

TURNSTAR

RELIABLE ★ DURABLE ★ GUARANTEED

TRAINING / TECHNICAL MANUAL



FULL HEIGHT TURNSTILE

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1. COPYRIGHT & LIABILITY

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- 1.2. All information, drawings and diagrams may not be made public or shared with a third party.
- 1.3. the event of any breach of abovementioned copyright, the copyright of TURNSTAR SYSTEMS will be strictly enforced.

2. INTRODUCTION

- 2.1. This Manual is specifically compiled to train and refer the technical staff of TURNSTAR to assemble, test and fault find the specific product. The manual will discuss in depth features of the product for the reader to gain a full understanding of the operation and maintenance required.
- 2.2. Turnstar strives for repeatable quality instilled in its product range and to achieve this, there is an agreed standard for manufacturing, assembly and testing. For more information on these standards, refer to the TURNSTAR Technical Standards documentation.

3. OVERVIEW

- 3.1. The FH Turnstile is a high security access control product
- 3.2. The Turnstile has a heavy-duty mechanism with controller, which locks and unlocks two solenoids.
- 3.3. The Turnstile is used as bi-directional entry and exit, one person at a time.
- 3.4. The FH Turnstile can be either a TRIUMPH model, with bent tube arms, or a TITAN model, with straight arms.
- 3.5. The TITAN offers a higher level of security than the TRIUMPH. It is available in 3-arm and 4-arm configurations.
- 3.6. The TRIUMPH is available in 3-arm, 4-arm and 5-arm configurations.
- 3.7. The FH Turnstile can be supplied with either a single or double passage.
- 3.8. The Turnstile requires a trigger for either entry or exit direction, typically provided by an access control system.
- 3.9. The Turnstile can be manufactured either from brushed stainless steel 304, powder-coated mild steel or in hot-dip galvanized.

4. GENERAL OVERVIEW

A single turnstile consists of the following components:

4.1. Comb and Base Bearing.

The comb is a fixed component on the side of the turnstile through which the rotor rotates. The arms of the rotor move in between the arms of the comb. This forms an area that cannot be walked through.

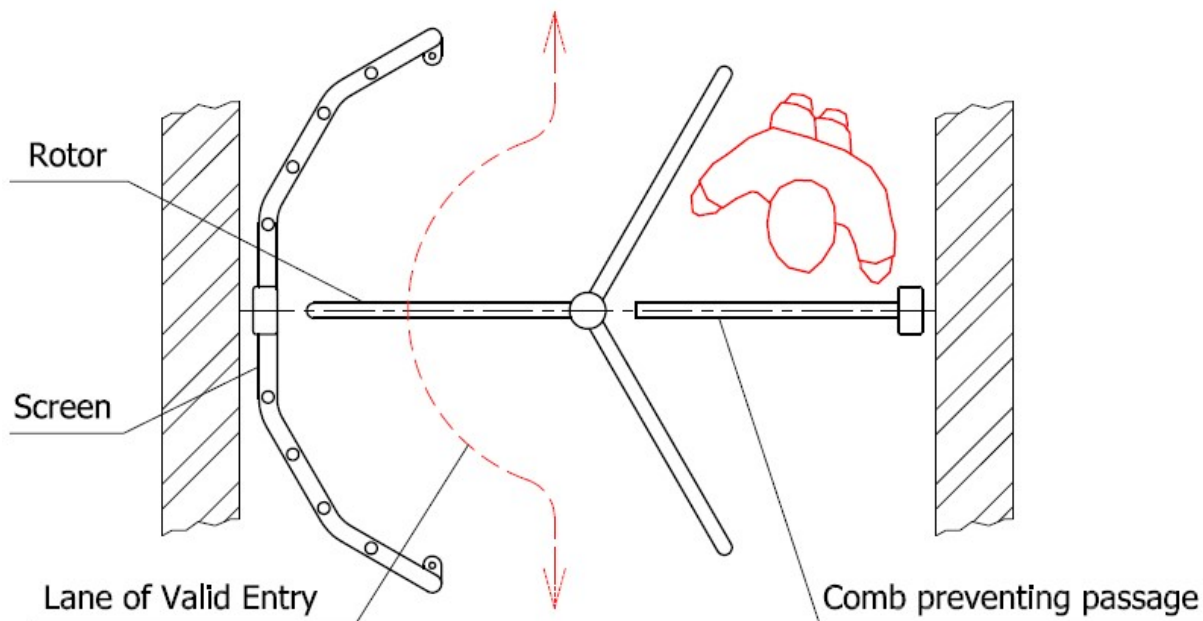


Figure 1: Plan view Turnstile and Comb, Channel omitted

The comb has four bolting lugs for fixing to the floor. It also has a bolt hole at high level for bolting to a wall or fencing post. It is recommended that the comb be bolted to a structure as it is not as stable as the screen which has a larger footprint over the bolting holes.

Welded to the leg of the comb is a base bearing. The base bearing consists of a stainless-steel pin, and a black plastic sphere ball. A white plastic bush is inserted into the bottom of the center tube on the rotor.

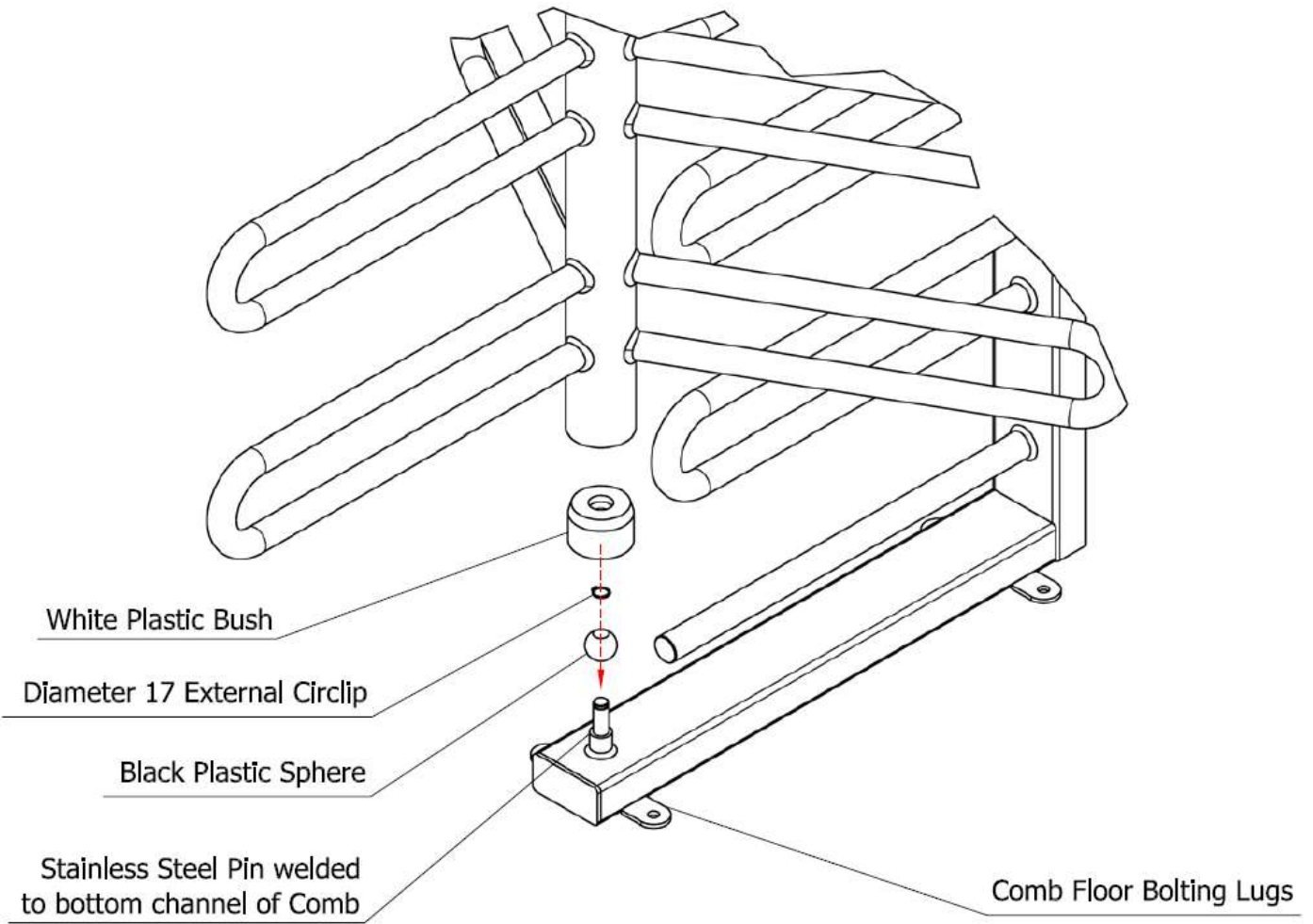


Figure 2: Turnstile base bearing assembly



Figure 3: White Plastic Bush



Figure 4: Black Bearing Sphere

4.2. The Screen

The screen is a fixed component on the side of the turnstile opposite to the comb. The screen serves two purposes:

4.2.1. For an entry/exit transaction through the turnstile, the rotation of the turnstile is 90 degrees. However, it is essential during transaction that the turnstile rotor be rotated past the point of no return at about 60 degrees. At 60 degrees, the turnstile will prevent the pedestrian from reversing and will force the pedestrian to rotate the rotor the further 30 degrees. The turnstile will then be ready for the next transaction. The limit switches on the top of the mechanism will detect when the turnstile has rotated past 60 degrees.

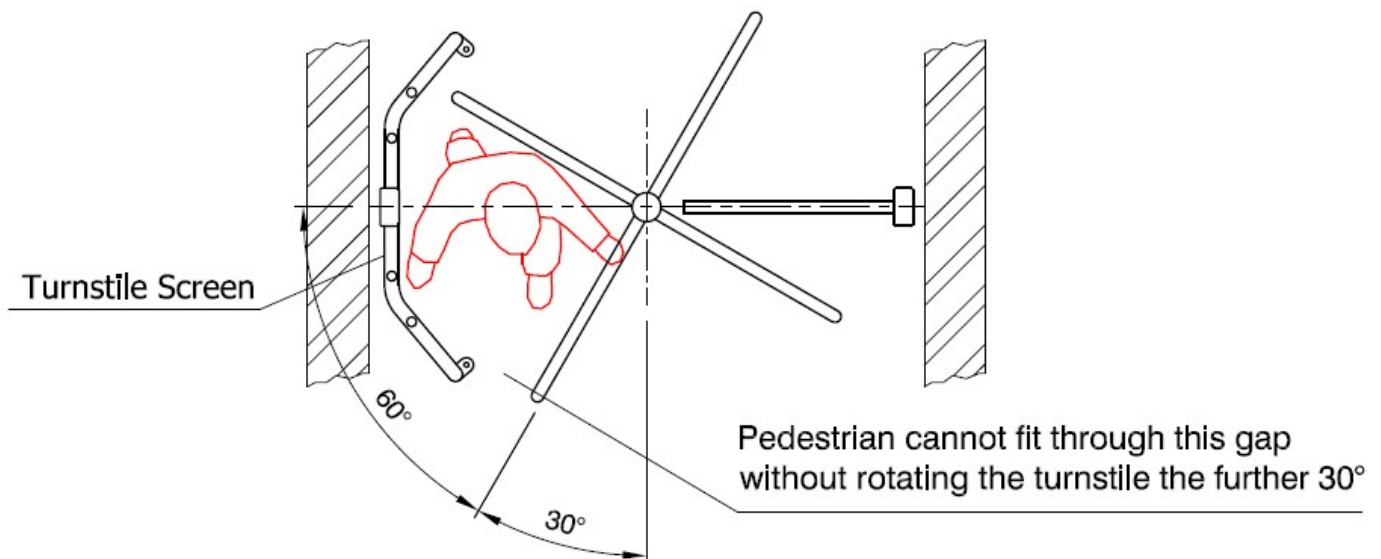


Figure 5: Rotor at 60 degrees

4.2.2. In the absence of the screen, should the turnstile be rotated 45 degrees by a pedestrian and held in that position, the entrance would be left open and any number of people will be able to pass through.

The screen is also a convenient place to place access control readers. The tube enables the wires of the access control readers to pass through into the top channel, to the control panel. The card reader mounting channel is welded 1200mm high to the center, from the base of the turnstile.

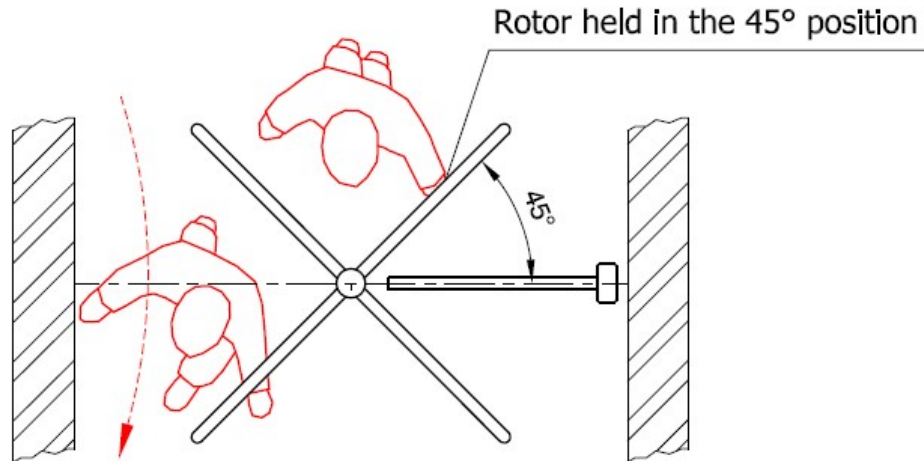


Figure 6: Rotor held at 45 degrees with no screen



Figure 7: Card reader mounting channel, draw wire and reader bracket

The screens for a 4-arm and 5-arm turnstile is the same, the screen for a 3-arm turnstile is different and wider.

The screen has 3 bolting lugs at the base for fixing to the floor. It also has a bolt at high level for bolting the screen to a wall or fencing post for extra stability.

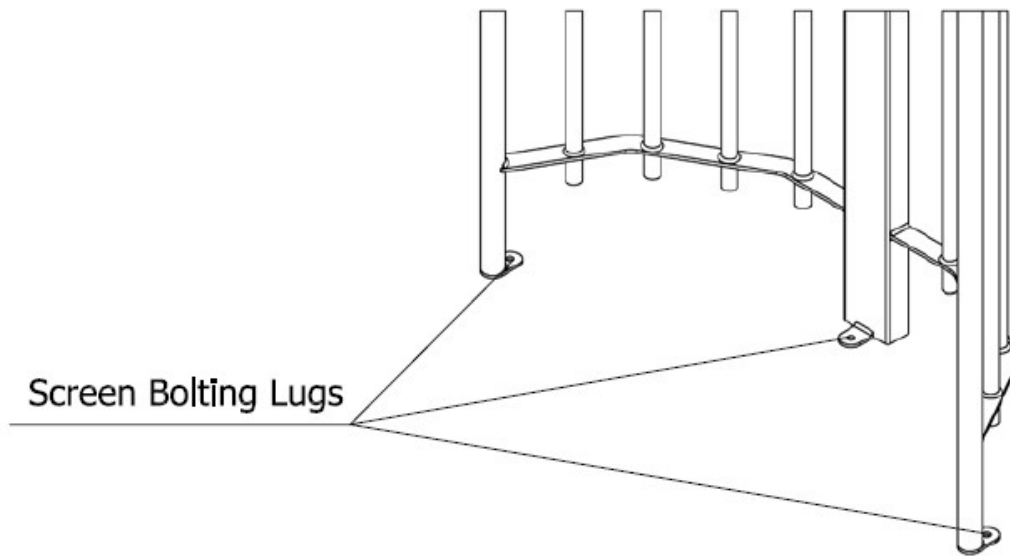


Figure 8: Screen bolting lugs

4.3. The Top channel and cover

The top channel and cover acts as a stabilizing lintel for the turnstile. It also houses the turnstile mechanism and controls. The top channel is bolted to the comb and the screen. The rotor is connected directly to the mechanism disk and is suspended from it. The lockable top cover is a sheet metal cover which rests on the top channel and protects the mechanism and controller.

