# **TURNSTILES** us

# **PRODUCT MANUAL**



# **MANTRAP AUTOMATIC CUBICLE**

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# 3. INTRODUCTION

#### 3.1. Brief

This manual serves to assist the technician in calibrating and programming the DFA motors in the Automatic Mantrap.

# 4. OVERVIEW

#### 4.1. Basic Function and Principle

The Mantrap Automatic Cubicle is suitable for applications requiring high volume access and high levels of Security.

The product is used extensively at entrances to banks, retail stores, colleges, office blocks and commercial buildings.

The product is designed for interior installation only and is not recommended to be installed outdoors where it will be exposed to rain and weather. It is highly robust, with a full steel frame and door.

#### 4.2. Sizes & Configurations

The Mantrap Automatic Cubicle is produced in three different sizes. This is also produced in either a single or double configuration. Custom sizes are available on request.

#### 4.3. <u>Motor</u>

The Mantrap Automatic Cubicle is driven by a highly durable door operator, which also acts as a door closer when power is off.

#### 4.4. Locking

The Mantrap Cubicle is supplied with a 200Kg magnetic lock as a standard feature. The door operator adds resistance with the maglock to ensure the door stays secure. Other options for locking are available on request.

#### 4.5. Monitoring

The cubicle has multiple infra-red presence sensors installed in the sides of the frame, to monitor the internal volume for detection of more than one occupant.

# 5. DATASHEET

Power	<ul> <li>220 Volt AC (110 Volt AC on request)</li> <li>50Hz / 60Hz</li> </ul>
Power Consumption	<ul> <li>80W Standby / 110W Operating – Single Mantrap</li> <li>160W Standby / 220W Operating – Double Mantrap</li> </ul>
Power Options	Battery Backup (Optional Extra)
Magnetic Lock	• 200Kg 24v Magnetic Lock
Door Closer Options on Power Failure	<ul><li>Normally closed door closer (standard)</li><li>Normally open door closer</li></ul>
Door Closing Detection	Magnetic Probe Sensor
Dual Occupancy	<ul> <li>Infra-red beam dual occupancy presence sensors (Optional)</li> </ul>
Fire Alarm	Fail-safe auto-unlock configuration
Trigger	Normally open dry contact
Frame	<ul><li>Mild-steel Powder-coated</li><li>Stainless Steel Grade 304 (on request)</li></ul>

# 6. CONTROLLER OPTIONS

Code	Description	Included With	Sensors
CBL01	Bi-directional 2 reader locking controller	Internal emergency pushbutton	
CBL02	Bi-directional 2 reader locking controller		Presence sensors
CBL03	Bi-directional single reader locking controller	2 external cycle start push-buttons	
CBL04	Bi-directional single reader locking controller	2 external cycle start push-buttons	Presence sensors
CBL05	Uni-directional bank locking controller		
CBL07	High security bank locking controller	Status control panel	Presence sensors

#### 7.1. General Dimensions



#### Figure 1: 800 x 700 x 2300 Single Mantrap Dimensions



#### Figure 2: 900 x 900 x 2300 Single Mantrap Dimensions







#### Figure 4: 1550 x 700 2300 Double Mantrap Dimensions



#### Figure 5: 1750 x 900 x2300 Double Mantrap Dimensions



#### Figure 6: 1950 x 1400 x 2300 Double Mantrap Dimensions

#### 7.2. Dimensions and weight table

Code	Туре	Dimensions	Weight (Approx.)
TSAT_SA	Single	800x700x2300	280 Kg
TSAT_SB	Single	900x900x2300	310 Kg
TSAT_SC	Single	1000x1400x2300	420 Kg
TSAT_DA	Double	1550x700x2300	510 Kg
TSAT_DB	Double	1750x700x2300	550 Kg
TSAT_DC	Double	1950x700x2300	730 Kg

# 8. INSTALLATION PREPARATION

#### 8.1. Preparing the plinth

The Mantrap can be installed on an existing finished floor, tiles or screed. The Mantrap has a full base plate that will be placed on top of the finished floor and will be mounted down with 4x off M12x90 Countersunk bolts.

