

**HANDBOOK FOR INFRA RED Mk2**

**REVISION B**

## Table of Contents

1 INTRODUCTION	1
2 MOUNTING	2
2.1 FLOOR MOUNTING SYSTEM	2
2.2 MACHINE MOUNTED SYSTEM	2
3 EXTERNAL CONNECTIONS	3
3.1 INPUTS	3
3.2 OUTPUTS	3
4 SETTING UP	3
5 INDICATORS	4
6 HINGE	5
7 INSPECTION	6
7.1 DAILY	6
7.2 ROUTINE MAINTENANCE	6
7.3 MAINTENANCE	6
8 PUBLICATIONS	7
8.1 PHOTOELECTRIC GUARDING PUBLICATIONS	7
8.2 OTHER PUBLICATIONS	7
8.3 BRITISH STANDARDS APPLICABLE TO PRESS BRAKE SAFETY	8
8.4 DRAFT DOCUMENTS	8
8.5 SINGLE MARKET PUBLICATIONS APPLICABLE TO SAFETY	9
8.6 OTHER DOCUMENTS APPLICABLE TO RELATED EQUIPMENT	9
9 SPECIFICATION	10
10 DRAWING LIST	11

## 1 INTRODUCTION

The Cambrake Infra-red photoelectric curtain is capable of detecting an object placed within the curtain and, when interfaced to the electrical control system of the machine, it will initiate the stopping sequence of the dangerous movement of the machine.

The system comprises two heads and both should be connected to the electrical supply. All communications between the heads is by way of the infra-red beam, no electrical inter-connections are required. The heads can even be connected to different supply voltages if required.

Please note that the system is a sensitive piece of electronic equipment. The system has been designed to give high reliability under normal conditions but the electronics may be damaged if the system is subjected to physical damage or abuse.

Under no circumstances must the covers be removed from the curtain. There are no user serviceable items within the curtain.

The rejection of the curtain is stated on the label on the side of the curtain.

## 2 MOUNTING

The photo-electric curtain is supplied in two formats - floor mounting and machine mounting. Both formats include anti-vibration mounts. These should be reassembled in the correct manner if they are removed in order to rearrange the mounting plates (see drawing 6017)

### 2.1 FLOOR MOUNTING SYSTEM

The floor mounting system should be securely fastened to the floor using M16 bolts, as detailed on drawing 6012. Height adjustment is possible by slackening off the two M10 nuts in the stand and lifting the photo-electric curtain to the required position. Please refer to diagrams 6013 for details of the vertical adjustment of the photo-electric curtain. Drawing 6014 gives details of the vertical positioning of the photo-electric curtain in relation to the machine bed and the trapping point.

A stop within the slide prevents the photo-electric curtain being slide out completely from the floor stand. To remove the photo-electric curtain completely from the floor stands the bolts at the rear of the stand must be removed completely. All nuts and bolts should be re-tightened when the photo-electric curtain is in the required position.

The photo-electric curtain should only be adjusted in either the horizontal or the vertical directions when initially mounting the system, in strict accordance with the details given on drawing 6014 and any HSE directives.

Additional fixed fencing may be required to prevent access to the trapping point from behind the photo-electric curtain.

No other equipment or brackets should be fastened to the photo-electric curtain.

### 2.2 MACHINE MOUNTED SYSTEM

The machine mounted system should be securely fastened to the machine using the fixing plate and spacer plate supplied, see drawings 6018 sheets 1 & 2 and 6030 for details. If the plate is rotated, the anti-vibration mounts must be re-assembled in the correct sequence as detailed in drawing 6017.

The photo-electric curtain must be mounted as detailed in drawing 6014 and any HSE directives with regard to the horizontal and vertical positions relative to the trapping point. Additional fixed fencing may be required to prevent access to the trapping point from behind the photo-electric curtain.

No other equipment or brackets should be fastened to the photo-electric curtain.

### 3 EXTERNAL CONNECTIONS

#### 3.1 INPUTS

##### Supply Voltage

Supply voltage to the curtain can be either 240v AC or 110v AC which is link selectable within the external connector as detailed in drawing 6016. The unit must be earthed using the earth stud in the connector. The cables must be rated at 5A (i.e. 6491X). Internal fuses protect the primary and secondary of the internal transformer. Please note that these fuses are not user replaceable.

##### Check input

When contacts 7-15 are closed by an external relay contact the curtain is put into check mode, which stops the emitter firing. During this time the output contact will all change to the relaxed or unenergised state, enabling the external electrical system to monitor the curtain status.

The curtain will return to normal use when this contact is opened.

The curtain will be in check mode within 100ms of the contact closing.

#### 3.2 OUTPUTS

Four volt free contacts are available, 3 normally open and 1 closed. All the contacts are internally a combination of both safety relays and are all internally fused. These fuses are not user replaceable.

See drawing 6016 for full details of the external connections.

### 4 SETTING UP

The heads should be securely fastened as detailed earlier. No electrical equipment is required to align the photo-electric curtain, it is only necessary to ensure that the heads are pointing towards each other with the external connectors in the same relative positions.

## 5 INDICATORS

Each 200mm board in the system has a green LED which is visible from the front of the curtain. The LED will be illuminated when the electronic scan has completed the board. If the curtain is interrupted such that the electronic scan has not passed a board the LED will not be lit. If the electronic scan has passed a board the LED will be lit. The LED may flash when the curtain is interrupted whilst the electronics are functioning to re-establish the scan.

The last board within the photo-electric curtain has two additional LEDs which indicate the curtain status. If there is a fault with any part of the control electronics or the curtain is interrupted the LEDs will be red. When the curtain is complete and both the safety relays have energised the LEDs will be green. If there is a fault with the power supply the LEDs will be off.

The outer LEDs pass through the amber state very quickly. It may be possible to see this intermediate state.

### Start Up

At start up the curtain is automatically put through a check procedure within the internal electronics. In order to check the curtain it is necessary to allow the system to complete a fixed number of scans. During this period (< 1s) the outer 2 LEDs will be red. When the checks have completed they will change to amber, but the safety relays will not energise.

It is necessary to interrupt the curtain (ideally with a template the same size as the rejection of the curtain) and then clearing the curtain.

Further checks will take place within the electronics, and if the curtain is clear, the output relay will energise. The outer LEDs will be green.

The output relays will now energise or de-energise depending on the curtain status.

## 6 HINGE

On the “L” shaped 600-200 system a lockable hinge is fitted as standard on the heads, allowing the vertical section to be rotated and locked in all positions between the vertical and the horizontal. A stop prevents the vertical section from being lowered beyond the horizontal. The vertical section should always be locked in position.

The locking mechanism on the hinge should never be over tightened. If the vertical section is rotated whilst the hinge is locked, the hinge may be over tightened. In this case either release the locking mechanism or carefully rotate the vertical section to free the locking mechanism.

The handle on the hinge locking mechanism may be repositioned without slackening the hinge, by pulling the handle away from the hinge and rotating the handle into the new position.

On no account should the vertical section be used as a table or support for workpieces or tooling, when in any position. This will damage the hinge mechanism.

## 7 INSPECTION

Reference should be made to the relevant directives issued by the Health and Safety Executive, H.M.Factories Inspectorate and your own safety department. For your information a copy of HSE IND (G) 7 ( C) is enclosed in this documentation. The following details are given as a guide to inspection only.

### 7.1 DAILY

1. Ensure that neither stand has become loose due to damage by passing forklift trucks, material knocks or vibrations.
2. Check that both the guard heads are securely fastened either to the floor or to the machine.
3. Check that no lens/filters are damaged.
4. Clean the lens/filters.
5. Check the rejection of the guard.
6. Check for cable damage.
7. Check that all plugs are secure.

### 7.2 ROUTINE MAINTENANCE

The system is designed to function with the minimum of maintenance. Ensure that the optical window is kept clean with an anti-static cleaner but do not polish as this will lead to a build up of static electricity. Check that the fixing bolts are all secure and that the external connectors are securely fastened with the locking catches.

