MasterFlow® MTX-51 Hot Runner Controller

Installation- and Operation Manual

MasterFlow®

LEADER IN HOT RUNNER TECHNOLOGY

Installation- and Operation Manual MasterFlow MTX-51 Hot Runner Controller

To avoid possible personnel injury or equipment damage when installing operating or maintaining this equipment, use good judgement and follow all safety regulations in your area. It is also important to read and follow the instructions in this manual before installation and use of the controller.

MasterFlow MTX-51 Hot Runner Controller is a microprocessor operated temperature controller. It is easy to use and have several functions to protect your heaters in the mould and to guide the operator if problems may occur. These functions will be described in this manual. MTX-51 is a universal temperature controller, and therefore has several advanced functions. In this manual, only the functions normally used/needed for hot runner temperature controlling, will be described.

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Chapter 1 MasterFlow MTX-51 Temperature control module

1-1 Features

- LCD display module
- Power frequency auto-detect
- One key Start(Stop) / Standby(Boost) function
- Built in buzzer
- Overvoltage protection, preventing burning of module resulting from faulty wiring
- Heater short-circuit protection
- Automatic detection of wire breakage of heater
- TRIAC short-circuit protection
- Detection against temperature wire breakage and reverse
  Troubleshooting of Temperature Sensor wiring
- Fuse break detection
- Present value PV and Set value SV displayed at the same time
- Selectable two trigger output modes (Zero cross or Phase angle firing)
- Smart SOFT START function
- Self-tuning, fuzzy logic
- Auto / Manual function
- PID Automatic Selection Function
- Output percentage limit setting
- Selectable two thermocouple types (J or K)
- Selectable two temperature scales (C or F)
- Six alarm options
- Temperature range
  K-type: 0~600°C (or 32-999°F) / J-type: 0~600°C (or 32-999°F)
- Set value SV easy operated via a membrane keypad on the front. Membrane keypad to withstand industrial heavy duty environment
- RS485 communication function: ASCII and RTU mode (Optional)
- ”Plug-in” units for flexible use and maintenance
- Indication of power phase supply on cabinet

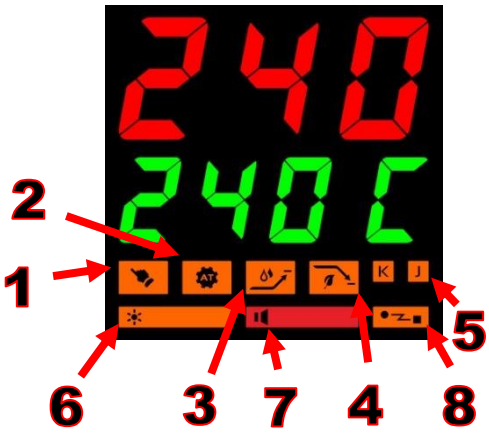
1-2 Specification

- Power input 230V AC +/- 10%
- Power frequency 50 / 60 Hz
- Power consumption: 230V AC 3W (each module)
- Input temperature sensor: J/K Type
- Temperature control range 0~600°C / 32~999°F
- Control accuracy +/- 0,25 %
- Measure accuracy +/- 0,25 %
- Storage temperature: -20~+70°C / -4~+158°F
- Working temperature: -10~+50°C / 14~+122°F
- Work humidity: 10~80% RH (no condensate)
- Output method: Zero Crossing / Phase Angle Firing
- Fuse: Quick response ceramic 250V AC / 20A 30mm
- Detection function: Current / Fuse open circuit / TRIAC short-circuit
- Communication mode: RS-485 (Standard MODBUS), Optional
- Communication rate: 9600/19200/38400/57600/115200

1-3 Keypad and display

1-3-1 Keypad and display

Position & Name	Display / Function
1. PV (Present Value)	**Operation mode:** Present Value.
	Parameter mode: Parameter name.
2. SV (Setting Value)	**Operation mode:** Present Value.
	Parameter mode: Parameter name.
	Manual output mode: Output (%)
3. Unit	Temperature unit (°C/°F) or parameter unit.
4. Auto / Manual mode key	Enable / Disable manual mode.
5. Function key (F)	Parameter level and parameter select key.
6. Increment key (+)	Increase value.
7. Decrement key (-)	Decrease value.
8. Set key	Set, set enable set shift key.
9. Power switch	Switch the MTX51-module On / Off



