

Operating & Maintenance Instructions

Thermoplastic Line Bending Heaters

Model 216 and 325, 216P and 325P

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1. Installation requirements

1.1 Lifting and Handling

The weights of the 216 / 325 machines are as follows:

216	46kg
325	50kg

The machine should be lifted by the carrying handle on the control box, and either the handles or the leg at the other end. The machine should be lifted by a minimum of two people. On the manual machine, ensure that the clamp beam is locked in the closed position with the red catch before lifting.

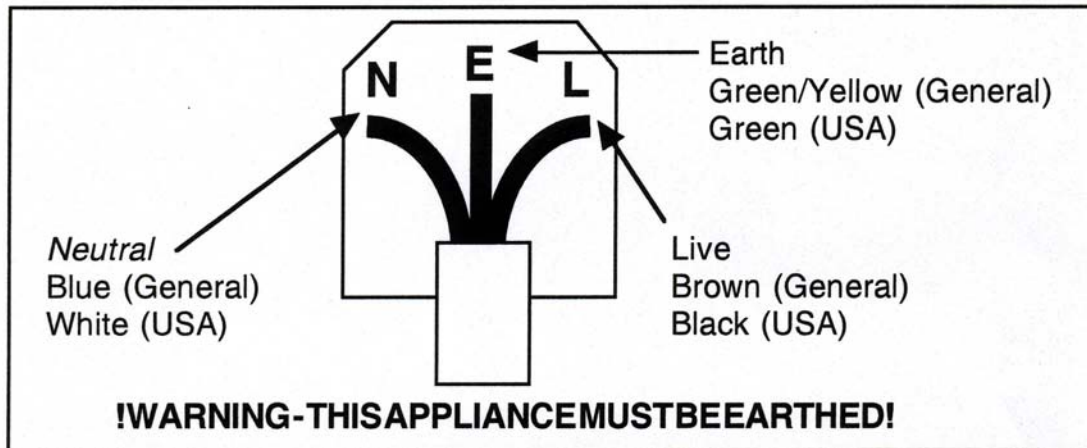
Due to the long thin shape of the machine, it may be found that the centre of the heater beam sags under its own weight. This has the effect of bringing the wires closer to the material in the middle of the machine, which may disturb bend consistency. To alleviate this, there is a central leg fitted to the machine, which can be adjusted and locked in the required position once the machine has been positioned.

1.2 Electrical Installation

!!IMPORTANT!

The wires in this mains lead are coloured in accordance with the following code:

General	Earth	USA
Green & Yellow	Neutral	Green
Blue	Live(Hot)	White
Brown		Black



General

The green and yellow wire must be connected to the terminal marked with the letter E, or the earth symbol, or coloured green and yellow or green.

The blue wire must be connected to the terminal marked with the letter N, or coloured blue or white.

The brown wire must be connected to the terminal marked with the letter L, or coloured brown or red.

USA (115V)

The green wire must be connected to the green pin (the largest).

The white wire must be connected to the silver pin.

The black wire must be connected to the brass pin.



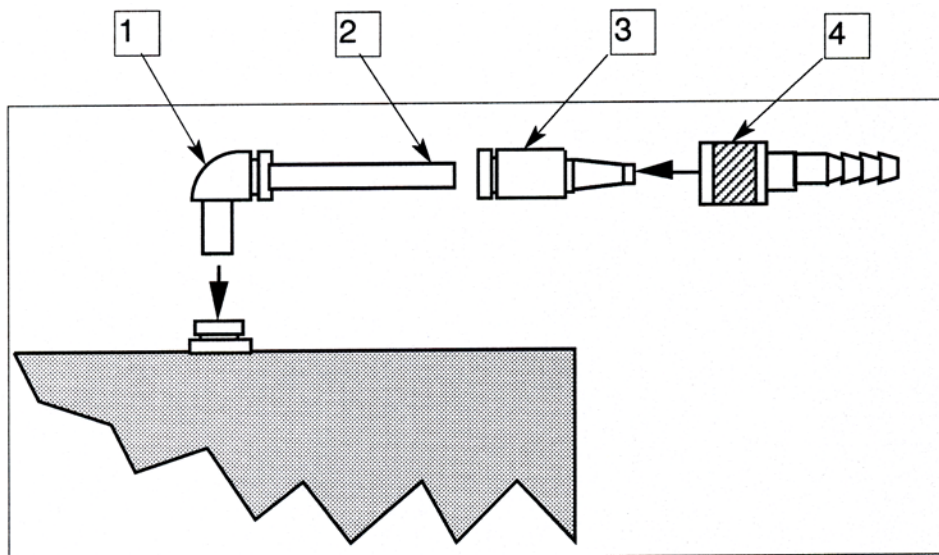
Warning - read instructions before installation and use.