If a plinth needs to be prepared, ensure the strength is enough for the mantrap's weight, as described in section 7.2.

The size of the plinth is shown in the dimensions in section 7.1.

#### 8.2. Opening Clearance

An opening clearance of 10mm each side should be allowed. On the top, a clearance of approximately 15mm should be allowed. This is important for installation to assemble the frame in the opening. The openings around can be filled post-installation with aluminium bars or other suitable materials. The openings required is shown in section 7.1.

If the mantrap is installed next to a wall, the mantrap can be assembled hard up against the wall. If required, the mantrap can be bolted to the wall for extra stability, inside the top bulkhead side plate.

#### 8.3. Conduits for power & data

- If power and data is brought from the floor, the conduit should be made flush with the finished floor level, and the cables to extend +- 3000mm (3 meters) above the floor level. When placing the mantrap base plate and side frame down, the cables should be pulled through the holes provided in the base plate, and up through the 100X50 section on the side frame, to enter the bulkhead, where the controller will be located.
- If power is to be introduced from the top down or from the sides, there is allowance made in the top and side plates to pull cables into the bulkhead in the form of 'knock-out' holes.

# 9. PARTS & ASSEMBLY

# 9.1. Overview of Assembly



Figure 7: General Assembly



#### Figure 8: Details on General Assembly

The table of parts below is a general overview of the mantrap as a single. For a double, typically, the bolts and vendor components are double the quantity.

Number	Quantity	Description
1	1	BASE PLATE WITH RUBBERISING
2	1	PIVOT SIDE FRAME ASSEMBLY
3	4	M16 NYLOCK HEX NUT, ZP
4	4	M16x30 PLAIN FLATWASHER, ZP
5	1	LOCK SIDE FRAME ASSEMBLY
6	1	AUTO BULKHEAD ASSY, LEFT PIVOT
7	1	AUTO BULKHEAD ASSY, RIGHT PIVOT
8	8	M12x20 SOCKETHEAD CAPSCREWS, ZP
9	12	25 HEX SET SCREW, 4.8, ZP
10	1	AUTO MANTRAP DOOR ASSY, RIGHT PIVOT
11	1	AUTO MANTRAP DOOR ASSY, LEFT PIVOT
12	2	DFA MOTOR ADAPTOR PIN

13	2	DFA SLIDE ARM
14	2	M8x40 SOCKETHEAD CAPSCREW, ZP
15	2	DFA SLIDE BLOCK
16	1	AUTOMATIC CEILING PLATE ASSY
17	1	CONTROL PANEL PLATE ASSY
18	4	M8x20 HEX SET SCREW, 4.8, ZP
19	16	M8x16 PLAIN FLAT WASHER, ZP
20	2	DOOR PIVOT PLATE WELDMENT
21	6	M6 HEX NUT, ZP
22	2	ROOF PLATE HALVE
23	14	M8x12 BUTTONHEAD CAPSCREW, ZP
24	10	M8x16 HEX SET SCREW, 4.8, ZP
25	10	M8 HEX NUT, ZP
26	2	EDGE TRIM
27	14	M5x8 SOCKETHEAD COUNTERSUNK CAPSCREW, A2

#### 9.2. Assembling the Side Frames and Bulkheads to the Base Plate

Place the base plate either in position on the site as prepared, ensuring to pull the cables through the openings if the conduit is introduced from the floor.

Remove the lower cover plates of the side frames to expose the openings for accessing the bolting holes.

Place the side frames on to the studs in the base plate as shown. Pull the cables through while doing this, using draw wire or lay the frame flat. Insert the M16 washers and locknuts on to the thread of the studs through the openings. Tighten until nuts are bottoming the frame with the base plate. Do not tighten completely yet.