(1) Manual Output Indicator

(2) AT (Auto Tuning) Indicator

(3) Soft Start Indicator

(4) Standby / Boost Indicator

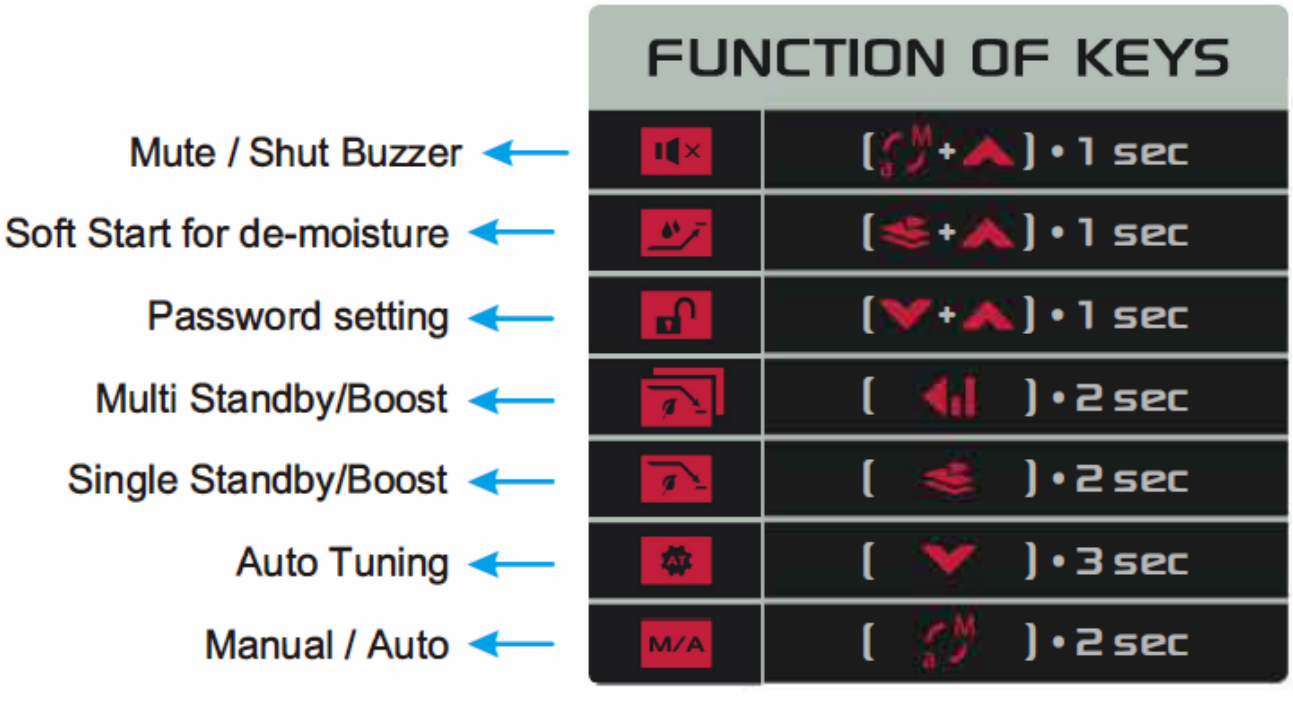
(5) Thermocouple Type

(6) Heater Output Indicator

(7) Alarm Indicator

(8) RS485 Communication Indicator

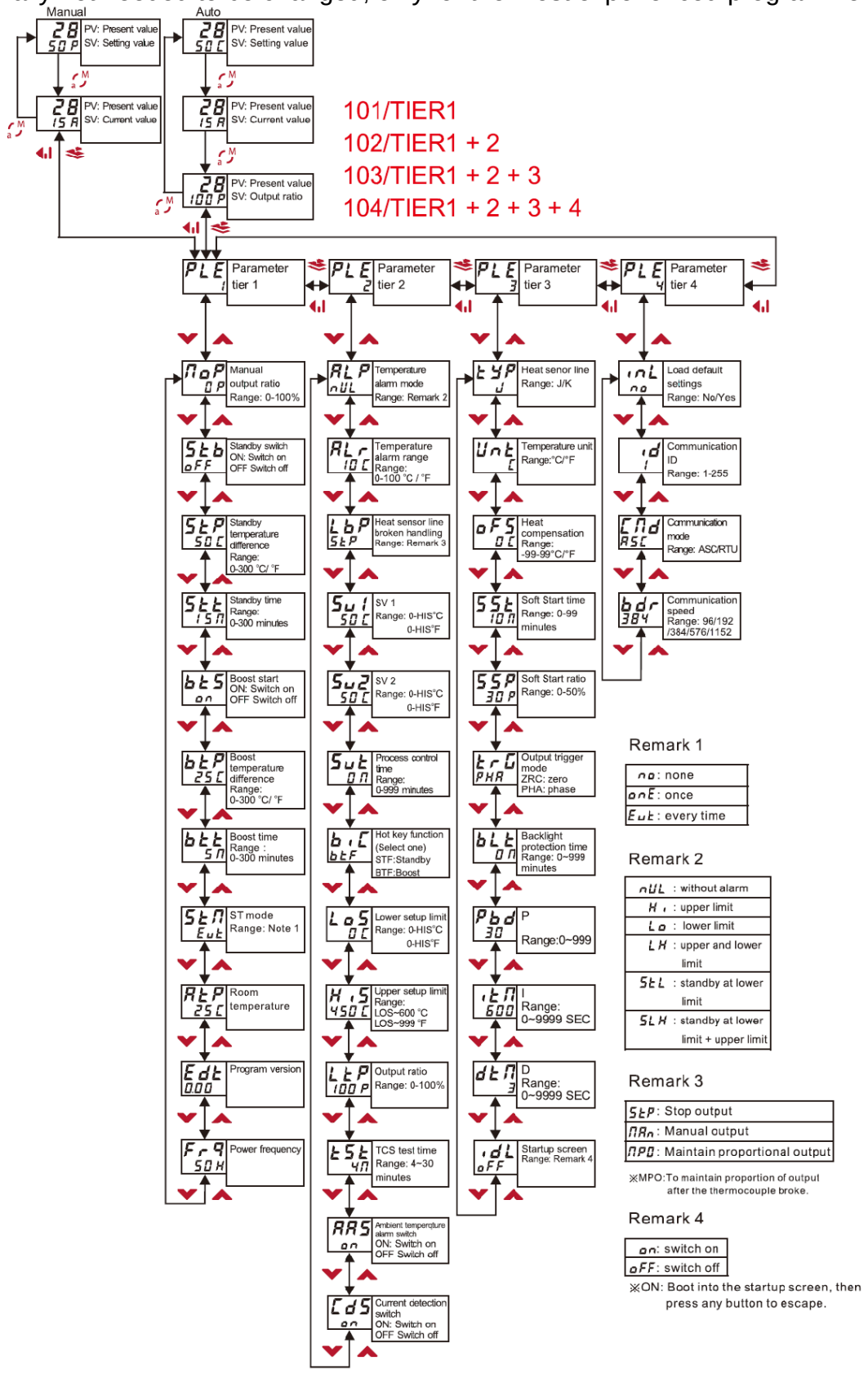
1-3-2 Function of Keys



1-4 Operation

1-4-1 Programming chart

Normally not needed to be changed, only for the most experienced programmer.



1-4-2 Operator / Parameter mode

MasterFlow MTX-51 can be in Operation mode or Parameter mode.

- Operation mode (standard): Controller display PV Present Value and SV Set Value.

Use  for SV modification.

Press  to enter parameter mode.

- Parameter mode: Controller display parameter name, value and unit.

Use  for value modification.

Press  to enter different Programming Levels.

See 1-4-1 for different Programming Levels.

1-4-3 Auto / Manual mode

- Auto mode (standard): Automatic control with thermocouple.
- Manual mode: Fixed output percentage is set by operator. (Thermocouple is needed with the default programming - explanation in 1.4.7 Manual Mode without thermocouple).

Change between Auto / Manual mode: By pressing 

-button for 2 seconds.

Indication of Manual mode when (pos 1) is light.