If in doubt about electrical supply or connection refer to your supplier or consult a qualified electrician.

1.3 Pneumatic Installation (216P and 325P only)

Compressed air at a pressure of between 3.0 and 8.0bar (45-120psi) is required (216P and 325P only). The connection point on the machine is located next to the electrical inlet on the control unit. A push fit elbow (1) and a short length of hose (2) is supplied, along with a Schrader type fitting (3) and (4). All that is required is a length of 6mm (1/4") inside diameter flexible air hose connected to a supply adjacent to the machine. Air consumption is negligible and should not be noticeable when connected to any existing system of average capacity.

The machine can be isolated from the air supply by pulling and disconnecting the Schrader fitting (4). The connector will automatically seal against air line pressure upon disconnection.



2. Introduction

The Model 216 and 325 local line bending heaters have been developed from our Model 2000 and 3000 machines and utilise the same multiple tensioned resistance wires, operating from below the material.

The two basic machines will heat bend lengths of up to 2166mm (85") and 3250mm (128") respectively.

The wires are electrically energised using a low voltage supply from a safety screened transformer. There is no contact between the heating wires and workpiece and no external cooling aids are required. A unique and innovative wire positioning mechanism allows for the the wire combinations and positions to be quickly adjusted and set to cover a wide range of configurations.

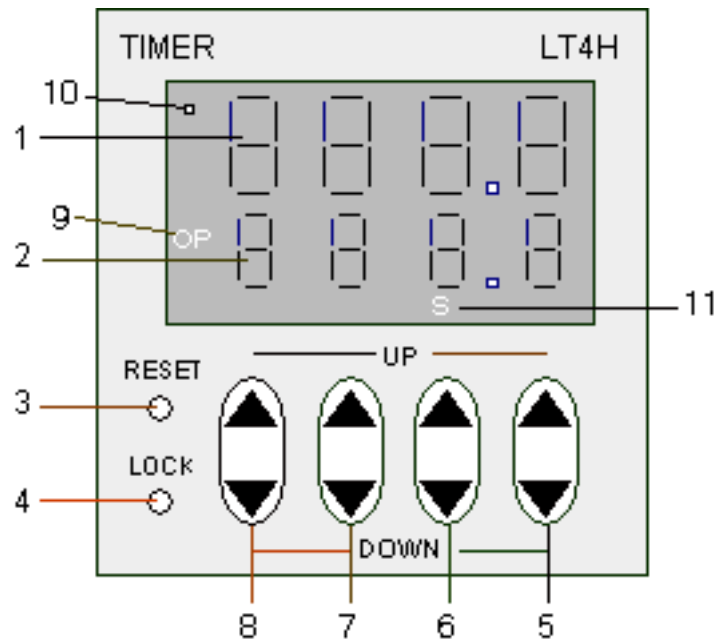
The upper clamp beam clamps the work to control distortion during heating. The clamp beam can be manually operated (216/325) or pneumatically operated (216P/325P). The heating cycle is timer controlled (see page 6 for timer operation) with a warning audible alarm to indicate the end of the cycle (216/325), or automatic release of the clamp beam (216P/325P).

Generally the design provides a linearly very uniform, adaptable, consistent and precise system for the bending of all types of thermoplastic sheet in general use.



