

PRODUCT SPECIFICATION FOR THE TYPE M360 GAS VENT CONTROLLER

(FOR USE IN CRYOGENIC REFRIGERATOR INSTALLATIONS WITH
A PIPED LIQUID NITROGEN SUPPLY)

REVISION STATUS

| Rev | Date | Revision Details | By | Chkd | Appd |
|-----|-------|---|-----|------|------|
| A | 5/98 | First Issued | GHL | NM | NM |
| 1 | 1/99 | Reissued for production units | GHL | NM | NM |
| 2 | 1/00 | Thermocouple is now M363-xxxx Corrections to timer settings (F21/1345) | GHL | NM | NM |
| 3 | 12/01 | Updated for M505 Controller connection details (F21/1447) | GHL | NM | NM |
| 4 | 3/03 | Additional Information (F21/1516) | GHL | | |



PRODUCT SPECIFICATION FOR THE TYPE M360 GAS VENT CONTROLLER

1. INTRODUCTION

Typically cryogenic storage installations consist of one or more refrigerators connected by insulated pipework to a bulk liquid nitrogen supply vessel. The refrigerators are filled under automatic control by the opening of a solenoid valve.

While no refrigerators are filling the excess liquid in the pipework evaporates and is vented as gas through relief valves.

When more nitrogen is demanded the gas remaining in the pipework is forced out through the liquid in the refrigerator until the fresh liquid arrives.

The gas may be usefully employed for defogging and chilling the refrigerator, however, if gassing is excessive it can lead to problems such as ice build up, multiple fill cycles and high nitrogen consumption. The problem is worse in multi refrigerator installations or where the pipework runs are long.

The purpose of the M360 controller is to minimise these problems by venting excess gas from the supply pipework prior to opening the Fill Solenoid valve(s) on the refrigerator(s).

2. PRODUCT DESCRIPTION AND SPECIFICATIONS

The M360 Gas Vent Controller is made up from the following components:-

| | Mowden Part No. |
|---|-----------------|
| Controller | M361 |
| Relay Boxes (1 per M303/M305 not required for M505) | M362 |
| Thermocouple + amplifier (2 off) (xxxx = length of thermocouple in mm. Standard is 5000) | M363xxxx |

Thermocouple fitting accessories.

2.1 M361 CONTROLLER (Dwg B4209/1)

General - The M361 Controller is housed in a wall mounting steel case, approximate size 300 x 200 x 150mm.

Inputs - The M361 Controller has screw terminal connectors for the following inputs:-

Vent Signal Input ST1 (Latching/Non Latching)
Vent Signal Input ST2 (Latching)

Note: Latching inputs accept a momentary input and start venting. The ST1 input, when set to non latching requires a constant input to maintain venting.

Setting of the operating mode of ST1 is by means of a link (see instruction manual IM1010)

230V/240V AC mains input

Outputs - The controller has screw terminal connectors for the following outputs:-

Vent Solenoid Valves (2 off)
Slave relay contact (Operated with Valve 2)
Remote Alarm Contact
Vent Signal Output.

The Solenoid Valve and Slave Relay contacts are rated at 24Vac 1 Amp max.

The Remote Alarm contact is rated at 50Vac/dc 2 Amps (resistive load).

The Vent Signal output feeds 12Vdc at 1 Amp maximum to drive the M362 relay boxes. This is sufficient to drive a maximum of 25 relay boxes or Vent relays(M507).

Switches – The Controller has the following switches:-

| | |
|-------------|------------------------------|
| Start/Test | (Starts Venting) |
| Stop | (Stops Venting) |
| Mute Alarms | (Silences the Alarm Sounder) |

Indicators - LED indication is provided for:-

Vent start signals (from refrigerators)
Power
Thermocouple 1 – liquid detected
Thermocouple 1 – fault
Thermocouple 2 – liquid detected
Thermocouple 2 – fault
Timeout on venting (stuck valve/supply alarm)
Remote alarm
Valve 1 on
Valve 2 on

2.2 M362 RELAY BOXES (Dwg 4207/1)

General – The M362 Relay box is housed in a plastic case, approximate size 120 x 65 x 40mm.