The lockable top cover has two camlocks locking it onto the top channel. The cover lifts up and off the channel when unlocked.

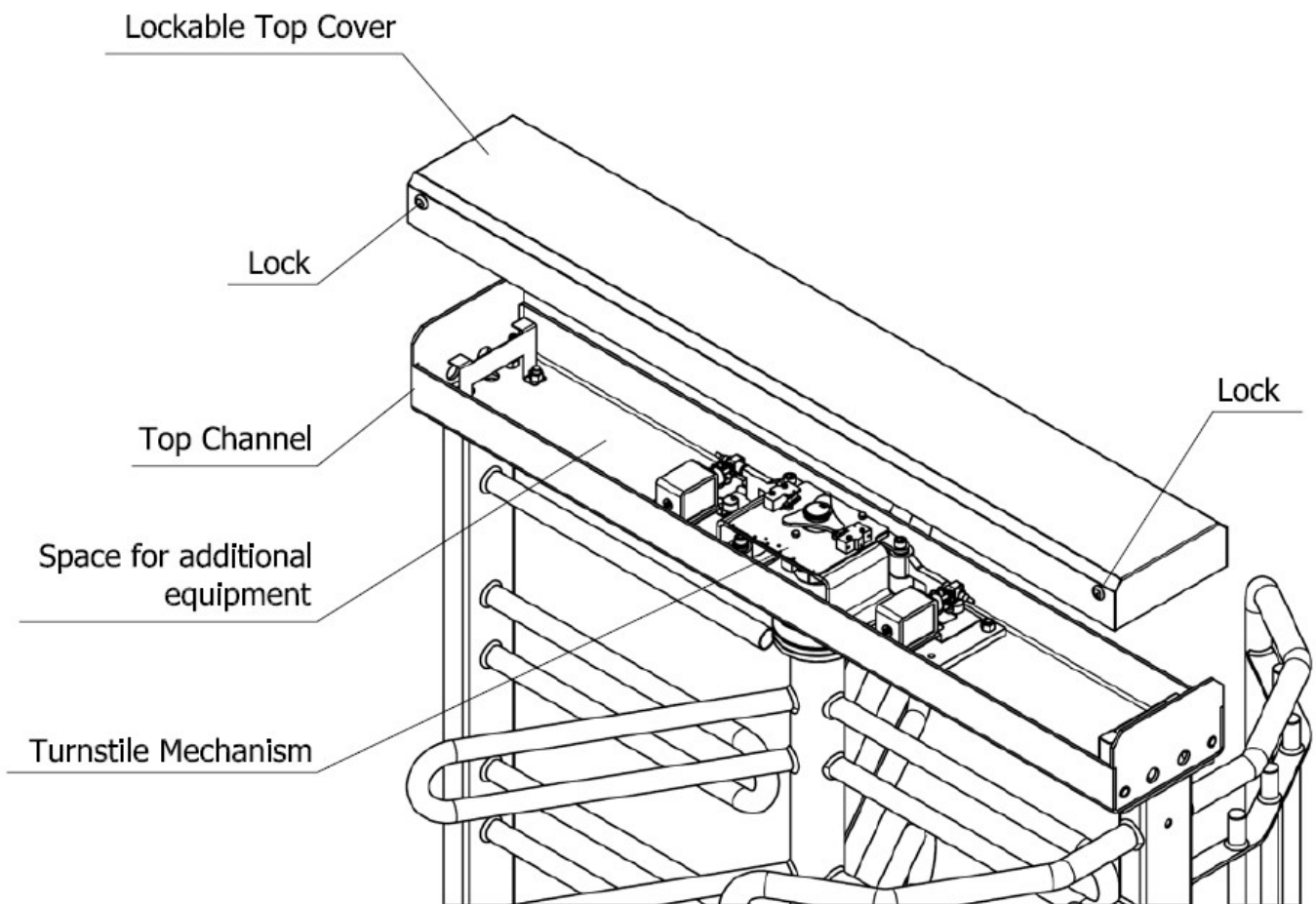


Figure 9: The top channel with cover raised

4.4. The Rotor

The rotor is a component which rotates when the turnstile is unlocked for either an entry or exit transaction. The rotor is suspended in the air from the turnstile mechanism and is connected to the mechanism by means of four rubber bushes and a coupling.



Figure 10: Rubber Bush

The rotor is fixed to the mechanism disk with a straddling washer called a bean washer, and 4 nylock hexnuts. This keeps the turnstile suspended. This is covered by a sleeve. The rotor pivots on the base bearing on the comb.



Grub Screw
holes for fixing
of Turnstile
Sleeve

Figure 11: Nylock hex-nut and sleeve

5. TURNSTILE OPTIONS

- 5.1. The TRIUMPH rotor is available in 3-arm, 4-arm and 5-arm configurations. The TRIUMPH rotor is manufactured from 32mm diameter U-tube arms. The arms are spaced 165mm apart which is since the U-tube arms of the rotor interweave with the U-tube arms of the comb.

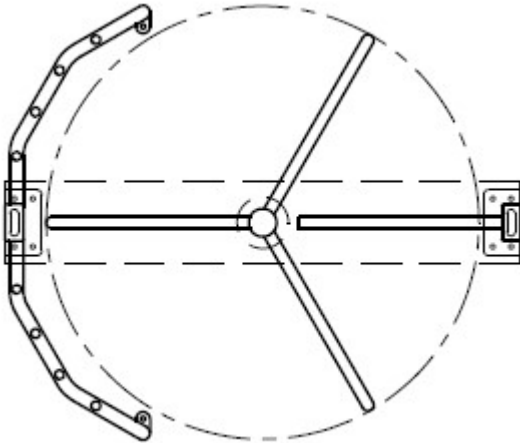


Figure 12: TRIUMPH 3-arm Plan View

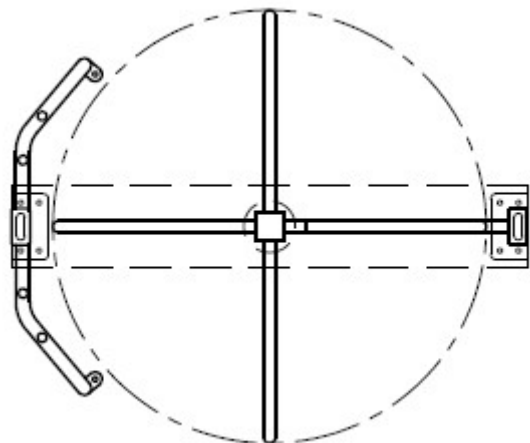


Figure 13: TRIUMPH 4-arm Plan View

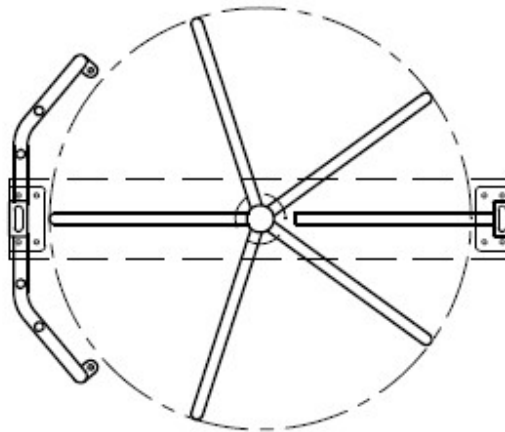


Figure 14: TRIUMPH 5-arm Plan View

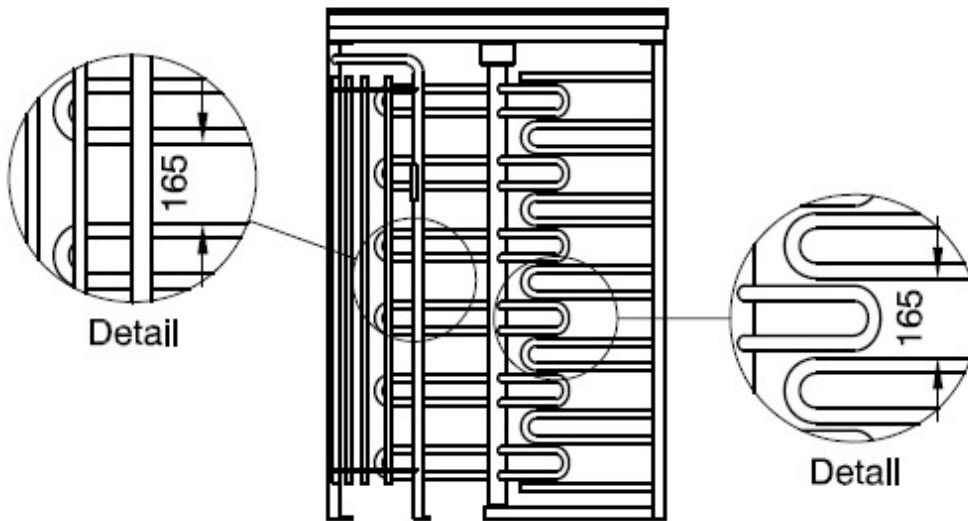


Figure 15: Triumph Side Elevation

5.2. The TITAN rotor is available in 3-arm and 4-arm configurations. The TITAN rotor is manufactured from 50mm diameter round tube arms. A plastic end cap is inserted into the ends of the arms. The arms are spaced 120mm apart and offer a higher level of security than the TRIUMPH.

