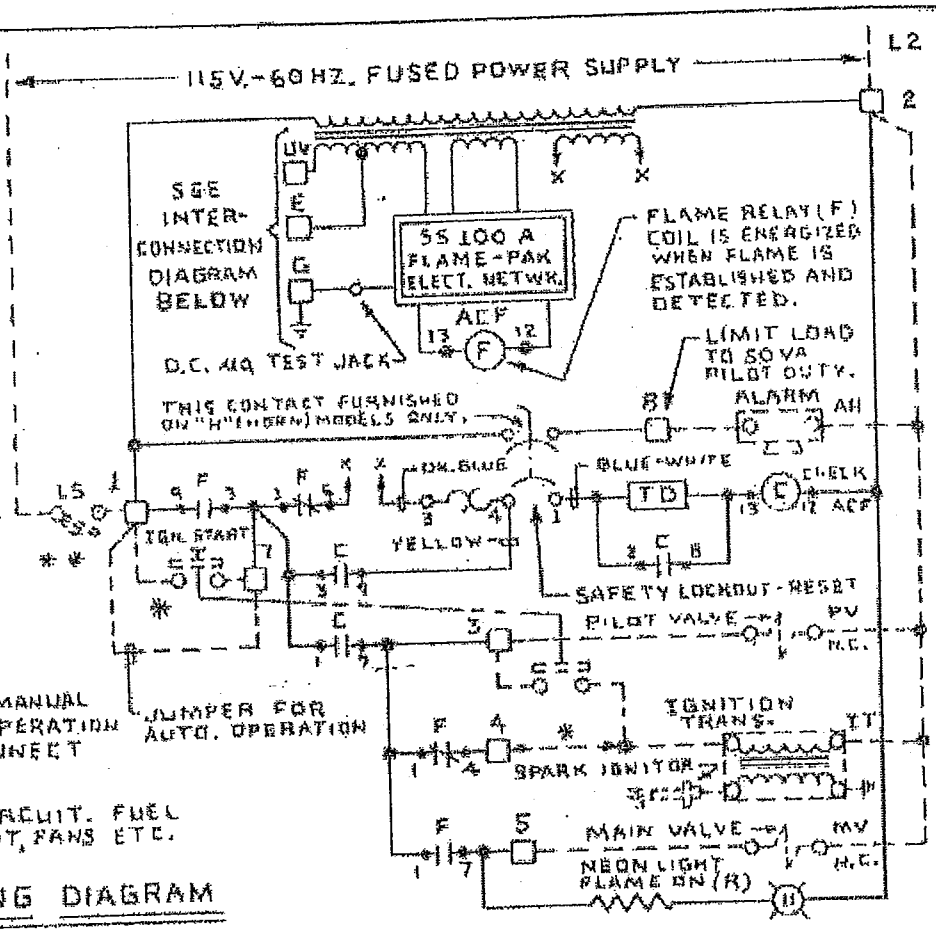
AUTO/MANUAL OPERATION

S5100A FLAME-PAK
ACF { C - CHECK RELAY
F - FLAME RELAY

SINGLE BURNER PROTECTOFIER (FORM 7256-BH)

NO CONNECTION

——— INTERNAL WIRING.
- - - - EXTERNAL WIRING.



* PUSHBUTTON SHOWN FOR MANUAL START, FOR AUTOMATIC OPERATION OMIT PUSHBUTTON AND CONNECT JUMPERS AS INDICATED.

** SAFETY INTLK. SERIES CIRCUIT. FUEL AND AIR PRESS. SWS., VENT FANS ETC. AS REQUIRED.

WIRING DIAGRAM

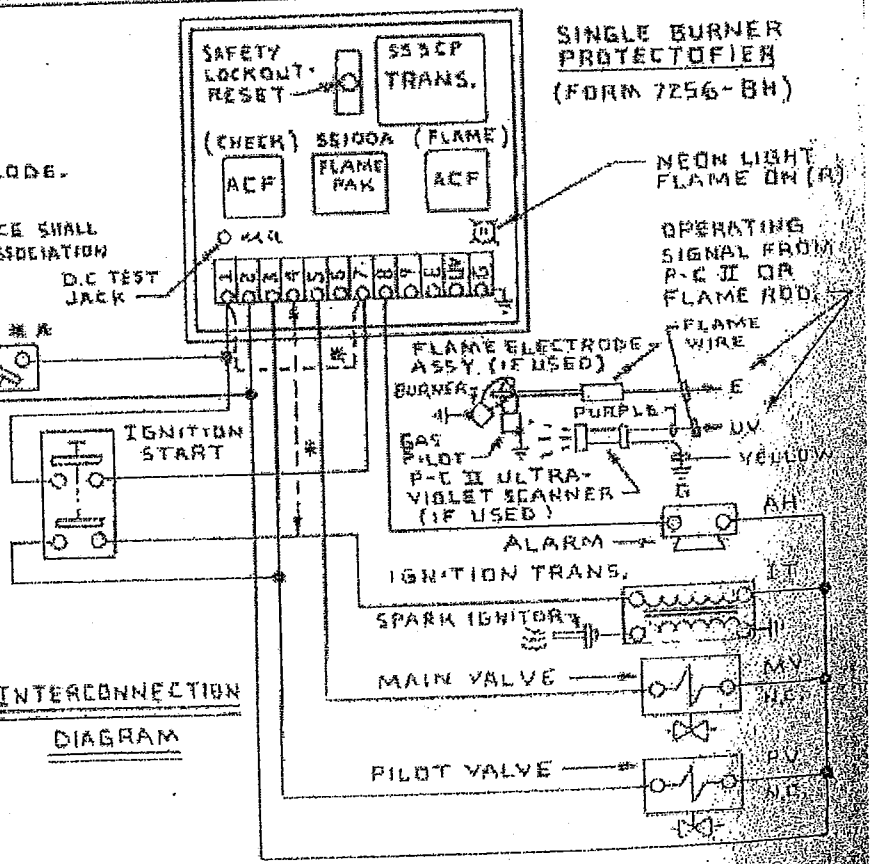
NOTES:
FLAME WIRE TO BE NO 14 TYPE TW 600V. INSULATED WIRE OR EQUAL. FLAME WIRE MUST NOT BE IN SAME CONDUITS WITH POWER WIRING.

IGNITION CABLE MUST BE RUN IN SEPARATE CONDUIT TO SPARK ELECTRODE. (DO NOT MIX WITH 115 V. WIRING.)

INSTALLATION, OPERATION AND MAINTENANCE SHALL CONFORM WITH NATIONAL FIRE PROTECTION ASSOCIATION STANDARDS, NATIONAL AND LOCAL CODES AND AUTHORITIES HAVING JURISDICTION. ANY MODIFICATION VOIDS APPROVALS.

115V.-60HZ. FUSED POWER SUPPLY

NOTES:
OPEN TYPE CONTROL SHOWN. LETTER SUFFIX "E" AFTER FORM NUMBER INDICATES ENCLOSED MODEL. LETTER SUFFIX "H" IN FORM NUMBER INDICATES PROTECTOFIER PROVIDED WITH CONTACT FOR FLAME FAILURE ALARM (SHOWN), STANDARD TRIAL FOR IGNITION PERIOD IS 15 SEC., SUFFIX "5" FOLLOWING LETTER "B" INDICATES 5 SEC. TRIAL FOR IGNITION PERIOD.



INTERCONNECTION DIAGRAM

PROTECTION CONTROLS, INC.
SKOKIE, ILLINOIS

WIRING DIAGRAM FOR:
PROTECTOFIER FORM 7256-BH

JOB NO.	DRAWN BY	DATE	DRWNG NO.
TR	[illegible]	1-26-88	X-341

REDRAWN 1-26-88

PROTECTION CONTROLS INC.
Skokie, Illinois

PROTECTOFIER
Form 7256 BH
(Drawing X-341)

Single Burner Supervision, Automatic or Manual Pushbutton Ignition, Plug-in Type SS100A FLAME PAK, Plug-in Type Control Relays.

OPERATING SEQUENCE

AUTOMATIC IGNITION

Provide wire jumper between terminal 1 and terminal 7 on PROTECTOFIER connect ignition transformer to PROTECTOFIER terminal 4.

Power on PROTECTOFIER terminal 1 and 2 provide power to electronic network (thru safety and cycling limit switch circuits).

1 - "ACF" CHECK relay "C" is energized thru N.C. contacts of "ACF" FLAME relay "F", SAFETY LOCKOUT switch circuit and component check "TD" circuit.

2 - Ignition transformer is energized from terminal 4 (thru N.C. contact of FLAME relay "F") to provide electric spark ignition to the pilot. Pilot solenoid valve is energized from terminal 3.

3 - With pilot flame established "ACF" FLAME relay "F" is energized.

a) FLAME relay "F" contacts transfer.

1) N.C. "F" contact in safe-start checking and SAFETY LOCKOUT circuit opens.

2) N.C. "F" contact in ignition transformer circuit opens to de-energize the ignition transformer.

3) N.O. "F" contact in main valve circuit closes to energize main valve. Neon indicator light on PROTECTOFIER chassis will glow to indicate flame is established.

MANUAL PUSHBUTTON IGNITION

No jumper required between terminal 1 and terminal 7 on PROTECTOFIER. Use momentary type pushbutton with two normally open contacts. Connect one set of normally open contacts between terminal 1 and 7. Connect other set of normally open contacts between terminal 3 and ignition transformer primary.

Power on PROTECTOFIER terminal 1 (thru safety and cycling limit switch circuits).

1 - Press and hold START button.

a) "ACF" CHECK relay "C" is energized thru N.C. contacts of "ACF" FLAME relay "F", SAFETY LOCKOUT switch circuit and component check "TD" circuit.

b) Ignition transformer is energized thru contact of START button to provide spark ignition to the pilot. Pilot solenoid valve is energized from terminal 3.

2 - With pilot flame established "ACF" FLAME relay "F" is energized.

a) FLAME relay "F" contacts transfer.
   1) N.C. "F" contact in safe-start checking and SAFETY LOCKOUT circuit opens.
   2) N.O. "F" contact between terminal 1 and terminal 7 closes providing holding circuit around START pushbutton contact.
   3) N.O. "F" contact in main valve circuit closes to energize main valve. Neon indicator light on PROTECTOFIER chassis will glow to indicate flame is established.

3 - Release START button. Ignition transformer is de-energized.

Failure to establish pilot flame during limited ignition trial cycle will cause SAFETY LOCKOUT switch contacts to open circuit to CHECK relay "C" coil. CHECK relay "C" is de-energized, pilot valve is de-energized and eletric ignition is stopped. With no flame signal, main valve remains de-energized.

SAFETY LOCKOUT requires manual reset.

Flame failure during operation shuts off fuel supply by de-energizing fuel valves. Automatic ignition model will automatically make one attempt to relight. Manual pushbutton start model requires manual push-button start to relight.

Power interruption to PROTECTOFIER terminal 1 de-energizes relays and fuel valves. Resumption of power on automatic ignition model will cause PROTECTOFIER to go thru another safe-start check and relight cycle. Manual pushbutton start model requires manual pushbutton start to relight.

Failure of CHECK relay "C" to prove safe-start check will prevent opening of fuel valves and also prevent ignition.

N.O. CHECK relay contact in safe-start check circuit closes when CHECK relay "C" is energized jumpering component check "TD" circuit.

Suffix letter "H" in Form number indicates Alarm circuit option is provided. Alarm circuit will be energized when SAFETY LOCK-OUT switch trips on failure to light pilot. Alarm load to be limited to 50VA maximum. Suffix letter "P" in Form number indicates PROTECTOFIER is enclosed type.

8/28/74

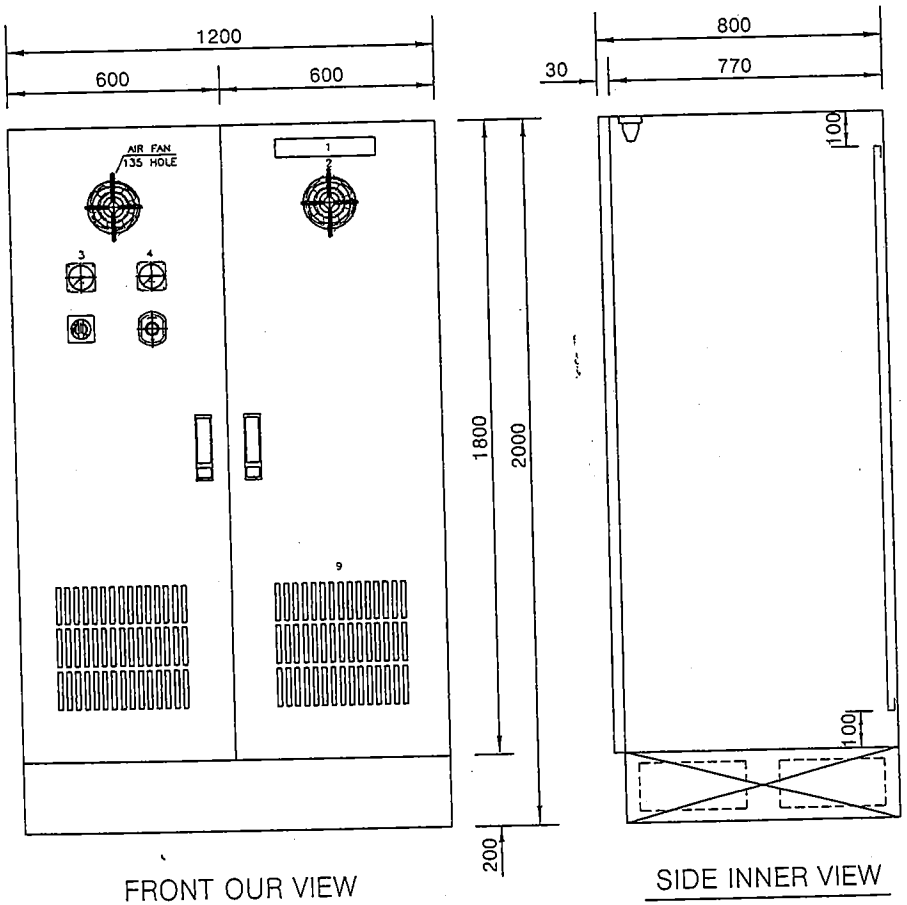
OVEN ELECTRIC CONTROL PANEL

DYFM

DONGYANG DYNAMICS

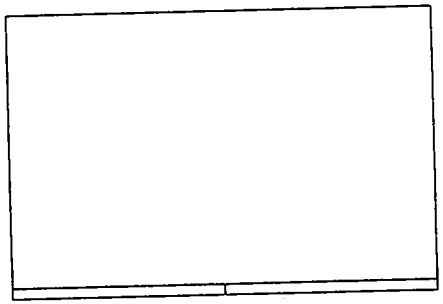
Operator should read this manual before start-up system to prevent accident or injury person.

DWG NO	DYE0802031

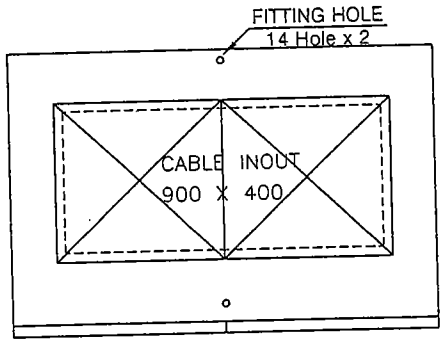


FRONT OUR VIEW

SIDE INNER VIEW



TOP OUR VIEW



BASE INNER VIEW

* NOTE *

1. LEGEND

No.	LOGO	DESCRIPTION
1	–	NAME PLATE
2	–FAN	VENTILATION FAN
3	–V1	VOLT–METER
4	–A1	AMP'–METER
5	–DP	DISPLAY
6	–PL1	POWER LAMP W/RED
7	–KE1	POWER KET SWITCH "OFF – ON"
8	–EM	EMERGENCY
9	–	VENTILATION
10	–	–
11	–	–
12	–	–
13	–	–
14	–	–
15	–	–
16	–	–
17	–	–
18	–	–
19	–	–

2. PAINT COLOR : MUNSELL No. 5 Y 7/1–METAL
3. CUBICLE : INDOOR, SELF MOUNTING, IP41
4. THICKNESS FRANE : 2.3t
   FRONT DOOR : 2.3t
   REAR : 2.3t BASE : 5t
5. CUTTING HOLE
   2 : 135 Hole
   3, 4 : 66Hole (80X80)
   5 : 292 x 227
   6~8 : 30 Hole

DO [illegible] YANG FOOD MACHINERY CO.,LTD	FINISH	DATE	08.08.11	QUANTITY		MATE.		DRAWING NAME	POTATO CHIP
		FILE NO		DESIGN	Y.S.CHOI	SCALE	n/s	DRAWING NO	DYE0802031

DWG NO	DYE080201

NO.	TITLE	DRAWING NO.	REMARKS
1	COVER	DYE080200	
2	DRAWING INDEX	DYE080201	
3	B/M LIST FOR INVERTER PANEL	DYE080202	
4	LAYOUT DIAGRAM (OUT VIEW1)	DYE0802031	
5	LAYOUT DIAGRAM (OUT VIEW2)	DYE0802032	
6	LAYOUT DIAGRAM (INNER VIEW)	DYE0802033	
7	SINGLE LINE DIAGRAM	DYE080204	
8	3 – LINE DIAGRAM (01/)	DYE080205	
9	3 – LINE DIAGRAM (02/)	DYE080206	
10	3 – LINE DIAGRAM (03/)	DYE080207	
11	3 – LINE DIAGRAM (04/)	DYE080208	
12	SCHEMATIC DIAGRAM (05/)	DYE080209	
13	SCHEMATIC DIAGRAM (06/)	DYE080210	
14	SCHEMATIC DIAGRAM (07/)	DYE080211	
15	SCHEMATIC DIAGRAM (08/)	DYE080212	
16	SCHEMATIC DIAGRAM (09/)	DYE080213	
17	SCHEMATIC DIAGRAM (10/)	DYE080214	
18	SCHEMATIC DIAGRAM (11/)	DYE080215	

NO.	TITLE	DRAWING NO.	REMARKS
19	SCHEMATIC DIAGRAM (12/)	DYE080216	
20	SCHEMATIC DIAGRAM (13/)	DYE080217	
21	SCHEMATIC DIAGRAM (14/)	DYE080218	
22	SCHEMATIC DIAGRAM (15/)	DYE080219	
23	SCHEMATIC DIAGRAM (16/)	DYE080220	
24	SCHEMATIC DIAGRAM (17/)	DYE080221	
25	SCHEMATIC DIAGRAM (18/)	DYE080222	
26	RELAY ARRANGE DIAGRAM(1/2)	DYE0802231	
27	RELAY ARRANGE DIAGRAM(2/2)	DYE0802232	
28	TERMINAL DIAGRAM (19/)	DYE080224	
29	TERMINAL DIAGRAM (20/)	DYE080225	
30	TERMINAL DIAGRAM (21/)	DYE080226	

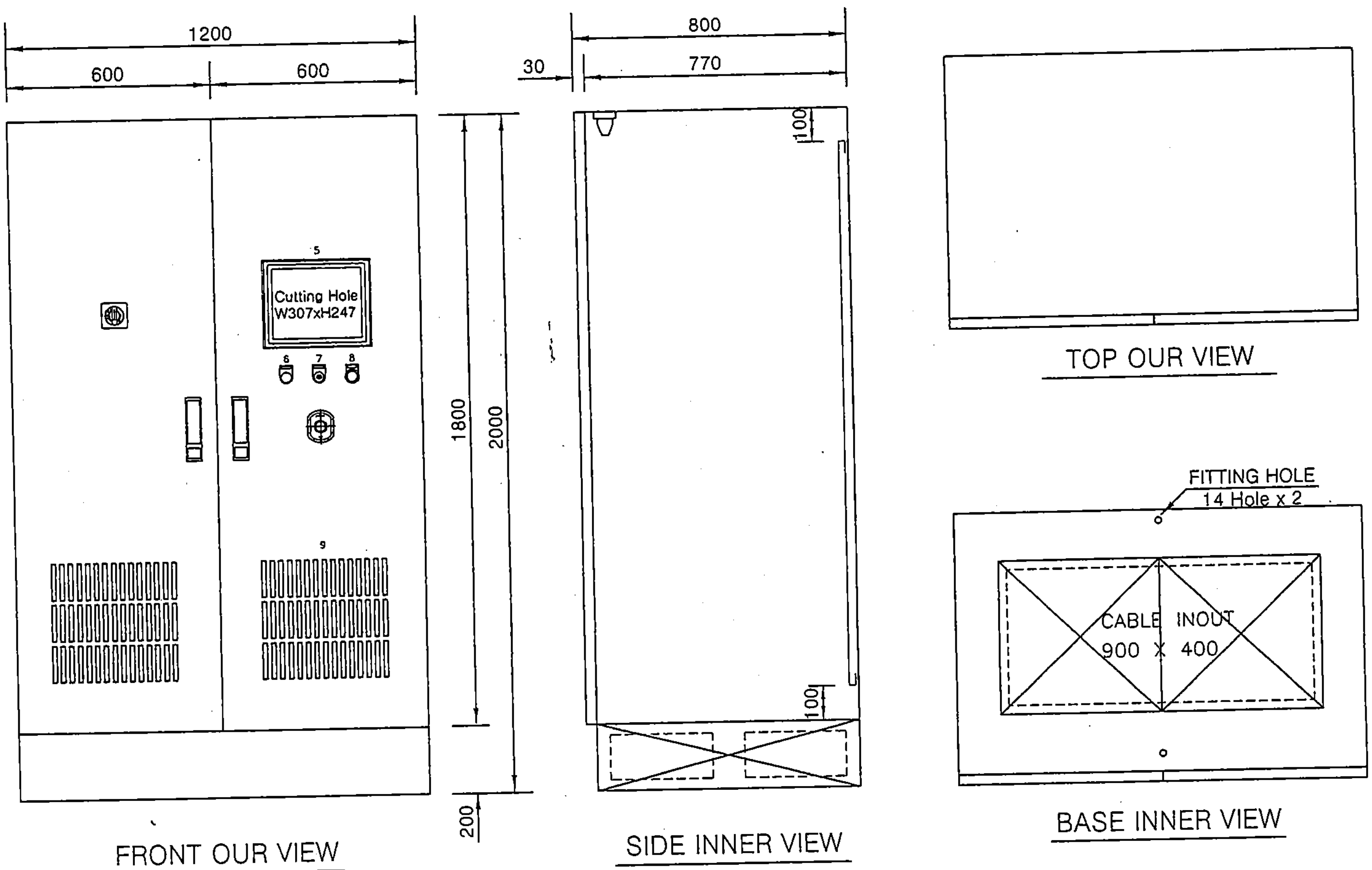
DO D[illegible] YANG FOOD MACHINERY CO.,LTD	FINISH	DATE	08.08.11	QUANTITY		MATE.		DRAWING NAME	POTATO CHIP
		FILE NO		DESIGN	Y.S.CHOI	SCALE	n/s	DRAWING NO	DYE080201

