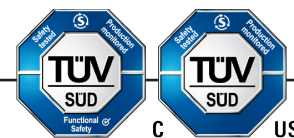


Operating Instructions: ATOM

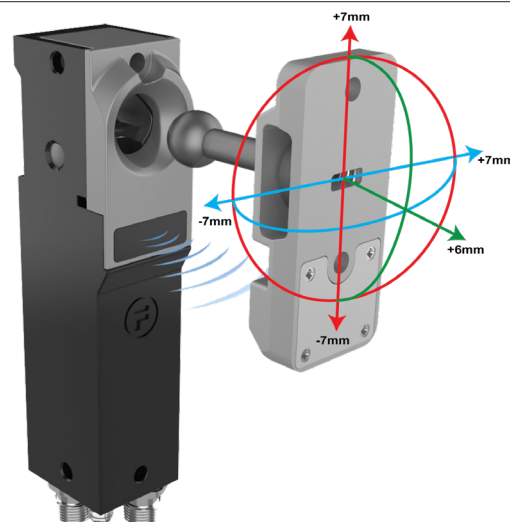


Description

ATOM is a compact and ultra-robust RFID high coded solenoid interlocking device. As typical with products from Fortress Interlocks, ATOM is externally approved and is suitable for applications up to PLe (Cat. 4). The metal housing and high retention force then suits ATOM for heavier industry applications.

High misalignment in the self-centring actuator covers any movement and inaccuracy in hinged and sliding door machine guarding. Additionally, ATOM's head has an open design manufactured in stainless steel to prevent dust, dirt and corrosion from impacting performance.

Available in multiple hardware variants, the device can be configured for applications where hazards persist after machinery is powered off. Multiple units can also be connected together with OSSD (Output Signal Switching Device) functionality preventing fault masking. The Large LED lens at the base provides clear state indication from all angles and at a distance.



Important:

The ATOM Interlocking Device is designed for use according to the installation and operating instructions enclosed. It must be installed by competent and qualified personnel who have read and understood the whole of this document prior to commencing installation.

If the Device or guarded machinery equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Any modification to or deviation from these instructions invalidates all warranties.

Fortress Interlocks Ltd accepts no liability whatsoever for any situation arising from misuse or misapplication of the Device.

The Device is not to be used as a Mains Isolator or Emergency Stop.

The Device is a component to be added to a permanent electrical installation meeting the requirements of the applicable IEC/EN standards.

All the voltages used within the connected circuits must be derived from a Safety Extra Low Voltage or Protected Extra Low Voltage power supply (SELV or PELV).

The Device meets the requirements of the standard EN ISO 14119 – Safety of machinery, interlocking devices associated with guards. Principles for design and selection.

DO NOT LEAVE AUXILIARY RELEASE / OVERRIDE DRIVER BIT IN PLACE!

Access to the Auxiliary Release Driver Bit and the availability of any spare ATOM Actuator assemblies must be securely controlled as they could make it possible to bypass the safety Devices and allow access to areas that may have a residual hazard or may result in incorrect operation of some Devices.

BEWARE OF INTENTIONAL MISUSE CAUSED BY OPERATORS WANTING TO BYPASS SAFETY SYSTEMS.

THE INSTALLER SHOULD ASSESS THE RISKS AND MITIGATE AGAINST THEM.

The installation and operation of the ATOM Device and the complete machine guarding application must take into account the requirements of EN ISO 14119, in particular Section 7 - Design for minimising defeat possibilities.

In order to maintain device safety rating, overall system must be validated to BS EN ISO 13849-2 and/or evaluated in accordance with BS EN 62061.

IF YOU HAVE ANY QUESTIONS OR QUERIES OF ANY NATURE WHATSOEVER PLEASE CONTACT THE SUPPLIER WHO WILL BE PLEASED TO ADVISE AND ASSIST.

Operating Instructions: ATOM

Power-to-Unlock Safety-on-Guard-Locking (SOGL)	Power-to-Unlock Safety-on-Guard (SOG)	Power-to-Lock Safety-on-Guard (SOG)
The recommended set up for most machine guarding applications and ideal for machines with run-down times. Unit unlocks when power supplied. Safety circuits change state when unit locks or unlocks.	Popular configuration for where the solenoid performs a process control function rather than a safety function. Unit unlocks when power supplied. Safety circuits change state when actuator is engaged or removed.	When power is supplied to the solenoid the unit becomes locked. Allows for faster access and exit in the event of a power failure or power off event. Safety circuits change state when actuator is engaged or removed.

Part No.	Solenoid Locking Type	Switch Configuration	M12 Connector Types
ATM-100A1-A	Power-to-Unlock	Safety-on-Guard-Locking (SOGL)	Single 5 Pin M12
ATM-100A2-A	Power-to-Unlock	Safety-on-Guard-Locking (SOGL)	2 x 5 Pin M12 in 'Daisy-Chain' configuration
ATM-100A3-A	Power-to-Unlock	Safety-on-Guard-Locking (SOGL)	Single 8 Pin M12
ATM-100A4-A	Power-to-Unlock	Safety-on-Guard-Locking (SOGL)	2 x 5 Pin M12
ATM-110A1-A	Power-to-Unlock	Safety-on-Guard (SOG)	Single 5 Pin M12
ATM-110A2-A	Power-to-Unlock	Safety-on-Guard (SOG)	2 x 5 Pin M12 in 'Daisy-Chain' configuration
ATM-110A3-A	Power-to-Unlock	Safety-on-Guard (SOG)	Single 8 Pin M12
ATM-110A4-A	Power-to-Unlock	Safety-on-Guard (SOG)	2 x 5 Pin M12
ATM-610A1-A	Power-to-Lock	Safety-on-Guard (SOG)	Single 5 Pin M12
ATM-610A2-A	Power-to-Lock	Safety-on-Guard (SOG)	2 x 5 Pin M12 in 'Daisy-Chain' configuration
ATM-610A3-A	Power-to-Lock	Safety-on-Guard (SOG)	Single 8 Pin M12
ATM-610A4-A	Power-to-Lock	Safety-on-Guard (SOG)	2 x 5 Pin M12