### 7.3 MAINTENANCE

It is recommended that the system is checked at least once a year to ensure that the reliability and operation are maintained.

This can be ensured with our extended warranty scheme, whereby our trained engineers will make at least one visit during the extended warranty period.

## 8 PUBLICATIONS

The following list is not intended to be an exhaustive list of all publication that are related to safety, but only to show a general cross section of the documents available. Further information can be obtained from the Health & Safety Executive Publication department, HMSO stationery stockists and British Standard Institute. Our sales and technical departments may be able to offer advice if required.

### 8.1 PHOTOELECTRIC GUARDING PUBLICATIONS

BS6491 : 1984	British Standards Publication
HSE IND(G)7( C)	HSE Publication. Copy enclosed.
Safety Notices and Policies	Your own company publications.
HSE Guidance Note PM41 July 1984	The application of photoelectric safety systems to machines.

### 8.2 OTHER PUBLICATIONS

Power Press regulations 1965 and 1972.  
Health and Safety Executive Guidance ISBN 0-11-885534-4.

Press Brakes.  
Health and Safety Executive ISBN 0-11-883784-2.

Health and Safety at Work Act. 1974.

Factories Act.

Electricity at work regulations. 1989.

IEE Wiring Regulations 16th Edition. Regulations for Electrical Installations.

Machinery Directive.

Compressed Air Safety.

### 8.3 BRITISH STANDARDS APPLICABLE TO PRESS BRAKE SAFETY.

BS2771 : 1986 EN60204 : 1985

Electrical Equipment of Industrial Machines.

BS5304 : 1988

Safety of Machinery.

BS6491 Part 1 : 1984 BS6491 Part 2 : 1987

Electro-sensitive Safety Systems for Industrial Machines.

Safety of Machinery. Basic Concepts, General Principles for Design.

BSEN292 Part 1 : 1991

Technical Principles.

BSEN292 Part 2 : 1991

BSEN294 Safety of machinery.

Safety distances to prevent danger zones being reached by the upper limbs.

### 8.4 DRAFT DOCUMENTS.

prEN 50100-1 : 1992

Safety of Machinery : Electro Sensitive Protective Devices

Part 1 : Specification for General Requirements

BSEN953 Draft British Standard

Safety Of Machinery - General requirements for the design and construction of guards. (fixed or movable)

prEN692 Draft European Standard

Mechanical Presses - Safety.

prEN693 Draft European Standard

Hydraulic Presses - Safety.

BSEN954-1 Draft British Standard

Safety of Machinery - Safety related parts of control systems.

Part 1 : General principles for design.

## 8.5 SINGLE MARKET PUBLICATIONS APPLICABLE TO SAFETY.

Management of Health and Safety at work Regulations 1992.  
ISBN 0 11 886330 4

A guide to the Provision and Use of Work Equipment Regulations 1992.  
ISBN 0 11 886332 0

Manual handling of loads: A guide to the Manual Handling Operations Regulations 1992.  
ISBN 0 11 886335 5

Workplace (Health, Safety and Welfare) Regulations 1992.  
ISBN 0 11 886333 9

A guide to Personal Protective Equipment at Work Regulations 1992.  
ISBN 0 11 886334 7

Work with display screen equipment: a guide to the Health and Safety (Display Screen Equipment) Regulations 1992.  
ISBN 0 11 886331 2

## 8.6 OTHER DOCUMENTS APPLICABLE TO RELATED EQUIPMENT.

COSHH Regulations.

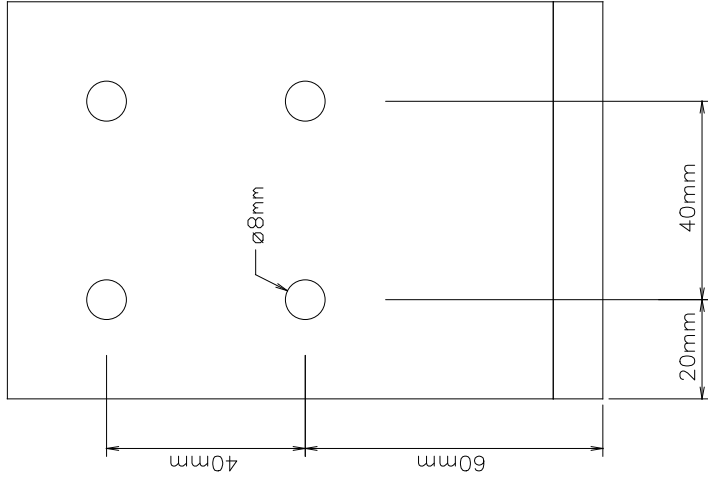
HS/G 42 Safety in the use of metal cutting guillotines and shears.  
ISBN 0 11 885455 0

## 9 SPECIFICATION

Range	500mm to 3m and 2m to 16m depending on system. Up to 25m by special order.
Height	Active curtain 200mm to 1.6m in 200mm steps depending on system. Physical height see drawing 6015
Resolution	100mm to 15mm depending on system. Standard 30mm.
Response time	$\leq 20\text{ms}$
Relay outputs	Forced action safety relays. 3 x normally open, 1 x normally closed.
- Max current	1A (limited by internal fuses)
- Max voltage	240v AC
-Supply voltage	110v AC or 230v AC +/- 10%. Link selectable on external connector.
-Frequency	50/60 Hz

## 10 DRAWING LIST

6011 Sheets 1 & 2	Angle plate details for IR Mk2 Type 1 & 2
6012	Floor plate details for IR Mk2
6013	Drawing for IR Mk2 vertical adjustment
6014	Drawing for IR Mk2 vertical curtain position
6015	Drawing for IR Mk2 active area of curtain
6016	Drawing for IR Mk2 external connections
6017 Sheet 1	Anti-vibration mounts fixing details - Angle section
6017 Sheet 2	Anti-vibration mounts fixing details - Plate
6018 Sheets 1 & 2	Machine mounting plate details for IR Mk2 Type 1 & 2
6030	Machine mounting plate details for IR Mk2 Type 3



Material MS Angle 120mm x 120mm x 10mm

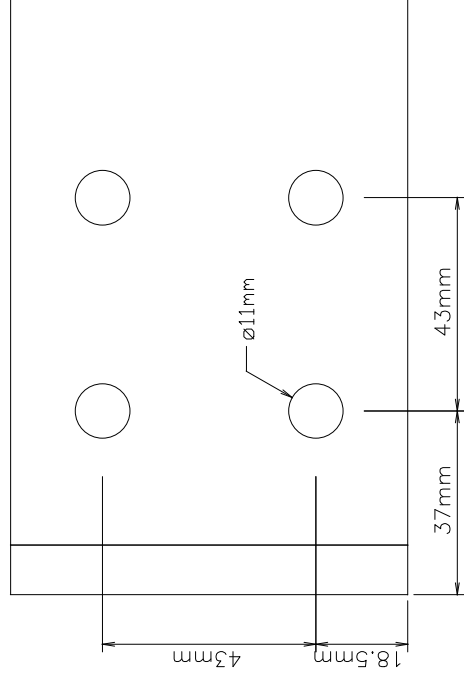
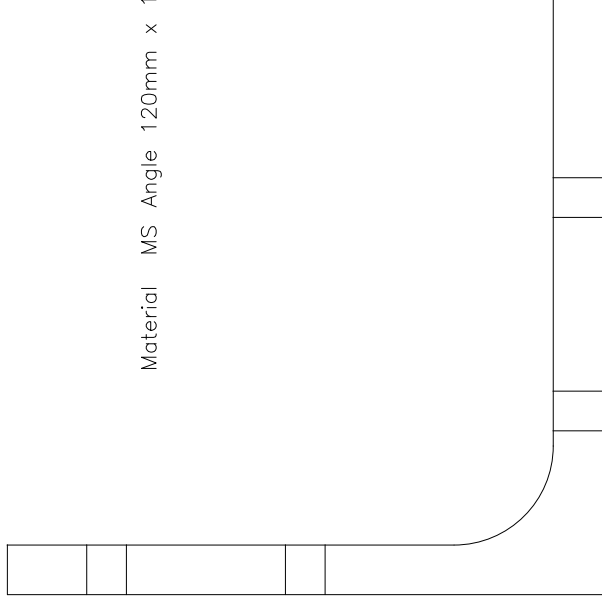