Model 325

3. Timer



- 1 Live display. Displays time elapsed since cycle start (in seconds). Red illuminated display.
- 2 Set time display. Displays time set (in seconds) and can be adjusted when the timer is at rest or during a cycle. Orange illuminated display.
- 3 Reset button. Cancels timing cycle.
- 4 Lock button. Locks the Set Time, so that it cannot be adjusted by pressing toggle buttons 5,6,7 or 8. Press to lock and to unlock.
- 5 Tenths of seconds toggle button. Press on the down arrow to decrease tenths of seconds and the upward arrow to increase tenths of seconds (between 0 & 9).
- 6 Seconds toggle button. Press on the down arrow to decrease seconds and the upward arrow to increase seconds (between 0 & 9).
- 7 Tens of seconds toggle button. Press on the down arrow to decrease tens of seconds and the upward arrow to increase tens of seconds (between 0 & 9).
- 8 Hundreds of seconds toggle button. Press on the down arrow to decrease hundreds of seconds and the upward arrow to increase hundreds of seconds (between 0 & 9).
- 9 Operational indicator. Illuminated orange, flashes during cycle.
- 10 Secondary operational indicator. Illuminated red, flashes during cycle.
- 11 Format indicator. Illuminated orange, displays the time format (normally seconds).

Note:

FOR 216P AND 325P MACHINES

When a heating cycle is initiated by pressing the timing cycle start button, the timer automatically begins timing the cycle, by lowering the upper heater beams, thus clamping the material loaded in the unit. At the end of the cycle, upper heating beams will automatically lift off the material allowing it to be released for folding.

FOR 216 AND 325 MACHINES

When the heating cycle is initiated by lowering the upper heater beams, the timer must be started manually by pressing the start button. An audible alarm indicates the end of the heating cycle, and at this time the upper heating beams should be raised. Pushing the cancel button will stop the alarm and reset the timer.

4. Hazard Assessment

Hazard assessment is as follows:-

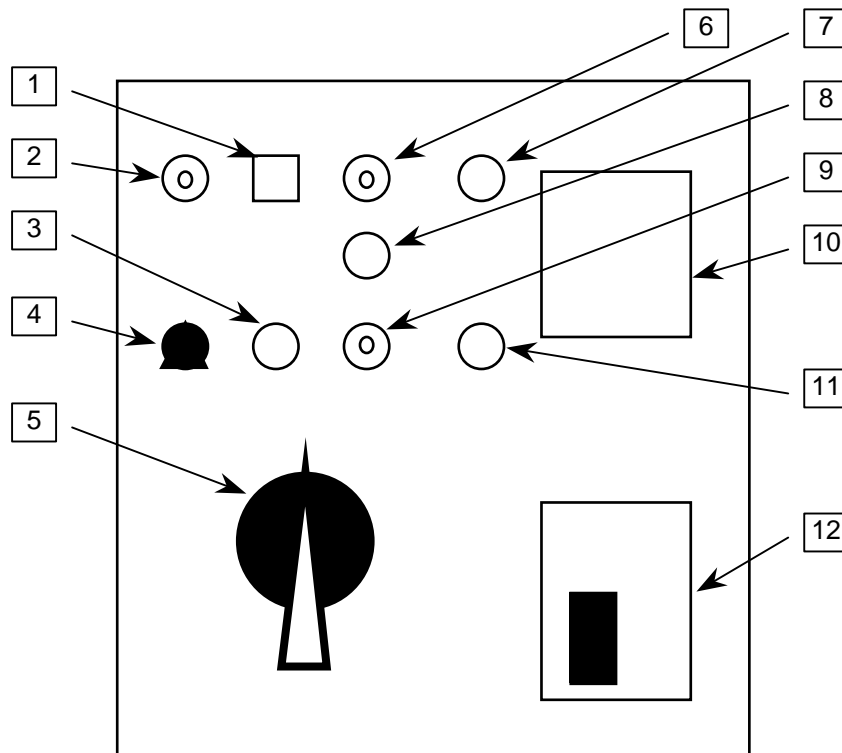
- 1) Exposed electrically powered heating wires.
 - 2) Upper clamping beam which is pneumatically powered (216P/325P).
 - 3) Electrical equipment operating on 240 volts AC power supply.
-
- 1)
 - a) The low voltage power supply transformer is safety screened to prevent the possibility of direct connection between the primary and secondary windings and is protected by thermal overloads.
 - b) The voltage between the heating wires and earth (ground) does not exceed 25V.
 - c) Contact with the heating wires is possible but unlikely. The wires are generally screened by the work support channels. Warning marks are placed in the relevant positions. In the event of contact the likely injury will be a very local severe burn.
 - 2)
 - a) The clamping pressure is pre-set to limit the clamping forces and no serious hazard exists due to the clamping pressure alone. The pressure regulator is only accessible by removing machine covers.
 - b) The speed of heater beam approach is controlled to allow reaction time.
 - c) A "Cancel cycle" (raise clamping beam) control is located next to the "start cycle" point.
 - 3)
 - a) The electrical power is handled and distributed in line with current recommendations and regulations.

