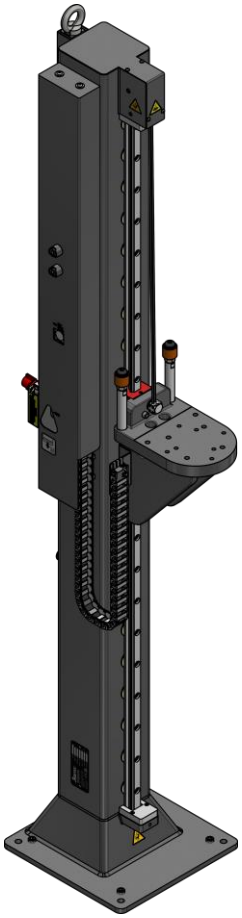
INSTRUCTION MANUAL

COLUMN D100

3arm®



TECNOSPIRO MACHINE TOOL, S.L.U.

P.I Pla dels Vinyats I, s/n nau 1

08250 - Sant Joan de Vilatorrada. Barcelona - España

Telf. +34 938 76 43 59

E-mail: 3arm@3arm.net

ISO 9001 BUREAU VERITAS Certification

TECNOSPIRO MACHINE TOOL SLU

DESIGN & QUALITY 3arm Made in Barcelona

www.3arm.net

TABLE OF CONTENTS

1 INTRODUCTION

Dear Customer,

We would like to congratulate you on your choice and are pleased to continue our ongoing endeavours to provide our customers with a simple, reliable and versatile way to improve workplace ergonomics.

We hope these simple instructions will help you set up and operate the machine you have chosen. We would advise you to pay special attention to the pages on the concepts of installation, maintenance and safety.

We wish you a long working life for your machine and hope that you will ratify the excellent investment you have made by purchasing a lifting column compatible with 3Arm products®.

2 ABOUT THIS MANUAL

This document corresponds to the Column D100 instruction manual.

-ORIGINAL MANUAL-

Intellectual/Industrial Property Information:

Tecnospiro Machine Tool, S.L.U. (the Company) duly informs that all content in this document including, for example, the text, images, graphic designs, brands, trading and company names (hereinafter, the Intellectual/Industrial Property), belong to the Company and that the Company is the exclusive owner of their usage. Copying, reproduction, distribution, public communication and total or partial use of the Intellectual/Industrial Property, in any form or manner, even quoting the sources, is prohibited, unless expressly agreed in writing by the Company. The use of any content that due to its characteristics is similar to the Industrial/Intellectual Property is also considered an infringement of the Company's Industrial/Intellectual Property rights.

2.1 CONSIDERATIONS

- ✓ Before using the equipment, be sure to read this instruction manual and follow the instructions for use and safety correctly.
- ✓ All the instructions listed in this manual refer to the individual unit. It is the end user's responsibility to analyse and apply all the necessary safety measures required for the end use.
- ✓ This manual must be kept in a place close to the equipment for the entire life of the equipment for future consultations.
- ✓ If any part of this manual is unclear, confusing or inaccurate, please contact your 3arm® and/or Roscamat® distributor.
- ✓ The content of this manual may be subject to change without prior notice.
- ✓ If the manual is lost or damaged, contact TECNOSPIRO MACHINE TOOL, S.L.U. to provide a new one.
- ✓ Reproducing or sharing this documentation – or part of it – to third parties is only permitted with express written authorisation from TECNOSPIRO MACHINE TOOL, S.L.U.
- ✓ The illustrations shown in this manual may differ in some details from its specific configuration and should be understood as a standard representation.

Paragraphs indicating assembly, adjustment, installation or maintenance steps are framed with a brown background.

Paragraphs with highlighted information are framed with a grey background.

2.2 VERSION

Document	Revision date
Instruction manual	22/02/2023

3 SAFETY INFORMATION

3.1 SCOPE OF APPLICATION

This chapter contains very important information regarding the safety of your equipment; it is aimed at all staff involved in any of the stages of this equipment's working life (transport, assembly, installation, commissioning, adjustment, training, operation, cleaning, maintenance, troubleshooting, dismantling/removal from service)

3.2 ALERTS AND GENERAL CONSIDERATIONS

- ✓ The equipment described in this document has been built in accordance with the current technological level and in accordance with the applicable technical standards in terms of safety. However, improper use, or incorrect integration by the end user may lead to the risk of injury.
- ✓ The equipment must only be used in perfect technical condition, respecting the safety regulations and the instructions provided in this document.
- ✓ Any breakdown that may affect safety must be corrected immediately.
- ✓ Without the proper authorisation of TECNOSPIRO MACHINE TOOL, S.L.U., no modification of equipment should be made.
- ✓ The equipment must only be operated for its intended use, any other use is strictly prohibited. Any use other than that indicated is considered misuse and is prohibited. The manufacturer assumes no responsibility for any damage that may arise from this.
- ✓ It is the responsibility of the integrator, owner and/or end user to determine the suitability of the product for each use, as well as its place of installation and the specific definition of the task to be carried out with this product within the limits stated in this manual.
- ✓ Do not use it for any purpose that is not outlined in this manual.
- ✓ The operator must only use the equipment after having received the instructions for its use.
- ✓ It is advisable that only one operator use the equipment at a time, any other use must be evaluated by the integrator/end user.
- ✓ It is forbidden to handle mobile and joint elements during usage.
- ✓ When not in use, it is advisable to leave the carriage in the lower position of its stroke.
- ✓ The work area of the equipment and its surrounding area must respect conditions of safety, health and hygiene at work. It is the integrator/end user's responsibility to conduct a study to guarantee safety.
- ✓ The presence of third parties in the work area of the equipment should be