DWG NO	DYE080202

ITEM NO.	DESIGN	SPECIFICATION		MODEL	Q'TY	MAKER	REMARKS
1	-INV1 , INV4 , INV5	INVERTER UNIT	3PH, AC460V, 60Hz, 12A, rated, for 5.5Kw	VLT2855	3	DANFOSS	
2	-INV2	INVERTER UNIT	3PH, AC460V, 60Hz, 2.1A, rated, for 0.75Kw	VLT2807	1	DANFOSS	
3	-INV3 ,INV4	INVERTER UNIT	3PH, AC460V, 60Hz, 16A, rated, for 7.5Kw	VLT2875	2	DANFOSS	
4	-INV7	INVERTER UNIT	3PH, AC460V, 60Hz, 7A, rated, for 3Kw	VLT2830	1	DANFOSS	
5	-Q0	MCCB	3POLE, 60Hz, 250AF/200AT	EZC250N	1	SHUNIDER	
6	-Q1 , Q5 , Q6	MOTOR PROTECTOR	3POLE, 60Hz, 30AF/14AT	GV2ME16	3	SHUNIDER	
7	-Q2, Q7 ~ Q10, Q14, Q15	MOTOR PROTECTOR	3POLE, 60Hz, 30AF/1.8AT	GV2ME07	7	SHUNIDER	
8	-Q3 , Q4	MOTOR PROTECTOR	3POLE, 60Hz, 30AF/18AT	GV2ME20	2	SHUNIDER	
9	-MC7 ~ MC10, MC12	MAGNECTIC SWITCKH	3PH, AC110V, 60Hz, 9A rated, for 0.75KW	LC1D066+LR97D07	6	TELEMECANIC	
10	-MC14 , MC15	MAGNECTIC CONTACTOR	3PH, AC110V, 60Hz, 9A rated, for 0.75KW	LC1D066+LAD-N20	2	TELEMECANIC	
11							
12	-FAN1,FAN2	COOLING FAN	1PH, 220V, 60Hz	UF-15P23	2	FUJITECH	
13	-FL	FLOURESCENT LAMP W/LS	1PH, 220V, 10W	-	2	-	
14	-V1	VOLT-METER	380V, 80x80	WB-V1	1	KYONG BO	
15	-A1	AMPERE-METER	200A, 80x80, 300%	WB-A1	1	KYONG BO	
16	-F1~F6	DIAZED FUZED W/HOLDER	660V, 4A,	-	6	SIBA	
17	-R1~R140	MINETURE RELAY	DC24V, 4a4b, 5A	SZR-MY4-N1	140	LG	
18	-CT1	CURRENT TRANSFORMER	200/5A, 5VA	UR-1	1	KYONG BO	
19	-POW	POWER SUPPLY	DC24V, 6A, 300VA	-	1	HWA SHIN	
20	-DP	TOUCH SCREEN	10.4Inch, 25W, 640x480	PMU-700S	1	LG	
21	-PLC	-	CPU	1769-L32E	1	A.B	
22	-	-	POWER	1769-PA4	1	A.B	
23	-	-	ANALOGE-INPUT, 6CH, RT	1769-IT6	1	A.B	
24	-	-	INPUT, 32POINT, SOURCE SINK INPUT	1769-IQ32	2	A.B	
25	-	-	ANALOGE-OUTPUT, 8CH, 4~20mA	1769-OF8C	1	A.B	
26	-	-	OUTPUT, 32POINT, Rated 2A, TR OUT	1769-OB32	2	A.B	
27	-PL1	PILOT LAMP	1PH, 220V, 60Hz, 30ø	KH-504	1	KUN HUNG	
28	-KEY	KEY SWITCH	1a1b, 2POSITION, 30ø	KH-3030-2	1	KUN HUNG	
29	-PB1	EMERGENCY PUSH BUTTON	1PH, 220V, 60Hz, 30ø, LOCK TYPE	KH-3071EB	1	KUN HUNG	
30	-X0	INOUT POWER TERMINAL	200A, 3P	AB1 VVN7035N	3	SHUNIDER	
31	-X1 , X2 , X3	OUTPUT POWER TERMINAL	30A, 1P	AB1 VV435U	64	SHUNIDER	
32	-X31 , X41 ~ X44	CONTROL TERMINAL	10A, 1P	AB1 VV235U	290	SHUNIDER	
33	-CABLE1	POWER CABLE	UL, BLOCK, 0 AWG 50mm2	-	1	-	
34	-CABLE2	POWER CABLE	UL, BLOCK, 12 AWG 4mm2	-	1	-	
35	-CABLE3	POWER CABLE	UL, BLOCK, 16 AWG 1.5mm2	-	1	-	
36	-CABLE4	CONTROL CABLE	UL, YELLOW, 18AWG	-	1	-	
37							

DO D[illegible] YANG FOOD MACHINERY CO.,LTD	FINISH	DATE	08.08.11	QUANTITY		MATE.		DRAWING NAME	POTATO CHIP
		FILE NO		DESIGN	Y.S.CHOI	SCALE	n/s	DRAWING NO	DYE080202

DWG NO | DYE0802032



* NOTE *

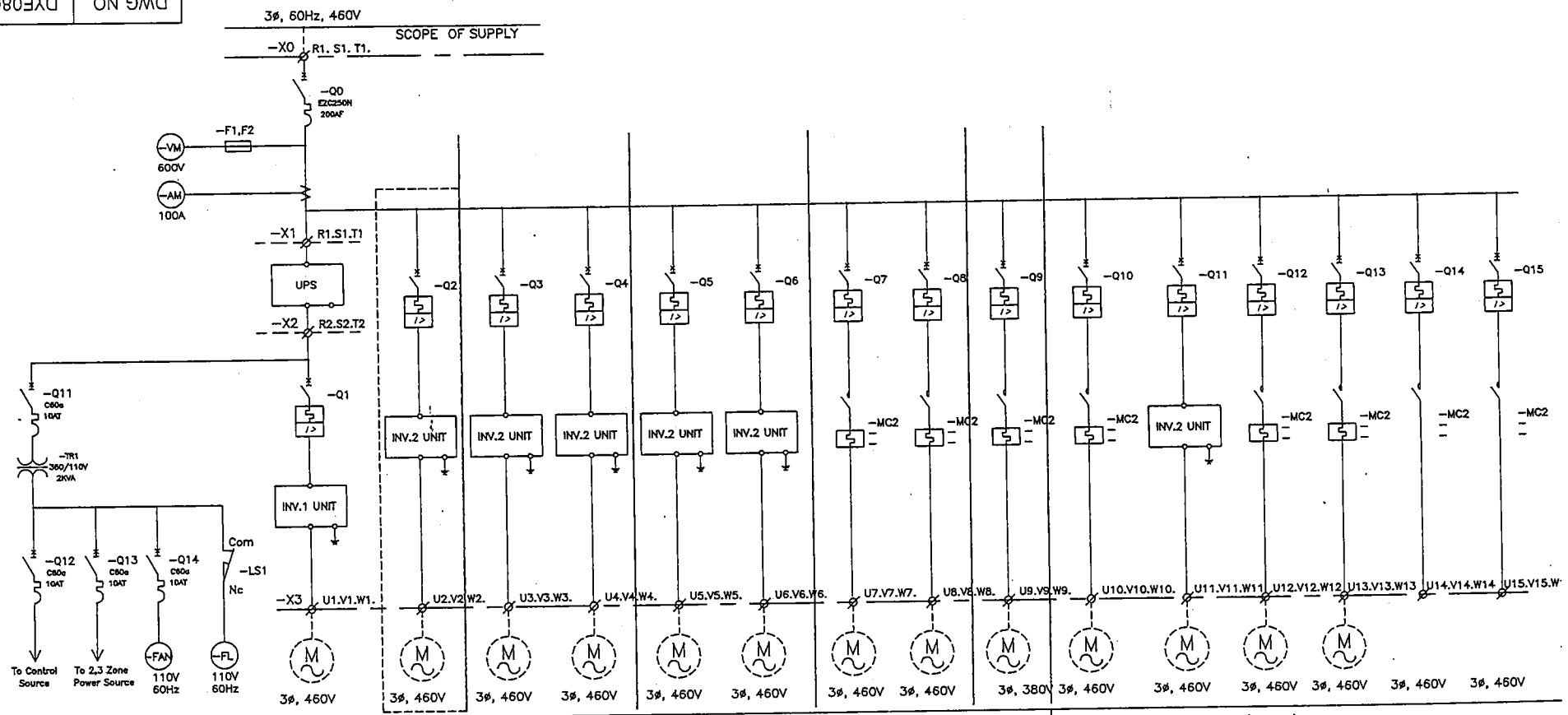
1. LEGEND

No.	LOGO	DESCRIPTION
1	–	NAME PLATE
2	–FAN	VENTILATION FAN
3	–V1	VOLT–METER
4	–A1	AMP'–METER
5	–DP	DISPLAY
6	–PL1	POWER LAMP W/RED
7	–KE1	POWER KET SWITCH "OFF – ON"
8	–EM	EMERGENCY
9	–	VENTILATION
10	–	–
11	–	–
12	–	–
13	–	–
14	–	–
15	–	–
16	–	–
17	–	–
18	–	–
19	–	–

2. PAINT COLOR : MUNSELL No. 5 Y 7/1–METAL
3. CUBICLE : INDOOR, SELF MOUNTING, IP41
4. THICKNESS FRANE : 2.3t
   FRONT DOOR : 2.3t
   REAR : 2.3t BASE : 5t
5. CUTTING HOLE 2 : 135 Hole
   3, 4 : 66Hole (80X80)
   5 : 292 x 227
   6~8 : 30 Hole

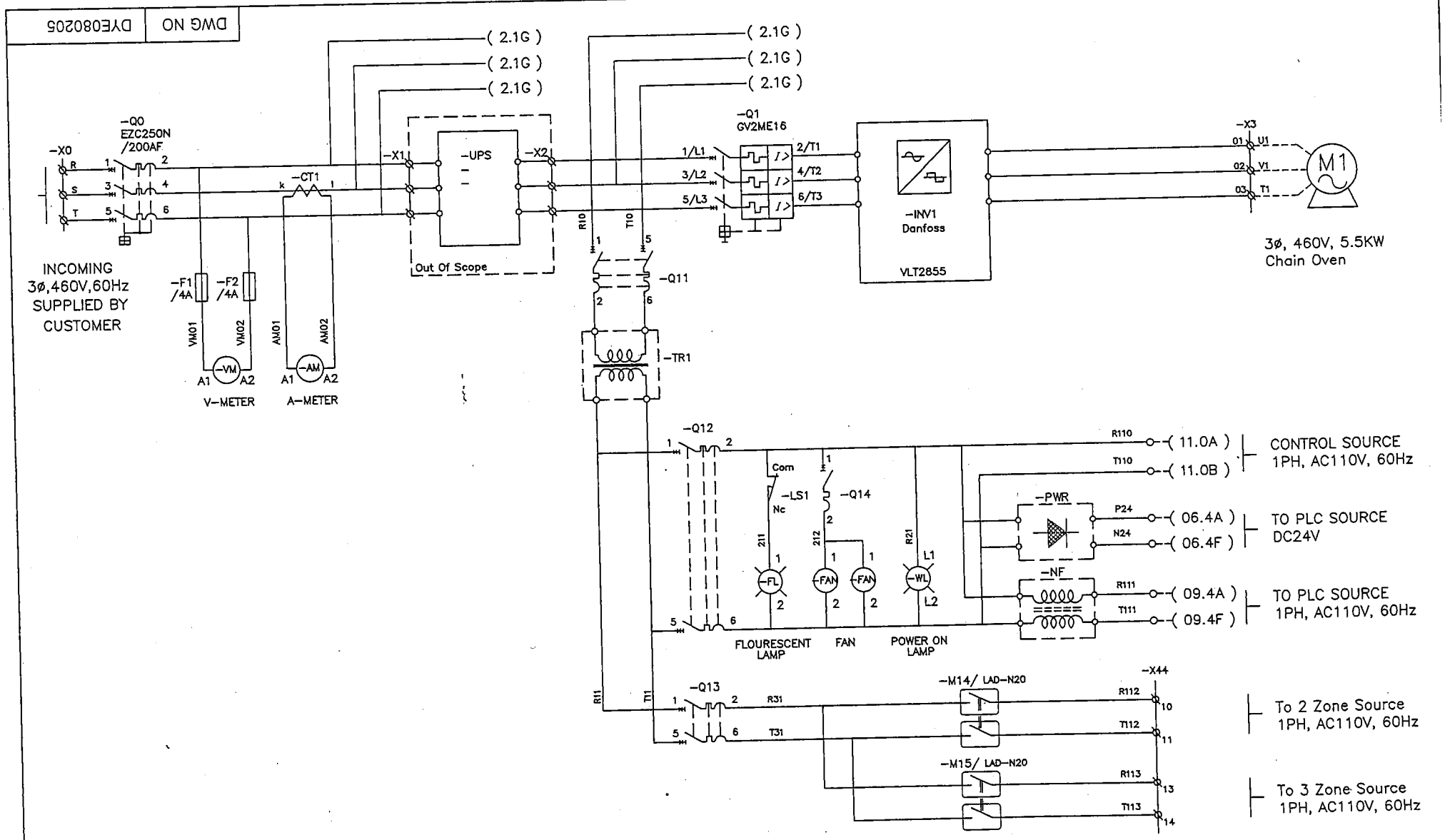
D[illegible] YANG FOOD MACHINERY CO.,LTD	FINISH	DATE	08.08.11	QUANTITY		MATE.		DRAWING NAME	POTATO CHIP
		FILE NO		DESIGN	Y.S.CHOI	SCALE	n/s	DRAWING NO	DYE0802032

DWG NO	DYE080204



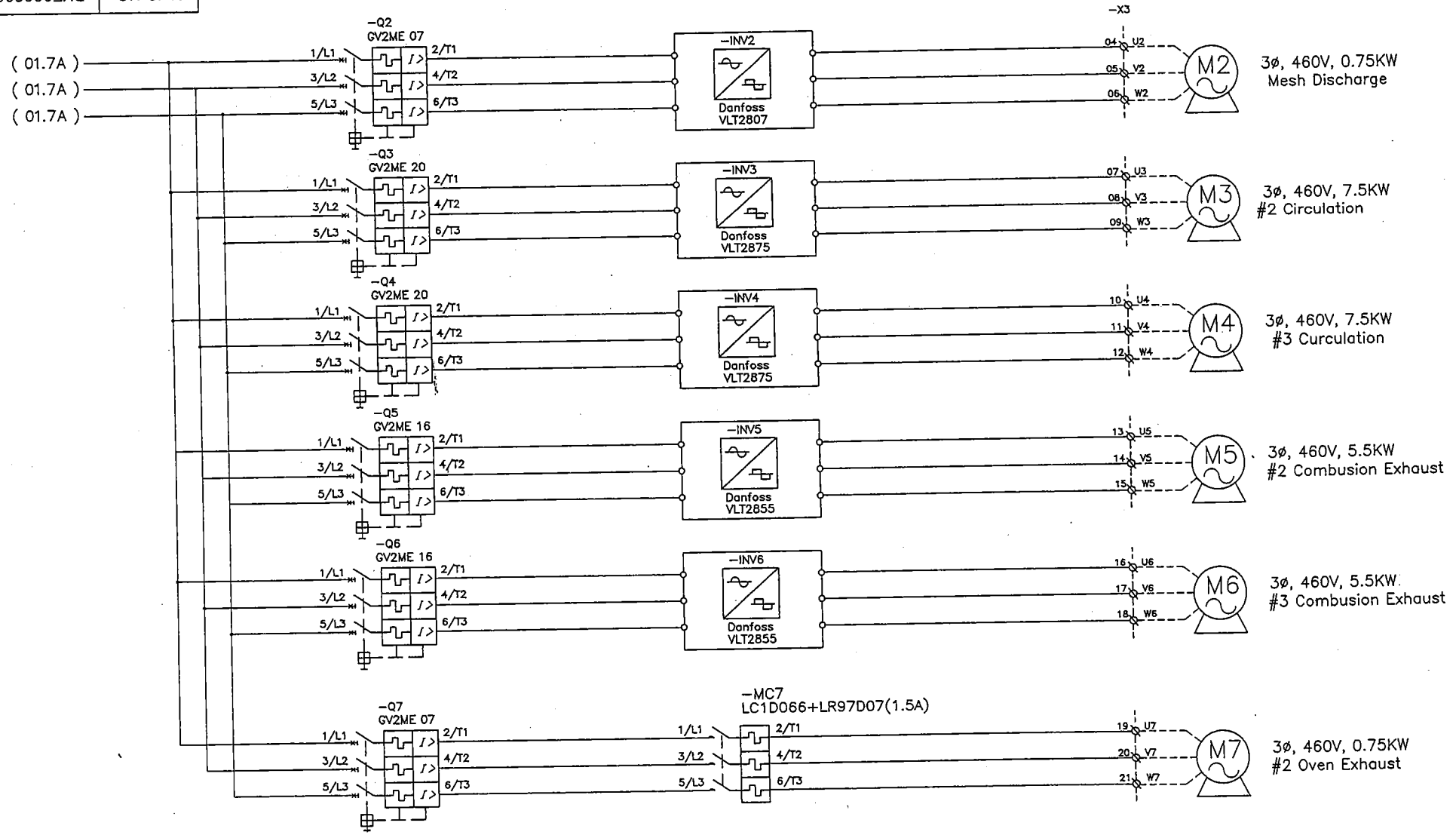
		IGF (Indirect)									DGF(Direct)					
FEEDER NAME		Chain Oven	Mesh Discharge	#2 Circulation	#3 Circulation	Combusion #2Exhaust	Combusion #3Exhaust	#2 Oven Exhaust	#3 Oven Exhaust	Hood	Pre-Heater Exhaust Fan	Pre-Heater Fan	Oven Fan	Exhaust Oven Fan	#2 Gun Burner	#3 Gun Burner
MOTOR CAPACITY (KW)		5.5	0.75	7.5	7.5	5.5	5.5	0.75	0.75	0.75	0.75	2.55	3.7	1.5	0.4	0.4
MCCB & PROTECTOR		GV2ME16	GV2ME07	GV2ME20	GV2ME20	GV2ME16	GV2ME16	GV2ME07	GV2ME07	GV2ME07	GV2ME07	GV2ME10	GV2ME14	GV2ME08	GV2ME07	GV2ME07
VVVF Or CONTACTOR		VLT2855	VLT2807	VLT2875	VLT2875	VLT2855	VLT2855	–	–	–	–	VLT2830	–	–	–	–
CONTACTOR LC1D–		–	–	–	–	–	–	066	066	066	066	–	096	066+LAD	066	066
EOCR LR97D		–	–	1PCS	1PCS	1PCS	1PCS	07(1.5)	07(1.5)	07(1.5)	07(1.5)	–	25(10)	07(3)	–	–
RETIONG CURRENT [A]		14	1.8	16	16	11	11	1.8	1.8	1.8	1.8	4.8	7.6	3.4	1.4	1.4

D YANG FOOD MACHINERY CO.,LTD	FINISH	DATE	08.08.11	QUANTITY		MATE.		DRAWING NAME	POTATO CHIP
		FILE NO		DESIGN	Y.S.CHOI	SCALE	n/s	DRAWING NO	DYE080204



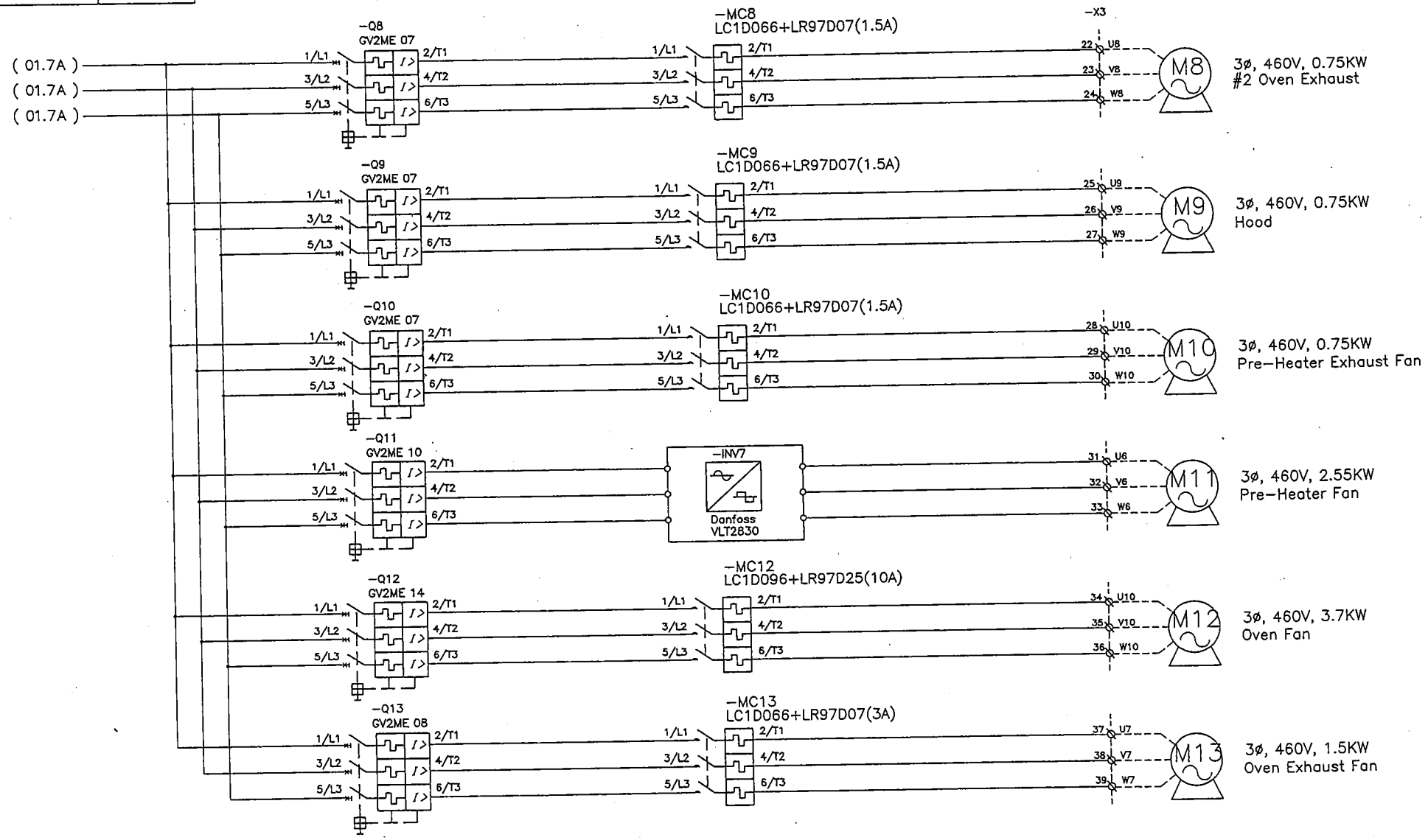
D YANG FOOD MACHINERY CO.,LTD	FINISH.	DATE	08.08.11	QUANTITY		MATE.		DRAWING NAME	POTATO CHIP
		FILE NO		DESIGN	Y.S.CHOI	SCALE	n/s	DRAWING NO	DYE080205