5. Machine Operation

- Connect the machine to a suitable mains supply.
- Switch on at the Mains On / Off switch (4). Mains indicator (2) illuminates.
- Select Continuous or Cyclic operation(8). In Continuous mode wires are energised at all times. In Cyclic mode wires are only energised while the timer is counting. The appropriate indicator (7) or (9) will illuminate to indicate the current mode.
- Select power choice 52%, 68%, 84%, 100% on rotary switch (5).
- Switch power to heater beams as required at the residual current circuit breaker (12).
- Set heating cycle time on timer (10) using the up or down button for each digit. The set time is displayed in the lower window. To prevent tampering with the timer setting press the LOCK•button on the timer - LOCK•will be displayed. To unlock press the LOCK button again.
- Load material and instigate heating cycle using push button (7).
- At the end of the set heating time the buzzer will sound, or the upper heating beam will unclamp the work. The material can then be removed to the cooling jig.
- The heating cycle can be cancelled with the cancel push button (11).

If a heating wire breaks or is not correctly fitted causing a short circuit the Residual Current (Circuit Breaker) Device (RCD) (12) will cut power to the heater beam. It can be reset once the cause of disconnection has been removed.

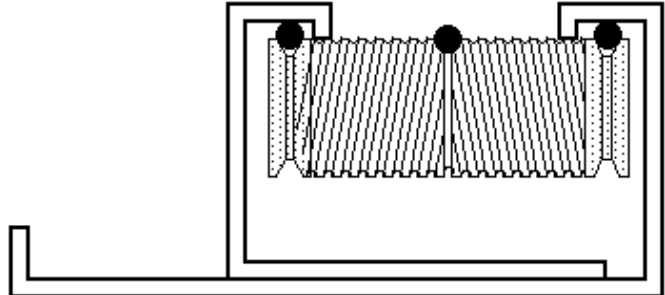
Please note that the Test button has been disabled as it is not relevant to low voltage applications.



6. Wire Positioning & Settings

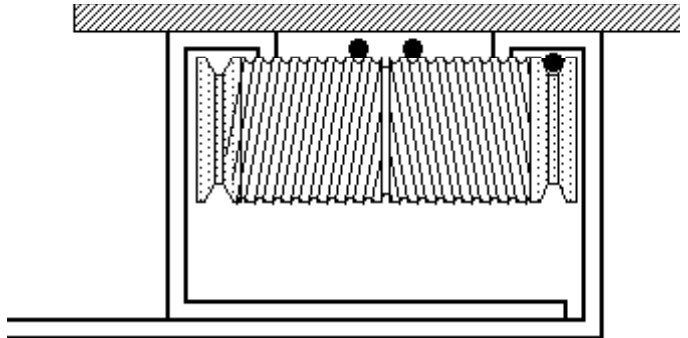
There are a number of adjustments, wire combinations and settings possible and the operator must understand the effect that each adjustment will have on bend character.

A single wire on the lower beam will be used for very thin material and will be set to 100% or 84% power. It will be positioned close to the work at 2mm (.040") wire height distance. The work clamp channels will be at their narrowest setting to provide maximum support against the material "waving" during the heating process.



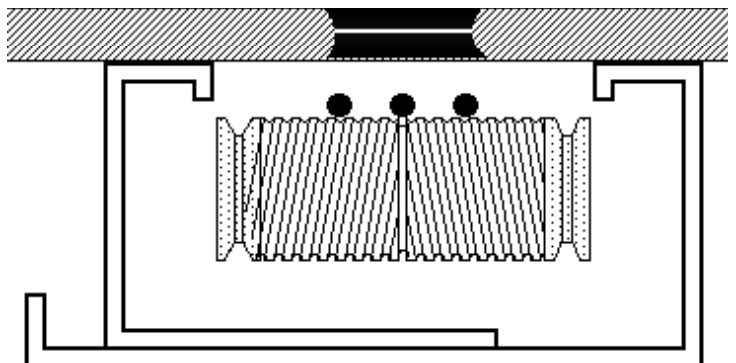
If "waving" occurs move the wire closer to the work clamp channel to gain more "cantilever" support.