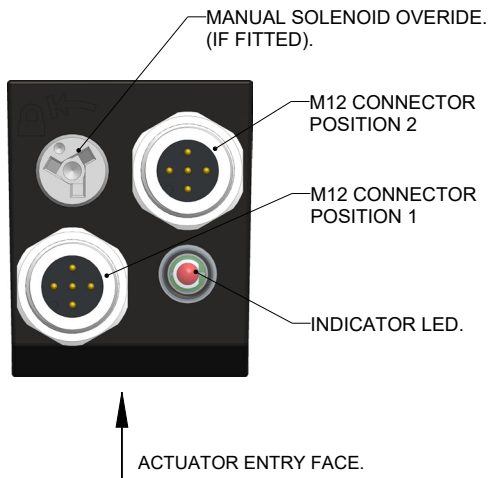
General Data	ATOM Product Type		
	Power-to-Unlock, Safety-on-Guard- Locking	Power-to-Unlock, Safety-on-Guard	Power-to-Lock, Safety-on-Guard
Housing Materials	Passivated and painted Zinc Alloy to BSEN12844 ZA3 and Stainless Steel to BS3146-2:1975 (ANC4B)		
Mechanical Life	1,000,000 Switching Operations		
Holding Force F	5 kN	8 kN	8 kN
Holding Force F_{zh}	6 kN	9.2 kN	9.2 kN
Maximum Holding Force, F_{1max}	12 kN	12 kN	12 kN
Minimum Actuating Radius	150 mm (see fig.5)		
Maximum Actuating Frequency	720 Operations per Hour		

Operating Instructions: ATOM

Environmental Data	
Ingress Protection	IP65 and IP67
Environment Type	Indoor
Operational Pollution Degree (IEC 664)	2
Ambient Temperature	-20°C * to +55°C (-4°F to +131°F)
*Note, the ATOM Device will only continue to work below freezing point (0°C) where it can be guaranteed that ice will not form on or in the device as it could cause the mechanical parts to bind and jam.	
Maximum Relative Humidity	50% at 70°C
Maximum Altitude	2000m
Vibration	Tested in accordance with GS-ET-19 and BS EN 60947-5-2
Electrical Data	
Operating Voltage, U_e	24V DC (+/- 10%)
Rated Insulation Voltage, U_i	60V
Rated Impulse Withstand Voltage, U_{imp}	500V
Voltage Drop, U_d	<3.5V
Rated Operating Currents	400mA
Minimum Operational Current	100mA
Off-State Current	<0.5mA
Rated Conditional Short-circuit Current	100 A
Overvoltage Category	Type 2
Electromagnetic Compatibility (EMC)	Conforms to BS EN 60947-5-3
RFID Sensor Data (as defined in EN 60947-5-2)	
Coding Type (as per BS EN ISO 14119)	High
Safety Output Timing Data	
Safety Response Time	<200ms
Safety Input Low to Safety Output Low	<25ms
Gate Open to Safety Output Low (SOG)	<200ms
Unit unlocked to Safety Output Low	<200ms

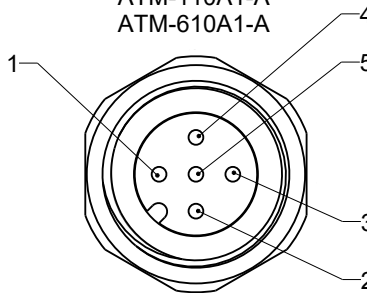
Wiring and Connection Information

ATOM CONNECTOR POSITIONS



SINGLE 5 PIN M12 CONNECTOR

ATM-100A1-A
ATM-110A1-A
ATM-610A1-A

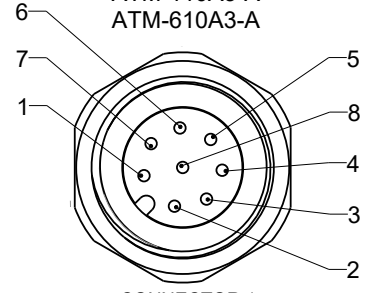


CONNECTOR 1
M12 MALE THREADED

		SIGNAL
CONNECTOR 1 M12 MALE	PIN 1	24V
	PIN 2	OUTPUT 1
	PIN 3	0V
	PIN 4	OUTPUT 2
	PIN 5	SOLENOID DRIVE

SINGLE 8 PIN M12 CONNECTOR

ATM-100A3-A
ATM-110A3-A
ATM-610A3-A



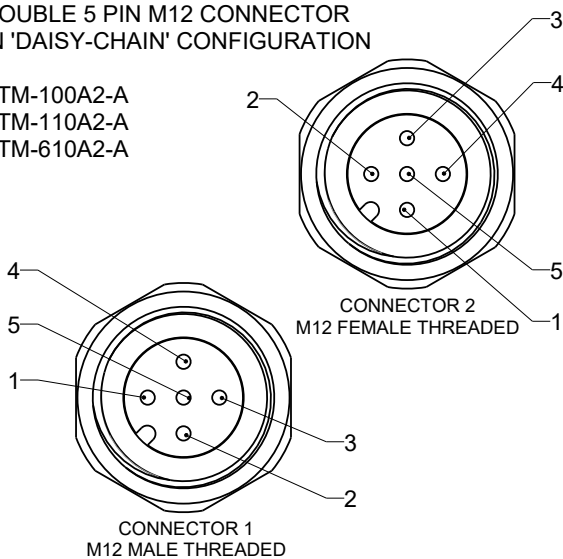
CONNECTOR 1
M12 MALE THREADED

		SIGNAL
CONNECTOR 1 M12 MALE	PIN 1	INPUT 2
	PIN 2	24V
	PIN 3	OUTPUT 1
	PIN 4	OUTPUT 2
	PIN 5	MONITOR
	PIN 6	INPUT 1
	PIN 7	0V
	PIN 8	SOLENOID DRIVE