Connections – A surface mounted plug connects to the solenoid valve lead from the refrigerator. A flying lead with socket connects to the refrigerator solenoid valve.

Screw terminal connections and cable glands are provided for cabling to the controller.

Indicators - LEDs indicate whether the connected refrigerator is filling or if venting is in progress.

2.3 M363 THERMOCOUPLE AMPLIFIERS (Dwg B4209/1)

General - The thermocouples complete with amplifiers are supplied as separate modules for installation into the M361 Controller case.

Thermocouple type - Type T (Cu/Con) with a stainless steel sheath.

Dimensions 2mm diameter. Length to be specified by customer. (5m is standard)

Fittings - Compression glands, ¼" BSP

3. OUTLINE OF OPERATION

When one of the refrigerators begins to fill, the Simultaneous Fill signal from the M305/M505 Controller signals to the M361 Controller input that liquid is required.

After a short delay the M361 Controller sends out 12V DC on it's output line. For M305 Controllers this operates a relay in all of the connected relay boxes, disconnecting the fill solenoids and preventing filling. At the same time a valve(s) is opened to vent gas from the pipe-work.

In the case of M505s no relay box is fitted. Instead a relay in the M507 disconnects the Fill Solenoid valve.

When all of the gas has been exhausted from the pipe-work the presence of liquid at the vent solenoid valve is detected as a rapid temperature drop by the thermocouple sensor.

As soon as liquid is detected the vent solenoid valve is closed and power is removed from the controller output line, releasing the relays and allowing the Fill solenoid valve(s) to operate.

A second thermocouple is positioned down-line from the vent valve. If for any reason this vent valve fails to close, the second thermocouple will detect liquid and sound an alarm.

As an additional safety feature provision is made to drive an optional second vent solenoid valve.

4. FEATURES

4.1 SYSTEM MONITORING AND ALARMS

The following conditions will generate audible and visual alarms:-

4.1.1 THERMOCOUPLE 2 IN LIQUID – This indicates that the vent valve 1 has failed to close.

This alarm may be latching, so that alarm will remain on after the thermocouple has warmed up again, or non-latching. Latching or non-latching operation is selected by a link on the main PCB.

If the alarm is latched it can only be cleared by a manual reset of the M361 Controller or by removing power for 20 seconds minimum.

4.1.2 THERMOCOUPLE OPEN CIRCUIT – If either thermocouple is disconnected or broken.

4.1.3 TIME-OUT ON VENTING – If Thermocouple 1 does not detect liquid within a pre-set time from opening the vent solenoid valve. This may indicate a sticking valve or failure of the liquid nitrogen supply. The time is adjustable (5, 10, 20 or 30 minutes) by means of switches.

4.1.4 REMOTE ALARM - If any alarm condition is present for longer than a pre-set delay time the REMOTE ALARM RELAY is released. This may be used to signal the alarm condition to a remote position. The delay time is adjustable (15 or 30 minutes), by means of switches. In case of a valve failure (TC2 in Liquid) the delay time defaults to a maximum of 2 minutes, irrespective of the switch settings.

In addition to signalling an alarm, the remote alarm may be activated in the following circumstances:-

- * In normal operation a 'watchdog' signal from the microprocessor is used to keep the Remote Alarm Relay operated. If there is a failure of the Controller the watchdog signal will, in most cases fail also. This will cause the Remote Alarm to release after a few seconds.
- * In the event of power failure the Remote Alarm Relay will be released immediately.

4.2 GENERAL FUNCTIONS

4.2.1 MANUAL VENTING – The Vent Solenoid Valve may be opened and closed by means of the START and STOP switches. If the START switch is held on it will override the first thermocouple allowing the second thermocouple and alarm functions to be tested.