restricted as much as possible, thus avoiding any impact on safety. For any other use, an additional study of the hazards derived from this way of working must be carried out.

- ✓ It is important that the users who operate this equipment are familiar with and sufficiently trained to use this product or similar products.

- ✓ In any case, the operator must read and understand this manual before use regardless of their knowledge, training or experience with similar equipment, especially the sections dedicated to installation, operation and safety.

- ✓ If you have questions about handling or maintenance procedures, please contact your 3arm® and/or Roscamat® distributor.

3.3 EXCLUSIONS

The following is beyond the scope of use of this equipment:

- ✓ Handling of any component or functions of the equipment outside of those specified in this manual.
- ✓ Use by people with some type of limited mobility or by animals
- ✓ Use by people who have not completed the relevant occupational risk prevention course.

It must not be installed in:

- ✓ Installation in corrosive areas.
- ✓ Installation in dusty areas.
- ✓ Installation in areas with high electromagnetic emissions.
- ✓ Installation in areas undergoing extreme temperatures (very high or very low)
- ✓ Installation in areas with high humidity.
- ✓ Installation in outdoor areas

3.4 SYMBOLOGY AND ICONS

- ✓ Throughout this manual and in the machine's structure, different symbols and pictograms can be observed, the meaning of which is summarised below.

	General danger symbol. This symbol is usually accompanied by another symbol, or a more detailed description of the danger.
	Trapping hazard

3.5 SYSTEM INTEGRATOR

The system integrator or end user is responsible for integrating the machine in the installation, respecting all the relevant safety measures.

The integrator/end user is responsible for the following tasks:

- ✓ Location and correct installation.
- ✓ Connections.
- ✓ Risk assessment.
- ✓ Facilities with the necessary safety and protection functions.

3.6 PERSONAL PROTECTIVE EQUIPMENT (PPE)

Personal protective equipment required during the transport, assembly and installation, commissioning and dismantling of this machine: **safety boots, safety helmet, safety goggles and safety gloves**.

Safety footwear, safety gloves and safety goggles for set-up and training, operation and troubleshooting.

It is the responsibility of the integrator/end user to define the personal protective equipment required based on the final application of the machine, in order to comply with the essential health, safety and hygiene requirements.

Operators should not wear loose clothing, rings or bracelets that may fall into the mechanism of the machine.

It is also mandatory to wear hair tied back to avoid snags with the moving parts of the machine.

3.7 TRAINING LEVEL OF THE STAFF INVOLVED

All people working with the machine must have read and understood the safety chapter of the documentation.

The minimum level of training to use the manipulator shall be:

- Production operators: occupational risk prevention course, full training on work stations and residual risks of the equipment. Minimum of one year's experience in similar facilities.

- Maintenance workers: Occupational risk prevention course, complete training in handling, operation, maintenance and conservation of equipment and residual risks. Minimum of two years' experience in similar facilities and with the technical level necessary to perform tasks without problems.

- Cleaning workers: Course on workplace hazard prevention, training on products and procedures for carrying out cleaning tasks.

- Apprentices/interns: These may only operate the equipment if supervised at all times by one of the facility's suitably qualified employees.

- Public (non-operators): Visitors or passers-by must maintain a minimum safety distance of two metres from the edges of the perimeter of the equipment.