DWG NO	DYE080206



D[illegible] YANG FOOD MACHINERY CO.,LTD	FINISH	DATE	08.08.11	QUANTITY		MATE.		DRAWING NAME	POTATO CHIP
		FILE NO		DESIGN	Y.S.CHOI	SCALE	n/s	DRAWING NO	DYE080206

DWG NO	DYE080207

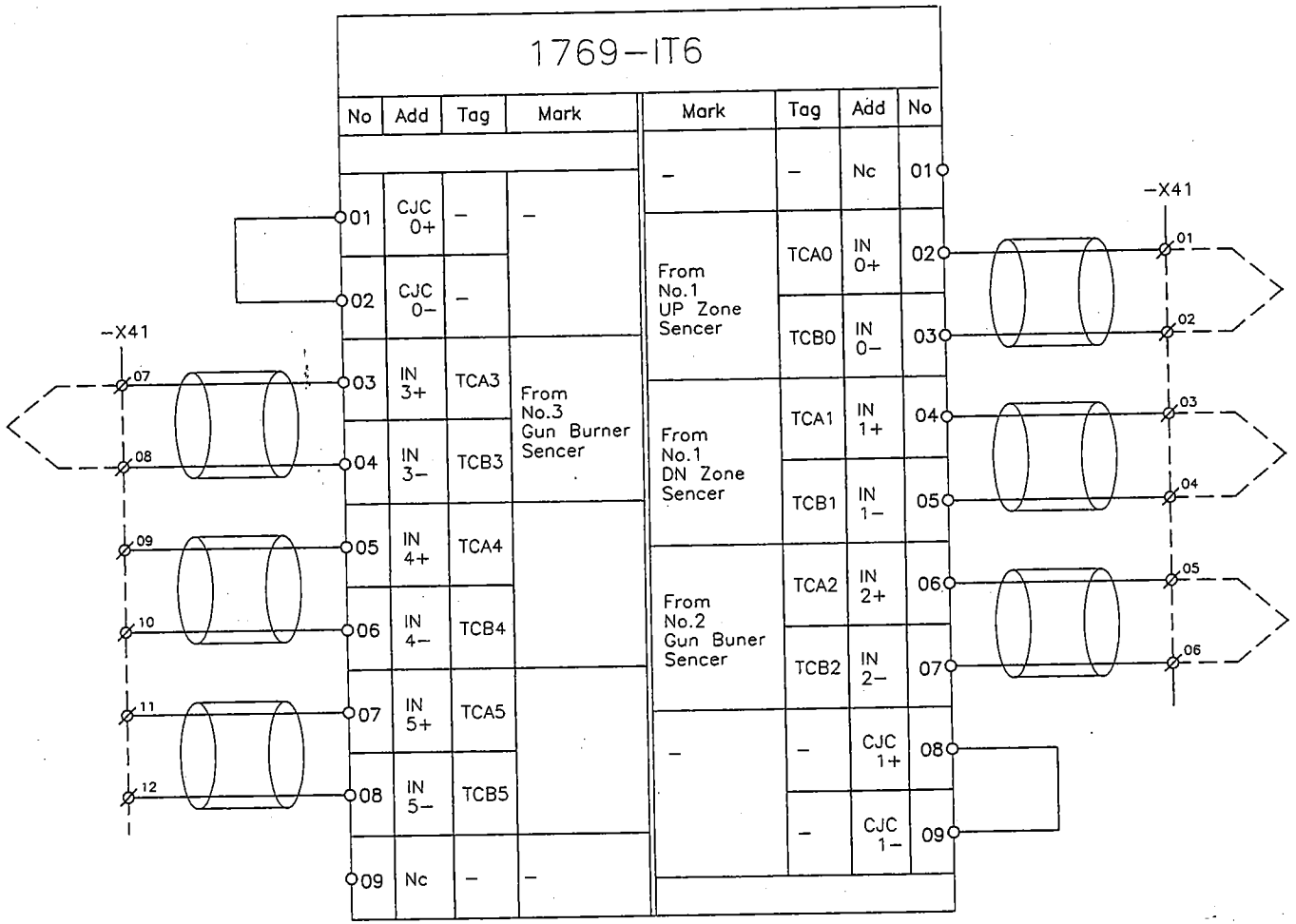


DL D[illegible] YANG FOOD MACHINERY CO.,LTD	FINISH	DATE	08.08.11	QUANTITY		MATE.		DRAWING NAME	POTATO CHIP
		FILE NO		DESIGN	Y.S.CHOI	SCALE	n/s	DRAWING NO	DYE080207

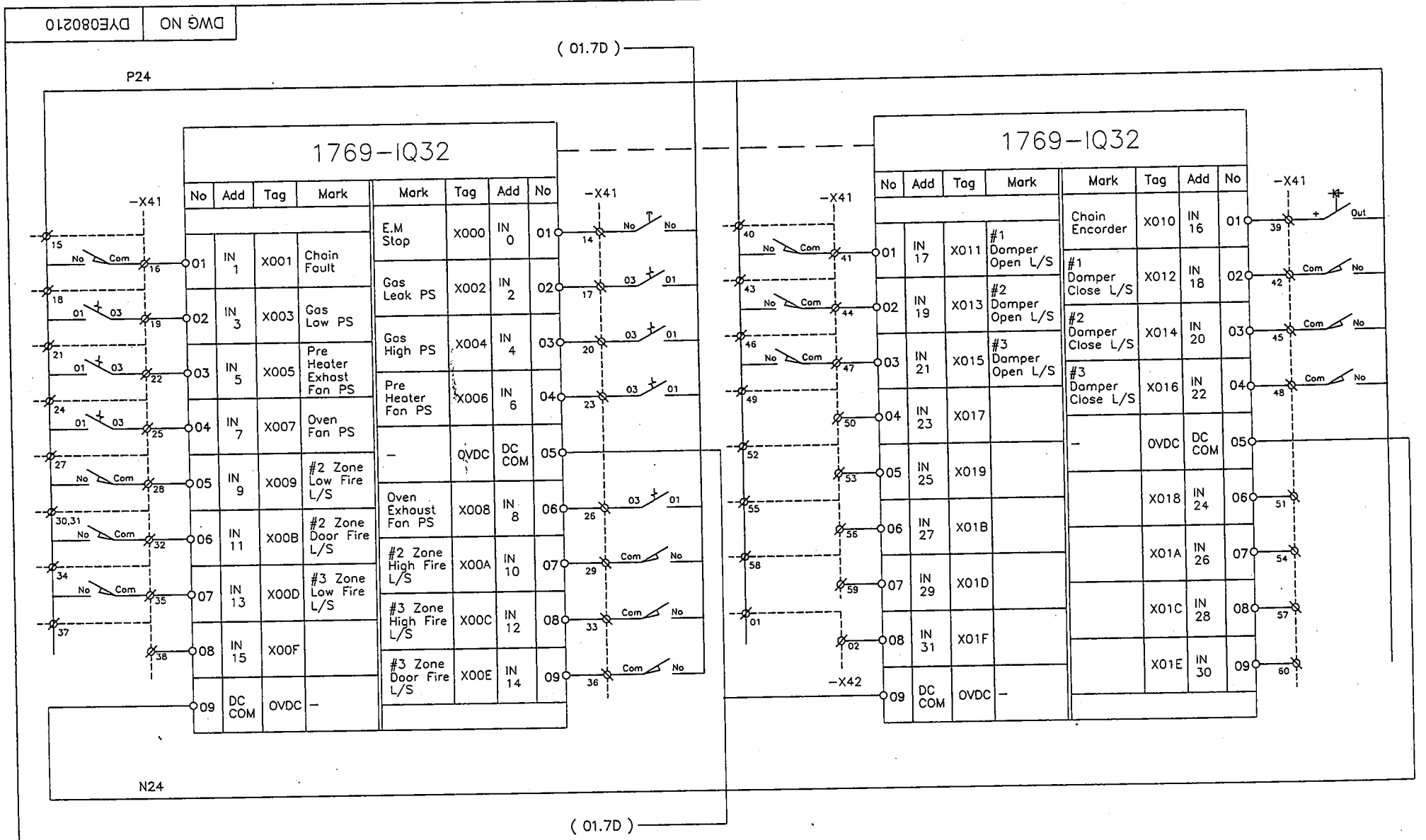
DWG NO	DYE080208

G YANG FOOD MACHINERY CO.,LTD		FINISH					DRAWING NAME	POTATO CHIP
		DATE	08.08.11	QUANTITY		MATE.		
		FILE NO		DESIGN	Y.S.CHOI	SCALE	n/s	DRAWING NO	DYE080208

DWG NO	DYE080209

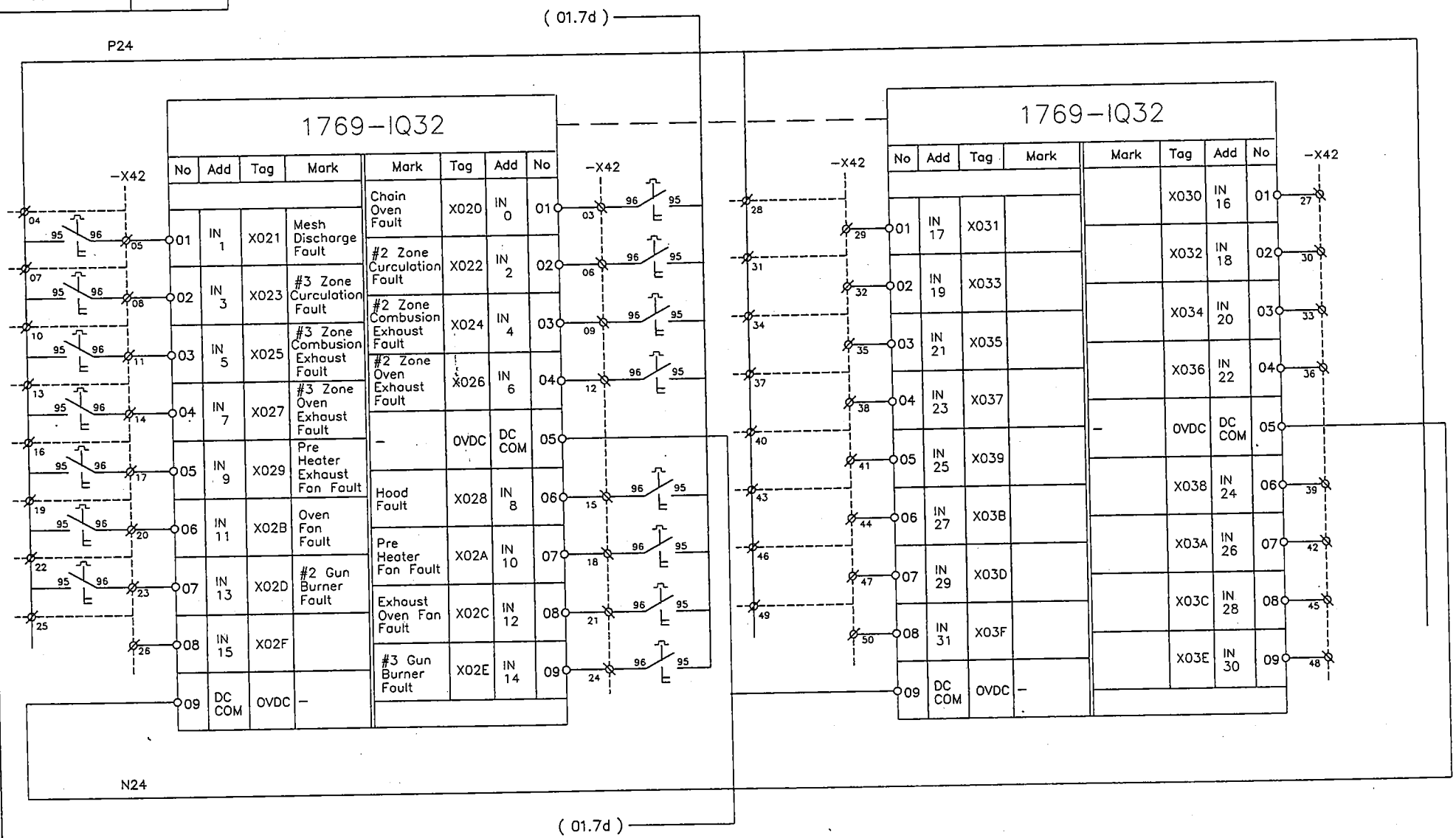


DD D[illegible] YANG FOOD MACHINERY CO.,LTD	FINISH	DATE	08.08.11	QUANTITY		MATE.		DRAWING NAME	POTATO CHIP
		FILE NO		DESIGN	Y.S.CHOI	SCALE	n/s	DRAWING NO	DYE080209



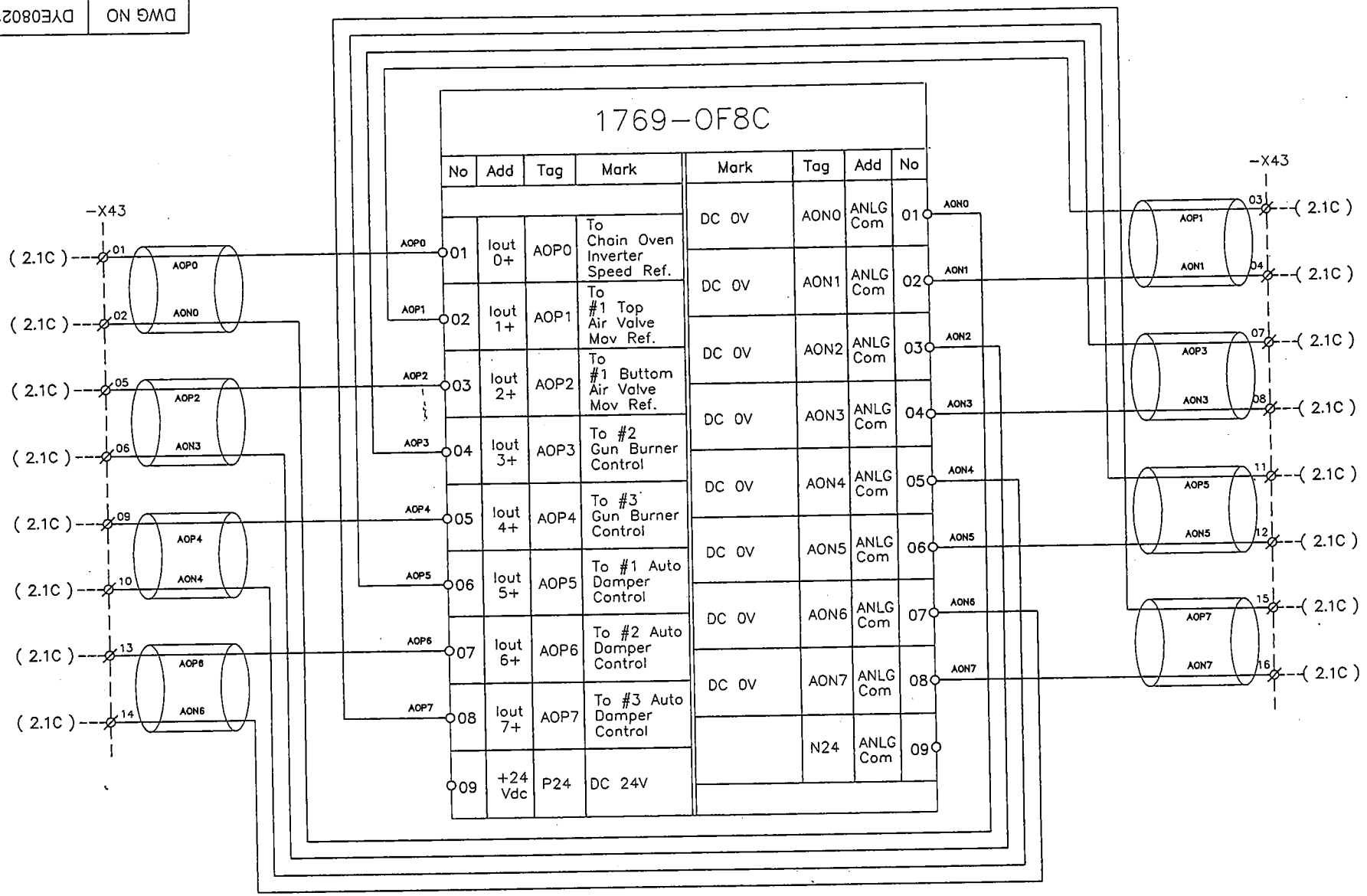
DONG YANG FOOD MACHINERY CO.,LTD	FINISH	DATE	08.08.11	QUANTITY		MATE.		DRAWING NAME	POTATO CHIP
		FILE NO		DESIGN	Y.S.CHOI	SCALE	n/s	DRAWING NO	DYE080210

DWG NO	DYE080211



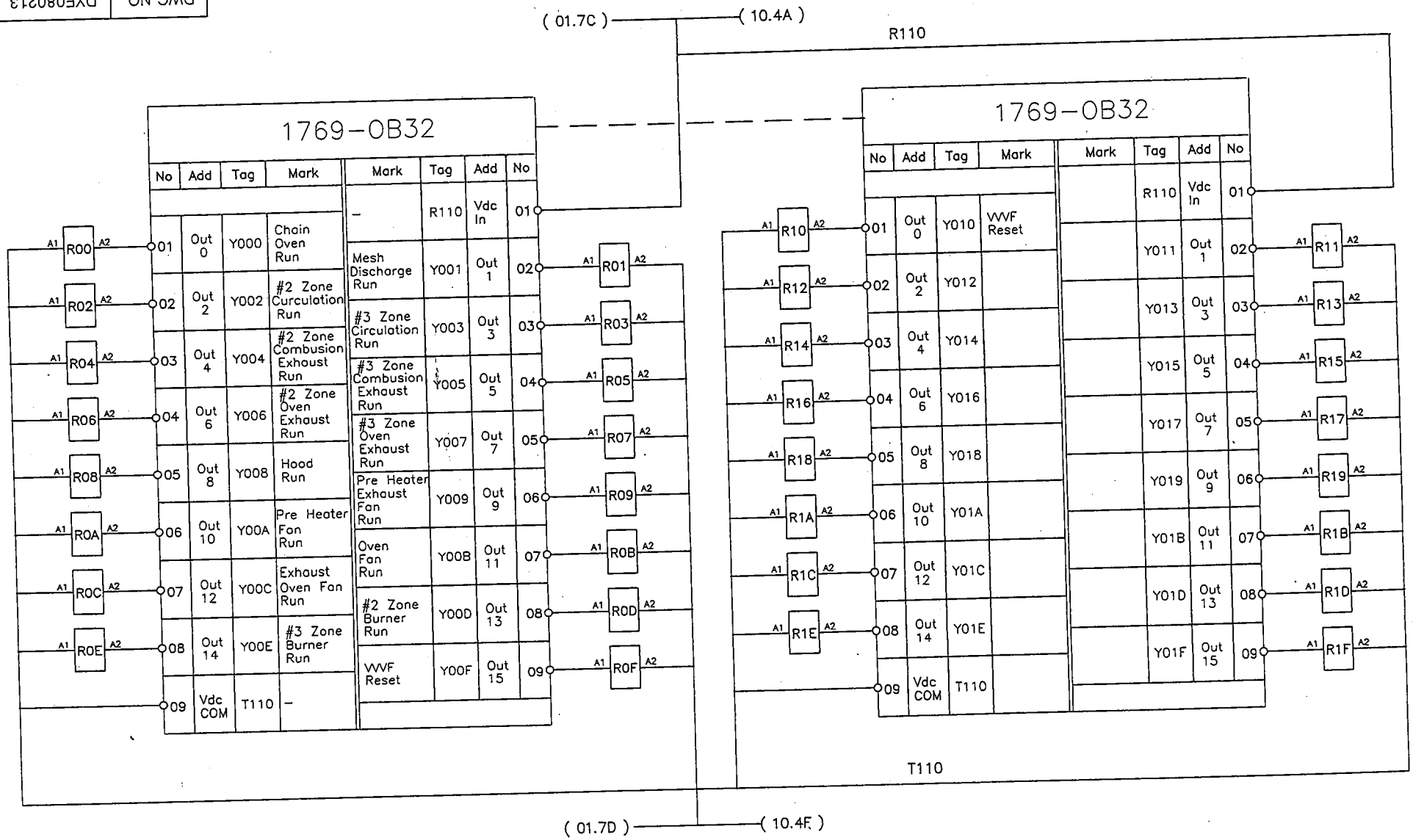
DC D[illegible]G YANG FOOD MACHINERY CO.,LTD	FINISH	DATE	08.08.11	QUANTITY		MATE.		DRAWING NAME	POTATO CHIP
		FILE NO		DESIGN	Y.S.CHOI	SCALE	n/s	DRAWING NO	DYE080211