4.2.2 ALARM MUTING - In an alarm condition the audible alarm sounds and Alarm LED flashes. Pressing the MUTE switch will silence the alarm but the LED will continue to flash. If subsequently a further alarm condition occurs the audible alarm will reactivate.

4.2.3 DELAY TO VENT – To retain the refrigerator defog feature when using some older Controllers (M311/Mk1) venting must be delayed. The delay time is adjustable between 0 and 20 seconds by means of a potentiometer. The time may be increased to 40 seconds by means of a moveable link on the PCB.

5. POWER REQUIREMENTS AND FUSE RATINGS

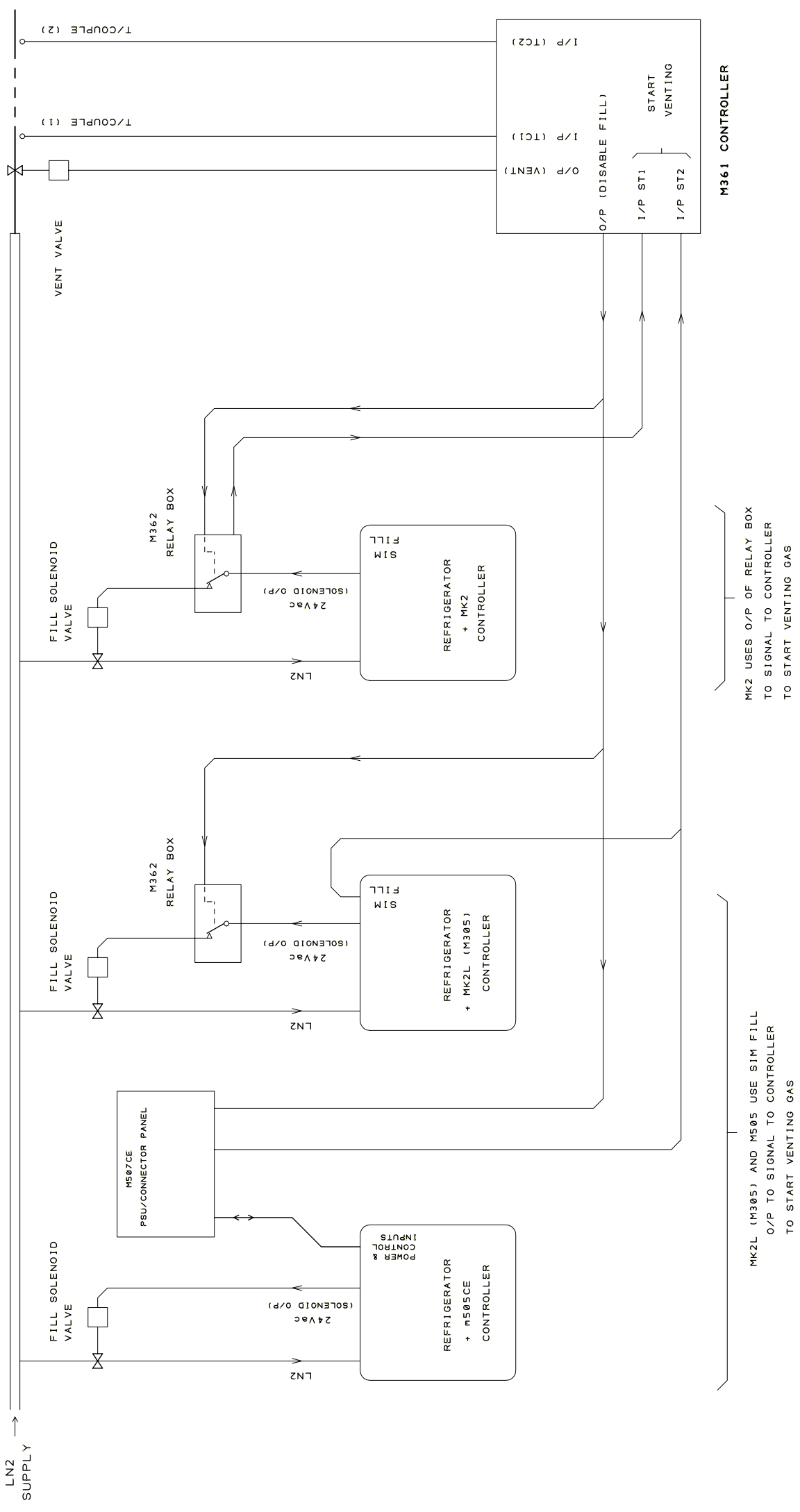
Input: 230Vac 50Hz, 1 amp Maximum.