Plate Ref 6011-1

DRAWN PG 12-12-96	REV E	TITLE Angle plate details for IR Mk2 Type 1	SHEET 1/2	DRAWING NUMBER 6011
CAMBRAKE Limited CRESCENT MILL, TODMORDEN, LANCs Telephone 01706 815711/818965 Fax 01706 817967				

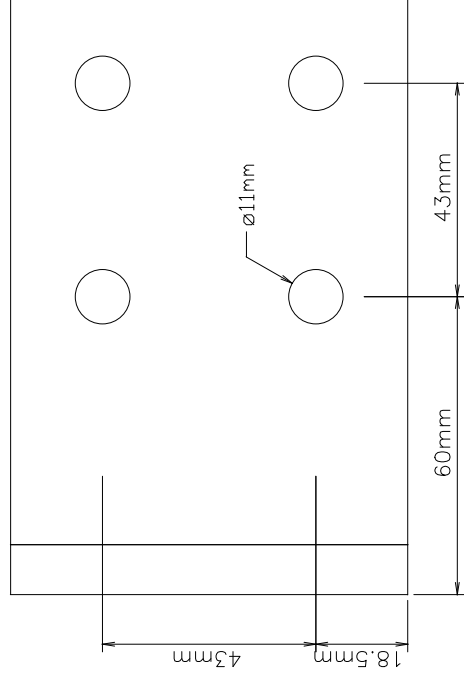
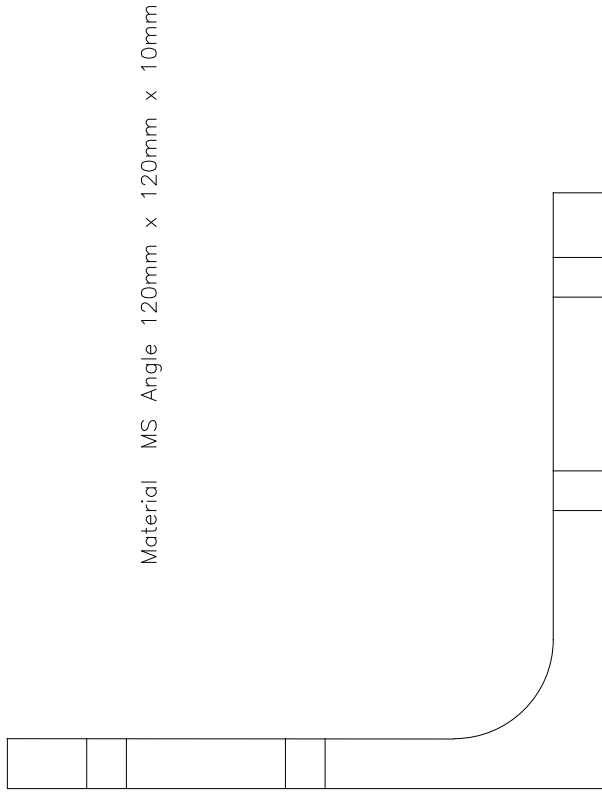
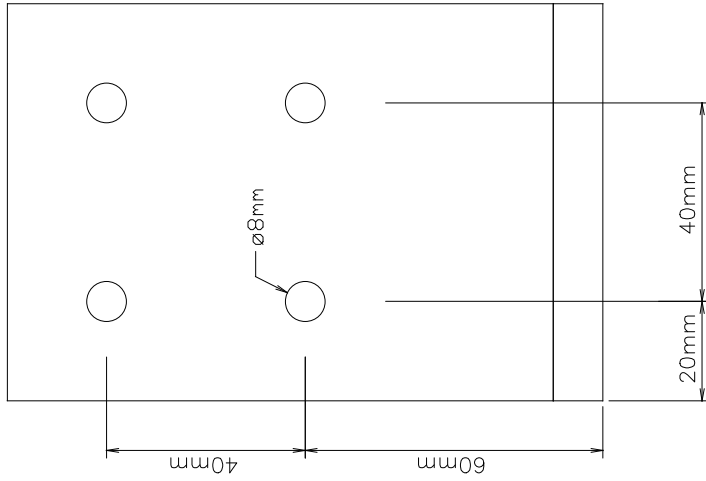
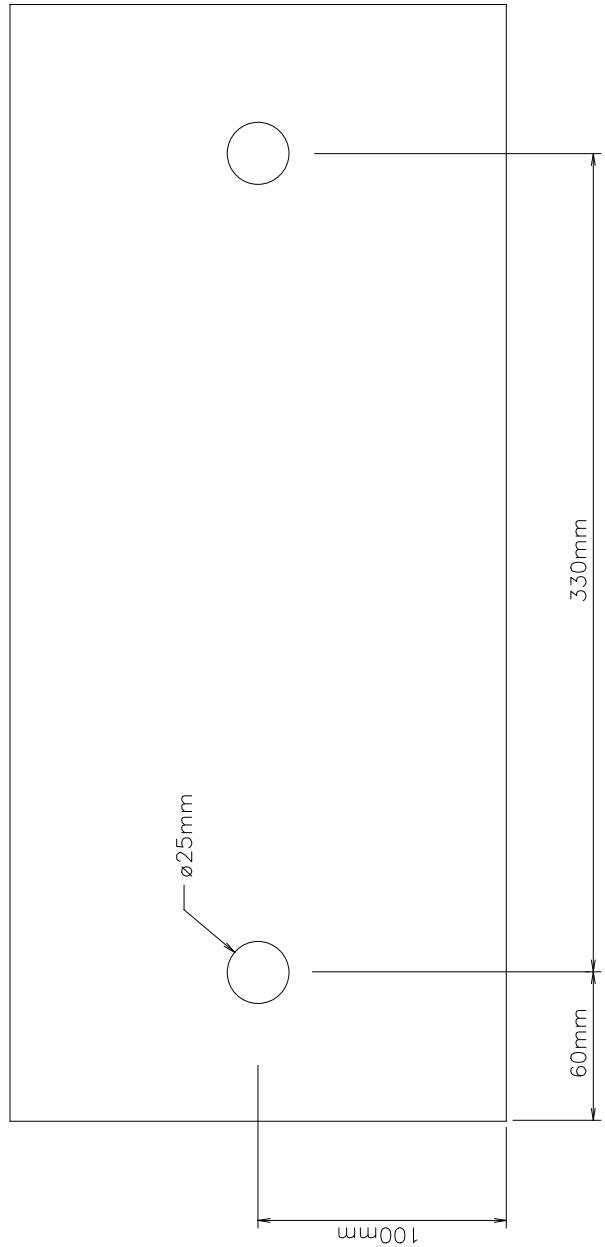
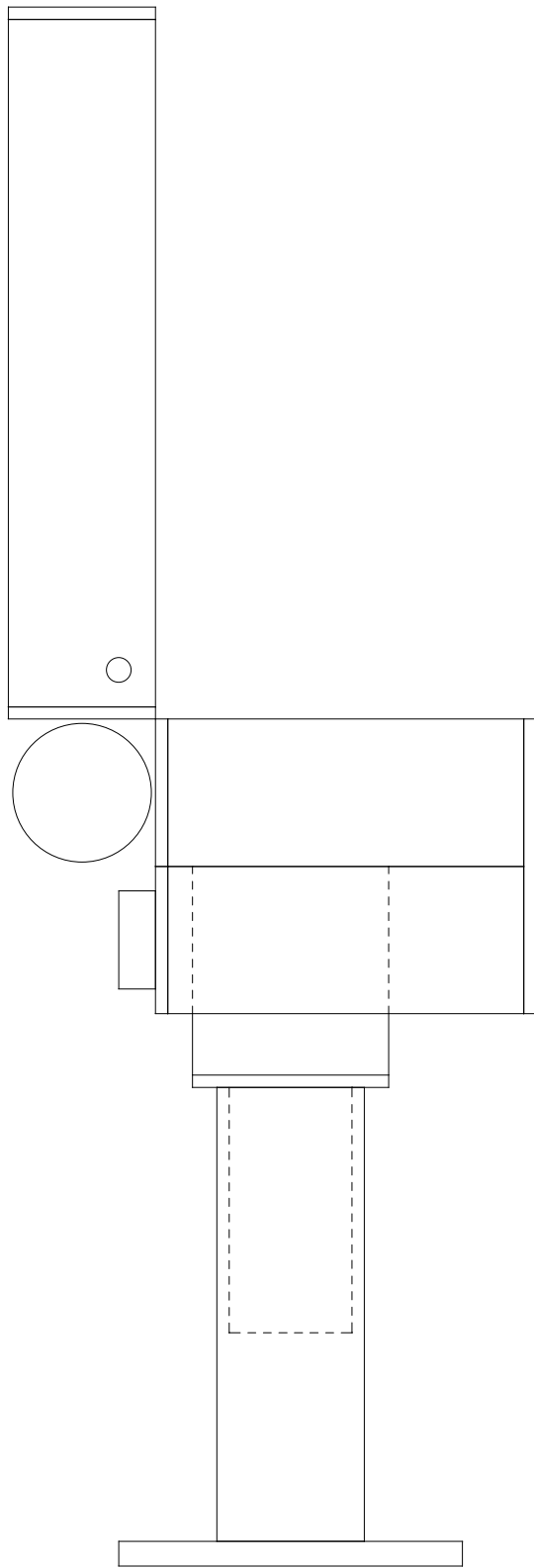
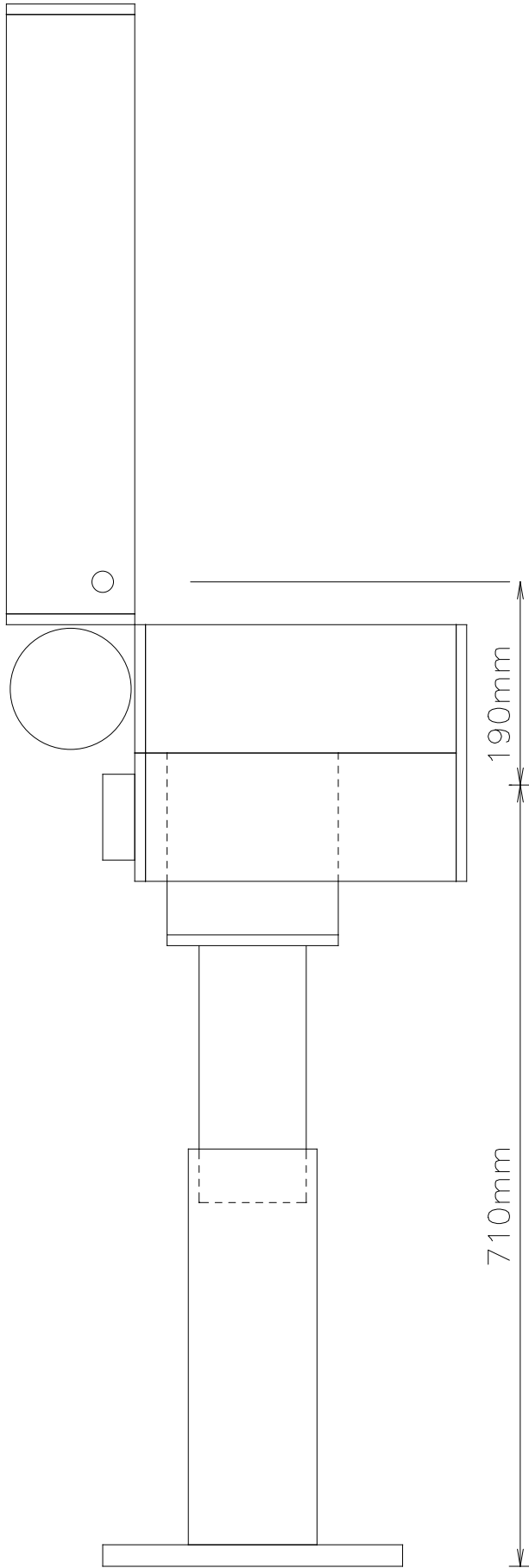