DWG NO	DYE080212



DONG YANG FOOD MACHINERY CO.,LTD	FINISH	DATE	08.08.11	QUANTITY		MATE.		DRAWING NAME	POTATO CHIP
		FILE NO		DESIGN	Y.S.CHOI	SCALE	n/s	DRAWING NO	DYE080212

DWG NO | DYE080213



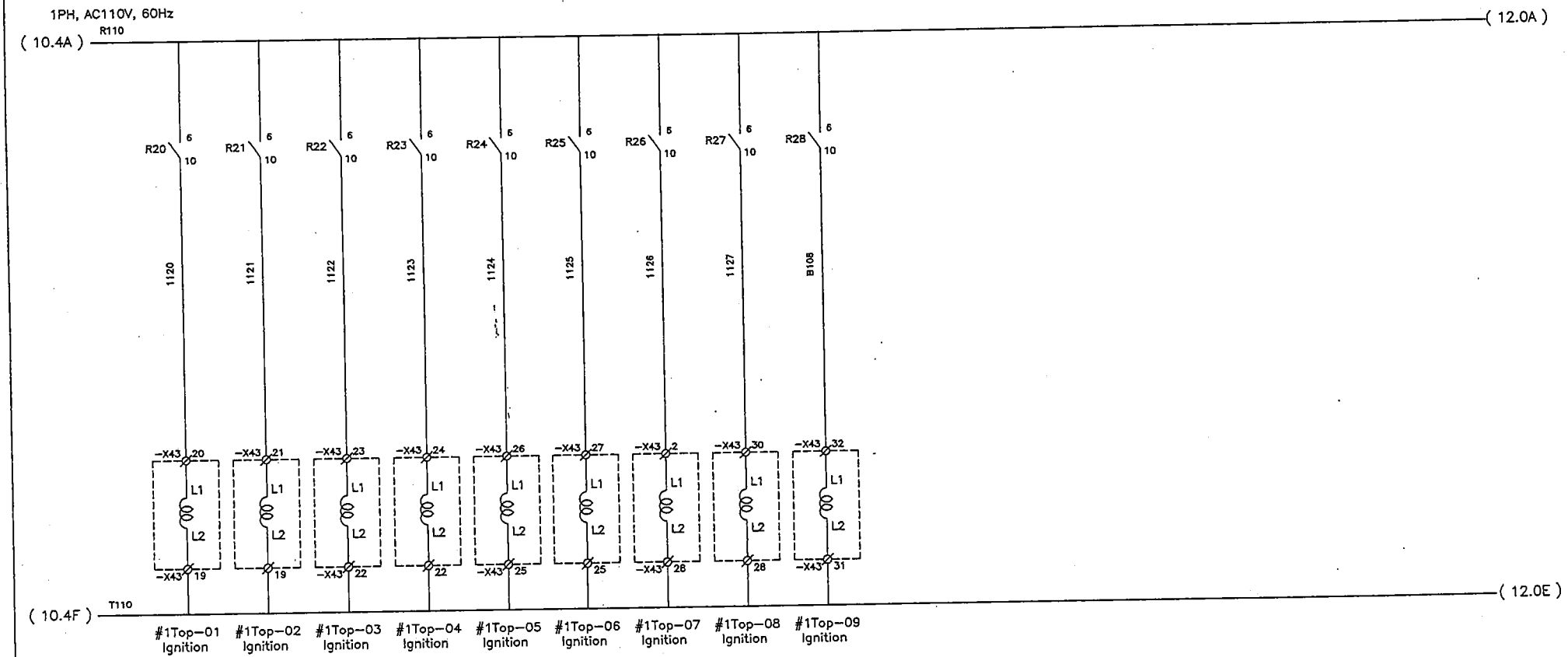
DONG YANG FOOD MACHINERY CO.,LTD	FINISH	DATE	08.08.11	QUANTITY		MATE.		DRAWING NAME	POTATO CHIP
		FILE NO		DESIGN	Y.S.CHOI	SCALE	n/s	DRAWING NO	DYE080213

DWG NO	DYE090214

DD	G YANG FOOD MACHINERY CO.,LTD	FINISH				MATE.	DRAWING NAME
		DATE	08.08.11	QUANTITY			POTATO CHIP
		FILE NO		DESIGN	Y.S.CHOI	SCALE	n/s
							DRAWING NO
							DYE080214

DWG NO	DYE080215

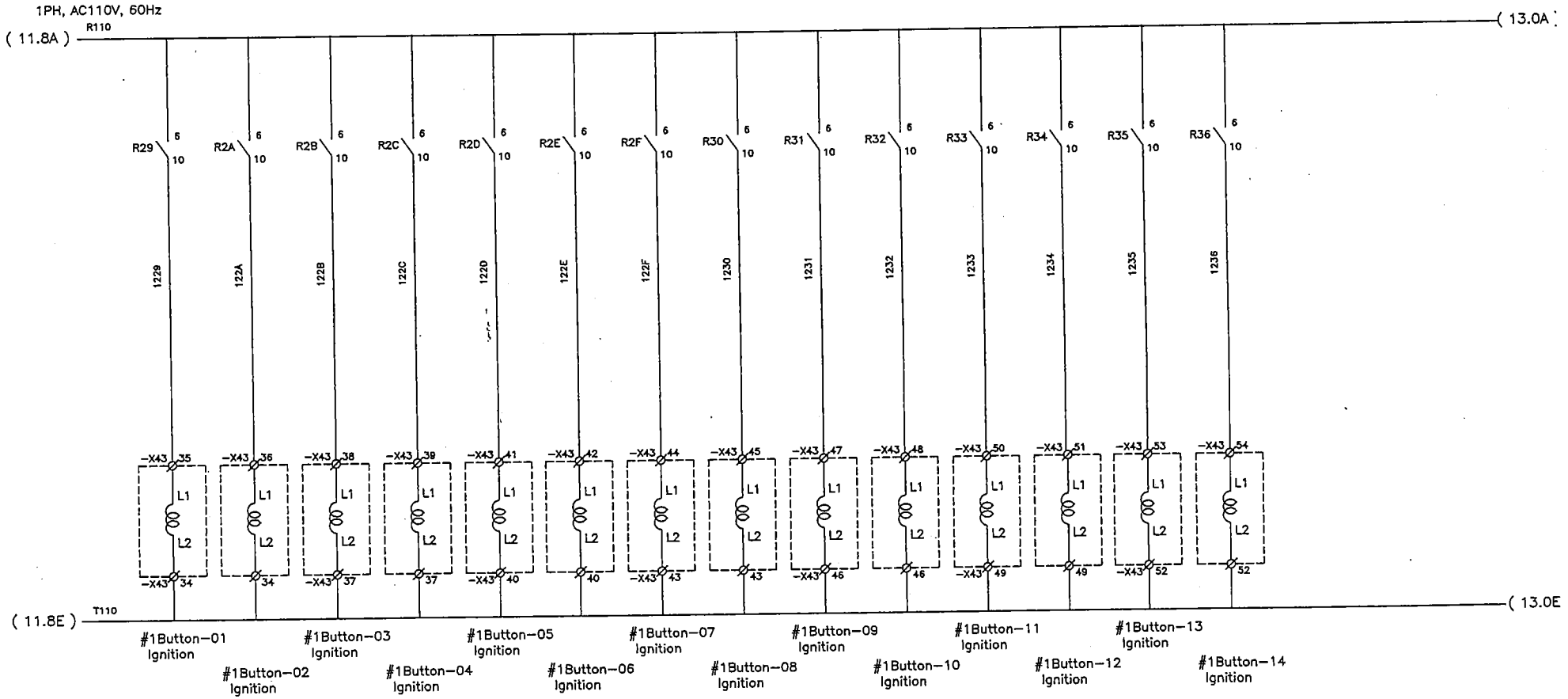
NOTE #1. *1 : BE INSTALLED IN LOCAL CONTROL BOX
#2. *2 : BE SUPPLIED BY CUSTOMER



DO D[illegible]G YANG FOOD MACHINERY CO.,LTD	FINISH	DATE	08.08.11	QUANTITY		MATE.		DRAWING NAME	POTATO CHIP
		FILE NO		DESIGN	Y.S.CHOI	SCALE	n/s	DRAWING NO	DYE080215

DWG NO	DYE080216

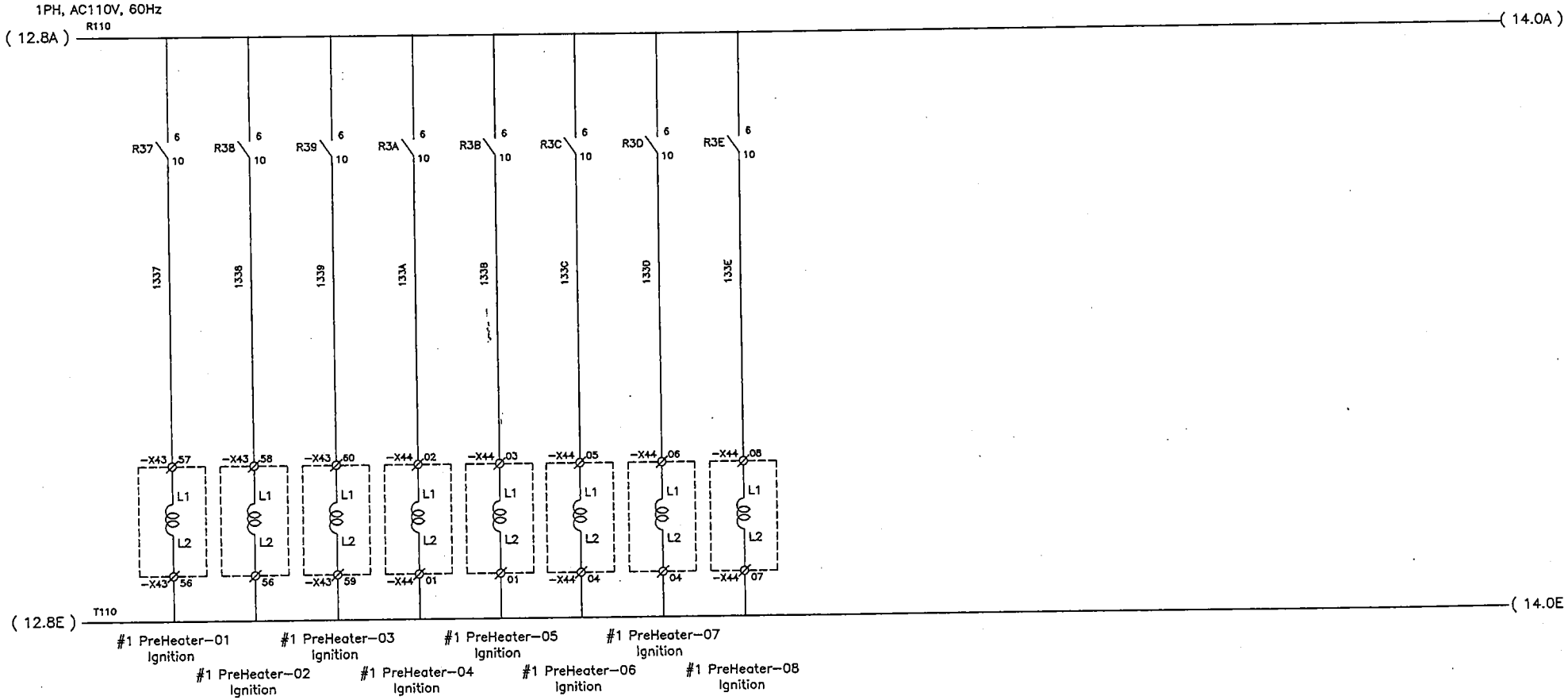
NOTE #1. *1 : BE INSTALLED IN LOCAL CONTROL BOX
#2. *2 : BE SUPPLIED BY CUSTOMER



DO [illegible]G YANG FOOD MACHINERY CO.,LTD	FINISH	DATE	08.08.11	QUANTITY		MATE.		DRAWING NAME	POTATO CHIP
		FILE NC		DESIGN	Y.S.CHOI	SCALE	n/s	DRAWING NO	DYE080216

DWG NO	DYE080217

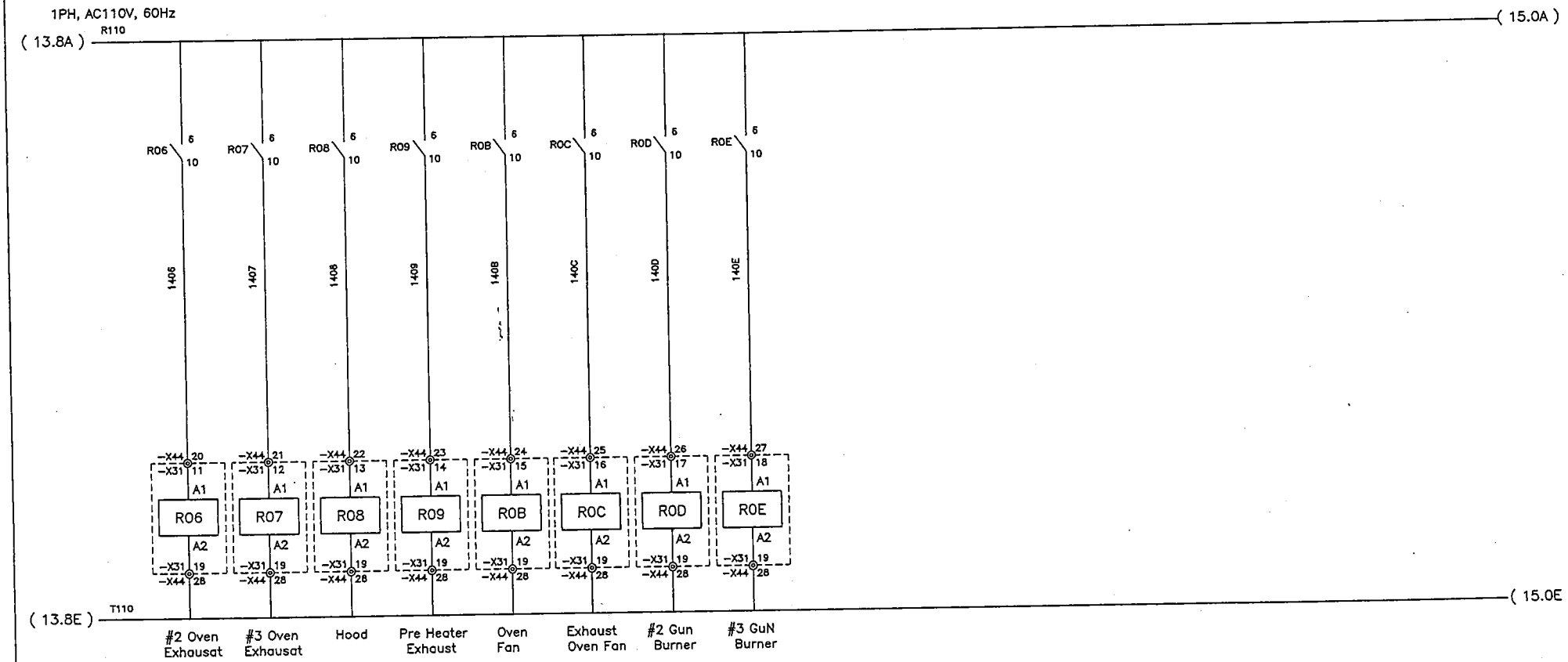
NOTE #1. *1 : BE INSTALLED IN LOCAL CONTROL BOX
#2. *2 : BE SUPPLIED BY CUSTOMER



DONG YANG FOOD MACHINERY CO.,LTD	FINISH	DATE	08.08.11	QUANTITY		MATE.		DRAWING NAME	POTATO CHIP
		FILE NO		DESIGN	Y.S.CHOI	SCALE	n/s	DRAWING NO	DYE080217

DWG NO	DYE080218

NOTE #1. *1 : BE INSTALLED IN LOCAL CONTROL BOX
#2. *2 : BE SUPPLIED BY CUSTOMER

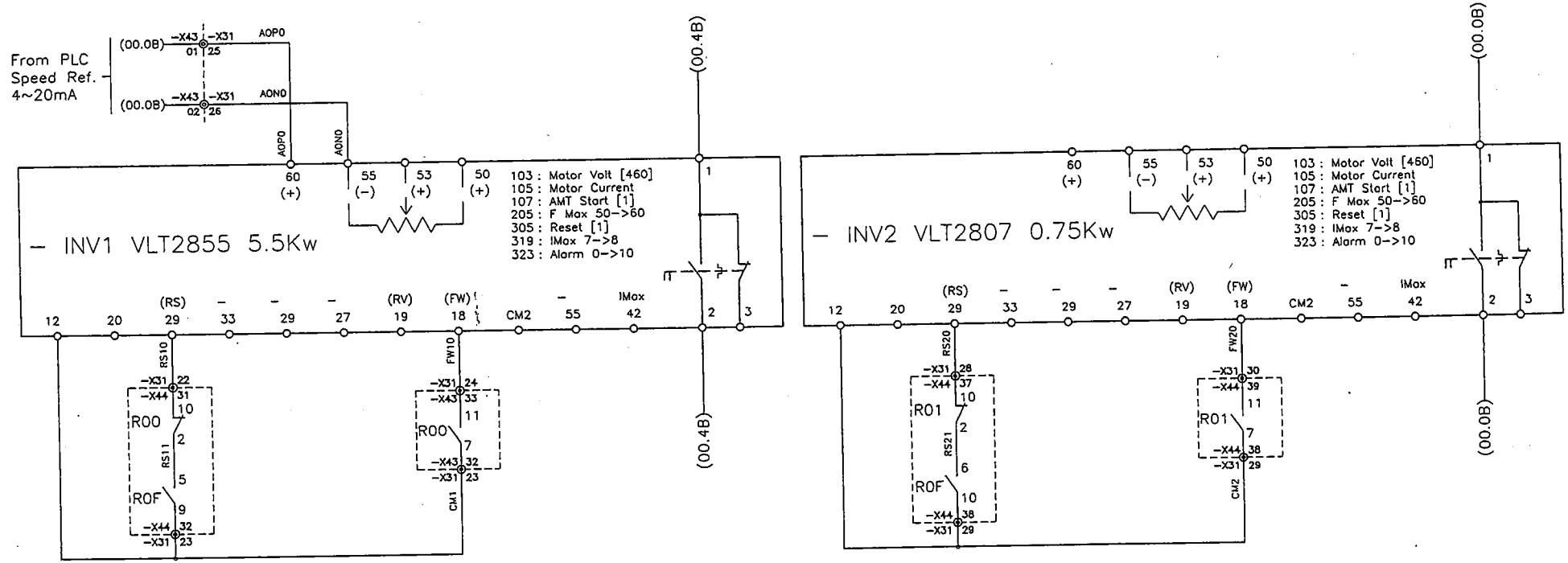


IG YANG FOOD MACHINERY CO.,LTD	FINISH	DATE	08.08.11	QUANTITY		MATE.		DRAWING NAME	POTATO CHIP
		FILE NO		DESIGN	Y.S.CHOI	SCALE	n/s	DRAWING NO	DYE080218

DWG NO	DYE080219

(01.7C) R110 (12.0

1ø, AC110V, 60Hz



(01.7D) T110 (12.0

Chain Oven

Mesh Discharge

-R00

	TER NO.	ADDR.
a	9. 5	-
b	9. 1	.1D
a	10. 6	.1B
b	10. 2	.1B
a	11. 7	-
b	11. 3	-
a	12. 8	.2D
b	12. 4	-

SZR-MY4-N1

-R04

	TER NO.	ADDR.
a	9. 5	-
b	9. 1	.5D
a	10. 6	-
b	10. 2	-
a	11. 7	-
b	11. 3	-
a	12. 8	.7D
b	12. 4	-

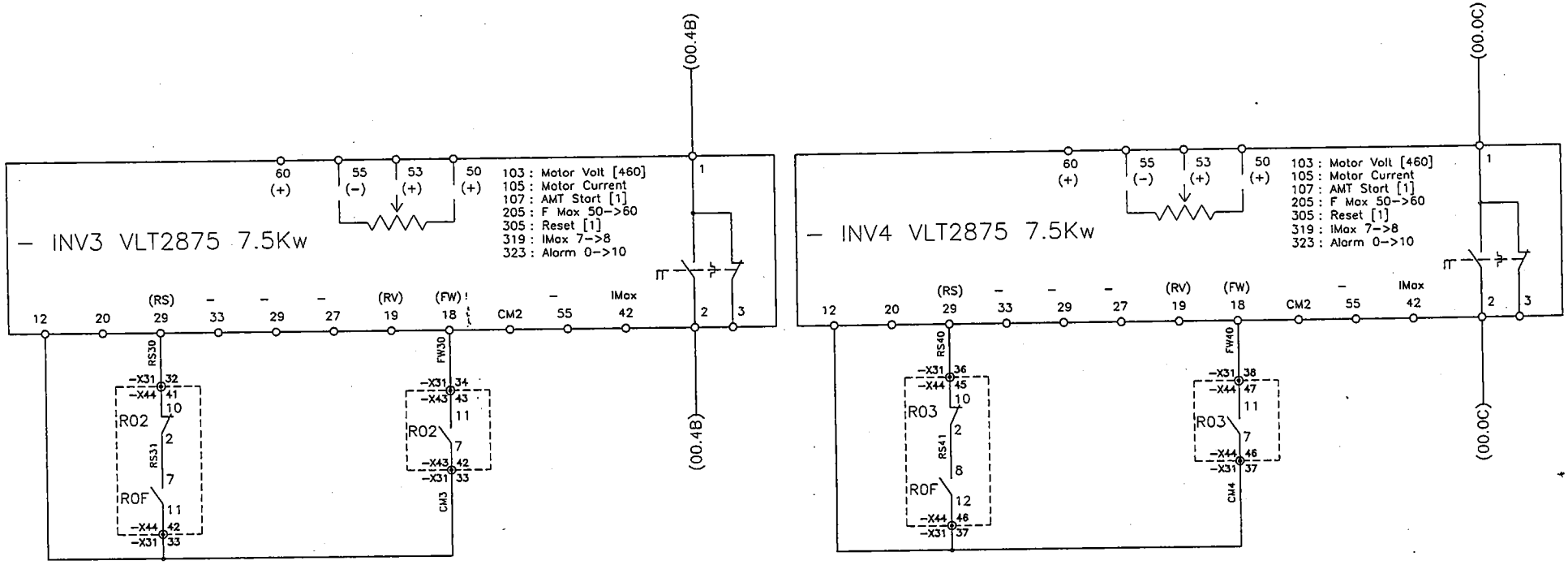
SZR-MY4-N1

IG YANG FOOD MACHINERY CO.,LTD	FINISH	DATE	08.08.11	QUANTITY		MATE.		DRAWING NAME	POTATO CHIP
		FILE NO		DESIGN	Y.S.CHOI	SCALE	n/s	DRAWING NO	DYE080219