If you lose the thermocouple during Auto mode production the output goes to zero to protect the heater from uncontrolled temperature raise. To be able to use Manual mode without thermocouple, please see section 1.4.7.

1-4-4 Soft start

When starting up the MTX-51 controller, an automatic soft start function is activated. The soft start output is 30 % (of 220 V) for 10 minutes. If the temperature reaches 120 °C during the soft start, the MTX-51 is automatically changing to Operation mode. Also, if the temperature is higher than 120 °C at the start the soft start will be ignored and the MTX-51 goes to Operation mode.

The most sensitive phase when heating up a hot runner system, is in the very start. Moisture in the heaters will be dried out safely during the soft start time with reduced power supply. All heaters absorb moisture during storage. Full output with moisture may cause heater failure, immediately or reduce heater lifetime.

Reprogramming of Soft Start Percentage and Soft Start Time is possible via Programming Level 1:

Press  to enter Programming Level 1.

Press  repeatedly until SSP (Soft Start Percentage) respective SST (Soft Start Time) is shown on PV display. Set new values according 1-4-1.

Use  for value modification.

Press  repeatedly to return to operation display.

Press  +  + 1 Sec = Enable / Disable Soft Start

SST (Soft Start Time) = 0 minutes means the soft start function is disabled.
Not recommended.

1-4-5 Hot Key Function

MTX-51 have a Hot Key Function. Hot Key Function can be programmed to enable Boost Function (Standard) or Standby Function. Follow instructions to switch function for Hot Key Function in the Programming chart Level 1. You have to choose Boost **or** Standby. You **cannot** have both at the same time.
The Hot Key Function can be used for one single MTX-51 module or one MTX-51 can control all other MTX-51 modules placed on the right side of controlling MTX-51.

Press  + 2 Sec = Activate/Deactivate Hot Key Function on current module.

Press  + 2 Sec = Activate/Deactivate Hot Key Function for

all MTX-51 Modules on the right side.

The Hot Key Function will last a certain pre-programmed time or until deactivated.

Function	Time enabled	Temperature difference
Boost Function	5 min	+ 25°C
Standby Function	15 min	- 50°C

Boost Function – To raise the temperature

In the event of a gate gets frozen the Boost Function can be used to temporarily raise the temperature in the gate area. Also, during start up cycles and/or colour changing procedure temporarily raised temperature can be useful.

Standby Function – To lower the temperature

In the event that the process have to be stopped temporarily the Standby Function can be enabled to protect the plastic material remaining in the hot runner system from degradation. Some plastic materials are more sensitive to be left at a high temperature for a long period of time. This temperature reduction function can be useful to prolong the time before material degradation.

1-4-6 Self-tuning PID-parameters

Reaction speed and power may differ a lot between different applications to be controlled by MTX-51. Large or small hot runner bushings, manifolds, heaters with high or low wattage, friction heat etc. are factors that have large influence on the temperature control. The controller follows the moulding cycle. The MTX-51 controller is self-tuning. It is fully automatic teaching, optimizing and setting the PID-parameters (fuzzy logic) for actual application. This is optimizing and stabilizing the temperature control.

If extreme control situations exist and above mentioned self-optimizing not is enough. Please contact MasterFlow for advice about instructions for general optimizing of PID-parameters (auto-tuning).

Press  + 2 Sec = Enable/Disable Auto Tuning

1-4-7 Manual Mode without thermocouple

In delivery condition it is not possible to use the manual mode without thermocouple. This is due to the programming in programming tier 2 (1.4.1 Programming chart), “Heat sensor line broken handling” with its default set to “StP”, which means that it will give no power without a thermocouple connected.
Example: If a thermocouple fails in production, the output will be 0 to that zone.