Plate Ref 6011-2

CAMBRAKE Limited CRESCENT MILL, TODMORDEN, LANCs Telephone 01706 815711/818965 Fax 01706 817967	TITLE Angle plate details for IR Mk2 Type 2		REV B	DRAWN PG 12-12-96	CHECK PG 12-12-96	SHEET 2/2	DRAWING NUMBER 6011

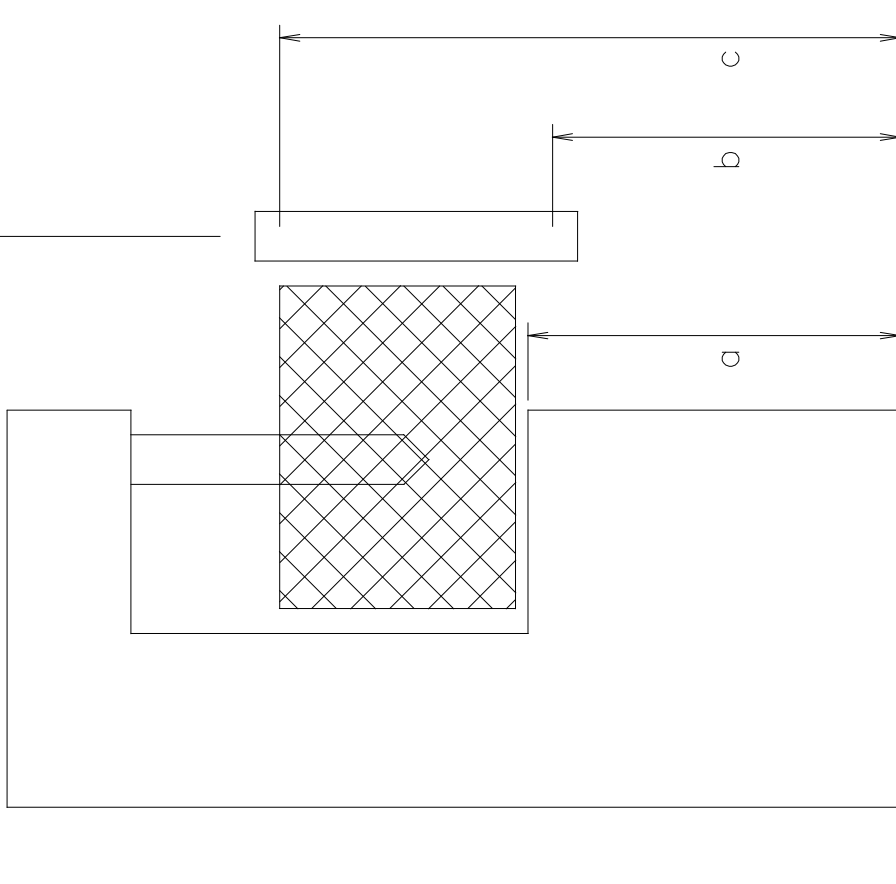


DRAWING NUMBER 6012	SHEET 1/1	DRAWN PG 12-12-96 CHECK PG 12-12-96	REV D	TITLE Floor plate details for IR Mk2	CAMBRAKE Limited CRESCENT MILL, TODMORDEN, LANCs Telephone 01706 815711/818965 Fax 01706 817967
------------------------	--------------	--	----------	--------------------------------------	---



CAMBRAKE Limited CRESCENT MILL, TODMORDEN, LANCs Telephone 01706 815711/818965 Fax 01706 817967	TITLE Drawing for IR Mk2 Vertical adjustment	REV	DRAWN	SHEET	DRAWING NUMBER
		B	PG 12-12-96 CHECK PG 12-12-96	1/1	6013

Height of machine bed mm (a)	Lowest point of curtain mm (b)	Highest point of curtain mm (c)
800	750	1350
801-900	800	1400
901-1000	850	1450
1001-1100	900	1500



$D = P + (RT \times 1.8)$  where  $P = 78$  (30mm rejection)  
 $P = 27$  (15mm rejection)  
 and RT is the response time of the machine.  
 P is taken from HSE publication PM41

Typically -

- $D = 78 + (200 \times 1.8)$  mm = 438mm (@ 30mm rejection)
- $D = 27 + (200 \times 1.8)$  mm = 387mm (@ 15mm rejection)

In an application with only a vertical curtain, it may be necessary to provide additional horizontal guarding to prevent somebody standing between the curtain and the trapping point.