#### Figure 9: Assembly of Side Frames to Base Plate



#### Figure 10: Detail of Bolting Side Frames to Base Plate

The lock side frame has cut-outs for the mortice lock on the sides as shown. These also typically have the external indicator lights on the sides.

The pivot side frame is similar to the lock side frame but has no indicator lights or mortice lock cut-outs. The door will pivot on this side. Place this side frame next to the door pivot pins on the base plate.



It is important to place the base plate and side frames correctly on the site requirement for the doors to open in the desired direction.





Place the bulkheads between the side frames on the top as shown. Place the bolts through the plates in the bulkhead into the side frame. Tighten the bolts fully.



Figure 12: Assembling the Bulkheads to the Side Frames



Place the bulkheads with the pivot of the door closer over the bearing pins, as these will be the door pivots.

Now tighten the bolts at the bottom of the side frames onto the base plate. Before bolting to the floor, check the dimensions as shown. It's important for the opening to be correct for the doors to fit correctly.



Figure 13: Dimensions of frame

# 9.3. Power and Control Cables to the center of the Bulkhead

Ensure the power and control cables are leading to the center of the bulkhead. This will be connected to the control panel after final assembly.

The cables for power and control should now be led to the center of the top bulkhead through one or more of the four available routes as shown.



# Figure 14: Cabling to the center of the bulkhead

# 9.4. Bolting down

The mantrap has 4 countersunk holes in the base plate for mounting down the mantrap to a finished floor level. This can be tiles or screed. Make sure the anchors are long enough to penetrate and grip to the concrete to hold the mantrap from shifting, otherwise procure longer anchors.



#### Figure 15: Bolting Down positions

# 9.5. Installing the doors

Each door has two bearing inserted at the top and the bottom. This may be packaged separately.

To prepare the door for installation, ensure the bearings are inserted flush with the top and bottom faces of the door. Use a rubber mallet to knock the bearings in if required.



#### Figure 16: Door Assembly

Each door has a striker plate mounted to the top. The striker plate will be towards the lock side of the door. There is also a sliding rail for the door operator.





Place the door at a slight angle onto the bearing pin, so that the bearing engages with the pin. The pivot pin on the base plate is rounded to allow for this placement. Lift the door to be perpendicular to the floor.





Place the pivot plate onto the door, through the inside of the bulkhead onto the threads available. The pin at the bottom of the plate must engage with the bearing in the door. The flat part of the pivot plate needs to be toward the upright for this to fit.



#### Figure 19: Door Assembly with Pivot Plates

Place the four hexnuts onto the threads and tighten the plate down. Ensure that the door can open and close easily without any resistance on the pivot before continuing.



Figure 20: Door pivot plate detail

Place the pivot plate onto the door, through the inside of the bulkhead onto the threads available. The pin at the bottom of the plate must engage with the bearing in the door. The flat part of the pivot plate needs to be toward the upright for this to fit.

#### 9.6. Connecting the drive arm

Place the drive DFA motor adaptor pin onto the spline in the motor as shown. Place the drive arm onto the adaptor. Make sure the drive arm is placed approximately 92 degrees from the open door angle (See **Figure 23: Drive arm position when installing**) This is necessary to ensure the door operator overshoots the 90 degree position to close the door fully when acting as a door closer and as an automatic operator.



#### Figure 21: Drive arm assembly

Place the Capscrew through the drive arm and adaptor into the spline. Turn the screw until it holds the drive arm in place, but do not tighten fully yet.



The screw needs to allow the drive arm to move vertically slightly, to pull the drive arm onto the sliding bush in the rail, which is described in the next section.



VIEW FROM UNDER





# Figure 23: Drive arm position when installing

While holding the door in the open or slightly open position, turn the drive arm toward the door and lift up slightly (The screw in the drive arm must be loose to allow for this). Place the pin the sliding bush, inside the sliding rail on the door. Use a rubber mallet to knock the drive arm pin fully into the bush.