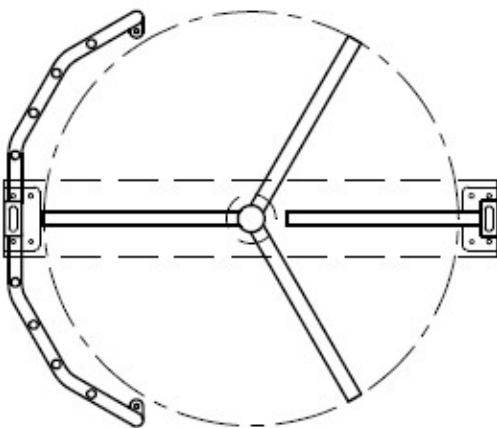


Figure 16: TITAN 3-arm Plan View

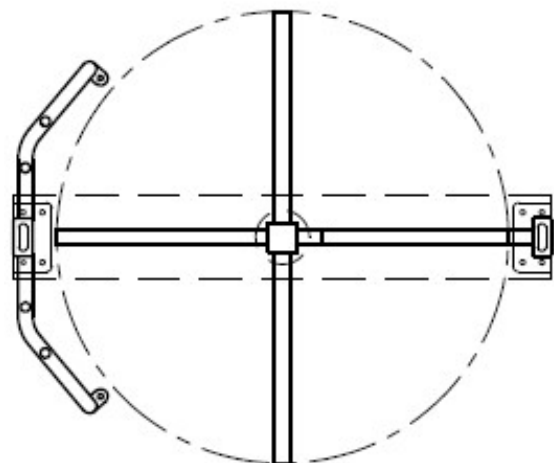


Figure 17: TITAN 4-arm Plan View

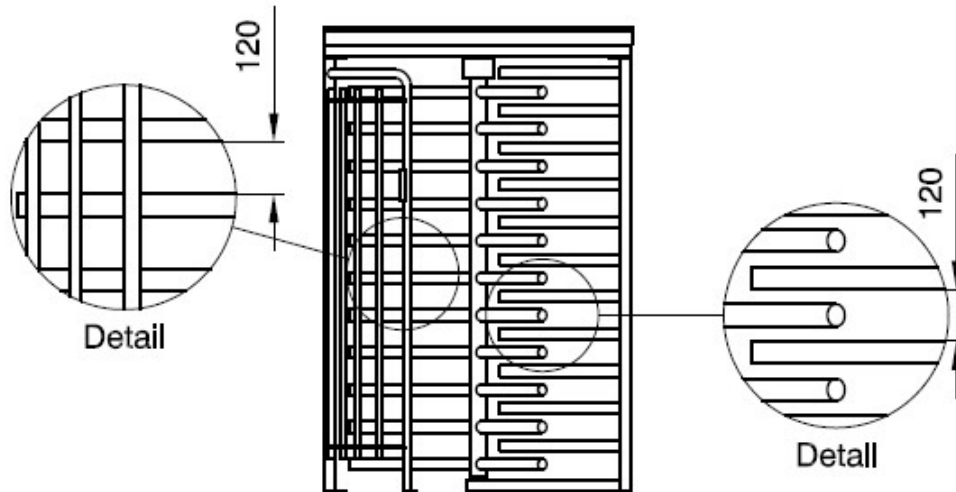


Figure 18: TITAN Side Elevation

6. WIRING ENTRY POINTS ON THE SIDE UPRIGHTS & CHANNEL

6.1. There are 4 wiring entry points into the turnstile top channel. Either through the central upright of the comb and the screen or through either side of the turnstile top channel.