As thickness increases, first two and then all three wires will be used and the work support channels will be moved to a wider setting. Wire spacing and the work wire distance should also be increased. Heating time will extend depending upon material thickness. With the thicker materials heating must be less concentrated. Note the heat pattern shown on the material.



There are some problems created by the material. Polypropylene, for example, is an exception to most rules and bending using normal techniques results in poor quality bends which spread considerably at the ends.

The technique is to fold so that the top face is on the outside of the bend.



Generally this will result in an internal bead being formed by the excess hot material on the inside of the bend. This will be similar in appearance to a good weld.

With the above combinations or variations on the principles illustrated a wide variety of bends can be achieved in numerous materials. Some materials such as polycarbonate have a very narrow thermoforming range unless the material is pre-dried. With the linear precision of the heater most such materials can be formed successfully without incurring the cost of the pre-drying process.

7. Wire Handling

Repositioning of the wires can be carried out manually with the power to the wires switched off, either at the RCD switch, or at the Mains switch. Acquire the habit of lifting the wires outboard of the brass rollers, this part of the wire does not get hot during use and can, therefore, be handled immediately after switching off the power to the beam.

If a wire is to be energised always check that it is not touching the work support channels. If a wire is to be positioned on the insulating rollers and not used it can touch any surrounding metalwork, except the brass rollers or their supporting fork, and it is often convenient to position isolated wires under the work support channel.

When setting wires always position at least 6mm (1/4") away from the work support channel. Wires too close will direct heat wastefully into the work supports and away from the work.

Wires positioned close to each other will tend to run hotter than normal and this may result in premature failure. In this event spread wires further apart or reduce the power setting one step.

8. Work Support Channels

The work support channels clamp the work to prevent distortion during heating, dissipate heat from the clamping face and provide the base reference point to control wire distance from the work face.

Adjustment is by loosening the socket head cap screws on the lower beam. The possible range of adjustment is limited by the design and when closed or opened fully they will centralise on the securing screws. Where there is a central joint care must be taken to ensure that the channels butt together otherwise cold air entering will corrupt the bend at this point.

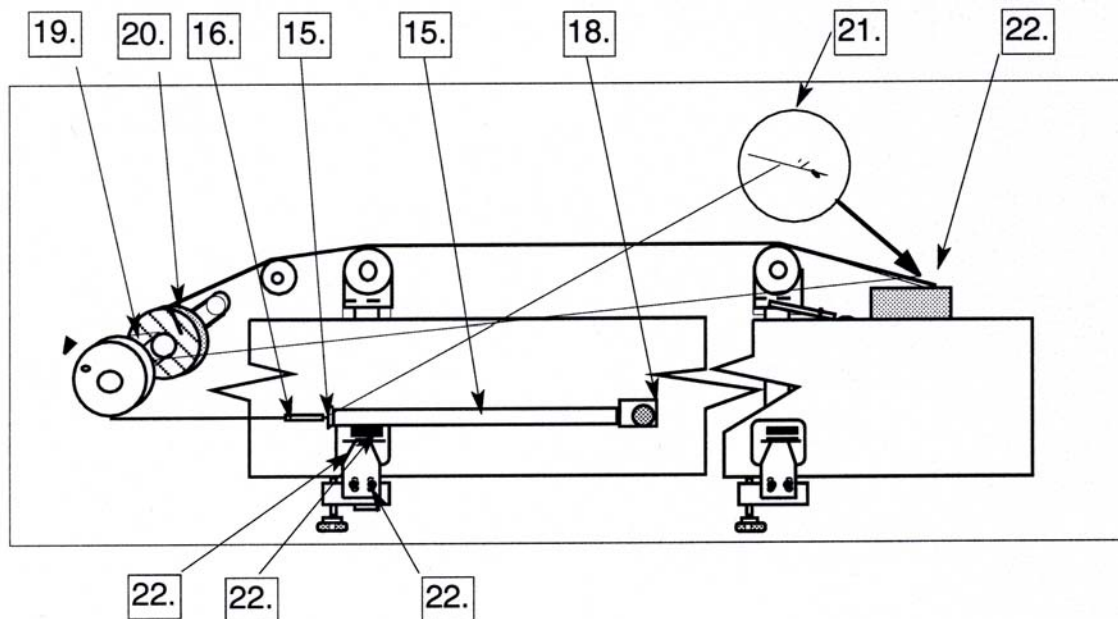
9. Wire Tensioning System

The tensioning system will control wire tension at all times compensating for expansion and contraction as operating conditions dictate. The system incorporates roller bearings to increase sensitivity and reduce friction and is constantly mobile during machine operation.