| | | |
|---------|-----|----------------------|
| Fuses : | FS1 | 3.15A(T) HRC Ceramic |
| | FS2 | 2.5A(T) |
| | FS3 | 1A(T) |
| | FS4 | 3.15A(T) |

FS1 – FS3 are located on the Power supply PCB in the base of the Case.
FS4 is located on the main PCB.

6. COMPLIANCE WITH EC DIRECTIVES.

The M360CE Gas Vent Controller is designed to comply with The Electromagnetic Compatibility Directive and Low Voltage Directive, when installed as detailed in the instructions supplied.



MK2L (M305) AND M505 USE SIM FILL
O/P TO SIGNAL TO CONTROLLER
TO START VENTING GAS

MK2 USES O/P OF RELAY BOX
TO SIGNAL TO CONTROLLER
TO START VENTING GAS

M361 CONTROLLER

| ISS | | DATE | MODIFICATION NOTE | APPD |
|-----|------|----------|-------------------|------|
| 1 | 3/03 | ORIGINAL | | |

| FILE REF | DR No. | TITLE |
|---|---------|-------|
| TECHDOCS\DR1126\M361\MISC 4206R1.SCH | 18/3/03 | GH |

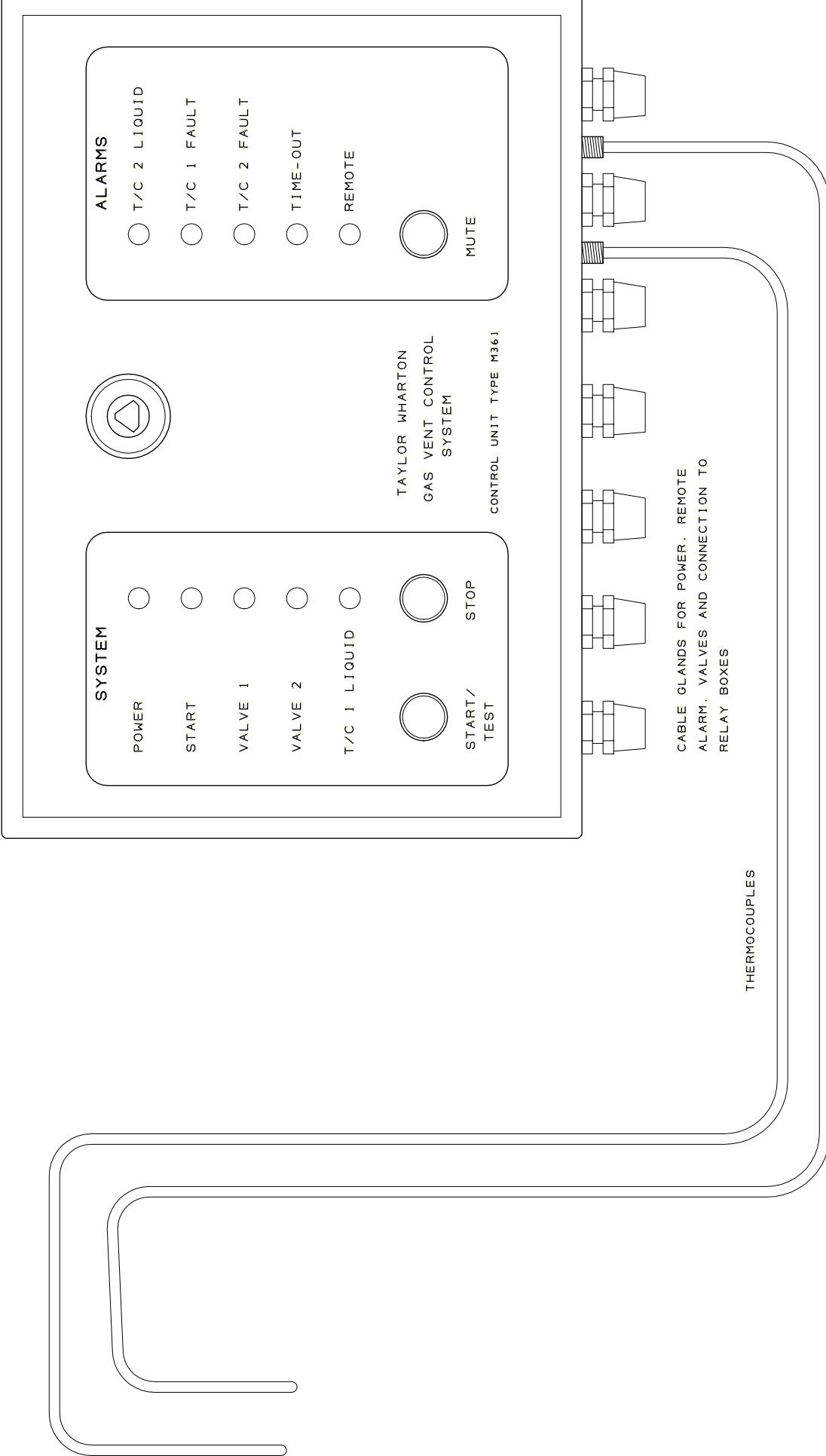
| DR No. | APPROVED | CHECKED | DRAWN | SHT. | OF |
|--------|----------|---------|-------|------|----|
| 1 | | | 1 | | |