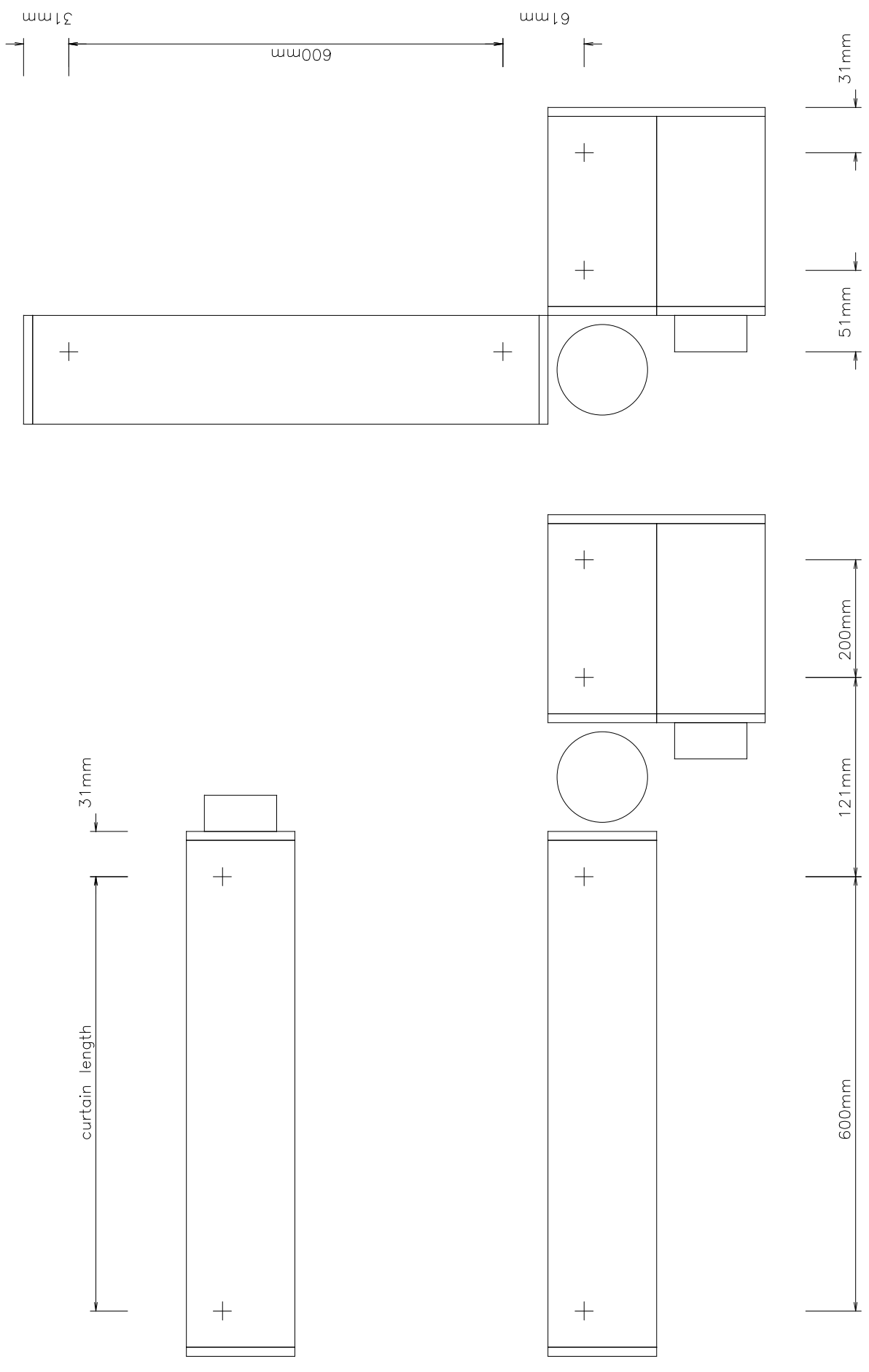
The measurements apply to both a machine mounted curtain and a free standing curtain.

Mounting details not shown.

See drawing number 6015 for details of active area of curtain.

Side access should also be prevented as shown.

CAMBRAKE Limited CRESCENT MILL, TODMORDEN, LANCS Telephone 01706 815711/818965 Fax 01706 817967	TITLE Drawing for IR Mk2 Vertical curtain position details		REV B	DRAWN PG 12-12-96	SHEET 1/1	DRAWING NUMBER 6014
				CHECK PG 12-12-96		



CAMBRAKE Limited CRESCENT MILL, TODMORDEN, LANCs Telephone 01706 815711/818965 Fax 01706 817967	TITLE Drawing for IR Mk2 Active area of curtain		REV B	DRAWN PG 12-12-96 CHECK PG 12-12-96	SHEET 1/1	DRAWING NUMBER 6015

Supply to terminals 1 + 9  
 Link terminals 5 + 13 for 240v  
 Link terminals 1 + 5 and 9 + 13 for 110v

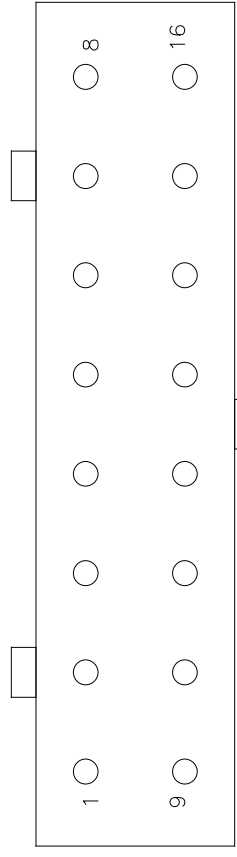
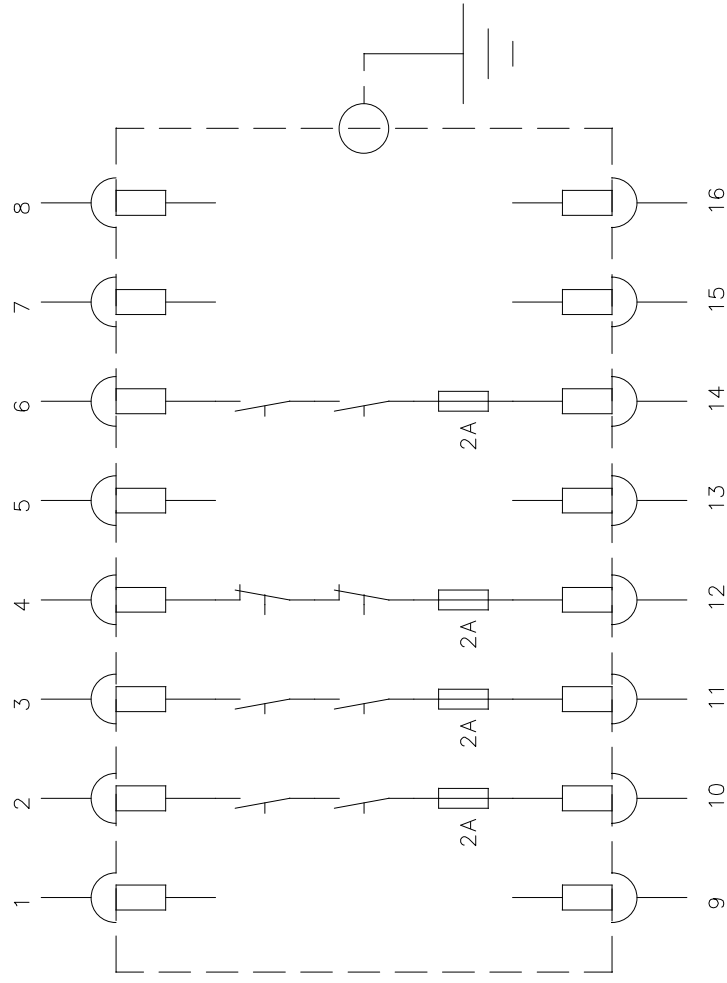
Dual Transformer operation (if fitted)  
 Additional links – 8 + 16 for 240v  
 and link 1 + 8 & 9 + 16 for 110v