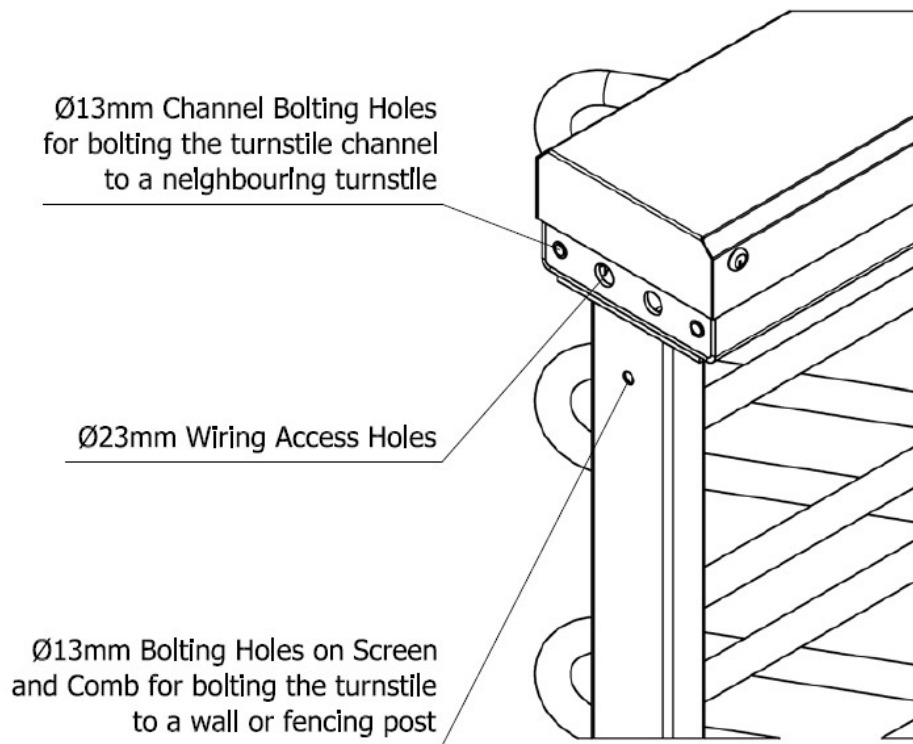


Figure 19: Turnstile access holes

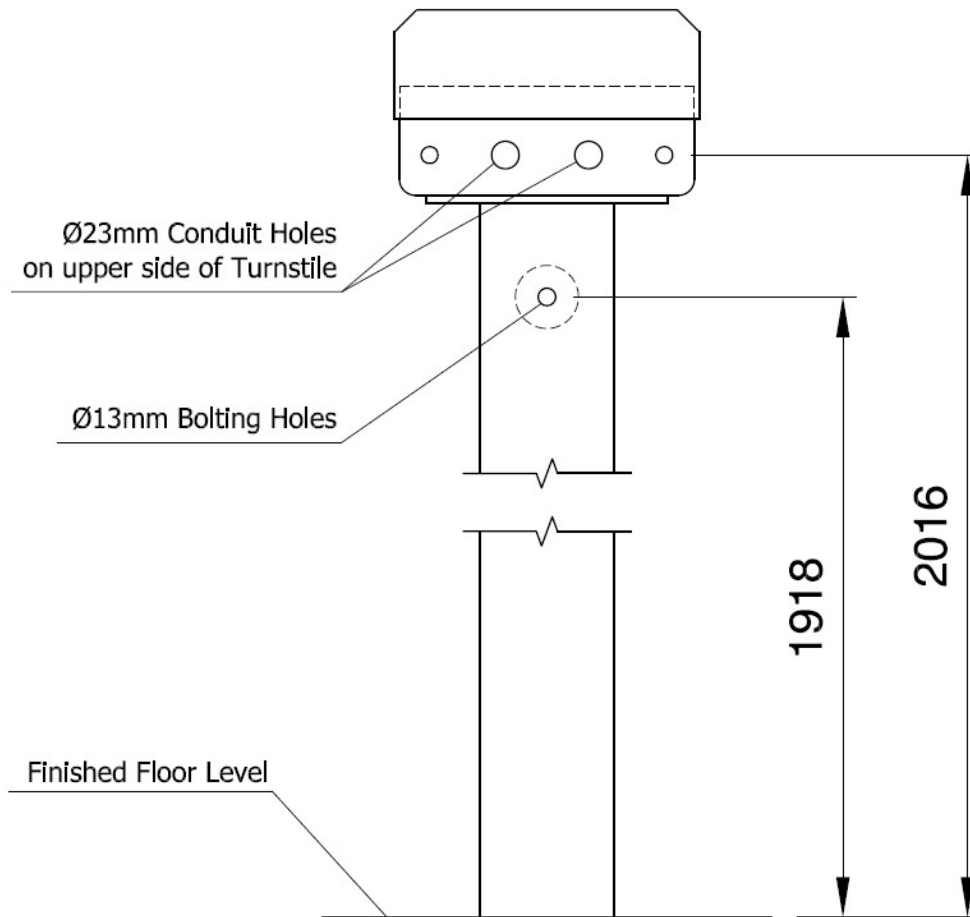
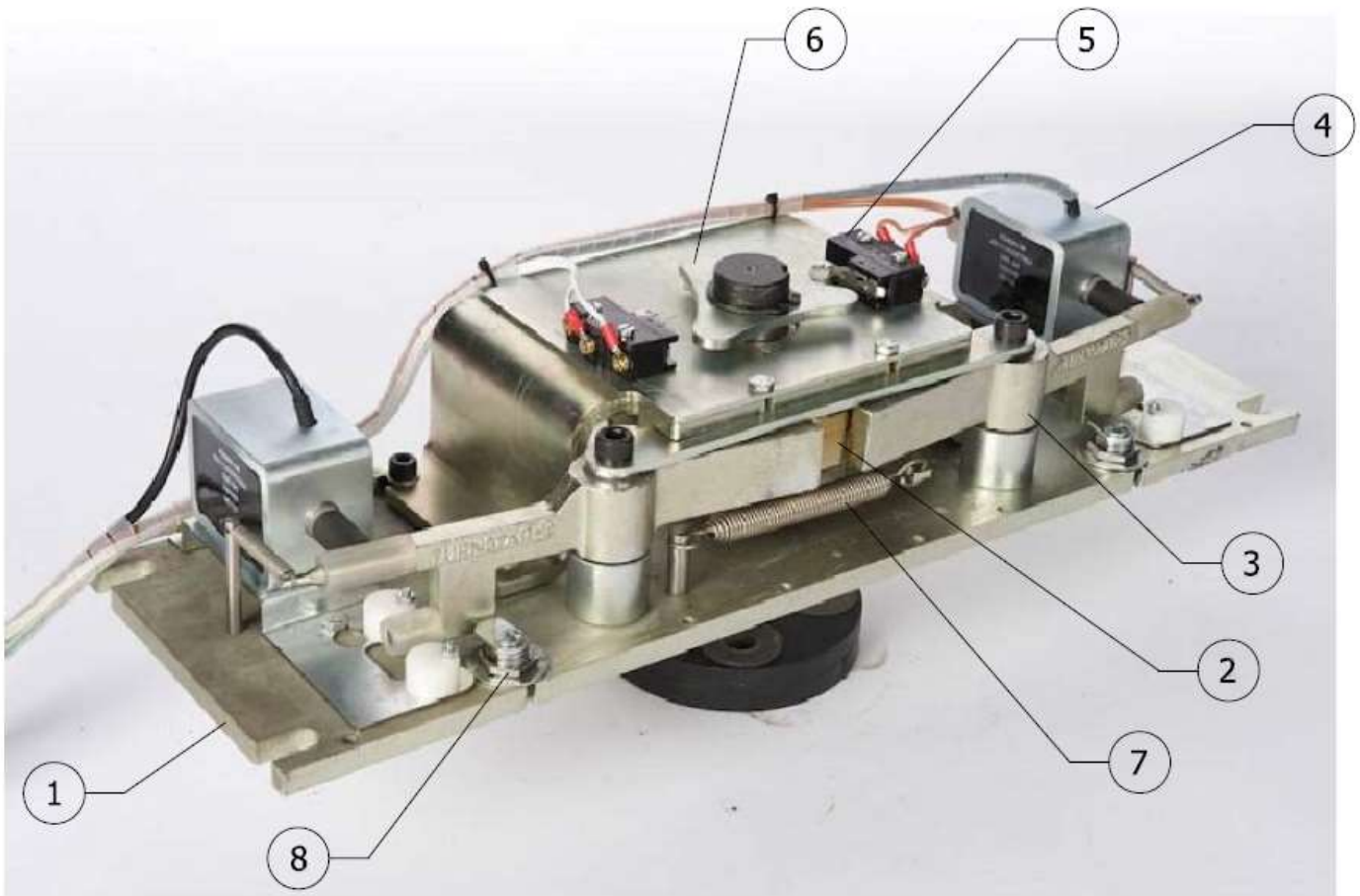


Figure 20: Side view of the comb and screen

7. **BOLTING A TURNSTILE TO THE FLOOR**

- 7.1. The simplest and easiest method of fixing the turnstile is to use M10x75 coach bolts with nylon plugs. RAWL bolts can also be used. Concrete of at least 20MPa and 175mm thick is required for the base foundation. When bolting to a fence post or anything made of steel, the hole must be drilled and tapped. The turnstile should never be welded to anything as the welding damages the turnstile finish and can cause corrosion. The turnstile comb should ideally be bolted to a wall or fence post for increased stability.
- 7.2. A turnstile should not be installed on brick paving. A concrete plinth should be prepared.

8. MECHANISM

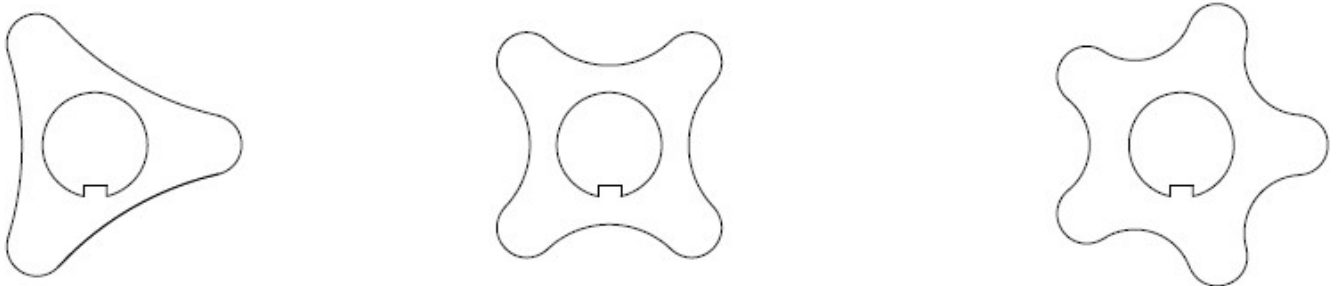


9. Figure 21: Turnstile mechanism and components

9.1. The mechanism consists of the following parts:

- 9.1.1. Mechanism plate – The mechanism plate is bolted inside the turnstile top channel and contains all the components mounted on top of it.
- 9.1.2. Anti-trap Disk – The disk is case hardened for longevity. A 3-arm turnstile has a 6-tooth locking disk, a 4-arm turnstile has an 8-tooth locking disk and a 5-arm turnstile has a 10-tooth locking disk. The positioning of the teeth prevents reverse rotation once the turnstile rotor has passed the point of no return. The locking disk is designed with the intermediate wide teeth to mechanically prevent the possibility of getting trapped inside the turnstile should there be a power failure during rotation.