Wiring and Connection Information

DOUBLE 5 PIN M12 CONNECTOR IN 'DAISY-CHAIN' CONFIGURATION

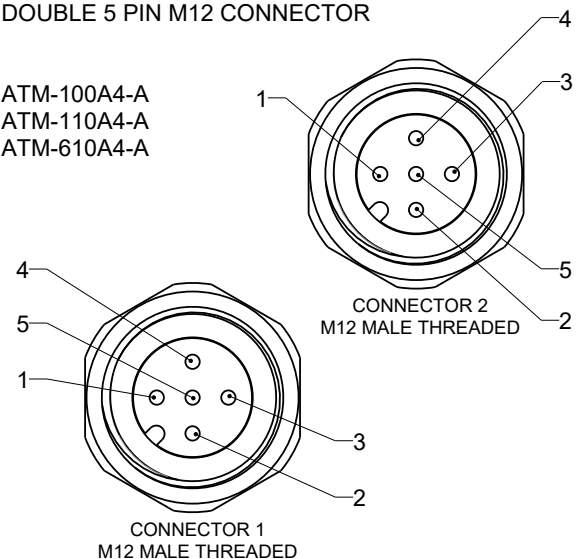
ATM-100A2-A
ATM-110A2-A
ATM-610A2-A



		SIGNAL			SIGNAL
CONNECTOR 1 M12 MALE	PIN 1	24V	CONNECTOR 2 M12 FEMALE	PIN 1	24V
	PIN 2	OUTPUT 1		PIN 2	INPUT 1
	PIN 3	0V		PIN 3	0V
	PIN 4	OUTPUT 2		PIN 4	INPUT 2
	PIN 5	SOLENOID DRIVE		PIN 5	SOLENOID DRIVE

DOUBLE 5 PIN M12 CONNECTOR

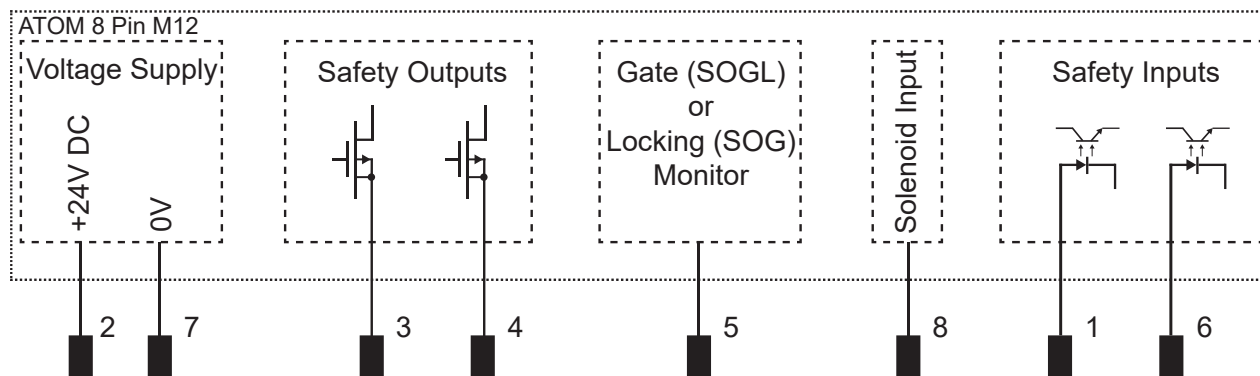
ATM-100A4-A
ATM-110A4-A
ATM-610A4-A



		SIGNAL			SIGNAL
CONNECTOR 1 M12 MALE	PIN 1	24V	CONNECTOR 2 M12 MALE	PIN 1	
	PIN 2	OUTPUT 1		PIN 2	
	PIN 3	0V		PIN 3	0V
	PIN 4	OUTPUT 2		PIN 4	SOLENOID DRIVE
	PIN 5			PIN 5	

Operating Instructions: ATOM

Wiring Diagram



Two Safety Outputs

Dual channel OSSD outputs with “low” voltage to indicate the safe state.

Must be connected to the next OSSD Device or an external evaluation device.

The External Evaluation Device must:

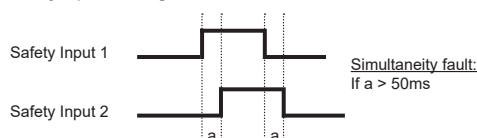
- Monitor both signals are high before it can leave its safe state
- Monitor that both signals are synchronous
- Have a Diagnostic Coverage of at least 99%

Two Safety Inputs

Dual channel safety inputs with “low” voltage to indicate the safe state

Must be connected to the previous OSSD device or 24V
A fault will be detected if the inputs are not synchronous (see timing fault diagram). A full input cycle is needed to clear the fault.

Safety Inputs Timing Faults



Solenoid Drive Input

Solenoid Drive input with “high” voltage to activate the solenoid.

For Power-to-unlock (PTU) devices the solenoid will unlock the unit.

For Power-to-lock (PTL) devices the solenoid will lock the unit.

For Safety-on-Guard-Locking (SOGL) devices the input must be driven from a safe and monitored source to be able to achieve PLe.

Monitor Output

Control output with “high” voltage to indicate active condition
For Safety-on-Guard-Locking (SOGL) devices the monitor is activated when the gate is opened.

For Safety-on-Guard (SOG) units the monitors is activated when the unit is unlocked.

Daisy Chain information

The number of units that can be wired in series depends on two main criteria:

1. Power line voltage drop
2. Total Safety Response Time

Voltage Drop

Each ATOM unit in series draws current and causes a voltage drop on the power line.

The greater the number of units + distance, the grater the voltage drop.

The voltage requirement for ATOM is 24+10%-15%, this means the voltage must not drop below 20.4V to ensure correct operation.

A typical application with units spaced 5m apart, wired with 22 AWG cable would allow for 4 units in series. For more detailed calculation please see the Voltage Drop Tool on the Fortress website.

The maximum number of units permitted in series is 8.

Safety Response Time

Each ATOM unit in series will increase the total safety response time of the line.

The maximum safety response time for one unit is 200ms.

The increase response time per additional unit is 25ms.