To be able to run without a thermocouple, you must change the programming in tier 2 to “NAn”, which is manual output.
Example: If a thermocouple fails in production, the output will go over to the last used manual percentage.
WARNING: The percentage will always be the last used percentage, (default 0% at delivery). But if you change to Manual mode, set the percentage to 100% and turn off the controller, then at next thermocouple failure the controller will switch over to last Manual mode setting: 100%. **DANGER FOR OVERHEATING!**

1-4-8 Fuse

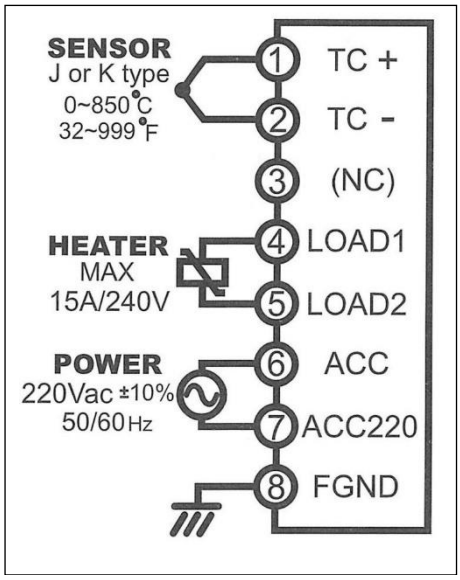
Please note that rectifier type fuses must be used for MTX-51 (type FF). If they are not, serious damage may occur on equipment, hot runner systems and mould.

Use 20 Amp FF Rectifier Fuses. **Note:** Always use an equivalent fuse, when replacing.

1-4-9 Indication of power supply

The cabinet indication lamps L1, L2 or L3 lights to indicate failure on the power supply phases to the cabinet.

1-4-10 Wiring



1-4-11 Output modes (Zero Cross / Phase Angle)

Phase angle firing or zero crossing trigger output can be selectable via Programming Level 1. See 1-4-1.

Press  to enter Programming Level 1.

Press  2 times. Now PV display programming Level 3.

Press  repeatedly until “trG” is shown on display

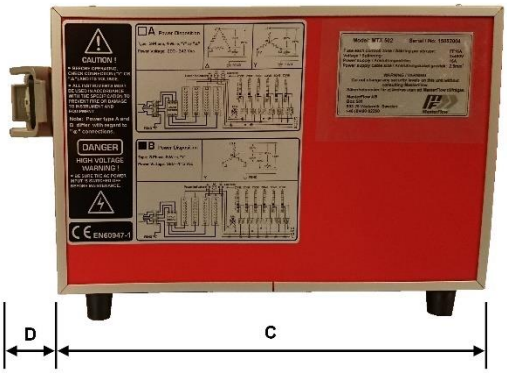
Use  for value modification.

Choose ZRC = zero crossing or PHA = Phase angle firing.

Phase angle firing is preset from factory on the MTX-51.