- 9.1.3. Locking pawls – the pawls are case hardened for longevity and pivots around a self-lubricating plastic bush. The locking pawls engage against the locking disk and pivot to allow rotation in a particular direction.
- 9.1.4. Solenoids – The solenoids exert force on the locking pawls and control the locking and unlocking of the turnstile for both the entry and exit direction. The solenoids can be set to fail secure (auto-lock on power failure is factory standard) or fail safe (auto-unlock on power failure).
- 9.1.5. Microswitches – The microswitches control the relocking of the turnstile during rotation once the turnstile has rotated past the point of no return.
- 9.1.6. Microswitch Cam – The cam is used to activate the microswitches. The number of points on the cam correspond the number of arm rows of the turnstile.



10.

11. Figure 22: (From left to right) 3-Arm Cam, 4-Arm Cam, 5-Arm Cam

- 11.1.1. Indexing spring with roller – The indexing roller controls the self-centering of the turnstile rotor to the zero-degree position after the rotation has passed the point of no return.
- 11.1.2. Turnstile locks – The camlocks allow the turnstile to be mechanically overridden for free rotation in the desired direction. The locks are accessible from the underside of the turnstile channel.



Figure 23: Override lock on the mechanism



Figure 24: Camlock and key

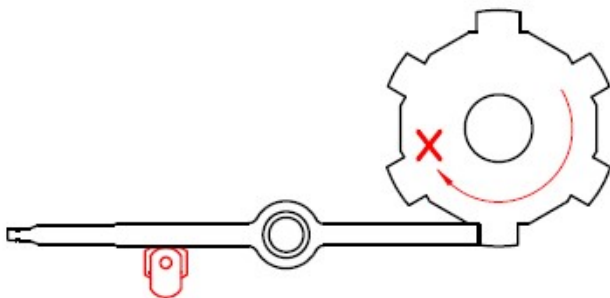


Figure 25: Override lock unlocked. Pawls controls locking on the disk

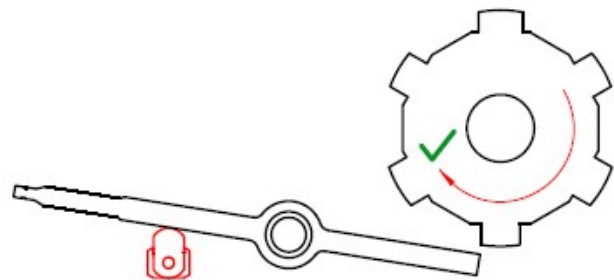


Figure 26: Override lock locked. Overrides the pawl to unlock the disk.

12. FAIL-SAFE AND FAIL-SECURE OPERATION

12.1. On the fail-secure arrangement of the solenoid, the spring is mounted to push the plunger and the pawl.

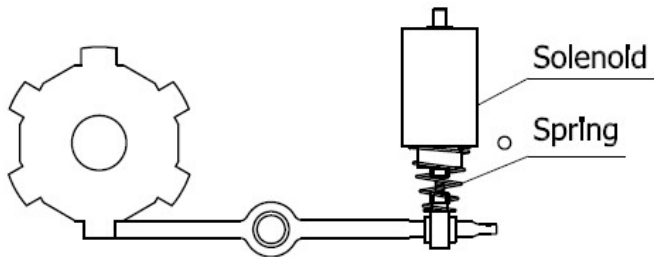


Figure 27: Fail-Secure De-energised

The solenoid is de-energised and the spring is pushing the pawl to lock the disk.

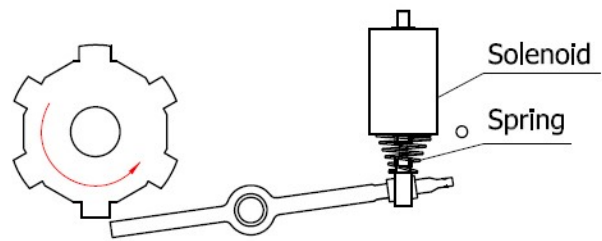


Figure 28: Fail-secure energised

The solenoid is energised, overriding the spring by pulling the pawl and unlocking the disk.

12.2. On the fail-safe arrangement of the solenoid, the spring is mounted to pull the plunger and the pawl.

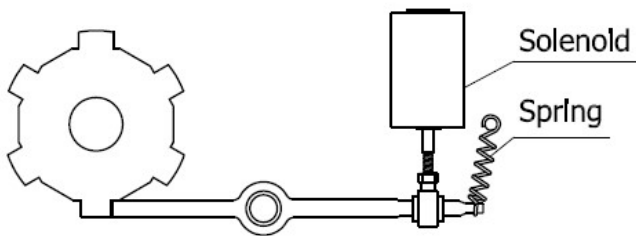


Figure 29: Fail-Secure De-energised

The solenoid is energised, overriding the spring by pushing the pawl and locking the disk.

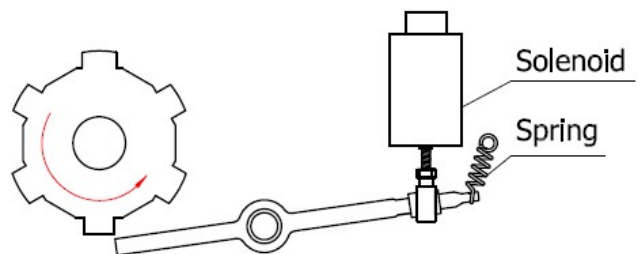


Figure 30: Fail-secure energised

The solenoid is de-energised and the spring is pulling the pawl to unlock the disk.