The total response time can be calculated using:

$T = 200\text{ms} + (n-1) \times 25\text{ms}$, where n = the number of ATOM units in the line

Operating Instructions: ATOM

Safety Data		ATOM Product Type		
		Power-to-Unlock, Safety-on-Guard- Locking	Power-to-Unlock, Safety-on-Guard	Power-to-Lock, Safety-on-Guard
Safety Function 1	Monitor Safety Inputs are High	√	√	√
Safety Function 2	Monitor door is closed	√	√	√
Safety Function 3	Keep the door Locked	√		
Safe State 1	1 OSSD output is low	√	√	√
Safe State 2	Door is Locked	√		
Performance Level (EN ISO 13849-1:2015)		Up to PLe		
Category (EN ISO 13849-1:2015)		Up to Cat.4		
SIL (according to IEC 62061)		Up to SIL CL3		
Diagnostic Coverage		A maximum DC of 99% can be achieved with suitable monitoring.		
PFH		4.16x10-9		
Device Type (according to ISO 14119)		Type 2	Type 4 with Lock	Type 4 with Lock
Demand mode (according to 62061)		High		
Applicable Standards		ISO 14119 , EN ISO 13849 , IEC 61508 , EN 60947-5-2, BS EN 62061		

Functioning
Power-to-Unlock Solenoid Type Closing and Locking
The ATOM Interlocking Device is closed by inserting the Atom Actuator assembly into the upper head portion of the ATOM Switch assembly (See Fig.1). Once inserted, the internal mechanism then locks the Actuator assembly into the ATOM switch placing the Device into its Locked-State.
Unlocking The Device is unlocked when voltage is applied to the Solenoid Drive pin.
Opening Once unlocked, the ATOM Actuator assembly can be removed from the ATOM Switch assembly.
Auxiliary Release Function In the event of power failure, the ATOM Interlocking Device can be released and unlocked using the supplied Auxiliary Release Driver Bit irrespective of the state of the solenoid. <ul style="list-style-type: none"> - Use the Auxiliary Release Driver Bit (with an appropriate Screwdriver) to drive and rotate the Override Spindle 90° clockwise. (See Fig.2). - Remove the ATOM Actuator from the ATOM Switch. - Rotate the Override Spindle 90° anti-clockwise back to its 'Locked' position and restore any necessary protection. Note; Auxiliary Release Driver Bit must be securely controlled during normal operation to prevent misuse.
Power-to-Lock Solenoid Type Closing
The ATOM Interlocking Device is closed by inserting the Atom Actuator assembly into the upper head portion of the ATOM Switch assembly (See Fig.1). Note, in all Power-to-Lock solenoid type devices the Device will remain in its unlocked-state until the solenoid is energised.
Locking The Device is locked when voltage is applied to the Solenoid Drive pin.
Unlocking The Device is unlocked when voltage is removed from the Solenoid Drive pin.
Opening Once unlocked, the ATOM Actuator can be removed from the ATOM Switch.
There is no Auxiliary Release function on a Power-to-Lock Solenoid type ATOM Device.

Operating Instructions: ATOM

Figure 1: Dimensional Drawing -

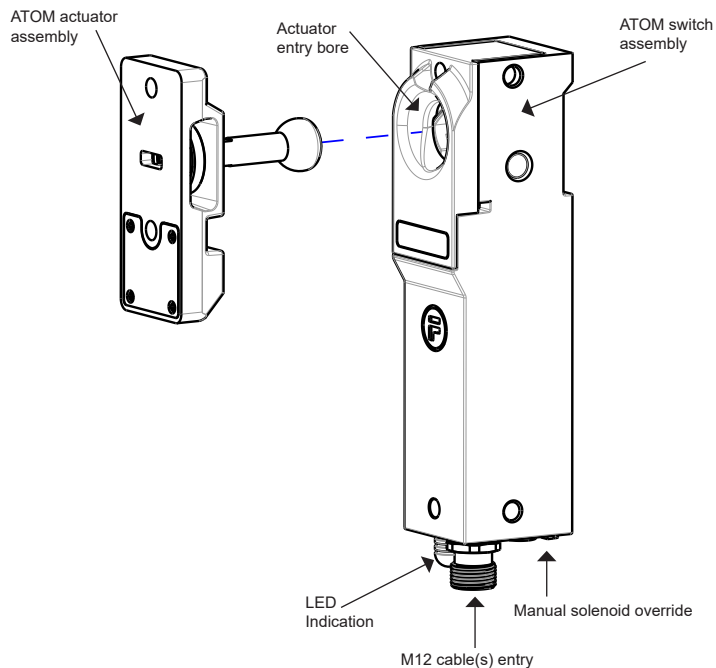
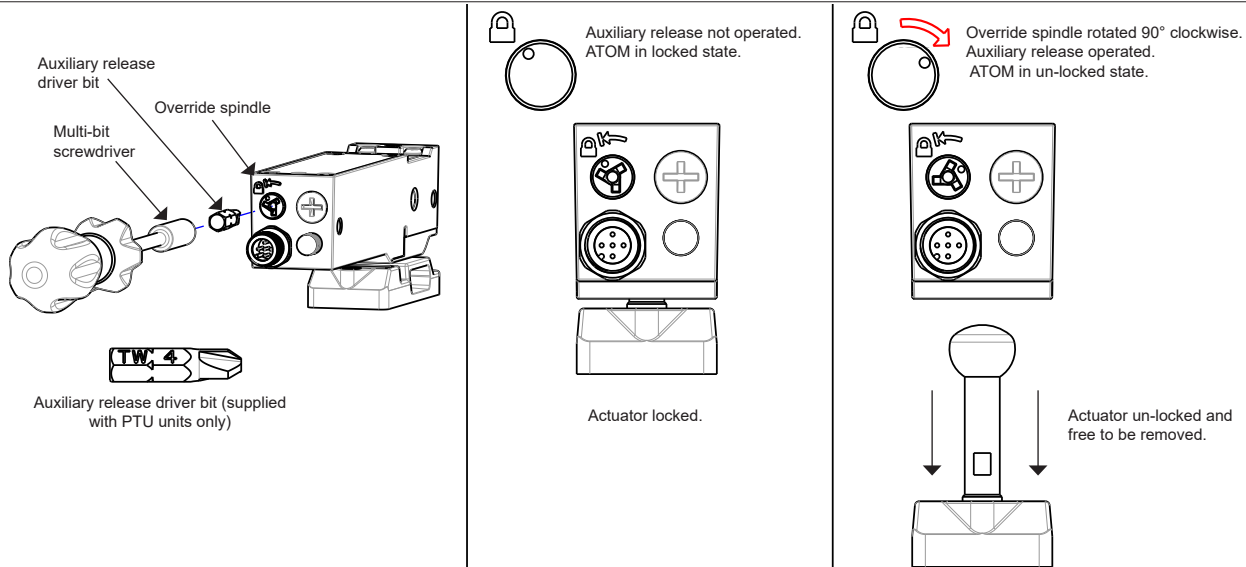