DWG NO	DYE030315

(01.7C) R110 (12.0A

1ø, AC110V, 60Hz



(01.7D) T110 (12.0

#2 Circulation

#3 Circulation

–R00

	TER NO.	ADDR.
a	9. 5	–
b	9. 1	.1D
a	10. 6	.1B
b	10. 2	.1B
a	11. 7	–
b	11. 3	–
a	12. 8	.2D
b	12. 4	–

SZR–MY4–N1

–R04

	TER NO.	ADDR.
a	9. 5	–
b	9. 1	.5D
a	10. 6	–
b	10. 2	–
a	11. 7	–
b	11. 3	–
a	12. 8	.7D
b	12. 4	–

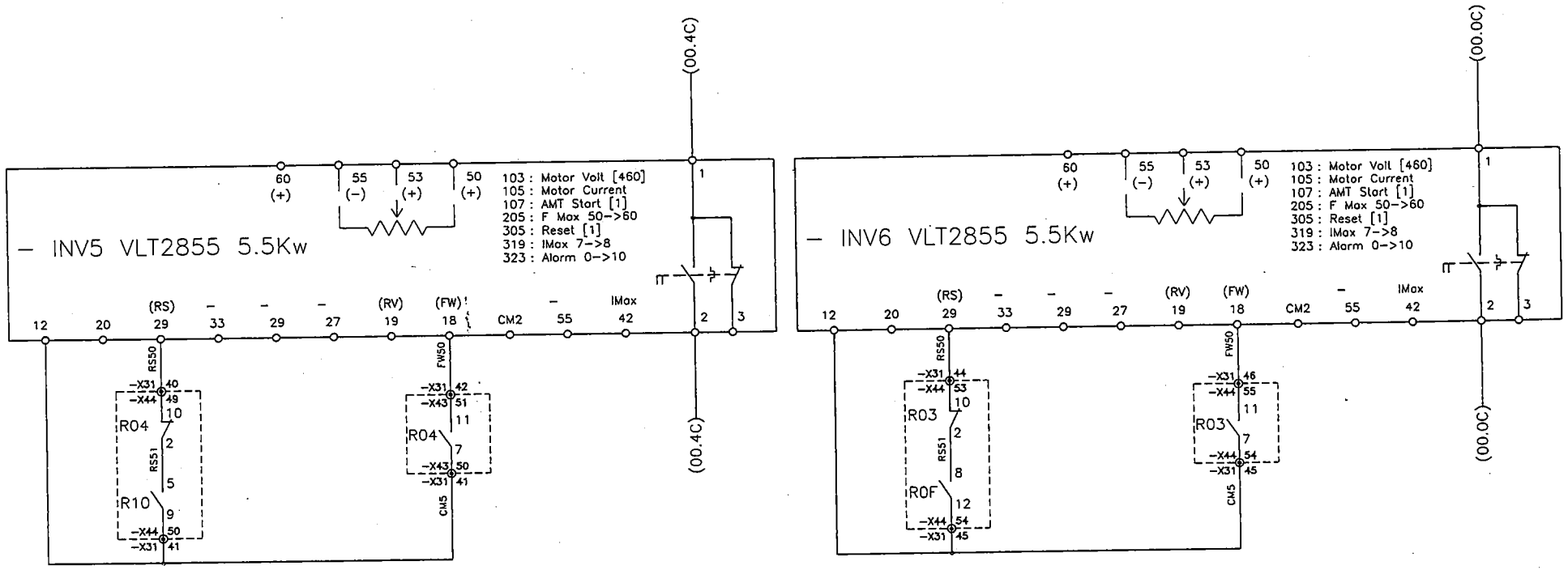
SZR–MY4–N1

DO [illegible]G YANG FOOD MACHINERY CO.,LTD	FINISH	DATE	08.08.11	QUANTITY		MATE.		DRAWING NAME	POTATO CHIP
		FILE NO		DESIGN	Y.S.CHOI	SCALE	n/s	DRAWING NO	DYE080220

DWG NO	DYE080221

(01.7C) R110 (12.0A

1ø, AC110V, 60Hz



(01.7D) T110 (12.0

#2 Combusion Exhaust

#3 Combusion Exhaust

−R00

	TER NO.	ADDR.
a	9. 5	−
b	9. 1	.1D
a	10. 6	.1B
b	10. 2	.1B
a	11. 7	−
b	11. 3	−
a	12. 8	.2D
b	12. 4	−

SZR−MY4−N1

−R04

	TER NO.	ADDR.
a	9. 5	−
b	9. 1	.5D
a	10. 6	−
b	10. 2	−
a	11. 7	−
b	11. 3	−
a	12. 8	.7D
b	12. 4	−

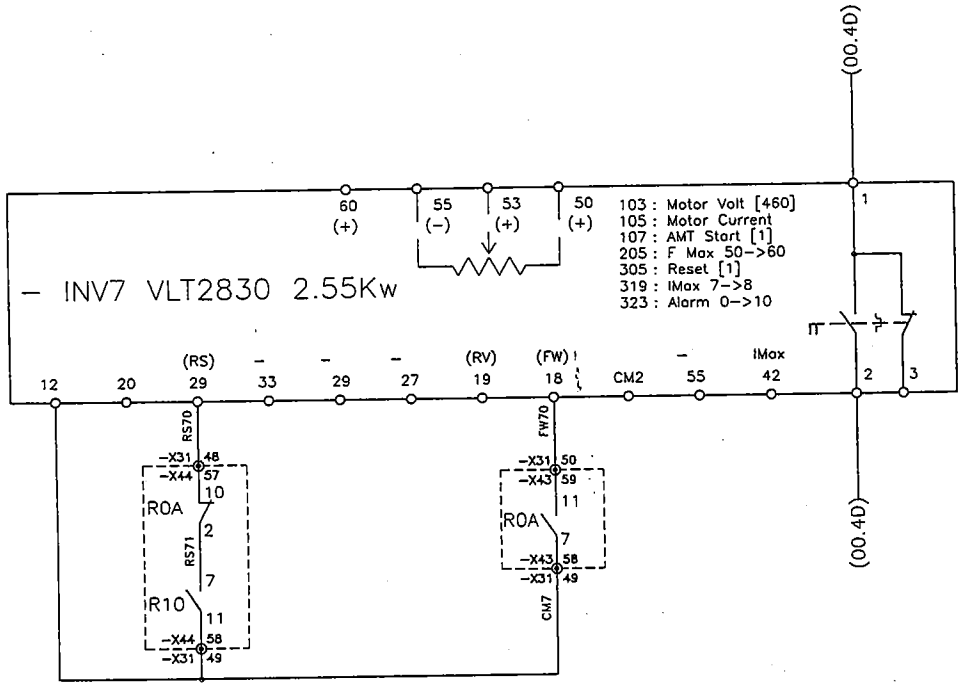
SZR−MY4−N1

DO [illegible] G YANG FOOD MACHINERY CO.,LTD	FINISH	DATE	08.08.11	QUANTITY		MATE.		DRAWING NAME	POTATO CHIP
		FILE NO		DESIGN	Y.S.CHOI	SCALE	n/s	DRAWING NO	DYE080221

DWG NO	DYE080222

(01.7C) R110 (12.0A)

1ø, AC110V, 60Hz



(01.7D) T110 (12.0)

Pre Heater Fan

–R00

	TER NO.	ADDR.
a	9. 5	–
b	9. 1	.1D
a	10. 6	.1B
b	10. 2	.1B
a	11. 7	–
b	11. 3	–
a	12. 8	.2D
b	12. 4	–

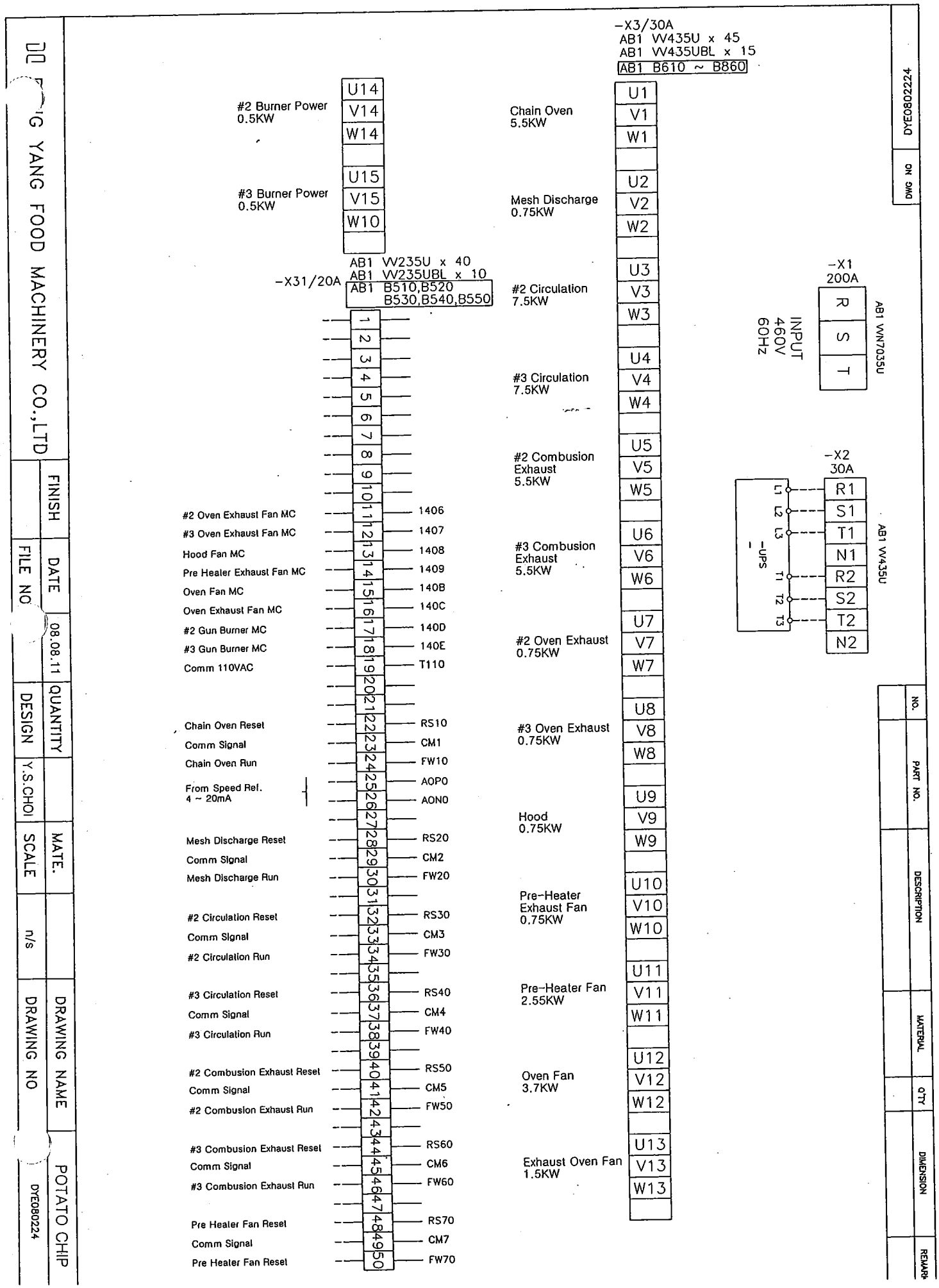
SZR–MY4–N1

–R04

	TER NO.	ADDR.
a	9. 5	–
b	9. 1	.5D
a	10. 6	–
b	10. 2	–
a	11. 7	–
b	11. 3	–
a	12. 8	.7D
b	12. 4	–

SZR–MY4–N1

DONG YANG FOOD MACHINERY CO.,LTD	FINISH	DATE	08.08.11	QUANTITY		MATE.		DRAWING NAME	POTATO CHIP
		FILE NO		DESIGN	Y.S.CHOI	SCALE	n/s	DRAWING NO	DYE080222


-X3/30A
AB1 VV435U x 45
AB1 VV435UBL x 15
AB1 B610 ~ B860
U1 V1 W1
Chain Oven 5.5KW
U2 V2 W2
Mesh Discharge 0.75KW
U3 V3 W3
#2 Circulation 7.5KW
U4 V4 W4
#3 Circulation 7.5KW
U5 V5 W5
#2 Combusion Exhaust 5.5KW
U6 V6 W6
#3 Combusion Exhaust 5.5KW
U7 V7 W7
#2 Oven Exhaust 0.75KW
U8 V8 W8
#3 Oven Exhaust 0.75KW
U9 V9 W9
Hood 0.75KW
U10 V10 W10
Pre-Heater Exhaust Fan 0.75KW
U11 V11 W11
Pre-Heater Fan 2.55KW
U12 V12 W12
Oven Fan 3.7KW
U13 V13 W13
Exhaust Oven Fan 1.5KW
-X1
200A
R S T
AB1 VN7035U
INPUT
460V
60Hz
-X2
30A
L1 L2 L3
-UPS-
T1 T2 T3
R1 S1 T1 N1 R2 S2 T2 N2
AB1 VV435U
U14 V14 W14
#2 Burner Power 0.5KW
U15 V15 W10
#3 Burner Power 0.5KW
AB1 VV235U x 40
AB1 VV235UBL x 10
-X31/20A
AB1 B510,B520
B530,B540,B550
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
#2 Oven Exhaust Fan MC 1406
#3 Oven Exhaust Fan MC 1407
Hood Fan MC 1408
Pre Heater Exhaust Fan MC 1409
Oven Fan MC 140B
Oven Exhaust Fan MC 140C
#2 Gun Burner MC 140D
#3 Gun Burner MC 140E
Comm 110VAC T110
Chain Oven Reset RS10
Comm Signal CM1
Chain Oven Run FW10
From Speed Ref. 4 ~ 20mA AOP0 AON0
Mesh Discharge Reset RS20
Comm Signal CM2
Mesh Discharge Run FW20
#2 Circulation Reset RS30
Comm Signal CM3
#2 Circulation Run FW30
#3 Circulation Reset RS40
Comm Signal CM4
#3 Circulation Run FW40
#2 Combusion Exhaust Reset RS50
Comm Signal CM5
#2 Combusion Exhaust Run FW50
#3 Combusion Exhaust Reset RS60
Comm Signal CM6
#3 Combusion Exhaust Run FW60
Pre Heater Fan Reset RS70
Comm Signal CM7
Pre Heater Fan Reset FW70
DWG NO DYE08022224
NO. PART NO. DESCRIPTION MATERIAL QTY DIMENSION REMARK
DD G YANG FOOD MACHINERY CO.,LTD
FINISH
FILE NO DATE 08.08.11
DESIGN QUANTITY
Y.S.CHOI
SCALE MATE.
n/s
DRAWING NO DRAWING NAME POTATO CHIP
DYE080224

DWG NO	DYE080225

-X41

AB1 W235U x 24
AB1 W235UBL x 6
AB1 B510,B520,B530

From TC #1 Top Sencer	1	TCA0	
	2	TCB0	
From TC #1 Down Sencer	3	TCA1	
	4	TCB1	
From TC #2 Gun Burner	5	TCA2	
	6	TCB2	
From TC #3 Gun Burner	7	TCA3	
–	8	TCB3	
Spare	9	TCA4	
–	10	TCB4	
Spare	11	TCA5	
	12	TCB5	
Emergency	13	–	
Com 24Vc	14	X000	
–	15	P24	
Gas Leak Ps	16	X001	
Com 24Vc	17	X002	
Gas Low Ps	18	P24	
Gas High Ps	19	X003	
Com 24Vc	20	X004	
Pre Ht Exh Fan Ps	21	P24	
Pre Ht FaN Ps	22	X005	
Com 24Vc	23	X006	
Oven Fan Ps	24	P24	
Oven Exh Fan Ps	25	X007	
Com 24Vc	26	X008	
#2 Low Fire L/S	27	P24	
#2 High Fire L/S	28	X009	
Com 24Vc	29	X00A	
	30	P24	

-X41

AB1 W235U x 20
AB1 W235UBL x 10
AB1 B540,B550,B560

Com 24Vc	31	P24	
#2 Low Fire L/S	32	X00B	
#2 High Fire L/S	33	X00C	
Com 24Vc	34	P24	
–	35	X00D	
–	36	X00E	
Com 24Vc	37	P24	
–	38	X00F	
Chain Encorder	39	X010	
Com 24Vc	40	P24	
#1 Damper Open L/S	41	X011	
#1 Damper Close L/S	42	X012	
Com 24Vc	43	P24	
#2 Damper Open L/S	44	X013	
#2 Damper Close L/S	45	X014	
Com 24Vc	46	P24	
#3 Damper Open L/S	47	X015	
#3 Damper Close L/S	48	X016	
Com 24Vc	49	P24	
–	50	X017	
–	51	X018	
Com 24Vc	52	P24	
–	53	X019	
–	54	X01A	
Com 24Vc	55	P24	
–	56	X01B	
–	57	X01C	
Com 24Vc	58	P24	
–	59	X01D	
–	60	X01E	

-X42

AB1 W235U x 20
AB1 W235UBL x 10
AB1 B510,B520,B530

Com 24Vc	1	P24	
–	2	X01F	
Chain Oven Fault	3	X020	
Com 24Vc	4	P24	
Mesh Dischorge Fault	5	X021	
#2 Curcultion Fault	6	X022	
Com 24Vc	7	P24	
#3 Curcultion Fault	8	X023	
#2 Combusion Exhaust Fault	9	X024	
Com 24Vc	10	P24	
#3 Combusion Exhaust Fault	11	X025	
#2 Oven Exhaust Fault	12	X026	
Com 24Vc	13	P24	
#3 Oven Exhaust Fault	14	X027	
Hood Fault	15	X028	
Com 24Vc	16	P24	
Pre Heater Exhaust Fan Fault	17	X029	
Pre Heater Fan Fault	18	X02A	
Com 24Vc	19	P24	
Oven Fan Fault	20	X02B	
Oven Exhaust Fan Fault	21	X02C	
Com 24Vc	22	P24	
#2 Burnr Fault	23	X02D	
#3 Burnr Fault	24	X02E	
Com 24Vc	25	P24	
–	26	X02F	
–	27	X030	
Com 24Vc	28	P24	
–	29	X031	
–	30	X032	

-X42

AB1 W235U x 23
AB1 W235UBL x 7
AB1 B540,B550,B560

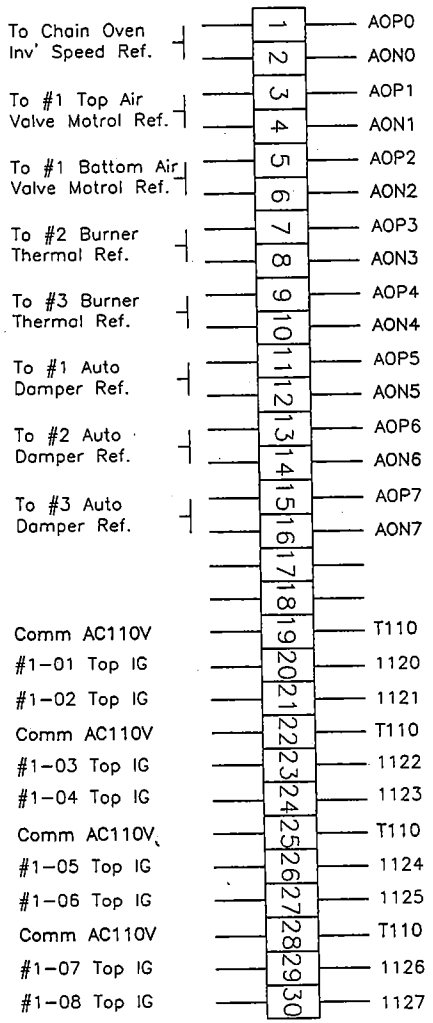
Com 24Vc	31	P24	
–	32	X033	
–	33	X034	
Com 24Vc	34	P24	
–	35	X035	
–	36	X036	
Com 24Vc	37	P24	
–	38	X037	
–	39	X038	
Com 24Vc	40	P24	
–	41	X039	
–	42	X03A	
Com 24Vc	43	P24	
–	44	X03B	
–	45	X03C	
Com 24Vc	46	P24	
–	47	X03D	
–	48	X03E	
Com 24Vc	49	P24	
–	50	X03F	
	51	–	
	52	–	
	53	–	
	54	–	
	55	–	
	56	–	
	57	–	
	58	–	
	59	–	
	60	–	

DO [illegible] G YANG FOOD MACHINERY CO.,LTD	FINISH	DATE	08.08.11	QUANTITY		MATE.		DRAWING NAME	POTATO CHIP
		FILE NO		DESIGN	Y.S.CHOI	SCALE	n/s	DRAWING NO	DYE080225