| DRAWING No. | |
|-------------|--|
| B4206/1 | |

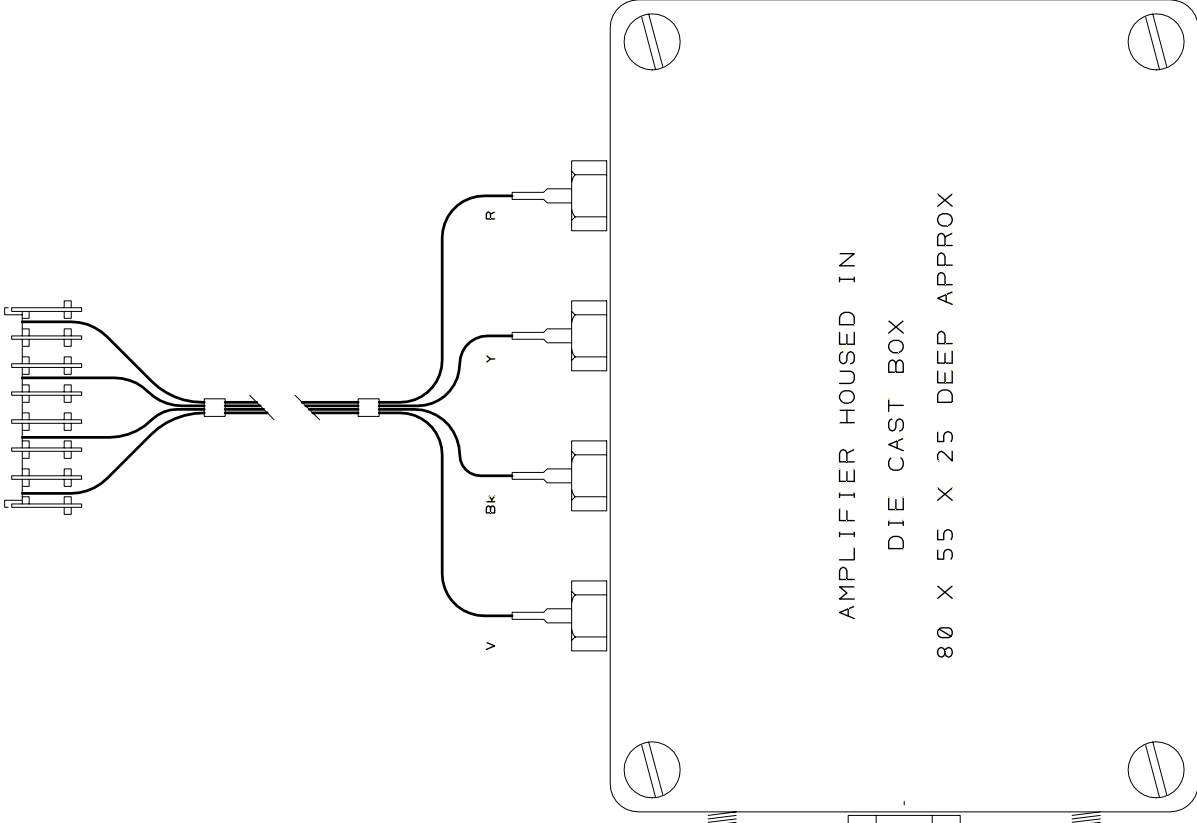
| MOWDEN CONTROLS LTD | |
|--------------------------|--|
| NORTH END, NORTHALLERTON | |
| N. YORKS. DL7 8EB. U. K. | |

| GAS VENT SYSTEM TYPE M360 | |
|---------------------------|--|
| SYSTEM BLOCK DIAGRAM | |

| MOWDEN CONTROLS LTD | |
|--------------------------|--|
| NORTH END, NORTHALLERTON | |
| N. YORKS. DL7 8EB. U. K. | |



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|---------------------------|----------------------|--------------------------|------|---------------|--|
| | | DRAWING No. | | B 4 2 0 8 / 1 | |
| | | MOWDEN CONTROLS LTD | | APPROVED | |
| | | NORTH END, NORTHALLERTON | | SHT. 1 | |
| | | N. YORKS. DL7 8EB. U. K. | | OF 1 | |
| FILE REF | M361\MISC\4208R1.SCH | DRAWN | GH | 18/3/03 | |