Figure 2: Dimensional Drawing -



Operating Instructions: ATOM

LED Output		
Led Pattern	Status	Function
OFF		UNIT NOT POWERED
GREEN		HEAD IN-UNIT LOCKED
RED		HEAD OUT-UNIT UNLOCKED
1 RED FLASH		MANUAL OVERRIDE USED
AMBER		UNIT FAULT
1 AMBER FLASH		INPUT FAULT
2 AMBER FLASH		OUTPUT FAULT
3 AMBER FLASH		WRONG RF ACTUATOR
GREEN RED ALT		HEAD IN UNIT UNLOCKED
GREEN OFF ALT		HEAD IN UNIT LOCKED INPUTS OFF
GREEN AMBER ALT		INCORRECT SUPPLY VOLTAGE
LONG AMBER + AMBER FLASH		INTERNAL FAULT CODE

Mounting Instructions

Tools and Fixings Required

4 x M5 Screws for securing ATOM Switch and Actuator.

- Screws must be suitable length for a minimum of 10mm thread engagement.
- Screws must be security type to prevent unauthorised removal or tampering, for example pin-hex or pin-torx anti-tamper security screws.
- Minimum required screw type and class; 12.9 Grade High Tensile Steel to maintain FZH value.
 - Note; F_{1max} value was achieved using four 12.9 Grade High Tensile Steel M5 Cap Head bolts
- Required torque setting; 8-12 Nm.

4 x M5 Nut / T-Nut / Threaded Hole for securing ATOM Switch and Actuator.

Driver suitable for securing M5 fixing screws.

Auxiliary Release Driver Bit (provided) to operate Auxiliary Release Function.

1/4" Driver to suit Auxiliary Release Driver Bit.

Adhesive Threadlocker to secure mounting fixings from loosening due to vibration.

Mechanical Mounting Instructions

1. Locate the ATOM Interlocking Device so that operation of the Auxiliary Release function, Functional testing, Electrical testing, Scheduled Inspection and Maintenance and final unit replacement are all easily possible.
 2. Operate the Auxiliary Release function to remove the ATOM Actuator from the ATOM Switch assembly. Note, this step is not applicable to Power-to-Lock solenoid type devices.
 3. Mount the ATOM Switch and ATOM Actuator assemblies to appropriate parts of the machine or guarding.
 - The ATOM Actuator must be correctly aligned and oriented with the ATOM Switch as per the assembly dimensions.
 - All mounting surfaces should be flat, stable and suitable of providing a minimum of 10mm M5 thread engagement or sufficient support to either an M5 Nut or M5 T-Nut. See Fig.3 and Fig.4 for some mounting examples.
 4. Perform Mechanical Function tests before completing installation and commission. See Mechanical Function test section
- Mount the complete ATOM Interlocking Device only in the correctly assembled condition.**
- The complete machine guarding installation must conform to all relevant design, construction and installation standards and guidelines.
 - Any gap around the perimeter of the machine and guarding when closed and locked (Safety Outputs High) must not exceed the limits specified in BS EN 294 & BS EN 953.
 - All fixing screws used to mount the complete ATOM Device must be permanently prevented from removal. If mounting fixings are visible, they must be secured against removal by personnel using standard tools, manipulation and un-authorised or un-identifiable removal. If mounting fixings are not visible or hidden, they must be secured against removal or loosening due to vibration. In both cases, a middle strength adhesive threadlocker is required.
 - The complete ATOM Device must not be used as a mechanical stop. Where applicable, precautions must be made to ensure the door or gate of any guarded area has sufficient support and stops to prevent the impact on the Device.