DWG NO	DYE080226

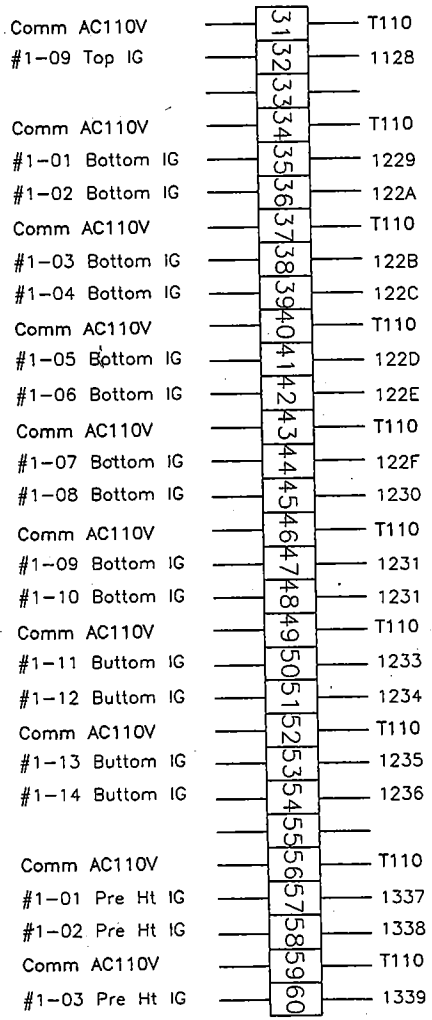
-X43

AB1 VV235U x 18
AB1 VV235UBL x 12
AB1 B510,B520,B530



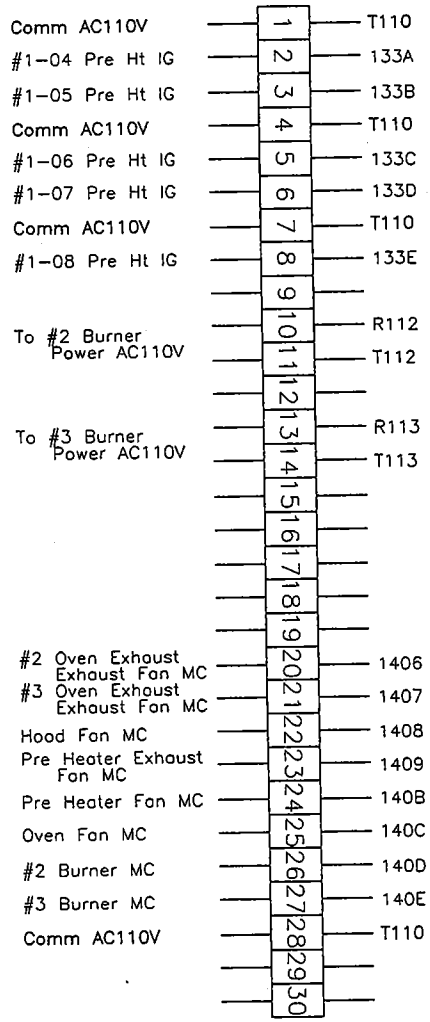
-X43

AB1 VV235U x 20
AB1 VV235UBL x 10
AB1 B540,B550,B560



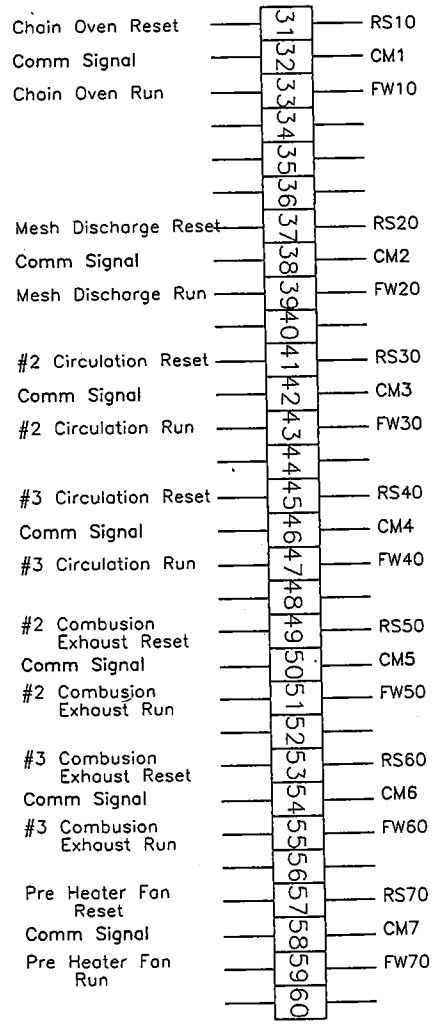
-X44

AB1 VV235U x 26
AB1 VV235UBL x 4
AB1 B510,B520,B530



-X44

AB1 VV235U x 23
AB1 VV235UBL x 7
AB1 B540,B550,B560



DONG YANG FOOD MACHINERY CO.,LTD	FINISH	DATE	08.08.11	QUANTITY		MATE.		DRAWING NAME	POTATO CHIP
		FILE NO		DESIGN	Y.S.CHOI	SCALE	n/s	DRAWING NO	DYE080226

OIL SPRAY UNIT

DYFM

DONGYANG DYNAMICS

Operator should read this manual before start-up system to prevent accident or injury person.

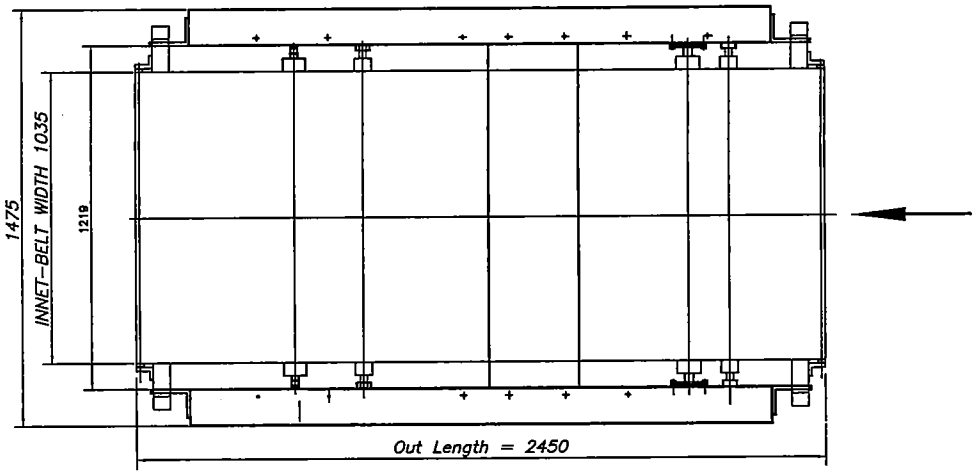
GENERAL DESCRIPTION

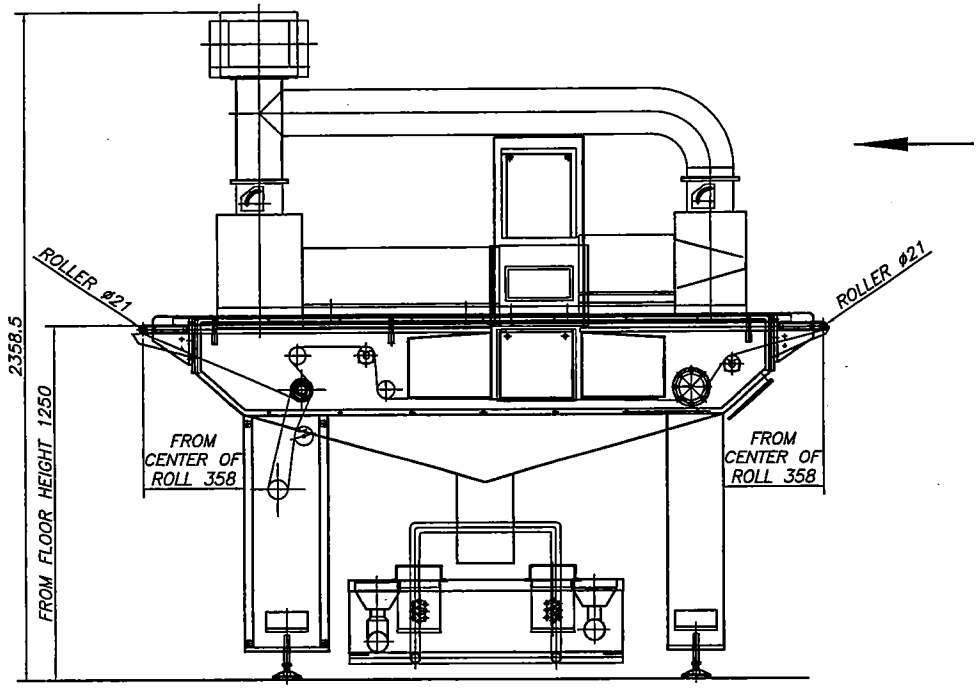
The "Oil spray unit" has been designed to be incorporated into a process line for coating a cracker product with Palm Oil or similar product at an application temperature of 50 °C.
The machine uses a centrifugal atomizing distribution system with high speed rotary sprayers. The quantity of oil that is distributed can be adjusted. Excess oil is collected in a tank, filtered and then put back into the circuit.

The machine includes a conveyor with a stainless steel structure (1) and a stainless steel wire-mesh belt (2). The extremes of the machine are fitted with snub rollers (3) to provide smooth transfers of product on and off line. The pick-up arm can be lifted by lever (4) to permit discharge of the baked product.
The wire mesh is wound around roller (5) that is in turn powered by a gear motor.
Oil is sprayed on the product by a set of upper and lower atomizers (6) each with its own directly connected motor. Hydraulic unit (7) circulates the oil and handles recuperation, filtration, refill and discharge.
The wire-mesh belt includes cleaning brush (8), tensioning (9) and tracking devices (10).
Upper aspiration unit (11) picks up air from the machine intake and transfers it to the discharge end. This creates an air barrier which, together with upper covers (12), prevents oil from exiting from the machine.
The machine is equipped with electric board (13) that carries the main operating, safety and alarm controls and devices.

When fluid is passed through piping to the centre of a rotating disc, centrifugal forces thus created will atomise the fluid to a greater or lesser extent depending upon the rotational speed of the disc.
The large bore oil feed pipes ensure free passage of the fluid direct from the tank to the centre of the disc. Careful pipework design ensures an even flow of fluid to each disc, thus giving an excellent all over even spray distribution for the vast majority of fluid. Tank design and pump is carefully considered in order to ensure the fluid is passed to the disc in its optimum condition,
Machine is designed to optimise the spray pattern which can be produced. This means that discs are mounted above and below the product to be sprayed in order to ensure 100% coverage.

OIL SPRAY





GENERAL TOLERANCE	
6↑~	± 0.5
16~63	± 0.3
4~16	± 0.2
1~4	± 0.1
SURFACE ROUGHNESS	
▽▽▽	0.85 ~ 6.35
▽▽	0.85 ~ 6.35

NOTE NO.	CONTENTS	DATE	SIGN
⚠			
⚠			
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TITLE	OIL SPRAY				
DESIGN	CHECK	APP	PROJECTION	DRAWING SCALE	DATE
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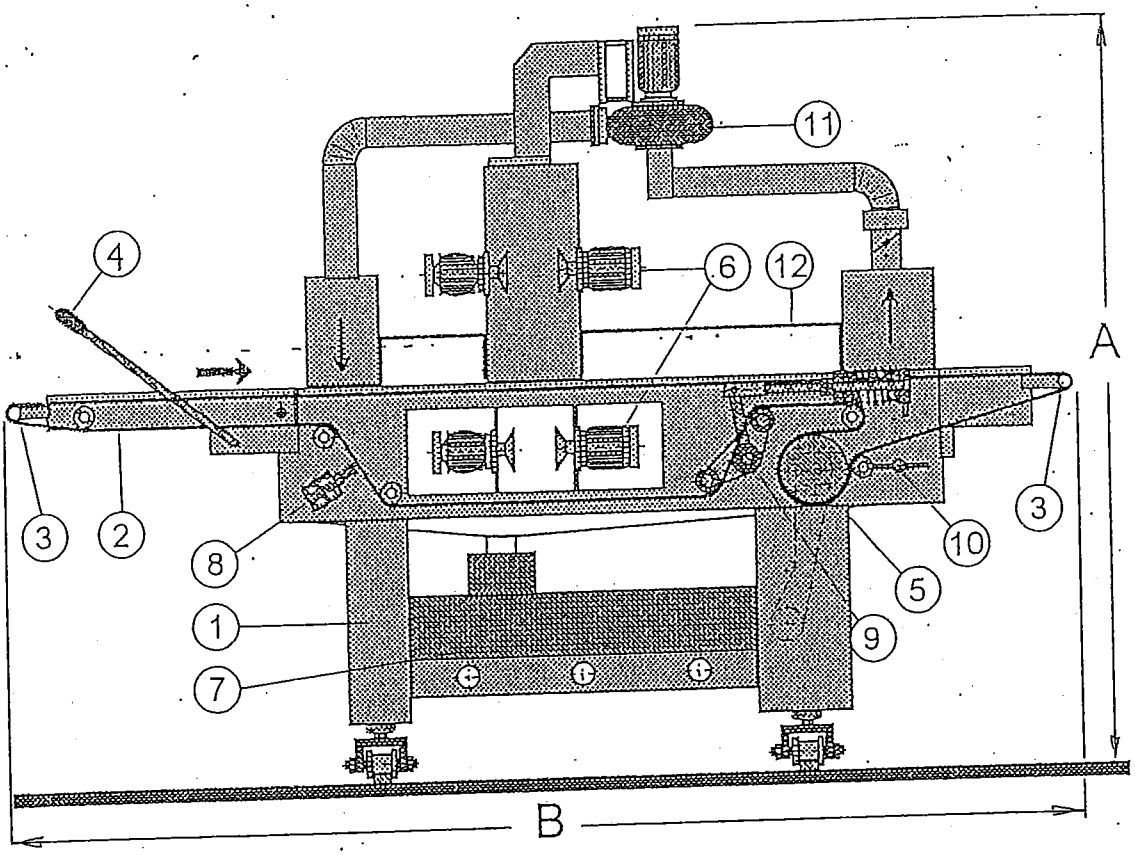
PART SCALE	FILE NO.			DRAWING NO.	HD-PT07-A1.



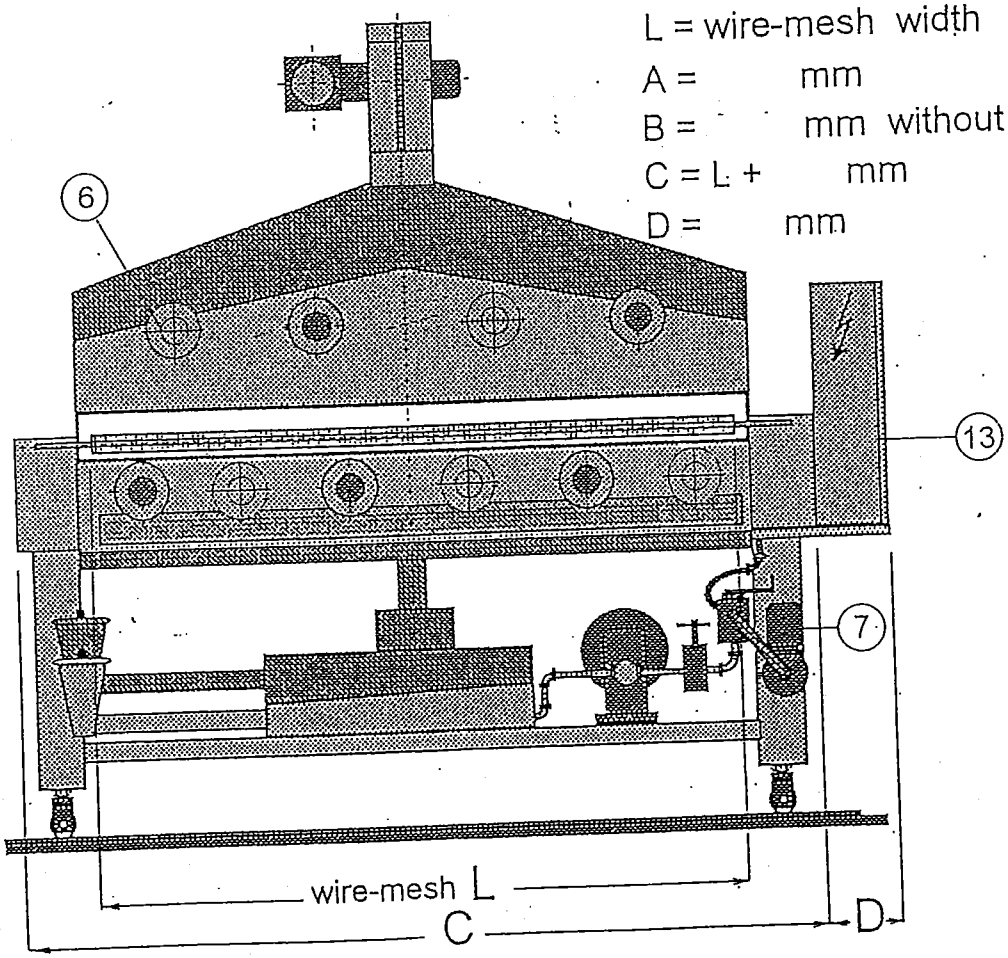
L = wire-mesh width

A = mm

B = mm without extension

C = L + mm

D = mm

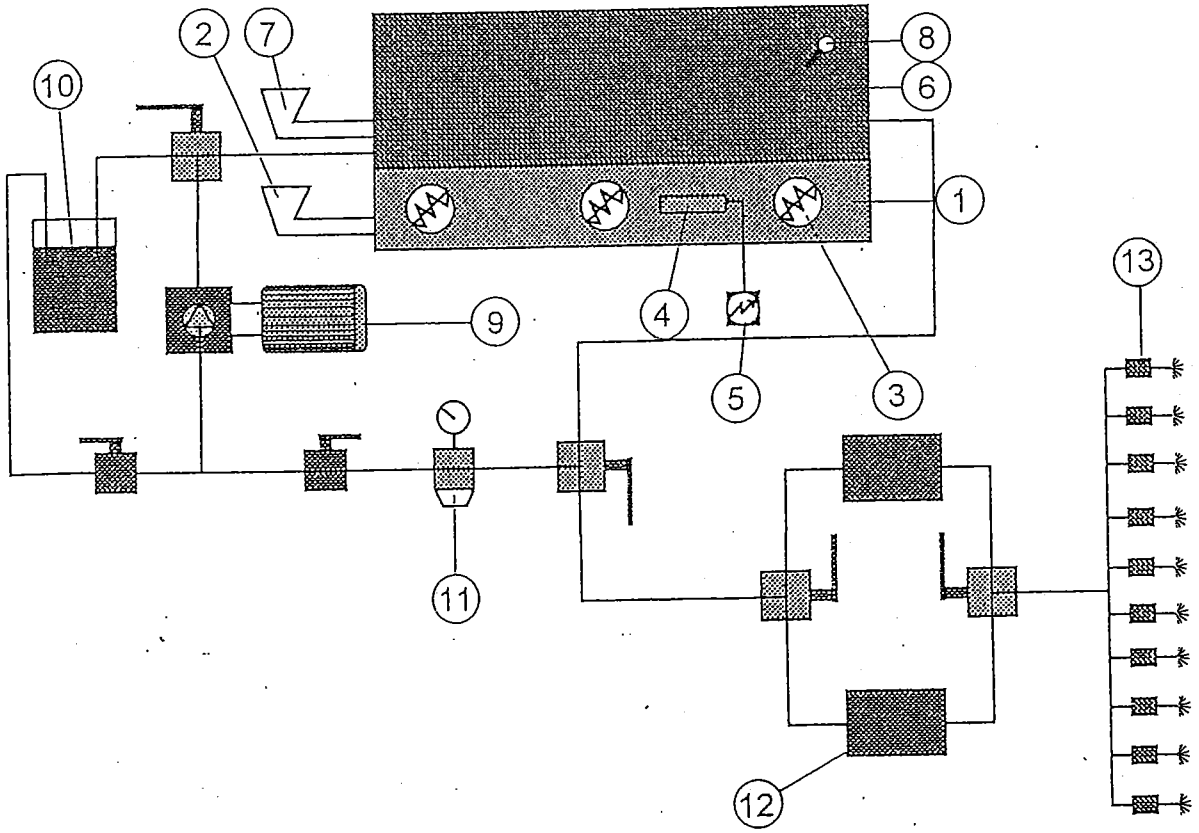


HYDRAULIC UNIT

The oil to be sprayed on the product is processed in a hydraulic unit mounted on-board the machine. Its main components include:

1 - tank for water used to heat the oil
2 - manual water refill opening
3 - heating coils
4 - water temperature sensor
5 - thermostat
6 - oil tank
7 - manual oil refill opening
8 - oil level gauge
9 - oil circulation pump
10 - oil pick-up and discharge tank
11 - pressure regulator with 0-10 bar pressure gauge
12 - filters
13 - set of atomizers

The circuit comes complete with manual valves, rigid and flexible pipes, connections, reduction fittings, etc.



GENERAL DESCRIPTION

The "Oil spray unit" has been designed to be incorporated into a process line for coating a cracker product with Palm Oil or similar product at an application temperature of 50 °C.
The machine uses a centrifugal atomizing distribution system with high speed rotary sprayers. The quantity of oil that is distributed can be adjusted. Excess oil is collected in a tank, filtered and then put back into the circuit.

The machine includes a conveyor with a stainless steel structure (1) and a stainless steel wire-mesh belt (2). The extremes of the machine are fitted with snub rollers (3) to provide smooth transfers of product on and off line. The pick-up arm can be lifted by lever (4) to permit discharge of the baked product.
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Machine is designed to optimise the spray pattern which can be produced. This means that discs are mounted above and below the product to be sprayed in order to ensure 100% coverage.

INSTALLATION

Installation does not require a specialist. Supervision by at least one expert fitter is sufficient.
Workers must wear safety gloves.

- Before starting to assemble the machine make sure there is a first aid box equipped with first aid materials in a nearby and accessible place.
- Condensate and wash water drain pits must have already been provided prior to installing the machine. Make sure their positions do not interfere with the legs of the machine.
- Check the floor load-bearing capacity where the machine will be installed.
- The machine is in a single piece and is positioned when work is well along. Make sure there is sufficient room for handling and manipulating it.
- Tracing must be done with reference to the oven drive unit.
- The machine can be pushed out from the processing line for easy cleaning. We recommend leaving at least 1800 mm. on one side and at least 1000 mm on the other side.
- Fasten the rails to the floor; check their parallelism and coplanarity.
- Push the machine so that its wheels mesh with the rails. Push the machine into position in the production line. Then fasten its mechanical stops.
- Use the bolts that fasten the wheels to lift or lower the machine so that its wire mesh is at the same height as those of adjacent machines.
- Do not rest the tools on the belt.
- The machine is not designed to work in an explosive atmosphere. It is forbidden to have it work in such an environment.
- Paths and connections of electrical cable trays, conduit, tubes, etc. to the machine must be compatible with the use it is put to. These must not, for example, be fastened to movable guards.