Check contacts 7 – 15

Relay outputs are only present at the connector marked. This can be either or both ends depending on the system requirements.

It is recommended that a suitable snubber networkwork is connected on the external contacts to reduce spiking and prolong contact life.

Connector detail

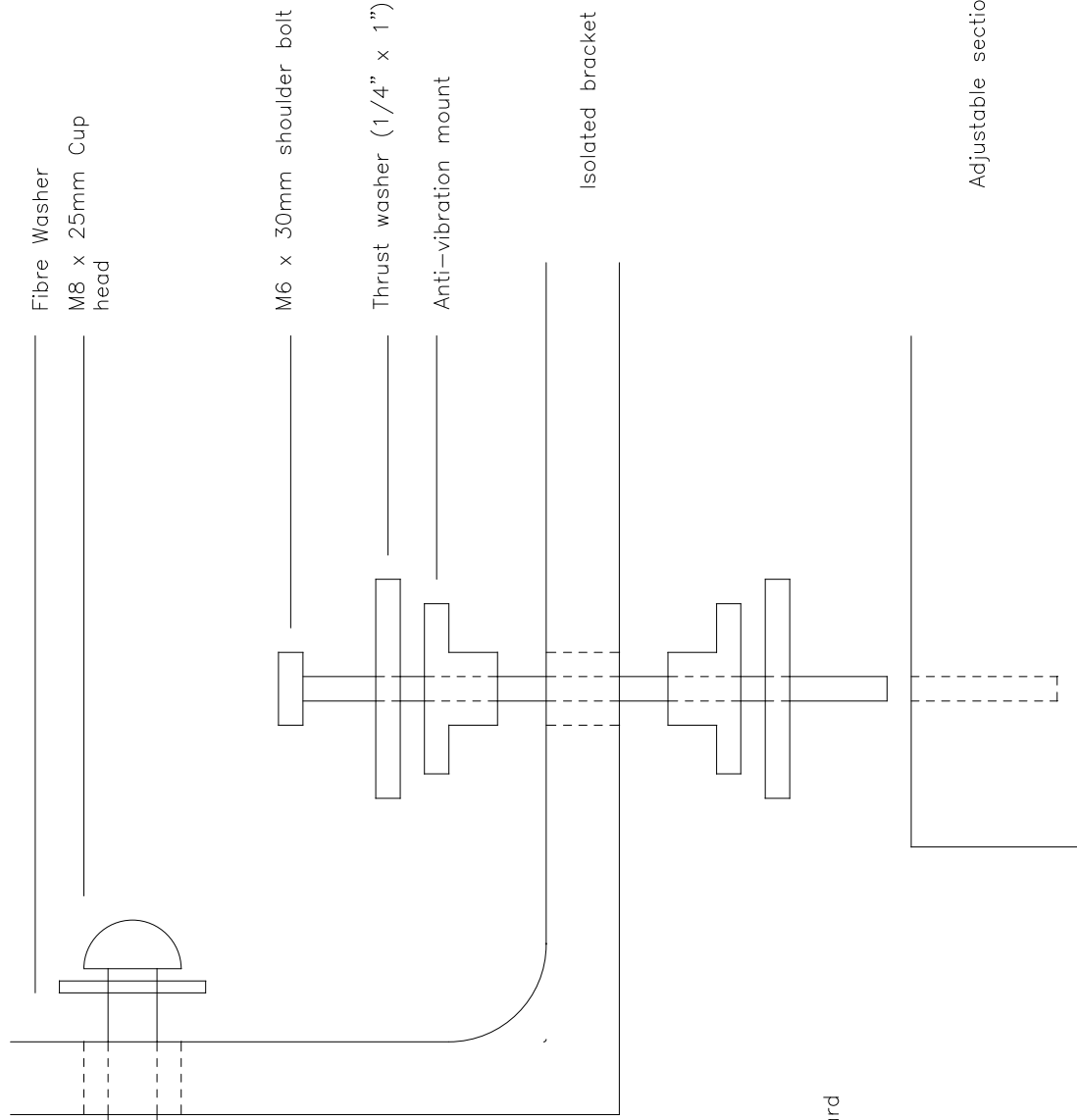


All relay contacts are forced action safety relays.

Internal fuses are not user replaceable

<b>CAMBRAKE Limited</b> CRESCENT MILL, TODMORDEN, LANCOS Telephone 01706 815711/818965 Fax 01706 817967	TITLE Drawing for IR Mk2 External Connections		DRAWN PG 12-12-96	SHEET 1 / 1	DRAWING NUMBER 6016
	REV C	CHECK PG 12-12-96			

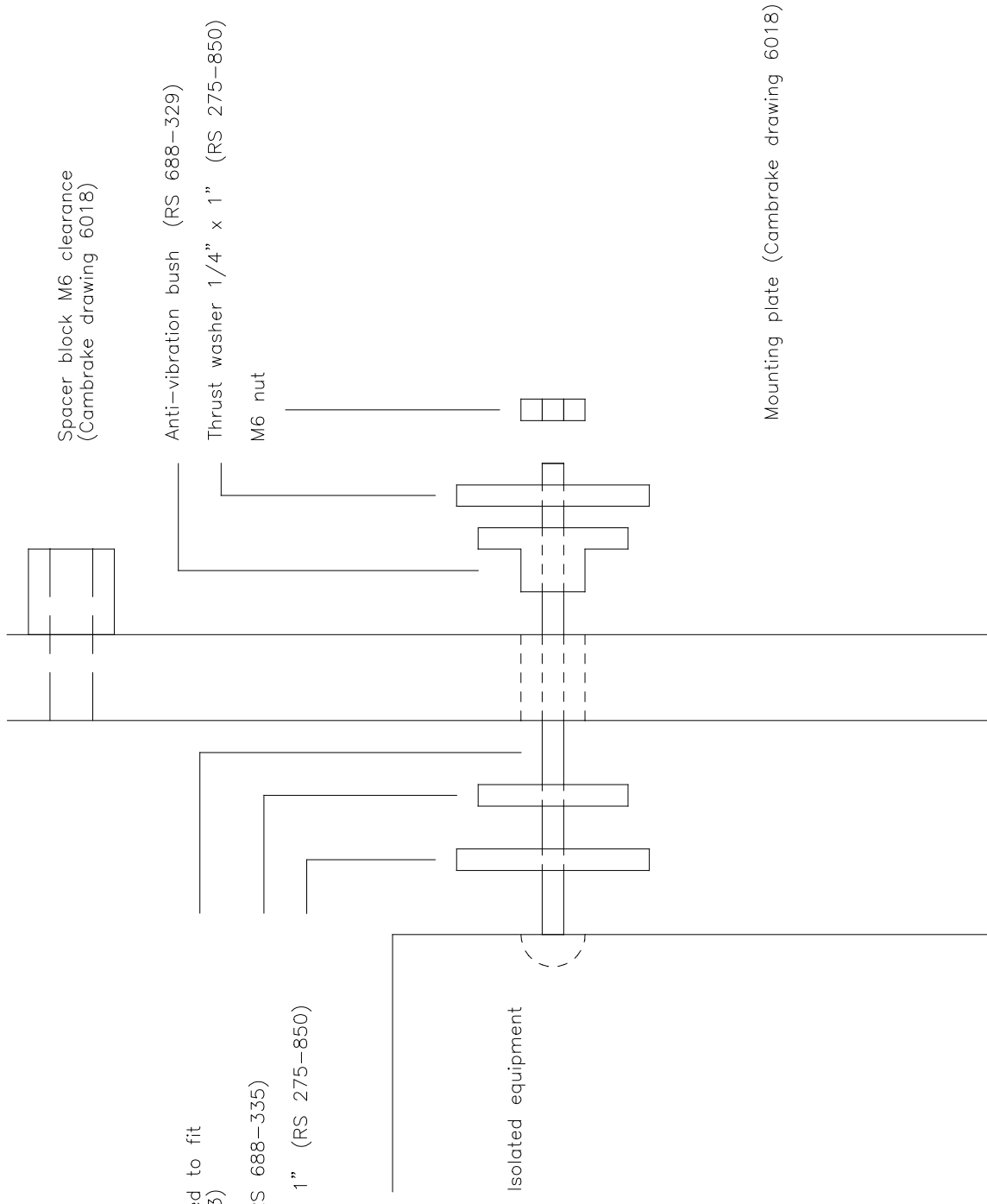
M8 nut (plated)  
 M8 Washer  
 M8 Spring washer