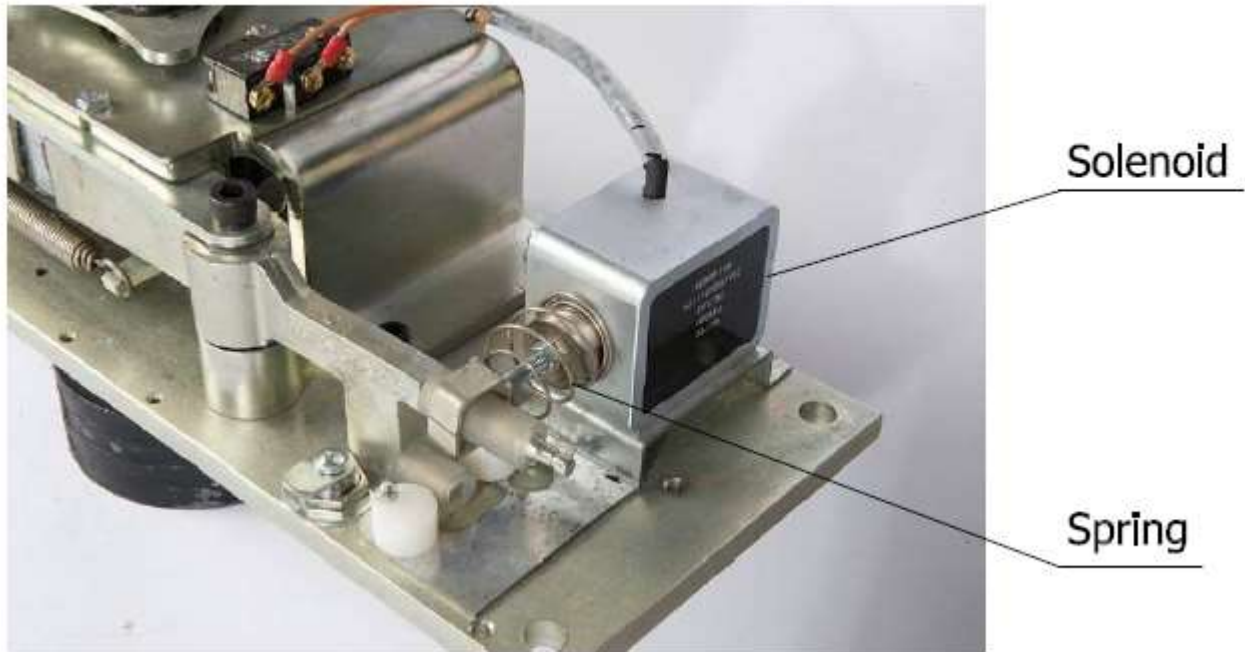


Figure 31: Fail-secure arrangement on mechanism

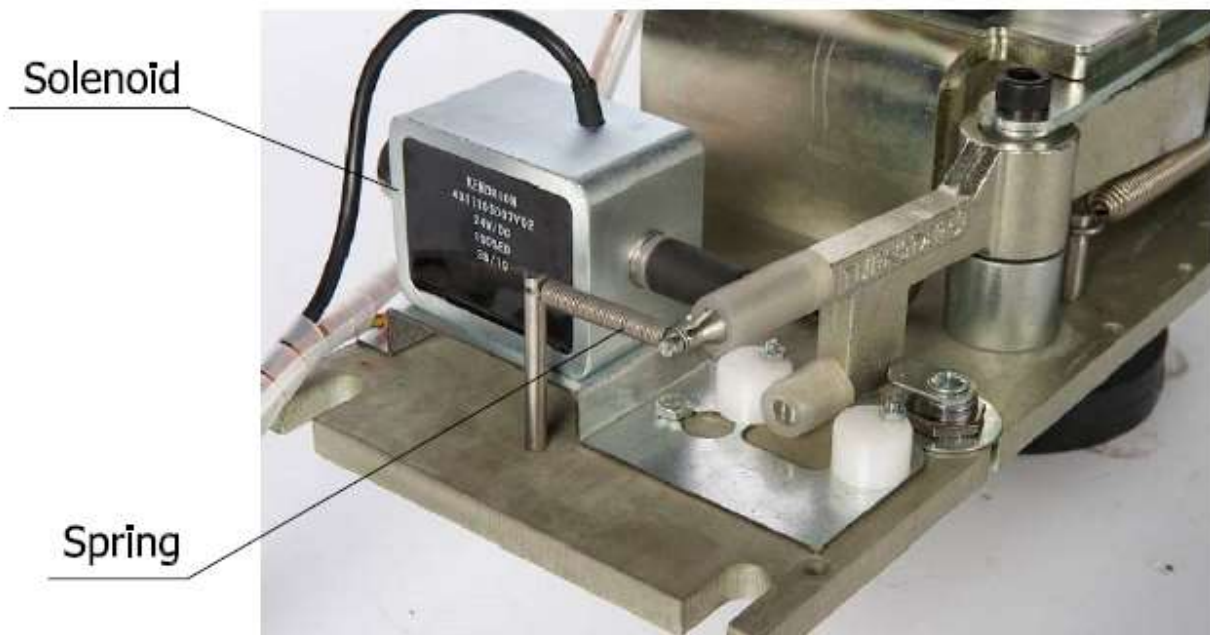


Figure 32: Fail-safe arrangement on mechanism

13. TURNSTILE CONTROLLER

13.1. The Turnstile Controller

The controller controls the locking and unlocking operation of the Turnstile.

The control panel consists of a chassis plate, power terminal block, isolator, 18V transformer, printed circuit board and a plug-in turnstile logic. It is also available with a battery backup printed circuit board and two 12V 7Ah batteries, in which case the 18v transformer is replaced with a 24v transformer.

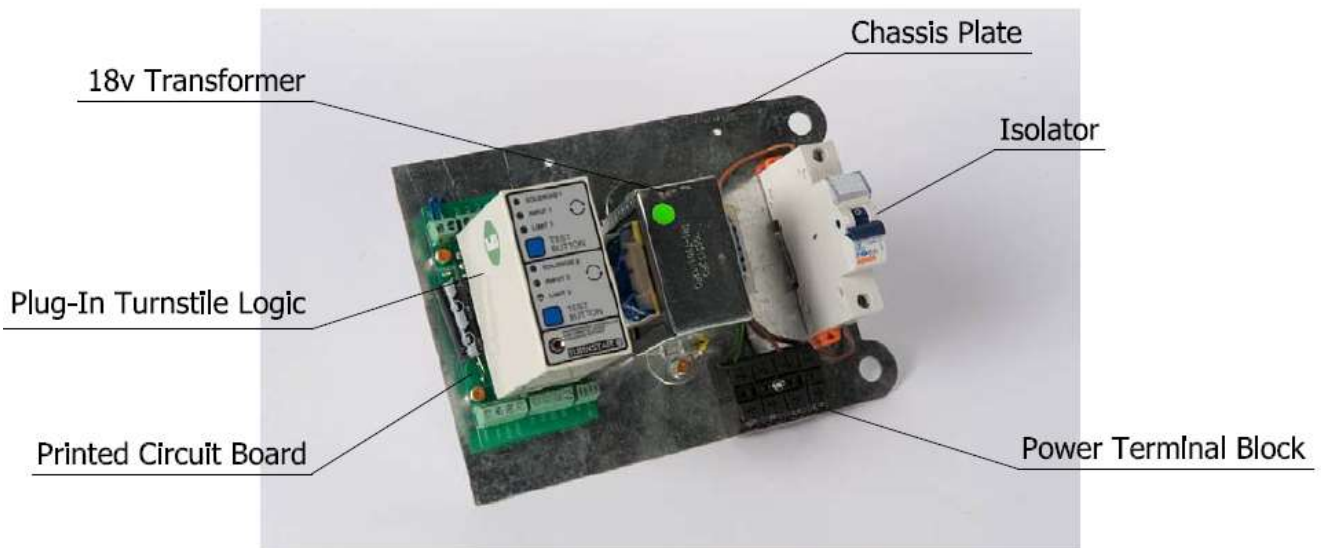


Figure 33: Turnstile control panel



Figure 34: Turnstile control panel with battery backup

The required trigger to unlock the turnstile is a dry contact which is a zero-voltage contact closure. The closing signal should be about a quarter second to half a second long. The turnstile logic is supplied with two blue test buttons which simulate a trigger from an access control system in either '**card1**' or '**card2**' terminals. This feature enables the installer to isolate whether a fault is with the turnstile or the access control system.



Figure 35: Turnstile plug-in logic

Once the turnstile has been unlocked by a trigger, the turnstile will relock when either:

- The turnstile has been rotated a full transaction, or
- The turnstile has timed out and no rotation occurred. The standard time-out is 10 seconds.

The '**Opt1**' and '**Opt2**' terminals are normally open contacts which can be used by the access control system as feedback that the turnstile has been rotated. Often it is assumed that the person walked through the turnstile and the anti-passback feature of the access control will be activated.

14. CONTROLLER LOGIC DIP-SWITCH DETAILS

14.1. Input 1 (Direction 1)

- 14.1.1. Normally open (N/O) – Extended trigger is ignored and only one rotation is allowed.
- 14.1.2. Normally closed (N/C) – Used for fire alarm activation. An extended trigger allows the turnstile to rotate freely.

14.2. Input 2 (Direction 2)

- 14.2.1. Normally open (N/O) – Extended trigger is ignored and only one rotation is allowed.
- 14.2.2. Normally closed (N/C) – Used for fire alarm activation. An extended trigger allows the turnstile to rotate freely.

14.3. Solenoid 1 (Direction 1)

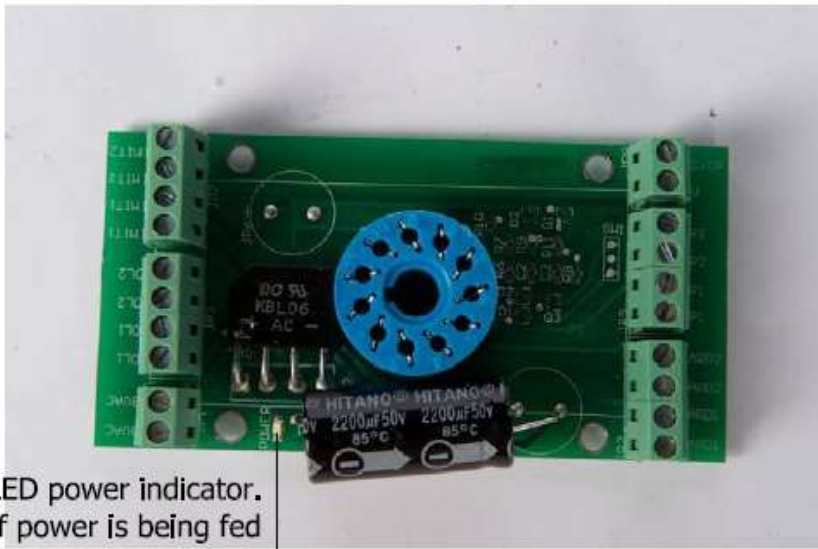
- 14.3.1. De-energised – Fail-secure setting.
- 14.3.2. Energised – Fail-safe setting.