During use some permanent extension of the wires will occur. There is a red marker (15) on each flexible cable (16) which connects the tensioning roller to the tensioning spring and when the marker is no longer visible because it is inside the spring shroud (17), the wire needs retensioning.

Using the hand knob at the end of the spring shroud (17) counteract the spring tension and pull the shroud away from the anchor point (18). Before releasing all the tension restrain the knurled pulley (19) on which the flexible cable is wound to ensure that the heating wire remains in position on its insulated pulley (20) within the end of the heating beam. Apply one additional turn of the flexible cable round the knurled pulley and replace the spring shroud onto its anchor point.

Wires should last, typically, at least 200 operating hours but will need occasional replacement. They should be considered as a consumable item and a spare roll of resistance wire should always be available for replacements. To replace a wire firstly remove all remains of the old wire paying particular attention to the area around the shaft and pulley to which the wire is attached.



Any small pieces left are a potential short circuit and will result in an RCD tripping unexpectedly. Form a loop in the free end of the wire on the roll of approximately 6-8mm (1/4-5/16") diameter (21). Use the parallel jaw pliers supplied as the wire is quite tough. Place on the wire anchor pin (22) and un-roll to the tensioning pulley at the other end of the machine. Cut off the roll allowing approximately 200mm (8") of spare wire past the pulley, insert into the small hole in the insulated pulley, fold over and rotate the pulley in the correct direction to apply tension. Holding the wire taught using the knurled pulley (19) wind the flexible tensioning wire round its pulley until the spring shield can be fitted onto its anchor point and the red marker is visible outside the spring shield. A new wire will often appear to run hotter than an old wire. This is because the surface is polished. Once some oxide has developed it will emit heat to air more readily and run at a lower temperature. Power emission is unaffected by oxide level.

Zero adjustment of the indicators

The wire height indicators (23) will have been factory set during machine assembly but may, during transport or general use, become disturbed making adjustment necessary. To set or check switch off all the power to the heater beams. Place a straight edge across the work support channels and adjust the wire height adjusting screw such that the wire just contacts the straight edge. Re-align the pointer with the zero mark on the scale (24) by means of the slotted adjustment provided under the clamp screws (25).

10. Maintenance

No regular maintenance should be necessary other than the usual good housekeeping routines associated with equipment of this type. Ensure that all electrical conduits and external low voltage wiring is maintained in good order, keep air cylinder piston rods clean and lubricate occasionally.

11. Fault Finding

Frequent wire breakages

Wires too close together thereby overheating. Move apart or lower power setting.

Too much tension on tensioning system.

RCD will not set

Heating wire touching the beam at some point, either within the heating area or around the tensioning system.

Mains Neon illuminates but timer does not operate

Control fuse loose or failed. Check and replace if necessary.

12. Spare Parts

There is no regular requirement for spare parts for the machine, with the only consumable part being the heating wire itself. Spare heating wire is available from the manufacturers or their local representative, descriptions as follows:

900/32 20SWG Ni-chrome x 10 metre Roll

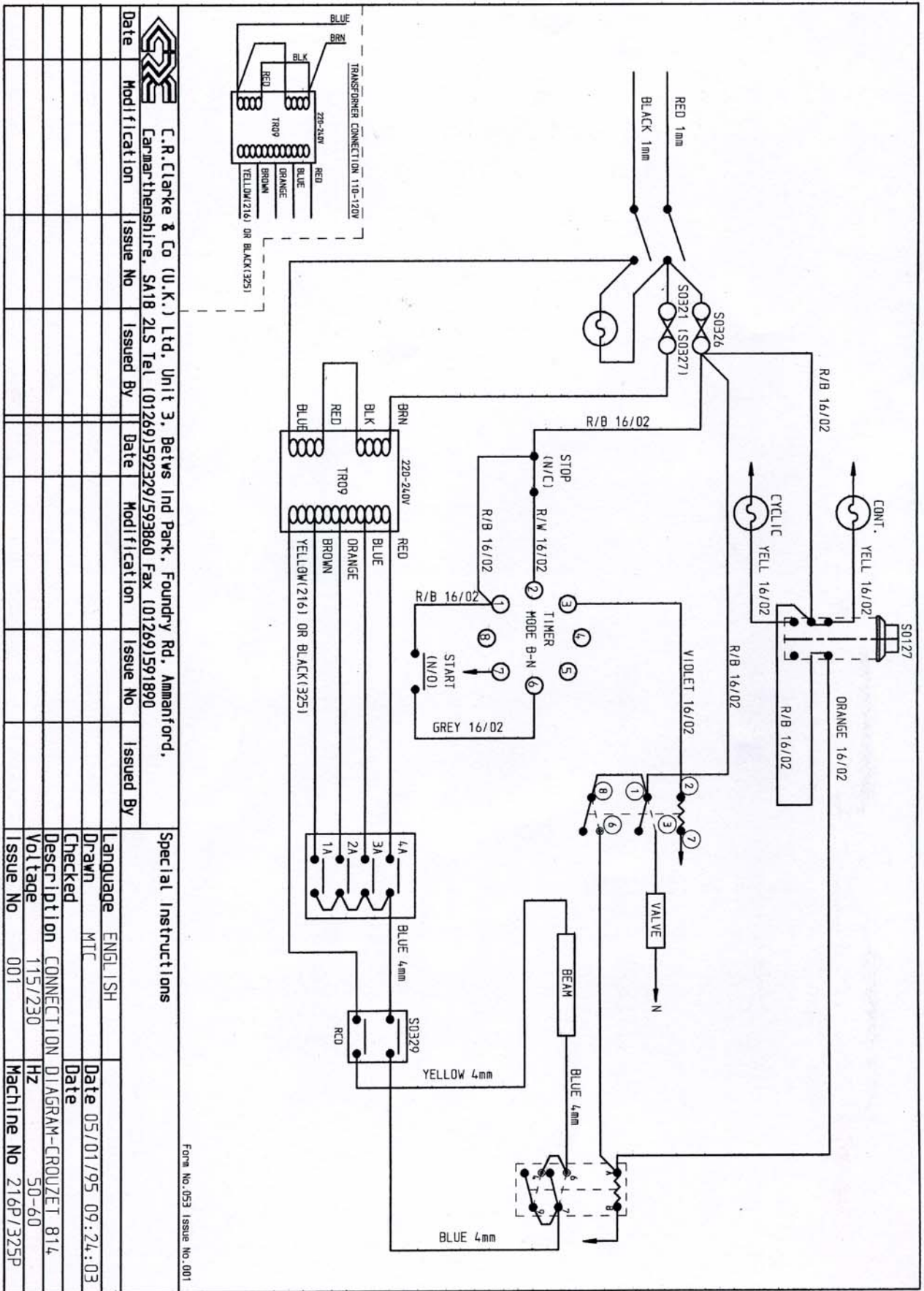
WX02 20SWG Ni-chrome x 1kg Roll

WX06 20SWG Super Ni-chrome x 0.5kg Roll

While more expensive, the WX06 Super Ni-chrome does give longer wire life, as it does not suffer from permanent extension when repeatedly heated and cooled. The standard Ni-chrome, while less expensive, will give a shorter life per wire, especially if used in Cyclic mode.

13. Technical Specification

	216	325
General		
Max Bend Length mm(in)	2160(85)	3250(128)
Max Wire Spacing Adjustment mm(in)	45(1.77)	45(1.77)
Wire Spacing Increment mm(in)	1.5(0.0625)	1.5(0.0625)
Max Wire Height mm(in)	12(0.5)	12(0.5)
Max No. of wires on Heater Beam	3	3
Max Material Thickness mm(in)	8(0.315)	8(0.315)
Electrical		
Voltage (General)	230V	230V
Voltage (North American)	115V	115V
Frequency	50-60Hz	50-60Hz
Max Power	0.085kW	1.25kW
Max Wire Voltage	-17 - 0 - 17V	-25 - 0 - 25
Physical		
WxDxH mm	3060x390x390	4150x390x390
WxDxH in	120x15x15	163x15x15
Weight kg(lb)	46(101)	48(106)



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Issue No 001				Machine No 216P/325P			

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