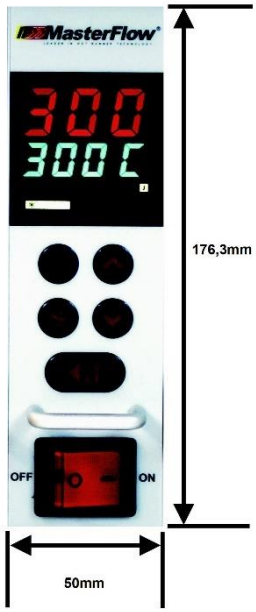
Chapter 2 Cabinet and connections

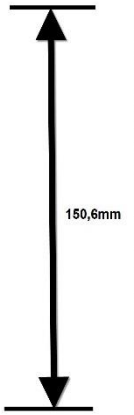
2-1 Dimensions

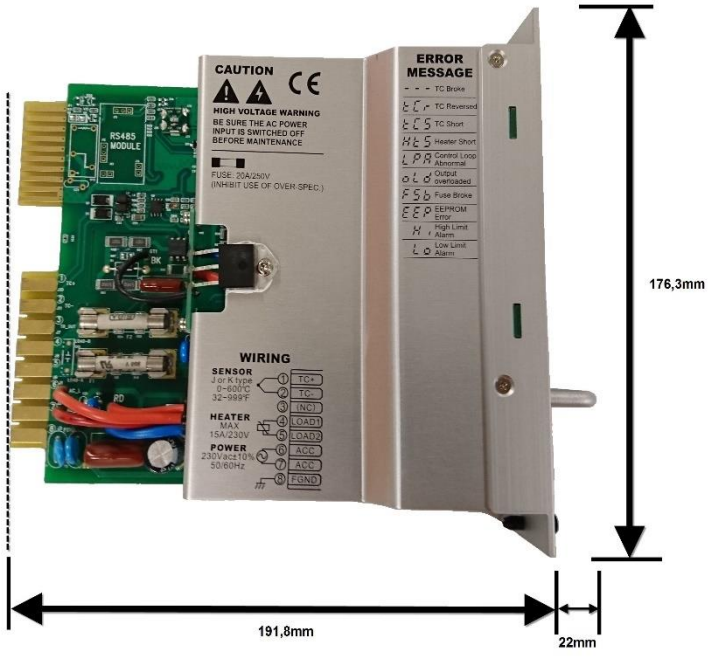


Unit: m/m

Cabinet	A	B	C	D
5102	215	223	299	45
5104		323		
5106		424		
5108		524		
5112		726		







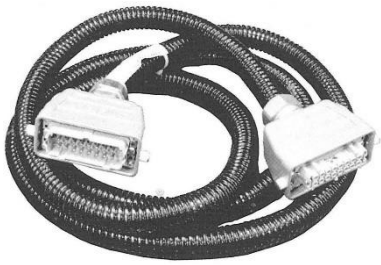
2-2 Electrical specifications

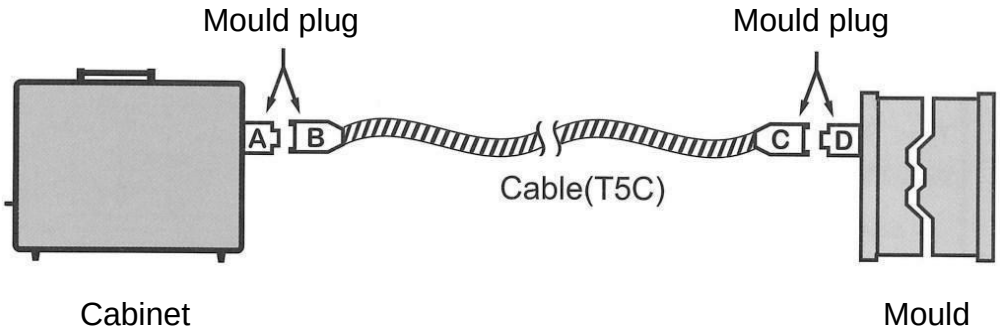
Type	5102	5104	5106	5108	5112
Zones	2	4	6	8	12
Power switch capacity (A)	16	32	32	63	63
Mould plug	16-pins x1	16-pins x1	24-pins x1	16-pins x2	24-pins x2
Power cable	2,5 mm²	6,0 mm²	6,0 mm²	10,0 mm²	10,0 mm²
Weight (kg) only cabinet	7,25	9	11,25	12,5	16

2-3 Mould cable

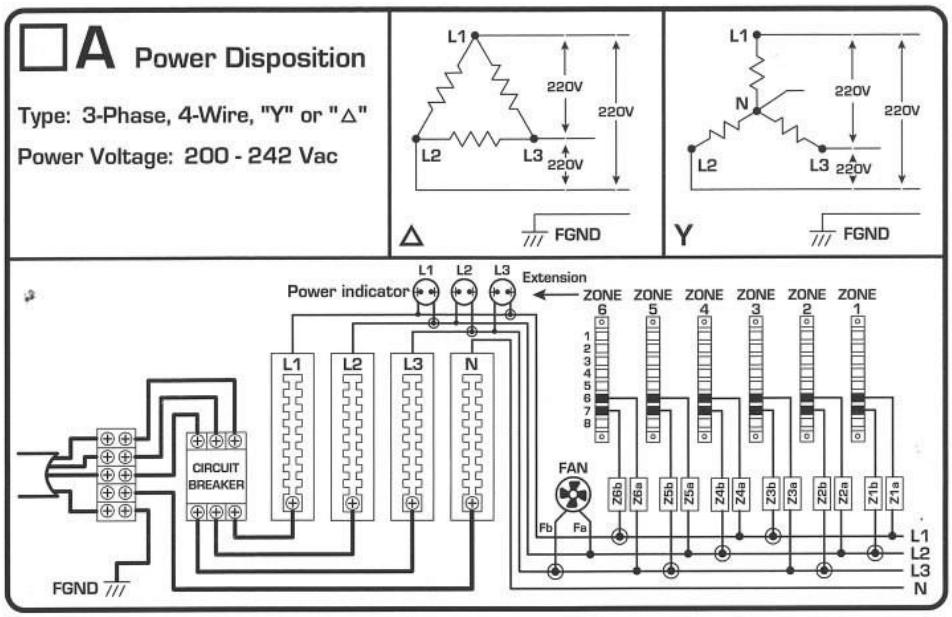
For all MTX-51 cabinets 4 meter mould cable / cables is included in delivery.