| DR No. | 1126 | | | | |
| GAS VENT SYSTEM TYPE M360 | | TITLE | | | |
| CONTROLLER (M361) | | | | | |
| GENERAL DETAILS | | | | | |
| ISS | DATE | MODIFICATION NOTE | APPD | | |
| 1 | 3/03 | ORIGINAL | | | |



M3 STUD
(2 OFF)

THERMOCOUPLE - 2mm DIAM
LENGTH AS SPECIFIED BY CUSTOMER.

AMPLIFIER HOUSED IN
DIE CAST BOX
80 X 55 X 25 DEEP APPROX

GAS VENT SYSTEM TYPE M360
T/C AMP MODULE TYPE M363

GENERAL DETAILS

MOWDEN CONTROLS LTD
NORTH END, NORTHALLERTON
N. YORKS. DL7 8EB. U. K.

DRAWING No.

B4209/1

| ISS | DATE | MODIFICATION NOTE | APPD |
|-----|------|-------------------|------|
| 1 | 3/03 | ORIGINAL | |

| FILE REF | DR No. | TITLE |
|------------------|--------|-------|
| M361\MISC\4209R1 | 1126 | |

| DRAWN | CHECKED | APPROVED | SHT. |
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| GHJ | | | 1 |
| 18/3/03 | | | OF 1 |