Figure 3: Extrusion Profile Mounting Application Example

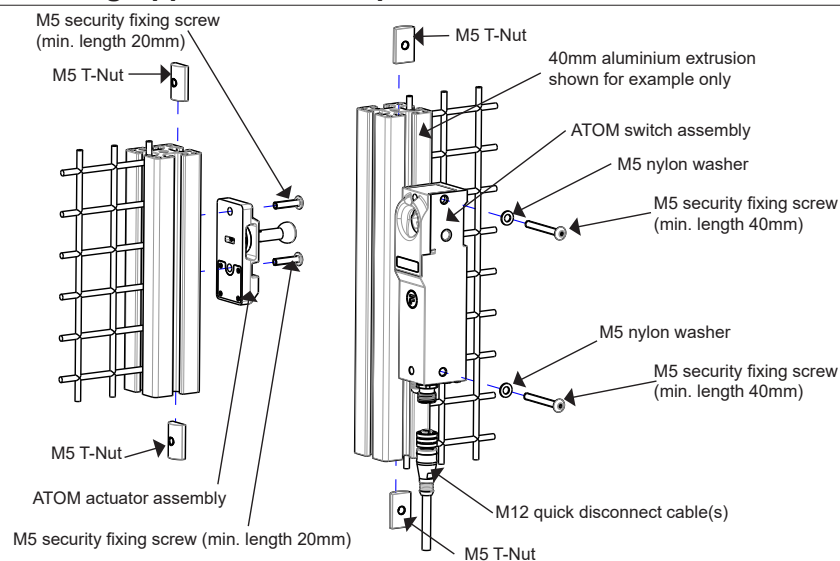


Figure 4: Plates and Guards Mounting Application Example

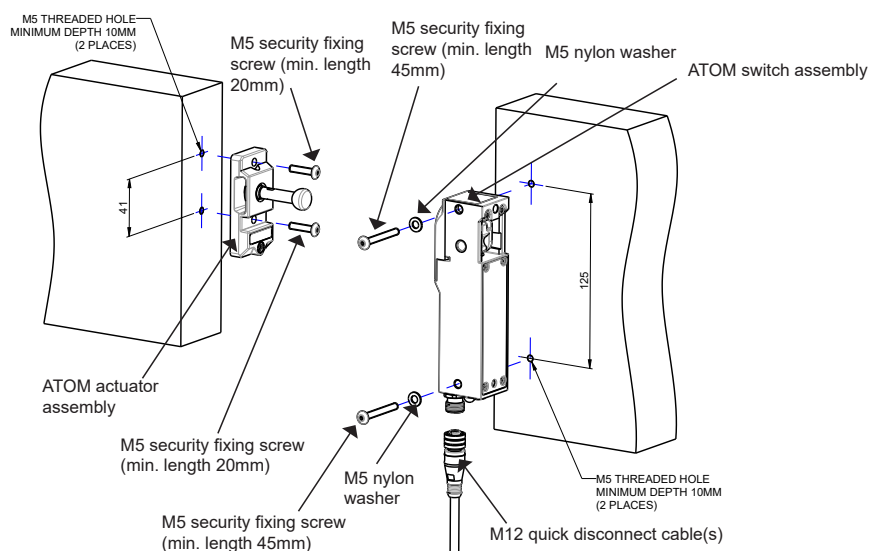
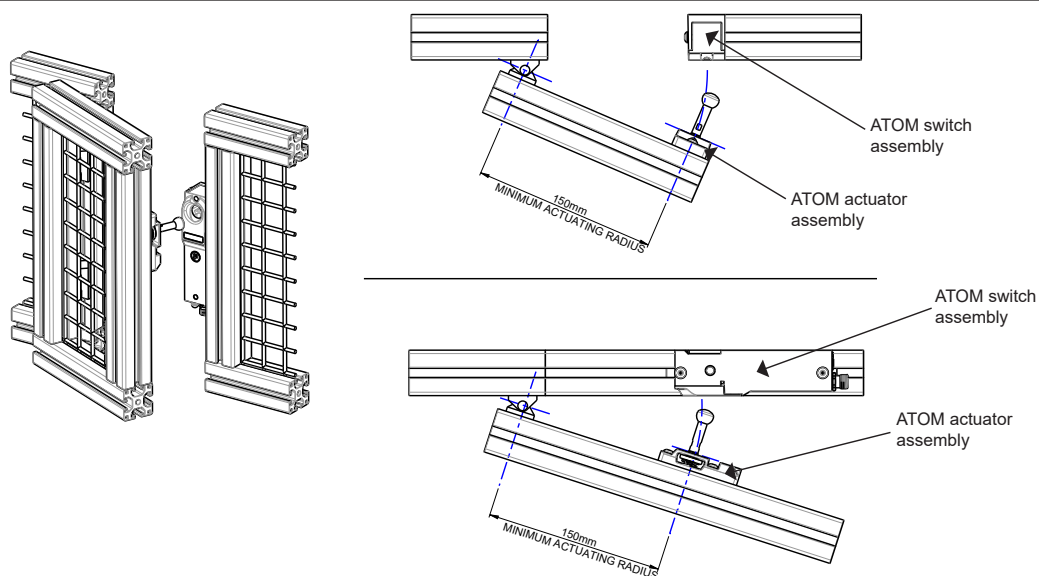


Figure 5: Hinged Door Application Example



Operating Instructions: ATOM

Electrical Connection Instructions

1. Make sure the electrical supply is isolated and safe before any installation.
 2. Insert appropriate M12 Connector cabling into base of ATOM Enclosure assembly.
 - Note; suitable connectors and cabling must be used to maintain IP65 and IP67 sealing.
 3. Perform Electrical Function tests before completing installation and commission. See Electrical Function test section.
- Ensure that all circuits connected to the ATOM Interlocking Device are derived from a Safety Extra Low Voltage or Protected Extra Low Voltage power supply (SELV or PELV).
 - Ensure the electrical connection and installation of the ATOM Device and complete guarding application is performed according to all relevant local standards and guidelines.

Mechanical Function Test (Unpowered)

Power-to-Unlock ATOM Interlocking Devices

1. Insert the ATOM Actuator into the ATOM Switch.
 - **It must lock into position.**
2. Operate the Auxiliary Release Function and remove the ATOM Actuator from the ATOM Switch.
3. Return the Override Spindle to its Locked position (See fig.2) and reinsert the ATOM Actuator into the ATOM Switch.
 - **It must lock into position.**

Power-to-Lock ATOM Interlocking Devices

1. Insert the ATOM Actuator into the ATOM Switch.
 - **It must not lock into position.**

Electrical Function Test (Powered)

1. Close the guard, ensure the ATOM Device is in its Locked-State and start the machine.
 - **It must not be possible to open the guard!**
 - **The Safety Outputs should be High.**
2. Switch off the machine, unlock the ATOM Device and open the guard.
 - **The machine must not start when the guard is open!**
 - **The Safety Outputs should be Low.**

Warning: This Device does not contain the Machine Reset or Restart facility after an escape or auxiliary release of the guard locking. Additional measures are required to achieve the reset of the machine system.

Maintenance and Inspection

Regular inspection of the following is necessary to ensure trouble-free, lasting operation:

- Secure mounting of components. (See Mechanical Mounting Instructions).
- Debris and wear.

If used on an infrequent basis, the complete Interlocking system must be functionally tested at least once every month. See Mechanical and Electrical Function tests listed above for test requirements.

WD40 lubricant, or equivalent, should be applied to the Head Portion of the ATOM Switch assembly every 10,000 operations. There are no user serviceable parts in this product. If any damage or wear is found with a device, please contact your local Fortress stockist.

The complete ATOM Interlocking Device must be replaced after 1 million switching operations.