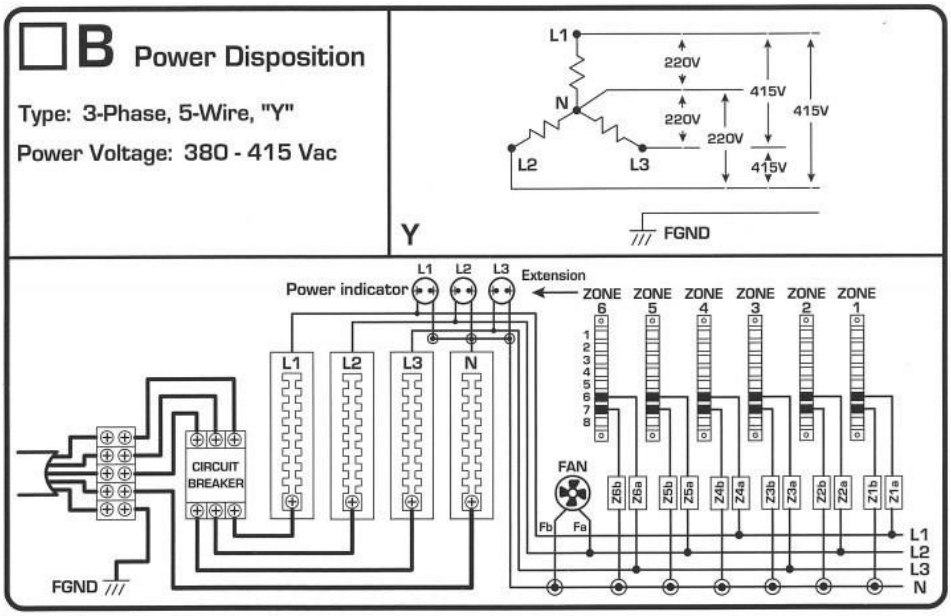
Mould plug A, B, C is included in delivery.
Mould plug D is not included in delivery.
Wiring according section 2-5.





2-4 Type of power wiring





CAUTION

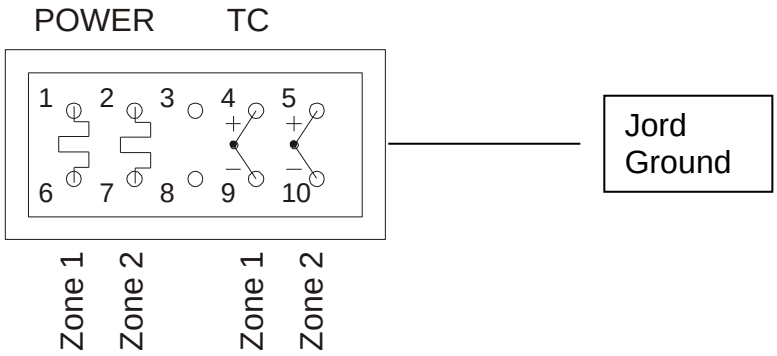
1) Before operating, check connection (”y” or ”**Δ**”) and its voltage.
2) All instruments must be used in accordance with the specification to prevent fire or damage to instrument and equipment.
3) Be sure the ac power input is switched off before maintenance.

NOTE! Power type a and b differ with regard to ”◉” connections.