ELECTRIC SYSTEM

This includes connections from control boards to the various machines that these monitor and control.
Connections are inside galvanized cable trays or light threaded galvanized metal conduit. Connections are made to the user using flexible sheathes or threaded connections.
If these components cannot be mounted on the machine there must be a path on posts supporting the cable trays.
Cables are the flame-proof type. For 380V users they have the following characteristics: isolation degree 4, flexible, minimum area 1.5 mm^2. For 24/110V users: isolation degree 2, minimum area 1 mm^2.
Cables and internal wires are numbered. Cables have their own numbering system. Wires are numbered according to the wiring diagram.
All movable guards have safety microswitches with alarm signals.

NOTE: when laying cables remember that the machine can be moved 1800 mm. out from the production line.

OPERATION

Supervisors and machinery operators should be instructed and trained in at least the following:

- Machinery safety procedures, including emergency procedures.
- The correct and safe way of operating machinery.
- Knowledge and understanding of the dangers they face.
- Understanding the purpose and function of the safeguards which protect them.
- Reporting faults immediately, including guard defects.
- Wearing and care of protective clothing and equipment.
- Need for good housekeeping.
- Statutory requirements.

SAFETY PROCEDURES

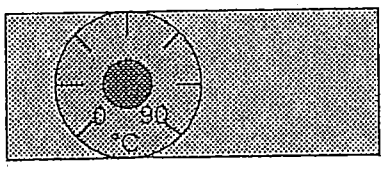
- Make sure that all the machine safety systems are in efficient working condition (emergency stop devices - earth connections - guard microswitches - optical and acoustic alarm systems)
- Before starting the machine ensure the immediate area around and on the machine is clear of unnecessary equipments.
- Never operate the machine with guards removed or insecurely fitted.
- Whilst the machine is in operation do not make any adjustments which are not part of the normal running procedures.
- Always ensure that operators are conversant with the machines functions and are fully aware of the position and purpose of control switches and emergency-stop buttons.
- Always isolate the machine at the mains before making adjustments to moving parts or electrical circuits.
- Never allow loose items of clothing to come in contact with the machine.
- Always ensure that only qualified personnel make adjustments to electrical circuits.
- Before starting the machine ensure all terminal box and trunking leads are securely fitted.

SAFETY DEVICES CAN BE PURPOSELY EXCLUDED DURING MACHINE ASSEMBLY, START-UP AND TESTING.
IN THIS CASE THE OPERATOR MUST BE INSTRUCTED AND INFORMED REGARDING RESIDUAL DANGERS AND MUST WORK IN TOTAL SECURITY TO PREVENT HARM TO HIMSELF AND TO OTHERS.
ALL SAFETY DEVICES MUST BE IMMEDIATELY RESTORED TO FULL OPERATIONAL EFFICIENCY WHEN THESE PROCEDURES ARE TERMINATED AND WHEN IT IS NO LONGER NECESSARY TO HAVE FREQUENT ACCESS TO THE DANGER ZONE.

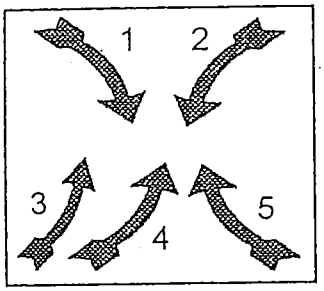
THE MANUFACTURER IS NOT RESPONSIBLE FOR HARM TO PERSONS OR PROPERTY CAUSED BY TAMPERING WITH GUARDS AND SAFETY DEVICES.

PRELIMINARY OPERATIONS

- Check the oil level and the amount of grease in all those components that require lubrication.
- Check that there are no foreign bodies on the conveyer.
- Check that each motor has a thermal disk if it is controlled by an inverter or a thermal cutout for other types of control.
- Clean all grease and oil off surfaces that come in contact with the product to be processed.
- Manually fill the water tank through its filler opening.
- Fill the oil tank, taking oil from the storage tank using the pump (DIAGRAM B). Check the oil level.
- Close movable and fixed guards.



- Set the water heating temperature on thermoregulator fixed on the tank side. At the beginning set 70°C; in production change according to the results.



- Check that motors rotate in the proper direction.
  The right rotation of atomiziers is illustrated on a label.

- Move the cleaning brush to where it contacts the mesh.
  Loosen the screws that fasten the brush support plate. This plate has slots that permit it to be moved.
- Check no-load absorption by all motors.

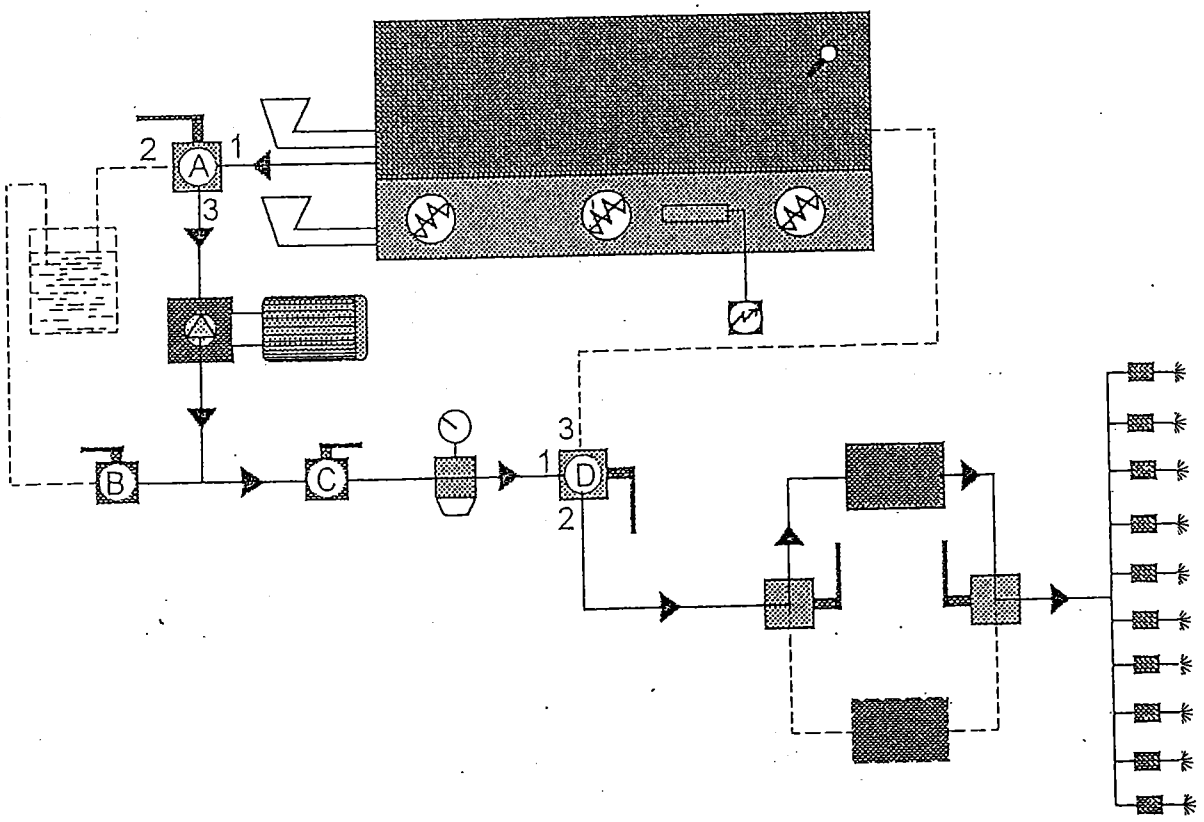
The following diagrams illustrate three operating situations for the machine:

DIAGRAM A - NORMAL OPERATION
Three-way valve "A" in position 1-3.
Two-way valve "B" closed
Two-way valve "C" open
Three-way valve "D" in position 1-2.

DIAGRAM B - LOADING OIL INTO THE CIRCUIT
Three-way valve "A" in position 2-3.
Two-way valve "B" closed
Two-way valve "C" open
Three-way valve "D" in position 1-3.

DIAGRAM C - UNLOADING OIL FROM THE CIRCUIT
Three-way valve "A" in position 1-3.
Two-way valve "B" open
Two-way valve "C" closed.

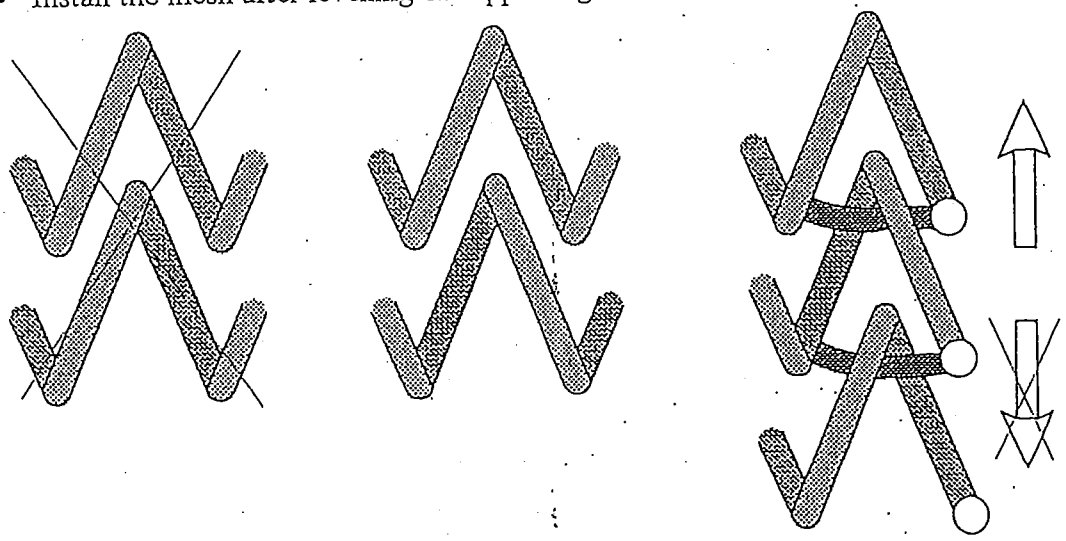
DIAGRAM A - NORMAL OPERATION



REPAIRS

The wire-mesh, if damaged/distorted, can be replaced by section; it is not necessary to replace the wire-mesh as a whole. When replacing a section and making a joint it is important that a full pitch and multiples of full pitches are replaced; failure to do so will cause the belt to ride above the pins where the incorrect joint has been made, with the subsequent possibility of the belt tracking off and causing damage.

- Uncrate the wire-mesh carefully to avoid damage to the mesh.
- Check the new belt for spirals that have been turned during shipment. Any turned spirals should be turned back into position or removed before tightening the mesh or permanent damage may result.
- Tighten the mesh to have as little slack as possible and remove the excess.
- Join only spirals of right hand to left hand; joining two spirals of the same hand will cause the mesh and/or sprockets to jump to one side each time this joint passes over the sprockets causing permanent irreparable damage to the mesh.
- Be sure the mesh is installed with the proper direction of travel.
- Do not install the mesh untill the conveyor has been checked for catch points where the mesh might get caught.
- Install the mesh after levelling of supporting bed or rollers.



Slat belts are easy to replace: just remove the coupling pins, pulling them out from the hinge and replacing worn slats, fastening them with new pins.

Pay attention to the direction of belt movement because slat meshes have a preferential direction for movement. Generally they move with the female joint facing forward.

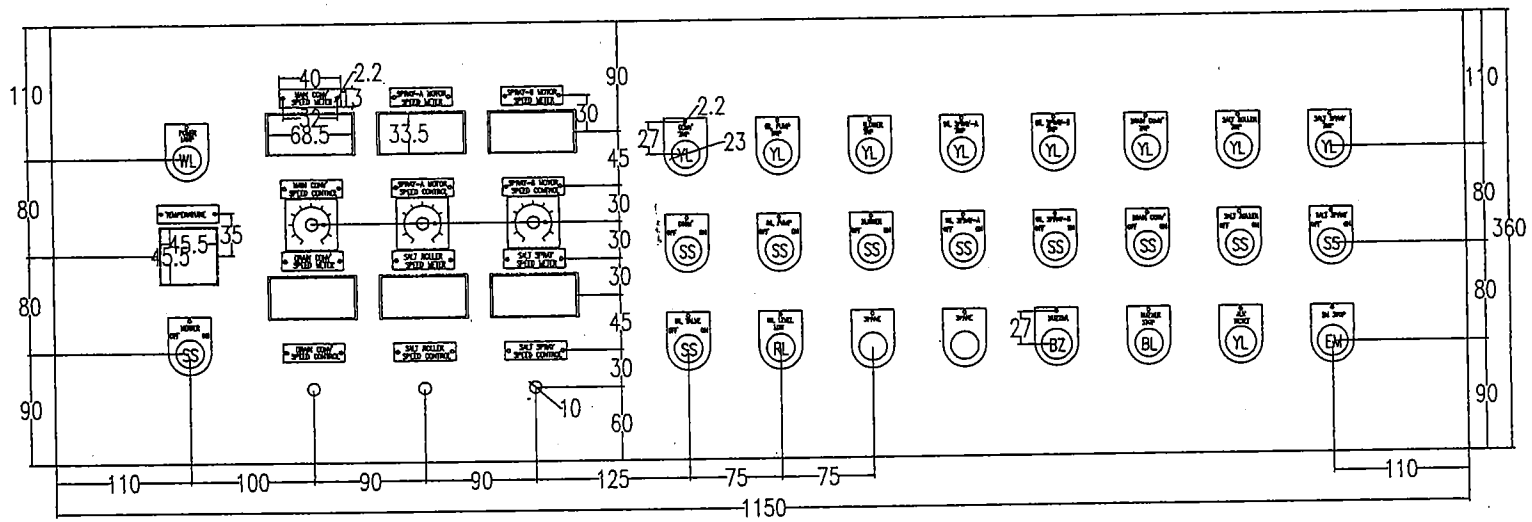
THE MANUFACTURER IS NOT RESPONSIBLE FOR MACHINE EFFICIENCY AND SAFETY WHEN NON-ORIGINAL SPARE PARTS ARE USED.

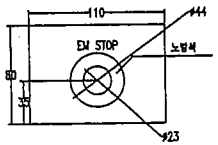
ELECTRIC CONTROL PANEL

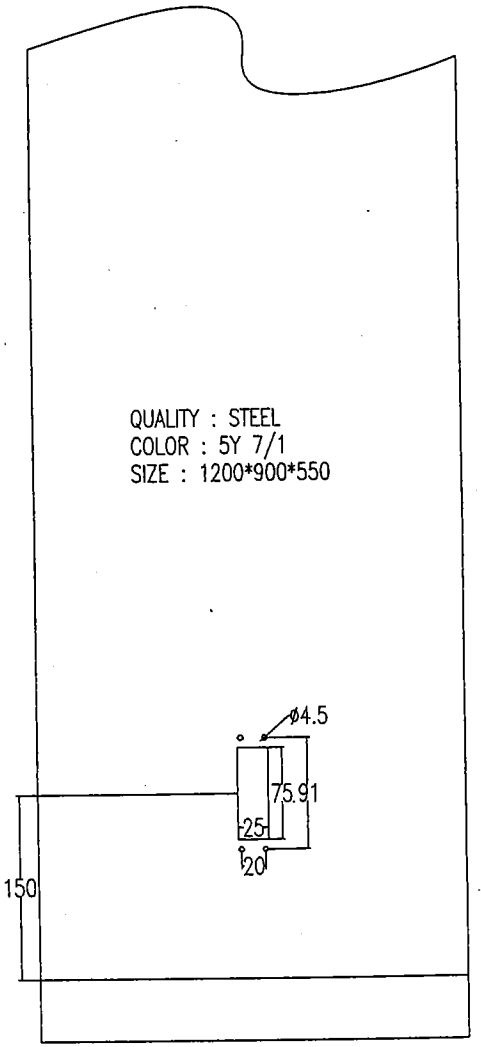
OIL SPRAY

DYFM

DONGYANG DYNAMICS







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CHKD BY	-	SCALE NONE				
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DRWN BY	B. C. DAM	DATE 2006. 04. 10.	-			

DONG YANG
FOOD MACHINERY CO. LTD

REF. NO	-	Sheet No.	of
DWG NO	DYE-001	Revision No.	0

REVISIONS

PRO

DWG NO DYE5031108

PART LIST

	DWG NO	NAME	MODEL	MAKER
01	MCCB1	MCCB	ABS-54 50A	LG
02	MCCB2	MCCB	EBS-33 20A	LG
03	MG1	MG S/W	GMC-40 200V	LG
04	MG2,3	MG S/W	GMC-9 200V	LG
05	CP1	CP	GCP32-10A	Honeywell
06	INV'1,4,5,6	INVERTER	F540-0.75K	MITSUBISHI
07	INV'2,3	INVERTER	F540-3.7K	MITSUBISHI
08	F1,F2	FUSE	DFH-F20	DAE YANG
09	R01-R21	RELAY	MY4N 200V	Honeywell
10	BZ	BUZZER	KH-4025	KUN HUNG
11	TZ4ST	TEMPERATURE	TZ4ST	Autonics
12	PL	PL		Telemecanique
13	PBL	PBL		Telemecanique
14	SS	SS	XB5AD21	Telemecanique
15	METER	SPEED-METER	MY4-DV 5VDC 1750RPM	Autonics
16	EOCR1,2	EOCR	SS05R	SAM HWA
17				
18				
19				
20				

NO.	PART NO.	DESCRIPTION	METEEIAL	Q'TY	DIMENSION	REMARK
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DWG NO	DYE-002	Revision No.	0

REVISIONS

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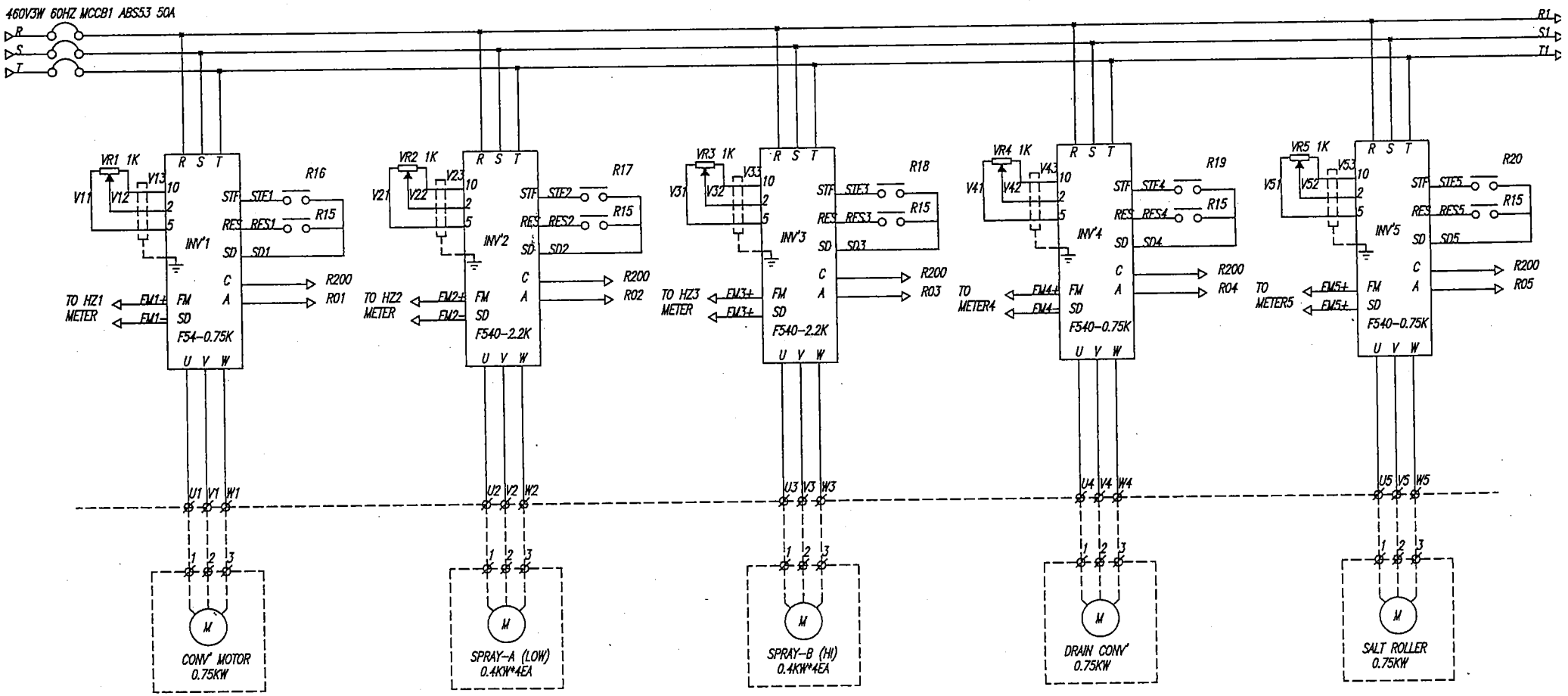