14.4. Solenoid 2 (Direction 2)

- 14.4.1. De-energised – Fail-secure setting.
- 14.4.2. Energised – Fail-safe setting.

14.5. Sound (Turnstile buzzer activates while the turnstile is being triggered to unlock.)

15. TURNSTILE WIRING DIAGRAM



Red LED power indicator.
On if power is being fed
to circuit board

Figure 5.6: Top View of Printed Circuit Board

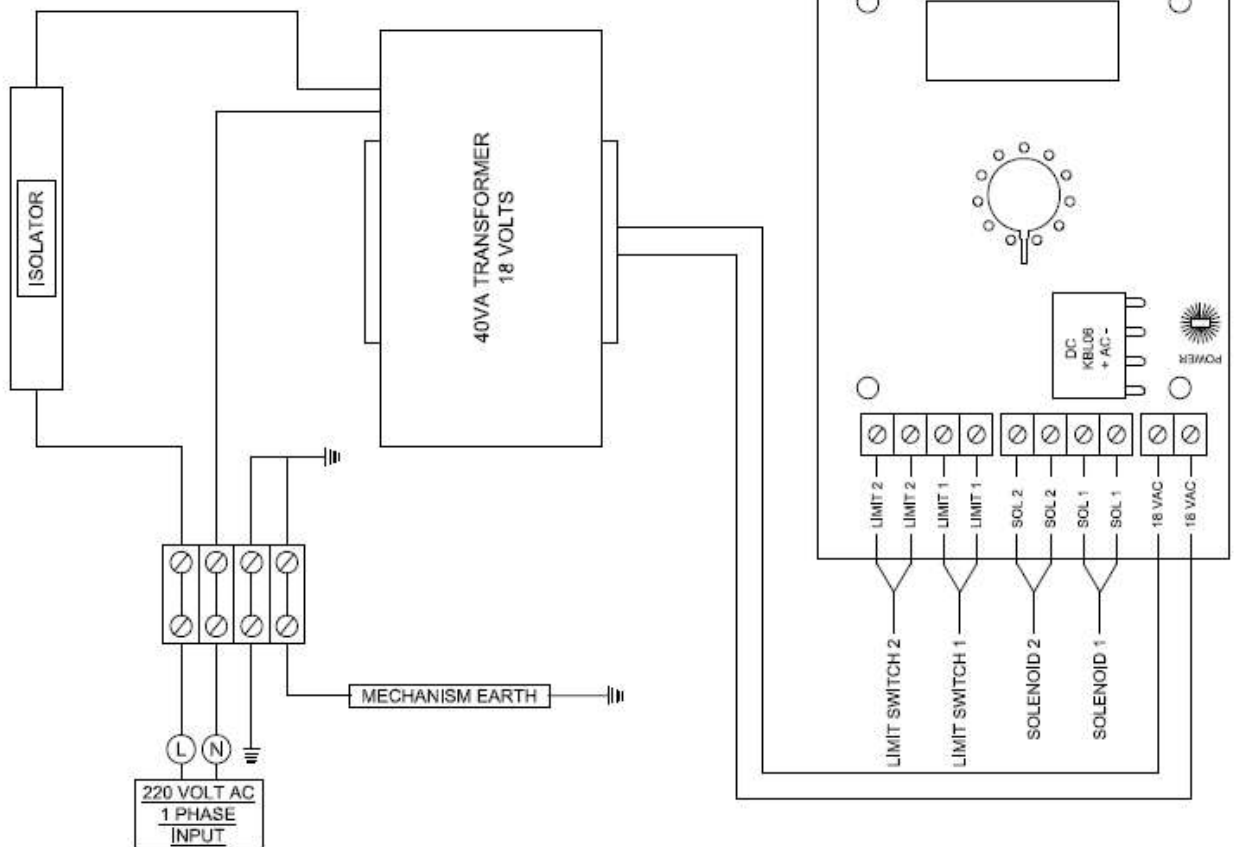


Figure 36: Wiring Diagram

16. TURNSTILE SPECIFICATIONS

16.1. Single VS Double Turnstile

A single turnstile is 1400mm wide and requires an opening of 1430mm wide for the cover to be removable.

A double turnstile is 2150mm wide and requires an opening of 2180mm wide for the cover to be removable. A double turnstile is effectively two single turnstiles side by side.

Each rotor of a double turnstile is controlled by its own mechanism and control panel.

The comb of a double turnstile is different from that of a single turnstile.

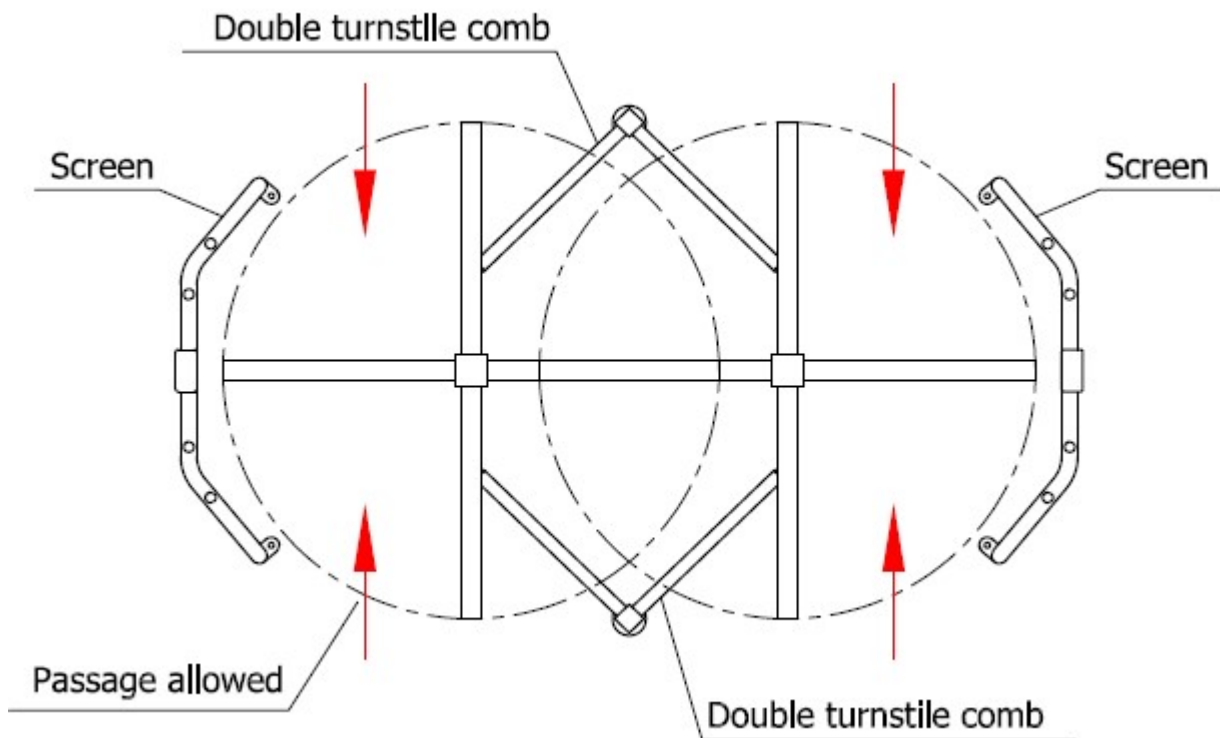


Figure 37: Double Turnstile plan view (Canopy omitted)

16.2. Finishes

Both the TRIUMPH and TITAN turnstile range can be supplied in one of the following finishes.

- Powder-coated mild steel (standard colour is charcoal blue hammertone)
- Hot dip galvanised mild steel *
- Hot dip galvanised mild steel with powder-coating *
- 304 grade brushed stainless steel
- 304 grade brushed stainless steel with powder-coating
- 316 grade brushed stainless steel *
- 316 grade brushed stainless steel with powder-coating *

The above marked with the asterisk (*) is suitable for exterior coastal installations (within 50Km of the coast).