#### Figure 24: Joining drive arm to sliding rail bush

On releasing the door, it will close fully into the mantrap frame. Repeat for the opposite side door, using a mirrored assembly as described.

Test the opening and closing of the door and check if the closing speed and force is satisfactory. See supplemental documentation for setting and adjustment of the door operator.

# 9.7. Installing the ceiling plate

Place the ceiling plate assembly (with downlight) in the center top of the mantrap, between the bulkheads. Ensure that the lips on the plate is facing up. The underside of the ceiling will be flush with the underside of the bulkheads.

Align the holes with those in the side frames and the bulkheads, and use the screws provided to tighten.



Figure 25: Assembly of ceiling plate

# 9.8. Installing the control panel plate

Place the control panel above the ceiling, with the lips facing up, there are four holes located on the side plates of the bulkhead for the control panel screws.

Make sure the wires for power and data freely lead to the control panel plate, as the connections will be done here.



#### Figure 26: Assembly of control panel plate

# 9.9. Drawing the sensor wire harness into the bulkhead

If available in the current configuration, the sensors wire harness will need to be pulled through from the side frame middle cavity into the bulkhead. Note that with the CBL01, CBL03 and CBL05 configurations, the sensors are not supplied.



# Figure 27: Location of the Sensor Wiring Harness

# 9.10. Installing the top panels



Note that the top panels should only be installed after all the connections are done and the mantrap has been tested as per the following sections.

Place each halve top panel on the top of the mantrap cubicle, with the down bends touching in the middle of the mantrap as shown. Fasten using the button head screws provided.



Figure 28: Top Plates installation

# 10. OTHER ASSEMBLIES FOR REFERENCE

#### 10.1. Magnetic Lock Assembly on Bulkhead

The magnetic lock is installed in the front bottom corner of the bulkhead with a M6 x 10 center screw and three M8 x 16 screws on a circle. The wire for the lock is pulled through into the bulkhead.



#### Figure 29: Assembly of Magnetic Lock on Bulkhead

#### 10.2. Magnetic Lock Striker Plate & Probe Sensor magnet Assembly on Door

The magnetic lock strike is installed at the top corner of each door. The strike plate has a rubber buffer to allow for float and a countersunk screw holding the plate and the buffer to the door. The screw is a specially supplied screw with an M6 thread.

The probe sensor magnet is installed on top of the door. This can be removed with a screwdriver to pry it up or installed by tapping it with a rubber mallet or by hand. It clips into the hole on the top of the door.



#### Figure 30: Assembly of Magnetic Strike Plate on the door

# 10.3. Door operator Assembly on Bulkhead

The door operator is installed in the bulkhead using 4 off M6 x 25 screws, washers and hexnuts. The door operator spline is concentric with the hole in the bulkhead.

On the opposite bulkhead, the door operator is turned so that the top is facing down.



Figure 31: Assembly of Door operator in bulkhead

# 10.4. Probe Sensor Assembly on Bulkhead

The probe sensor is installed in the bulkhead from the front up as shown. The probe sensor plate has screws welded to it, and the bulkhead has a hole and a slot to accept the threads. The slot is for adjustment of the probe sensor position. The threads are held from the other side of the bulkhead face with nylock hexnuts.



Figure 32: Assembly of Probe sensor on bulkhead

# 11. WIRING DIAGRAM AND CONNECTIONS



#### Figure 33: General Wiring Diagram for automatic mantrap

#### 11.1. <u>Connecting the sensors to the beam controller</u>

The harness pulled from the sensors on the middle sides of the side frame need to be connected to the beam controller board, found on the control panel. See diagram below.

One side of the board is for the infra-red transmitters and the other side is for the receivers.