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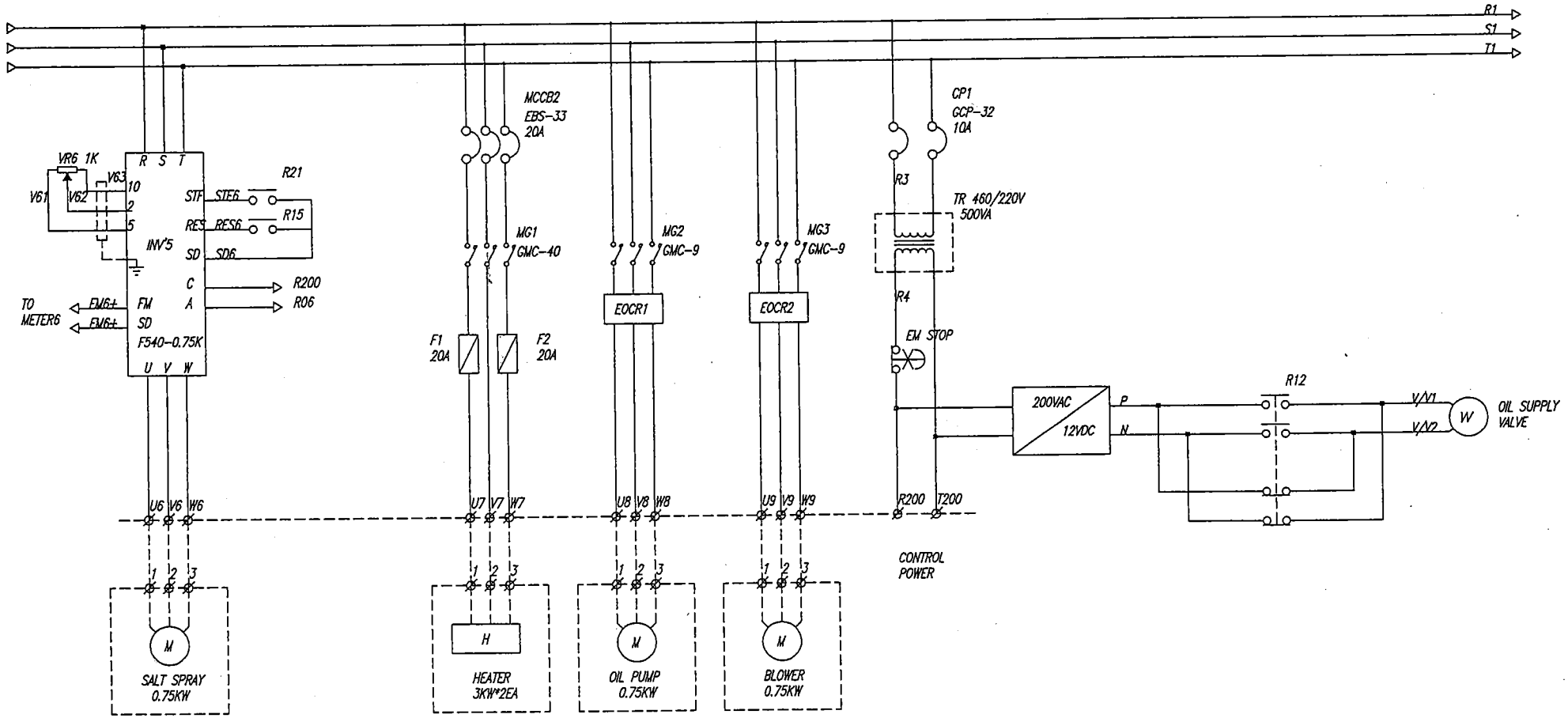

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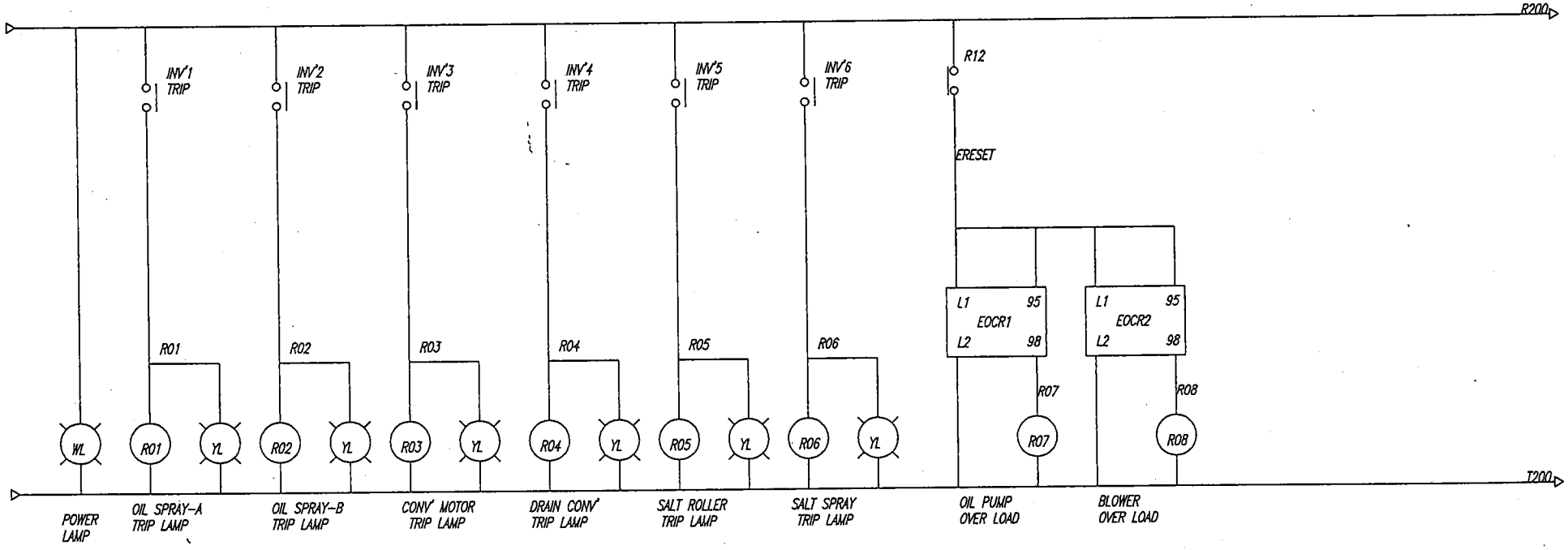

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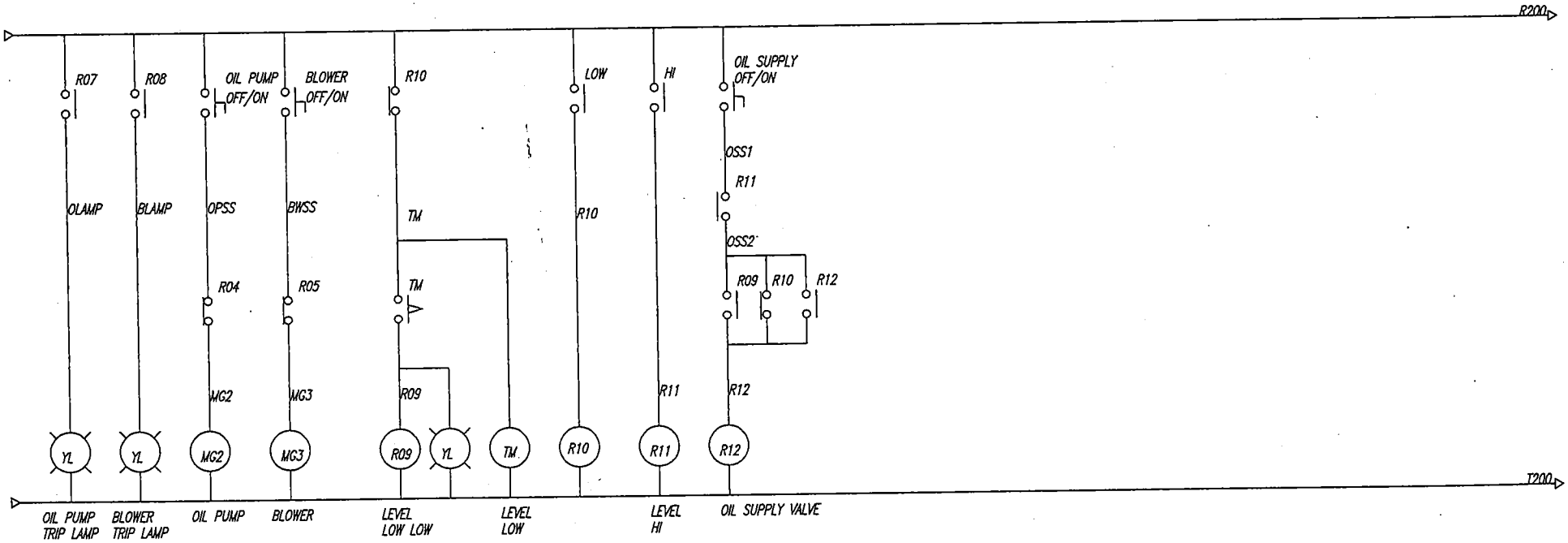

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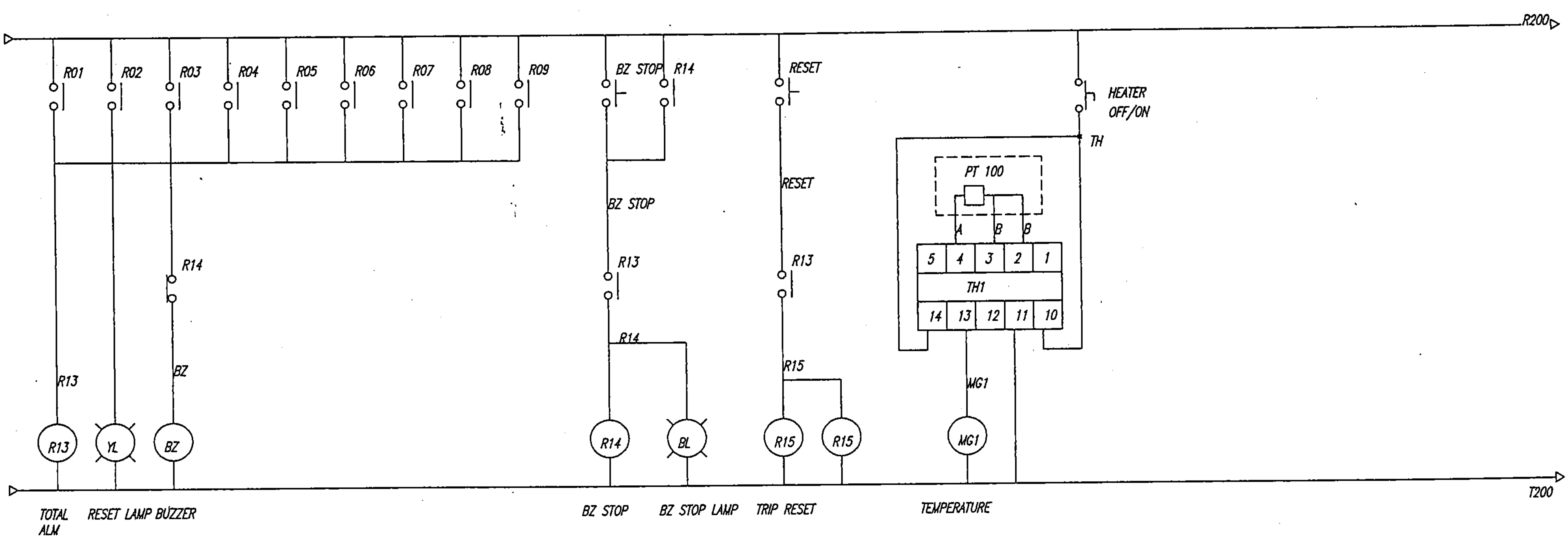

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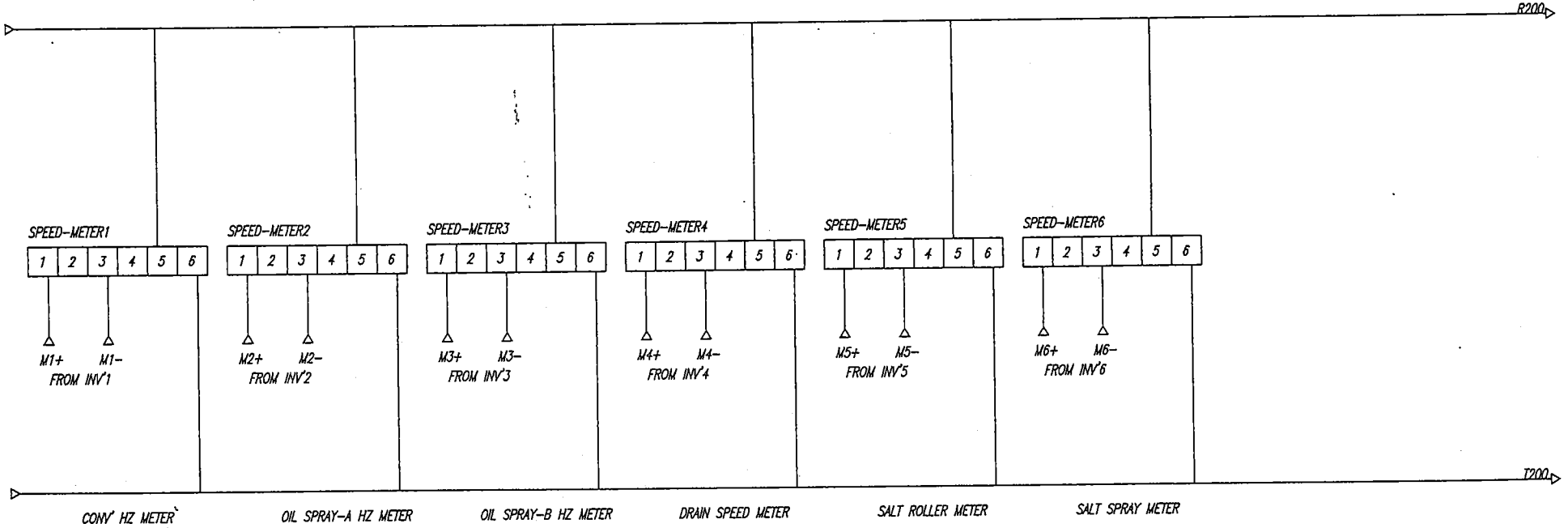
DWG NO DYE503108

DWG NO	DYE5031108



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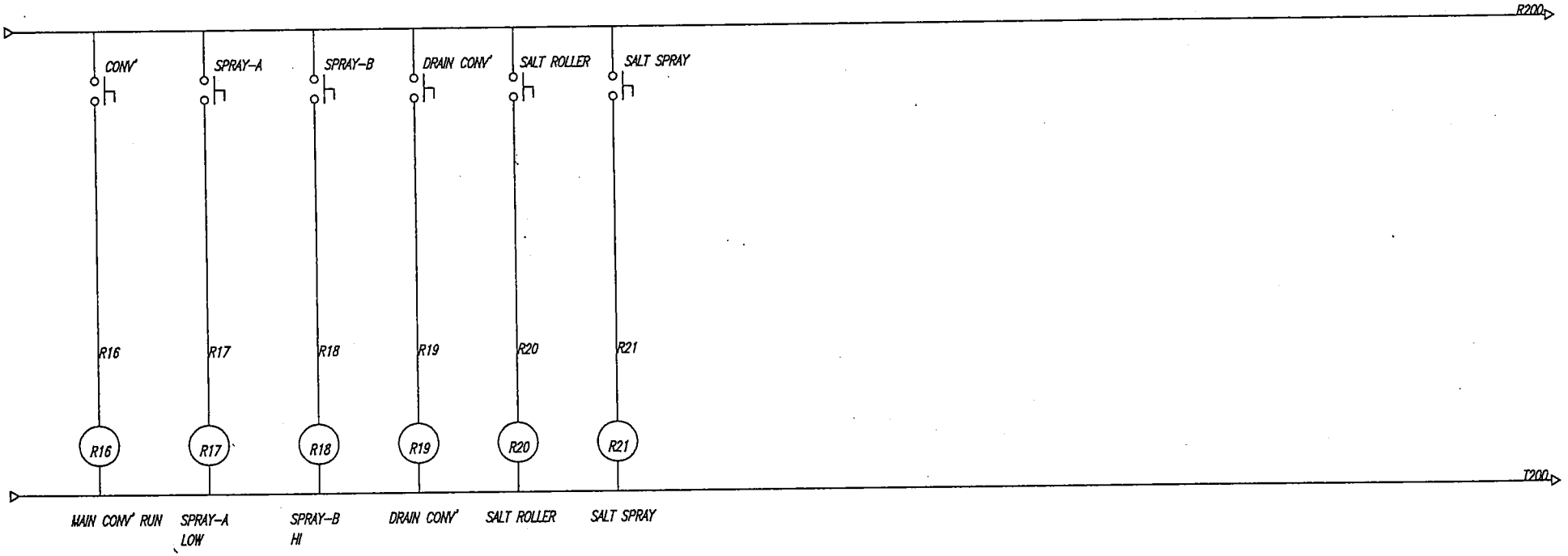
REF. NO	-	Sheet No.	of
DWG NO	DYE-008	Revision No.	0

REVISIONS

DWG NO DYE5031108



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DONG YANG
FOOD MACHINERY CO. LTD

REF. NO	-	Sheet No.	of
DWG NO	DYE-009	Revision No.	0

REVISIONS

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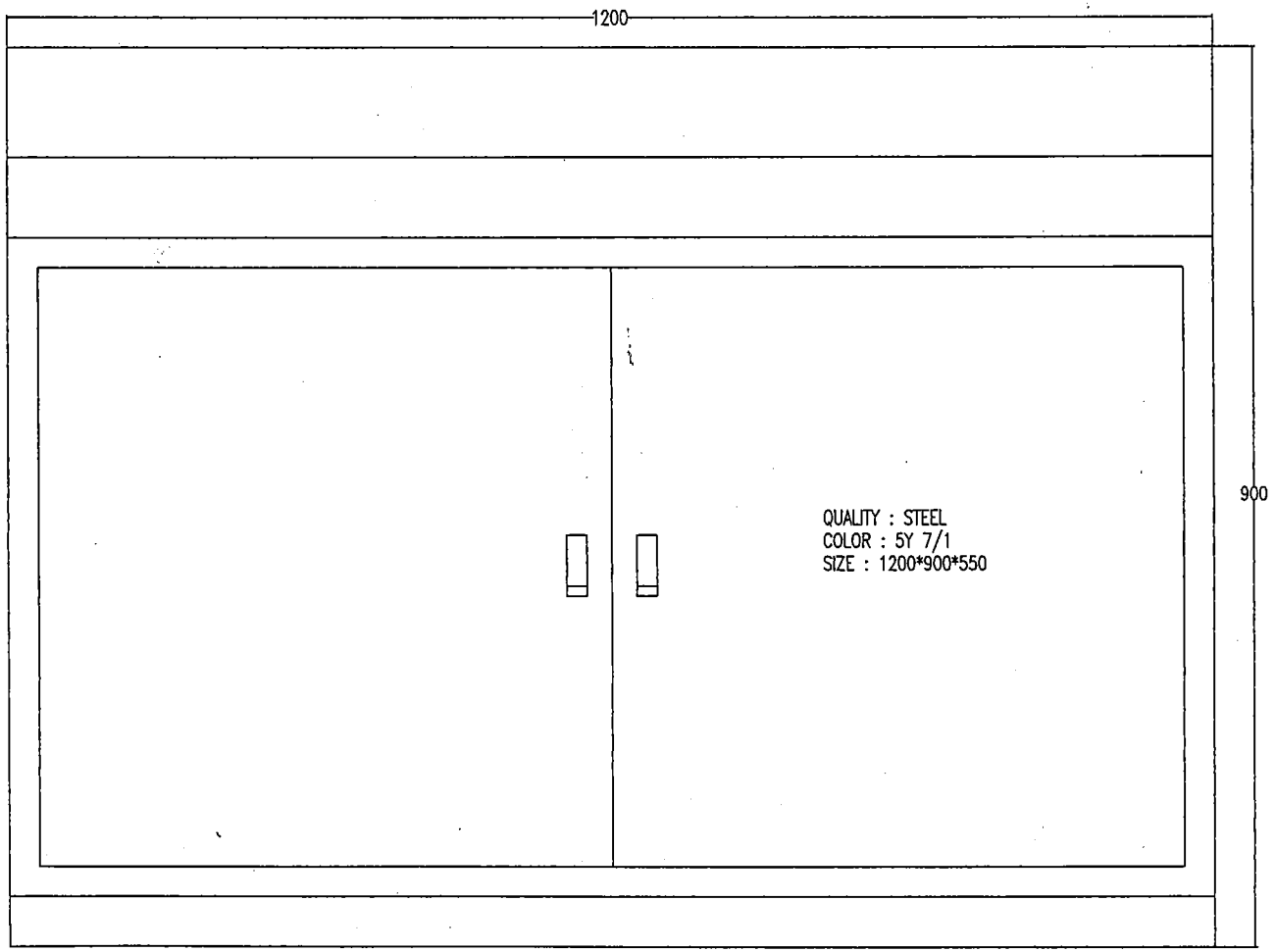

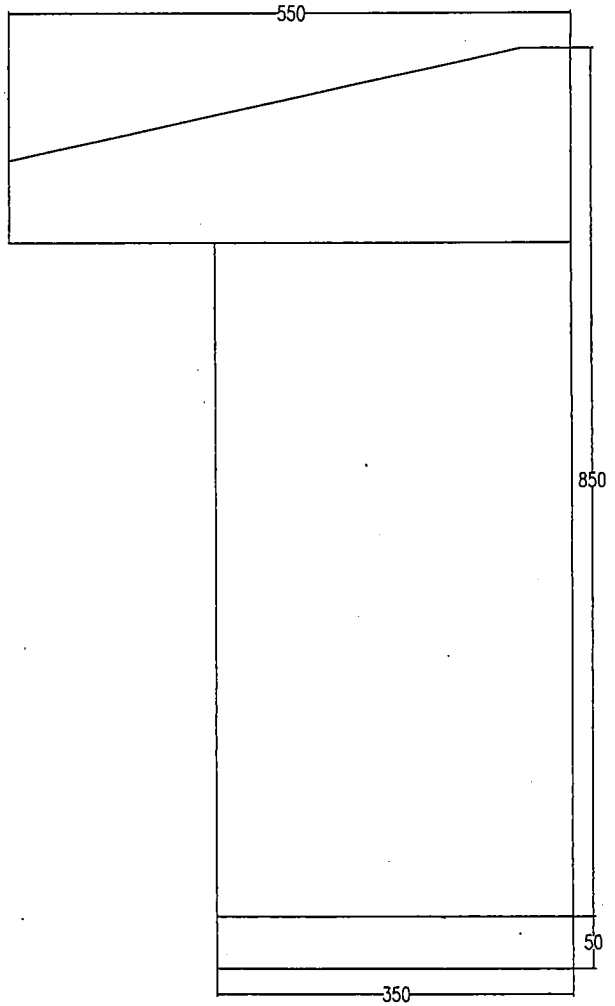

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DRWN	BY	B. C. DAM	DATE	2006. 04. 10.

PROJECT -

TITLE OIL SPRAY M/C

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REF. NO -

Sheet No. of

DWG NO DYE 001

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REVISIONS