Disposal

The ATOM Interlock Device does not contain any certified hazardous materials so should be disposed of as industrial waste.

Liability Coverage is Voided Under the Following Conditions:

1. If these instructions are not followed.
2. Non-compliance with safety regulations.
3. Installation and electrical connection not performed by authorised personnel.
4. Non-implementation of functional checks.

Protection Against Environmental Influences

In order to maintain full mechanical and electrical performance, the ATOM Interlocking Device must be protected against the ingress of all foreign bodies such as swarf, sand, blasting shot etc.

The ATOM Device is not suited for use in corrosive environments.

The ATOM Device is only suitable for dusty environments where careful consideration has been given to environment requirements, product selection and mounting positions. Contact your local Fortress stockist for guidance and details.

Where possible the ATOM Device must be mounted away from the guarded machine or by the use of anti-vibration mountings in order to avoid the effects of vibration, shock and bump.

The manufacturer reserves the right to modify the design at any time and without notice.

This guide should be retained for future reference.

Figure 6: Dimensional Drawing - ATOM Unit

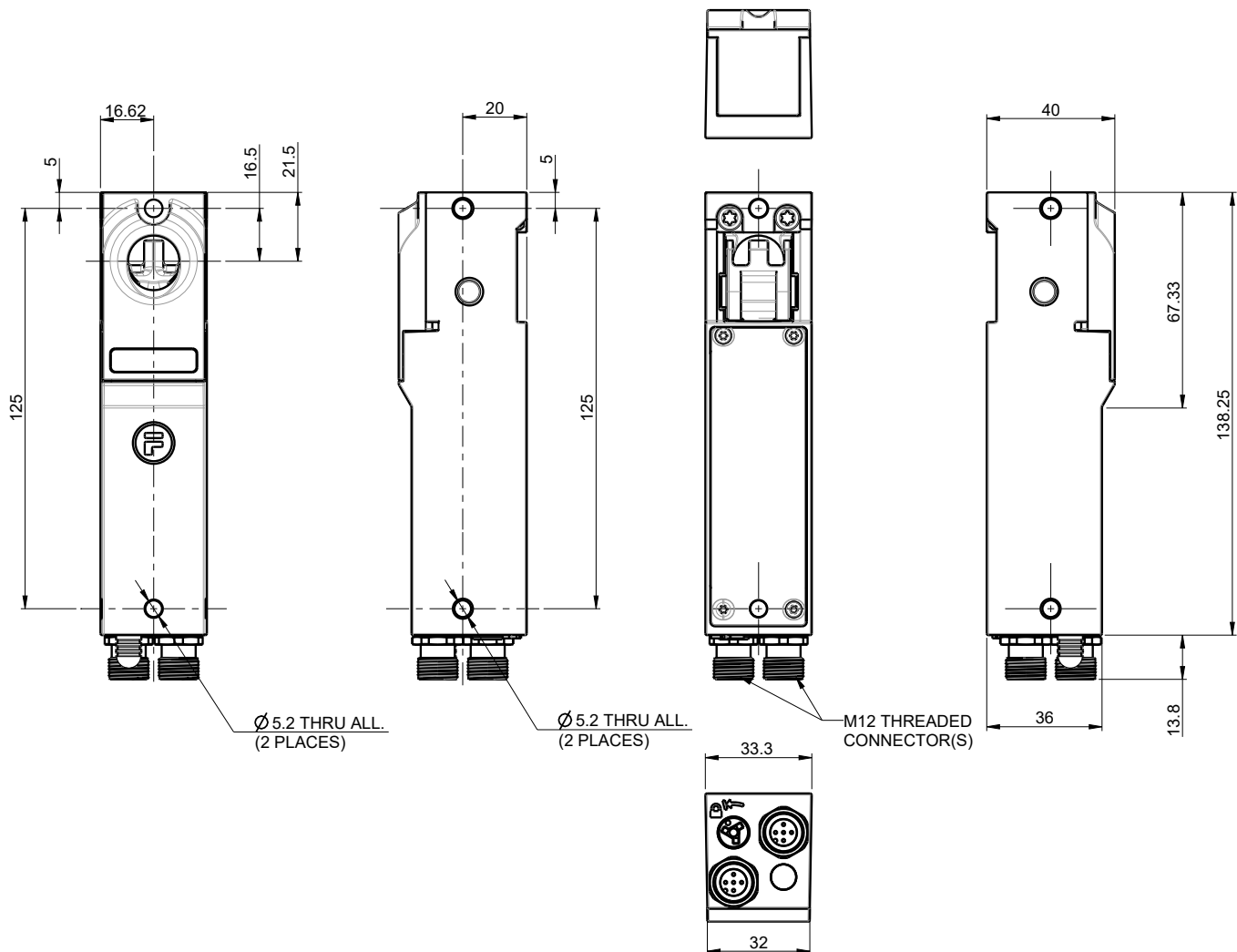
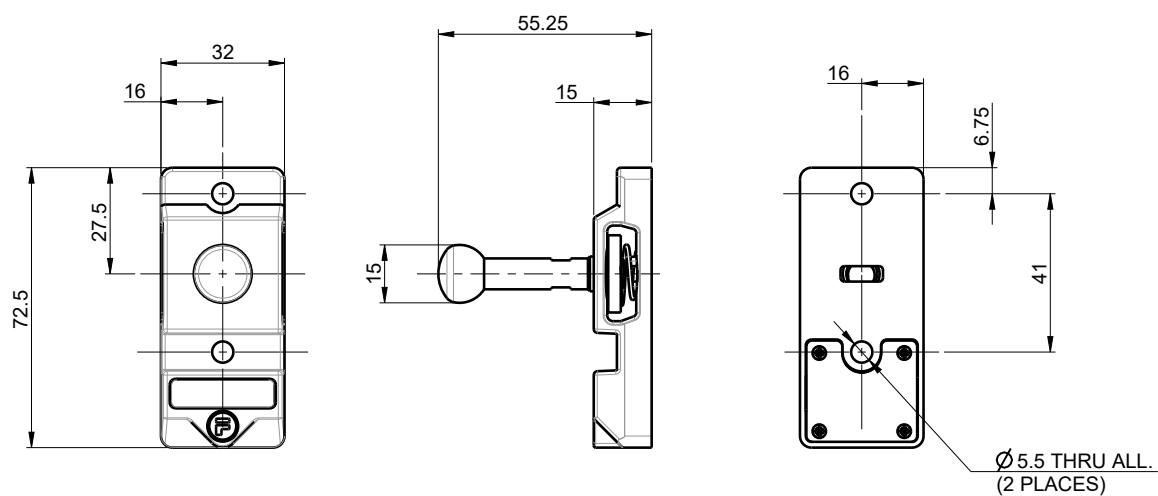
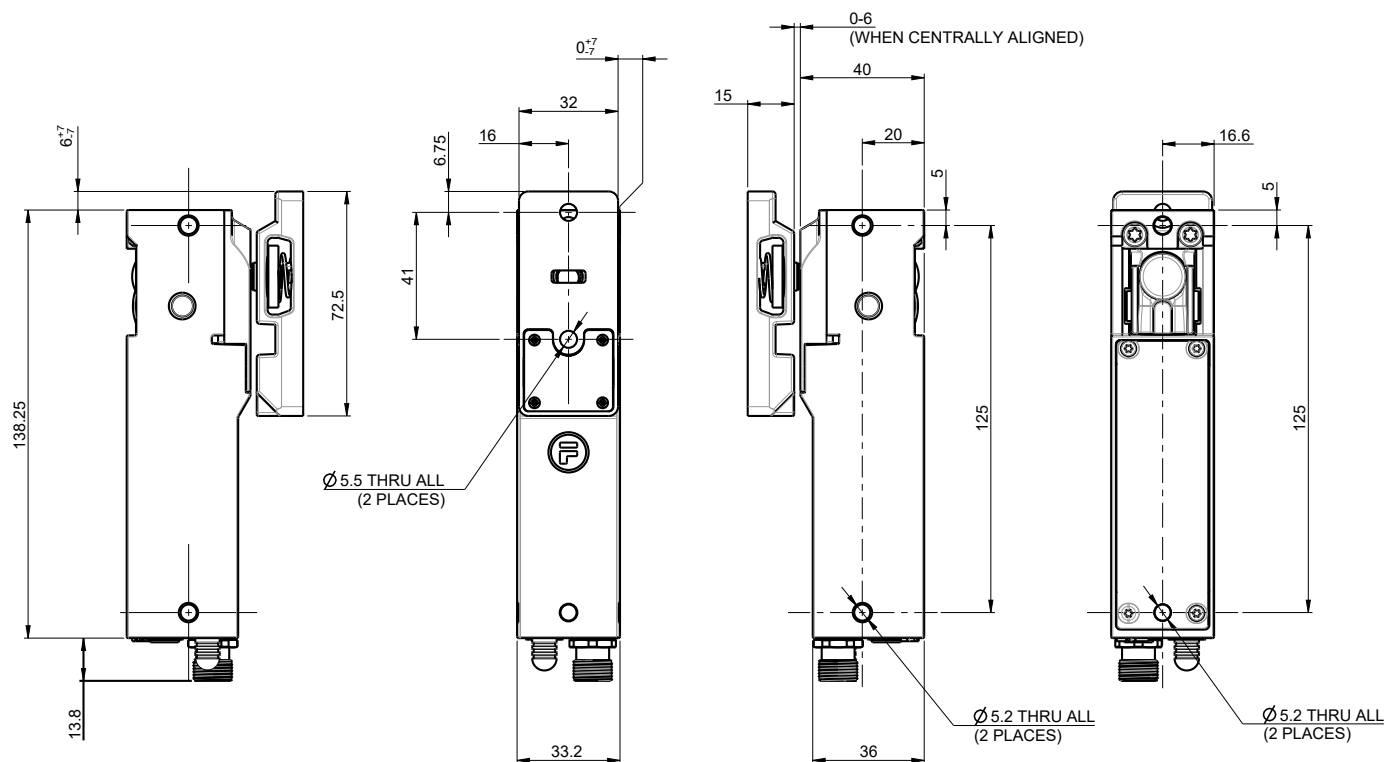