4 off each item per guard

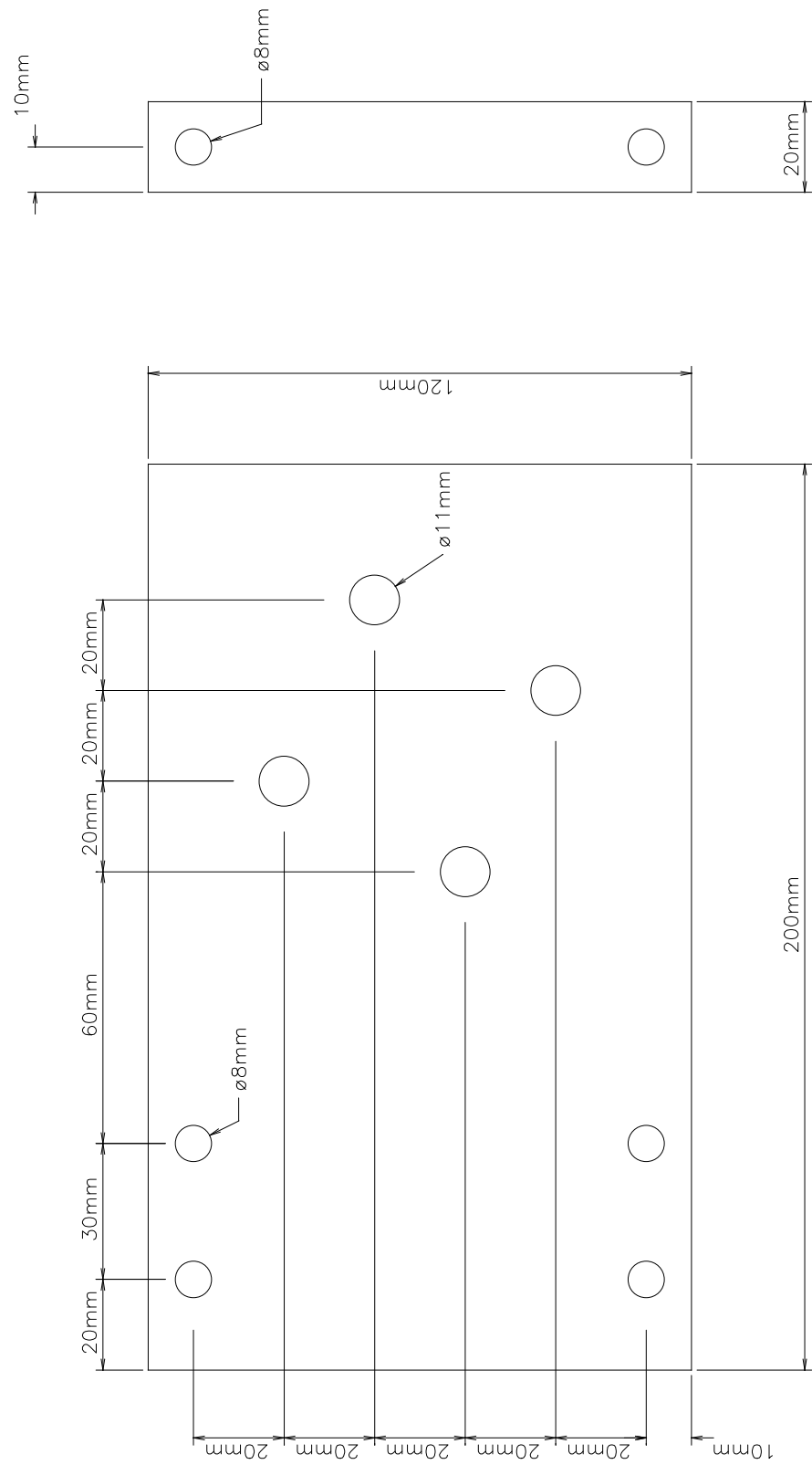
Adjustable section from floor mounting

CAMBRAKE Limited CRESCENT MILL, TODMORDEN, LANCS Telephone 01706 815711/818965 Fax 01706 817967	TITLE Anti-vibration mounts fixing details Angle section		REV D	DRAWN PG 12-12-96 CHECK PG 12-12-96	SHEET 1/2	DRAWING NUMBER 6017



CAMBRAKE Limited CRESCENT MILL, TODMORDEN, LANCs Telephone 01706 815711/818965 Fax 01706 817967	TITLE Anti-vibration mounts fixing details - plate		REV B	DRAWN PG 12-12-96 CHECK PG 12-12-96	SHEET 2/2	DRAWING NUMBER 6017

Material Plate - 200mm x 120mm x 6mm  
 Spacer - 120mm x 20mm x 12mm  
 hollow section