Figure 34: Beam Controller Harness Wiring

#### 11.2. The magnetic lock & probe sensor wiring

The magnetic locks each have a 0V (negative) wire and 24V+ (positive) wire. The 24V+ is wired directly to the power supply 24V+ output. The 0V will be wired to the FET outputs B and A. (A for door side A and B for door side B)

The probe sensor has two wires. It does not matter which wire is wired to the required terminal. One wire is wired to the common ground of the board and the other wire is connected to either C or D voltage free inputs. (C for door side A and D for door side B)



Figure 35: Wiring of Maglocks and Probe Sensor

# 11.3. Connecting power

Mains power should be connected to the terminal block provided. This will distribute live power to the 24v power supply.

The power supply is configured as a standard for 230V ac, 50Hz (This can be set to 110v on request).



Figure 36: Power Connection

#### 11.4. Wiring External LEDs

The LED wiring harness is led from the LEDs in the front upright where the two external LED indicator lights are mounted. This is also pulled through the upright into the bulkhead cavity of the side frame, same as the wire harness for the sensors.



#### Figure 37: External LED wiring

#### 11.5. Wiring Internal LEDs

There is a green LED indicator light mounted below each bulkhead as an optional extra. These are used to indicate to the user inside the mantrap if the door they are facing is locked or open.

The wires for these can be led from the bulkhead to the control panel.



#### Figure 38: Internal LED wiring

#### 11.6. Connecting triggers

The triggers are connected to the inputs A or B and the common ground block. The triggers are normally open dry-contacts, and a relay should be used to trigger these. The relay from an access control system is adequate for this purpose.

The emergency trigger will open both doors and keep the doors open for as long as the contact is closed. This is a normally open contact and requires a latch, as is usually provided by an emergency 'break-glass' switch.



# Figure 39: Trigger Wiring

# 12. <u>TESTING</u>

# 12.1. Stand-by state

The stand-by state is the stable state in which the unit must be to be able to accept a trigger for operation. Check that these conditions are true before testing.

- a) Mains power must be connected and on.
- b) Both doors must be closed, the magnetic locks must be engaged and the probe sensors on top of the doors must both send a signal to the control panel to signal that the doors are closed.
- c) The trigger input contacts from the access control relay must be in the open state.
- d) The emergency trigger input contact must be open.

# 12.2. Basic functions for operation

The basic function of the mantrap is as follows (Example from side A to B, same in reverse):

- e) User triggers the reader at side A. Reader closes the contact and triggers input A on the control board.
- f) The magnetic locks will disengage. The door operator will pause for a set time (factory set at 0,5 seconds) and then open the door A. The green LED on side A will light up and the red LED will go off.
- g) The user will walk into the mantrap. The door will pause in the open position for a set time (factory set at 1 second) and then close.
- h) When the door closes, the door operator will stop. The probe sensor on top of the door will send a signal to the control board that the door is in the closed state. This will start the cycle inside the mantrap to check for occupancy through the sensors. The red LED on side A will light up and the green LED will go off.
- i) The sensors will check for dual occupancy by means if either 3 sensors are broken. Below is a table of the two conditions, either valid (only one person in the mantrap) or invalid (two or more people in the mantrap).

State	Description	Reaction from controller
Valid	2 or less sensors broken	Door B opens, allowing the user through. Green LED light on side B will light up while red LED will go off.
Invalid	3 or more sensors broken	Door A opens, exiting the user from the side of entry. Green LED light on side A will light up while red LED will go off.

- j) If the passage was valid, after the user leaves through side B, door B will close. When the door is closed and the probe sensor on top of the door sends a signal to the control board that the door is in the closed state, the controller will accept this as a completed transaction, and the controller will reset.
- k) The mantrap is now in stand-by state and ready to accept another trigger from either side.

# 13. TROUBLESHOOTING & FAULT FINDING

Problem	Description	Solution
ProblemDescriptionUnresponsive to inputThe mantrap door does not open when a trigger is received		<ul> <li>a) Check that the probe sensor on top of both doors are sending a signal to the control panel when the doors are closed. Use a multimeter to test for resistance between the contacts on the probe sensor. Disconnect one wire from the board before testing.</li> <li>b) Check that a trigger is received from the access control system.</li> </ul>