Figure 7: Dimensional Drawing - ATOM Actuator Unit




Operating Instructions: ATOM

Figure 8: Dimensional Drawing - ATOM with Actuator Unit



ATOM Accessories

Description	
<p>Brackets for simplified mounting.</p>	 <p>The image displays six different 3D models of mounting brackets, each labeled with a code:</p> <ul style="list-style-type: none"> ATM-KB: A vertical bracket with a single mounting hole and a horizontal adjustment screw. ATM-KC: A vertical bracket with two mounting holes and a horizontal adjustment screw. ATM-KL: A horizontal bracket with a single mounting hole and a horizontal adjustment screw. ATM-KH: A vertical bracket with a single mounting hole and a horizontal adjustment screw, featuring a black handle. ATM-KS: A horizontal bracket with a single mounting hole and a horizontal adjustment screw, featuring a black handle.

ATOM Accessories

ATOM Brackets Options	
Part No.	Description
ATM-KB	Single angled bracket for sliding gates.
ATM-KC	Angled bracket(s) for hinged gates.
ATM-KL	With handle for sliding gates.
ATM-KH	With handle for hinged gates.
ATM-KS	Slidebar-style retractable actuator.

ATOM Cordset		
Part No.	Cable Length	Description
CABLE-2M-AT1	2m	To suit 5 Pin M12 connectors.
CABLE-5M-AT1	5m	
CABLE-10M-AT1	10m	
CABLE-2M-AT3	2m	To suit 8 Pin M12 connectors.
CABLE-5M-AT3	5m	
CABLE-10M-AT3	10m	
CABLE-2M-ATD	2m	To suit X 5 Pin M12 daisy chain connectors.
CABLE-5M-ATD	5m	
CABLE-10M-ATD	10m	

ATOM Shorting Plug	
Part No.	Description
SHORTING-PLUG-ATD	To terminate last ATOM unit at end of daisy chain.