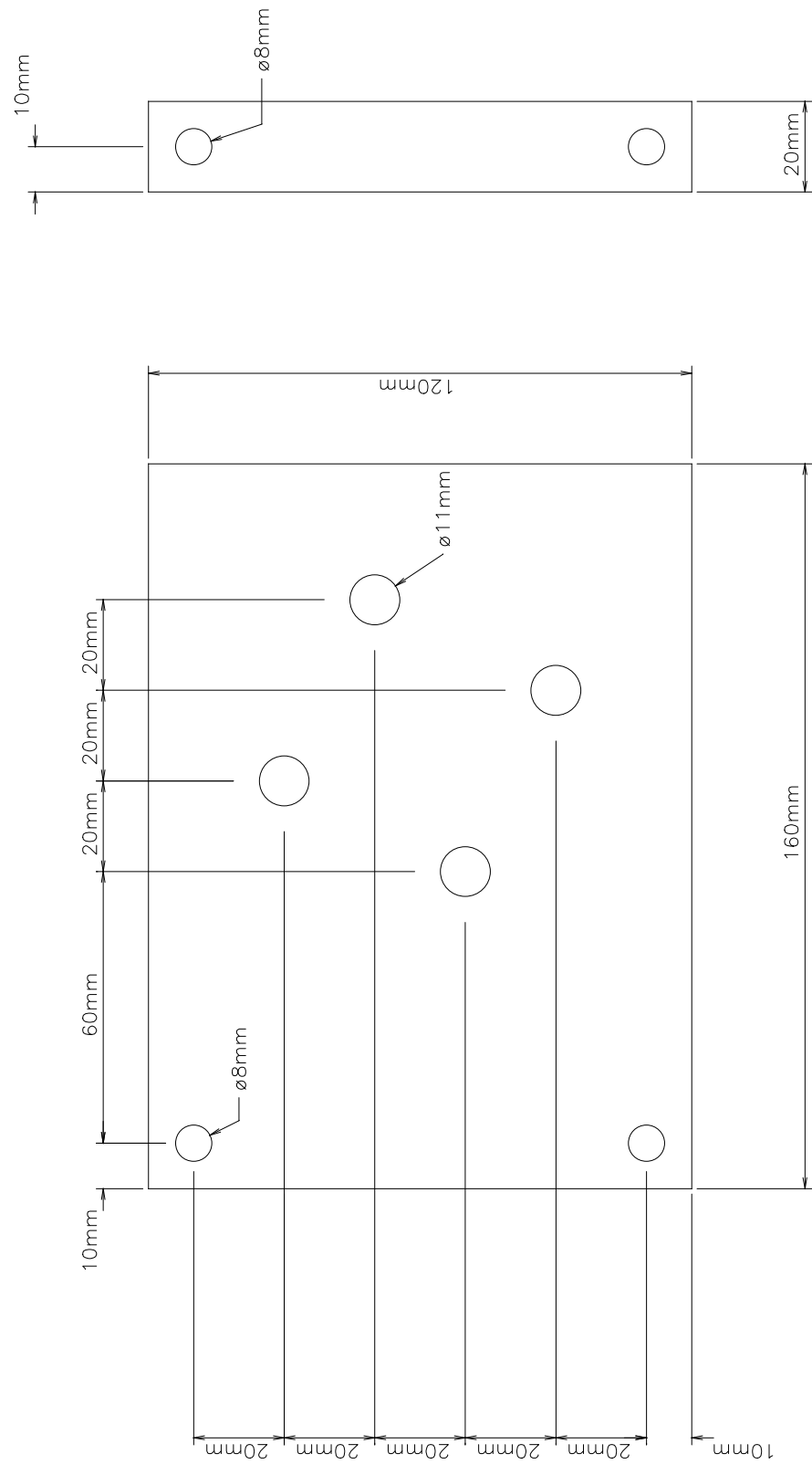


Spacer

Mounting Plate

CAMBRAKE Limited CRESCENT MILL, TODMORDEN, LANCs Telephone 01706 815711/818965 Fax 01706 817967	TITLE Machine mounting plate details for IR Mk2 Type 1		REV C	DRAWN Pg 12-12-96	CHECK Pg 12-12-96	SHEET 1/2	DRAWING NUMBER 6018

Material Plate – 200mm x 120mm x 6mm  
 Spacer – 120mm x 20mm x 12mm  
 hollow section

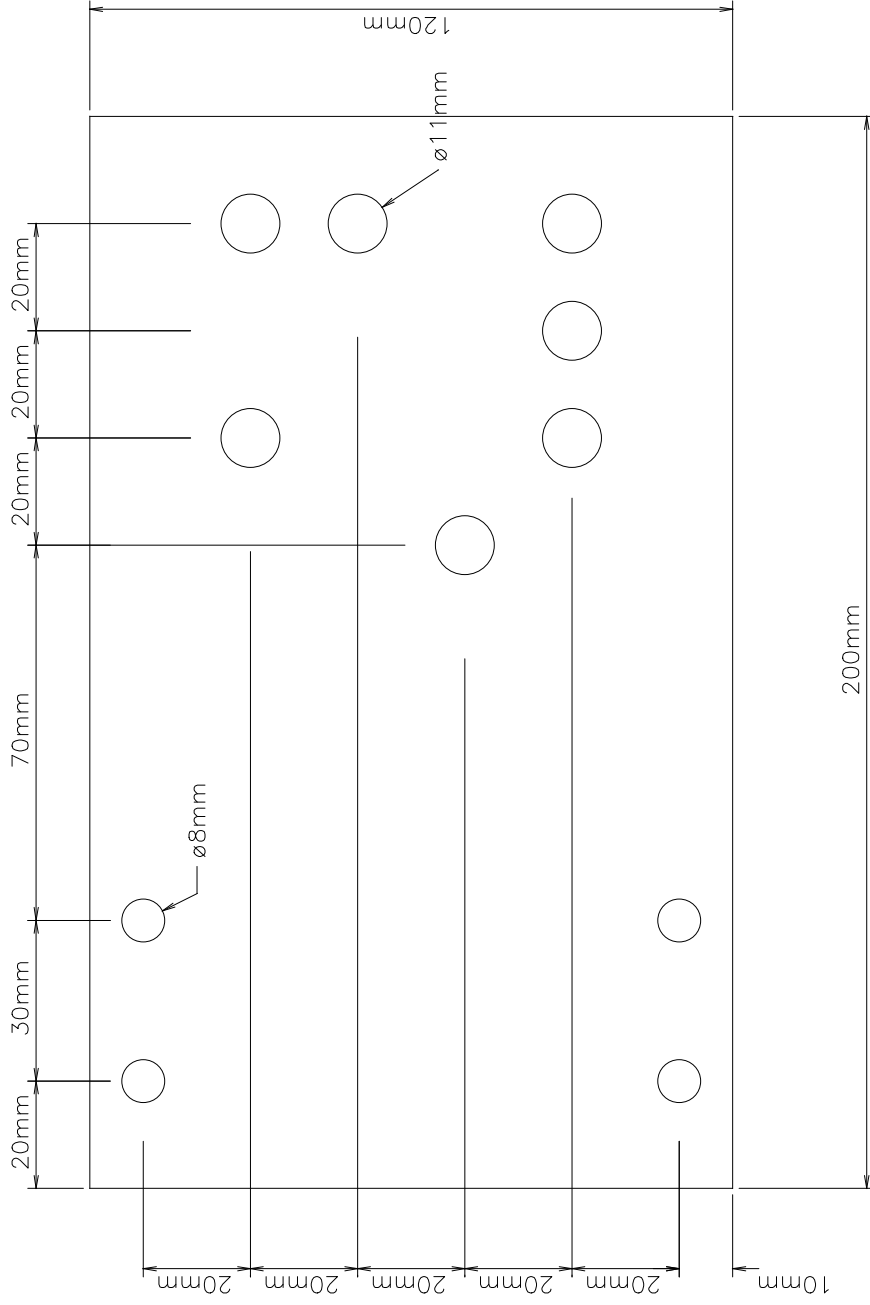


Mounting Plate

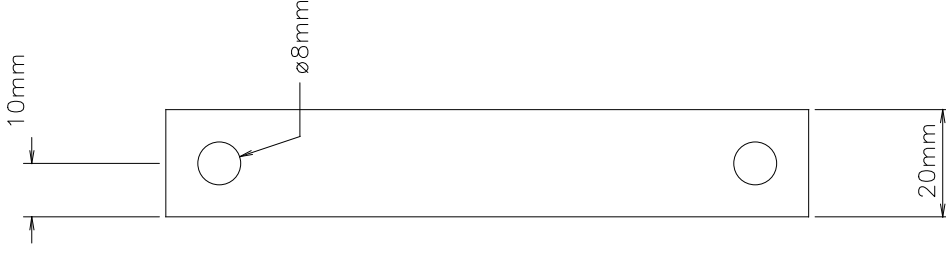
Spacer

CAMBRAKE Limited CRESCENT MILL, TODMORDEN, LANCs Telephone 01706 815711/818965 Fax 01706 817967	TITLE Machine mounting plate details for IR Mk2 Type 2		REV A	DRAWN Pg 12-12-96	CHECK Pg 12-12-96	SHEET 2/2	DRAWING NUMBER 6018

Material Plate – 200mm x 120mm x 6mm  
 Spacer – 120mm x 20mm x 12mm  
 hollow section



Mounting Plate



Spacer