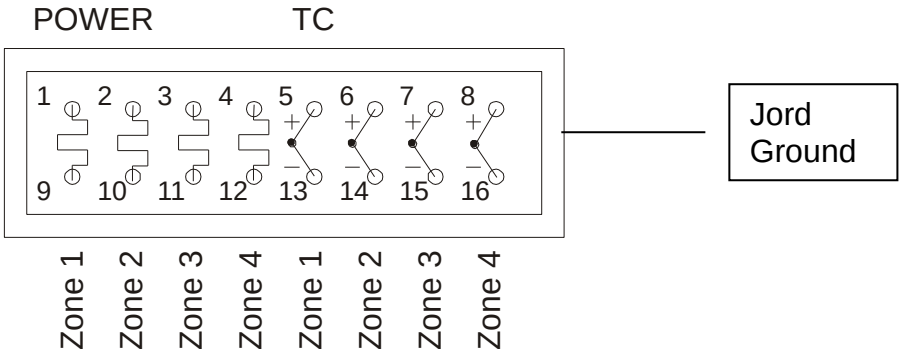
⚠ **WARNING! The FGND must be connected with earth ground!**

2-5 Mould plug standard wiring

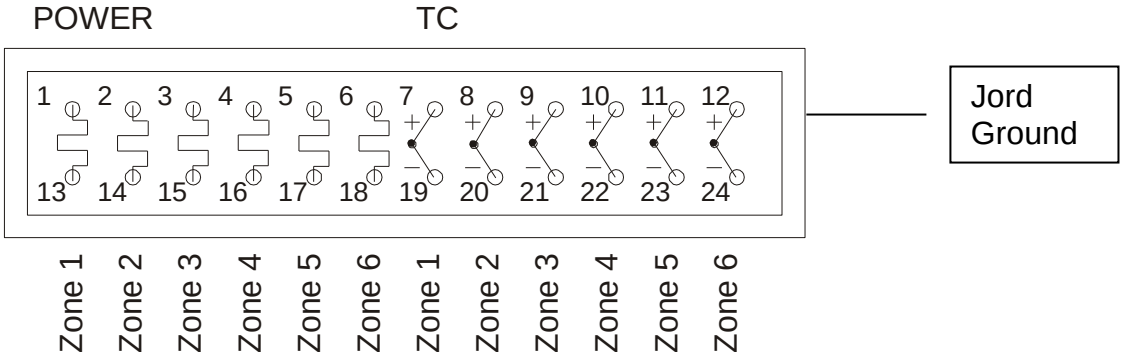
10-pin (not standard)



16-pin cabinet MTX 5102, 5104 and 5108



24-pin cabinet MTX 5106 and 5112



Chapter 3 Miscellaneous

3-1 Options

- MF Blindcover MTX-51

Chapter 4 Trouble shooting

Displayed	Code	Description
- - -	- - -	Temperature Sensor Wire Breakage
tCr	TCR	Temperature Sensor Wire reversed connection
tCS	TCS	Temperature Sensor Wire short circuit
HtS	HTS	Heater short circuit
LPA	LPA	Control circuit abnormal
oLd	OLD	Overload
FSb	FSB	Fuse open circuit
EEP	EEP	EEPROM Error
H ,	HI	Upper limit alarm
Lo	LO	Lower limit alarm
AtA	ATA	Ambient temperature alarm

Malfunction	Check item
1. No action after power on.	- MasterFlow MTX-51 is installed properly? - Power wiring is correct? - Main power switch is malfunction? - MTX-51 module is malfunction?
2. Fuse break indicator light.	- Change fuse.
3. Display ”---”.	- MasterFlow MTX-51 is installed properly? - Thermocouple wire broken? - MTX-51 module is malfunction?
4. Display ”TCR”.	- Thermocouple reverse (+/-)? - MTX-51 module is malfunction?
5. Display ”TCS”.	- Thermocouple wire short circuit? - MTX-51 module is malfunction?
6. Unstable PV value or no display of PV value.	- Refer 3. above. - Power leakage? - The ground is properly? - Hot Runner system physically bad installed into mould. - Too much contact between Hot Runner and mould may cause temperature problems.
7. Temperature not increasing at normal operation.	- MasterFlow MTX-51 is installed property? Mould cable loose or damaged? - Broken heater? - MTX-51 (triac) is malfunction? - Hot Runner system physically bad installed into mould. - Too much contact between Hot Runner and mould may cause temperature problems.
8. Temperature control is unstable.	- Refer 1., 4. and 5. above. - Hot Runner system physically bad installed into mould. - Too much contact between Hot Runner and mould may cause temperature problems.

If you need assistance – do not hesitate to contact our service department.

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