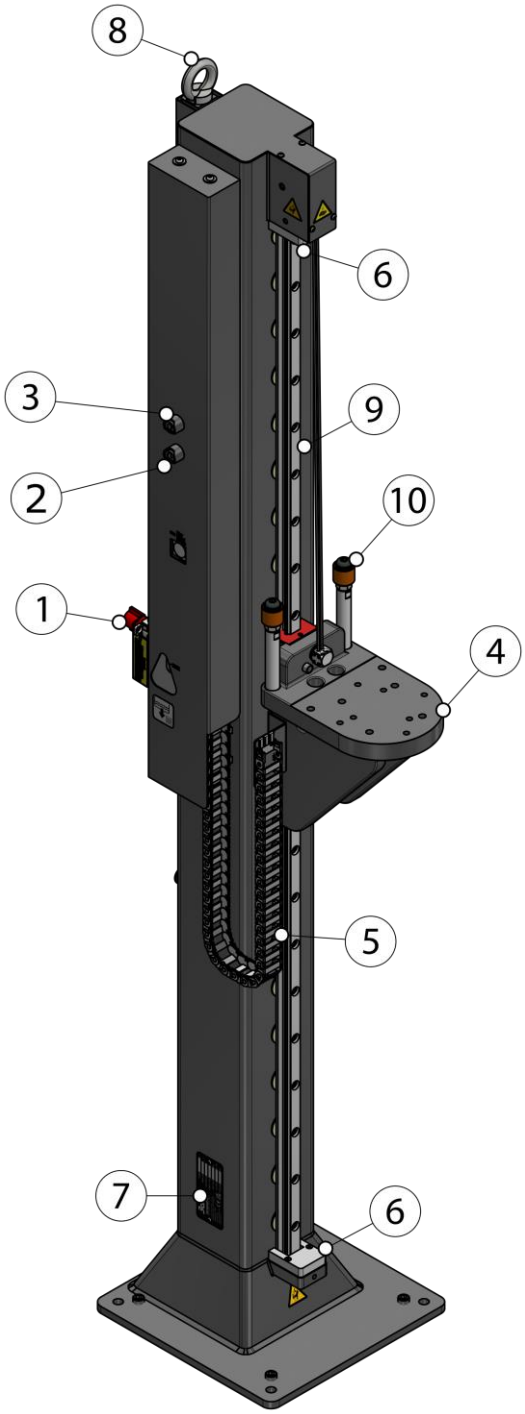
3.8 RESIDUAL RISKS

The residual risks of the equipment would be:

- ✓ Striking and crushing of hands or feet due to the falling of the part released from the tools.
- ✓ Striking and crushing in the displacement of the spine support.
- ✓ Striking and cutting with the structure of the column itself.
- ✓ Entrapment, slamming and/or crushing due to the manipulator falling or overturning.

4 GENERAL DESCRIPTION AND TECHNICAL INFORMATION

4.1 MAIN PARTS



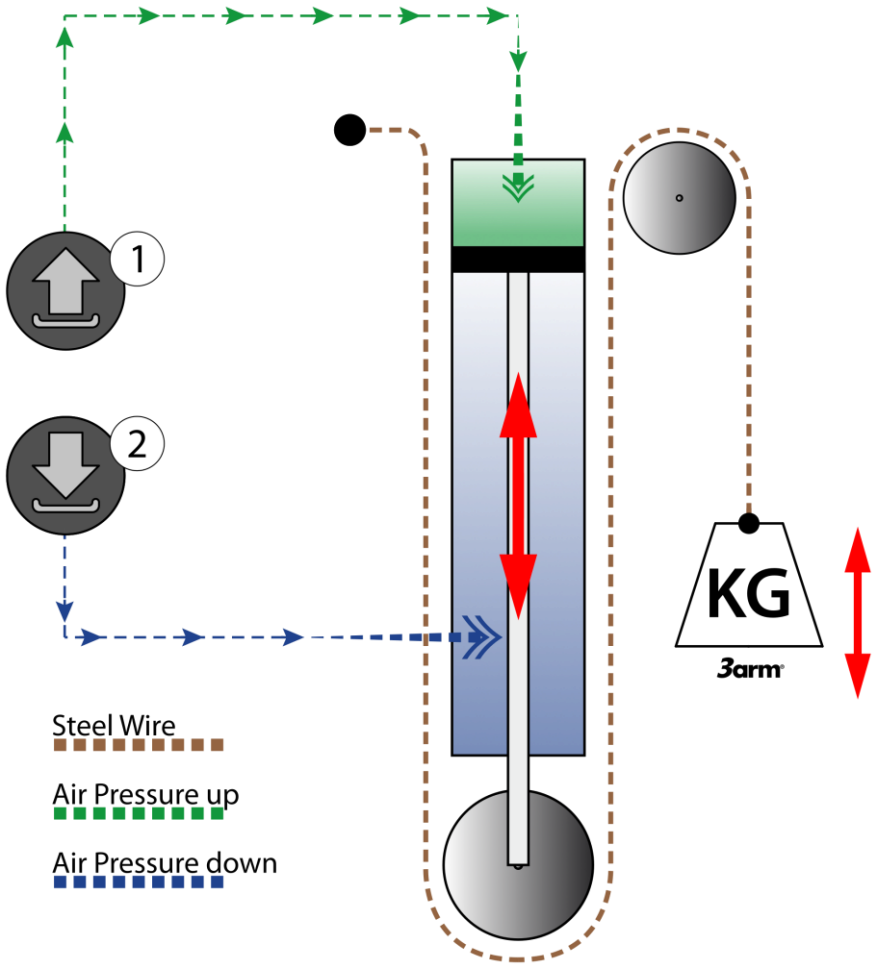
1.- Safety valve
2.- Column down push-button
3.- Column up push-button
4.- Support platform
5.- Cable tray chain
6.- Silicone stopper
7.- Nameplate
8.- Transport Ring
9.- Linear guide
10.- Anti-rotation stopper

4.2 DESCRIPTION AND OPERATING PRINCIPLE

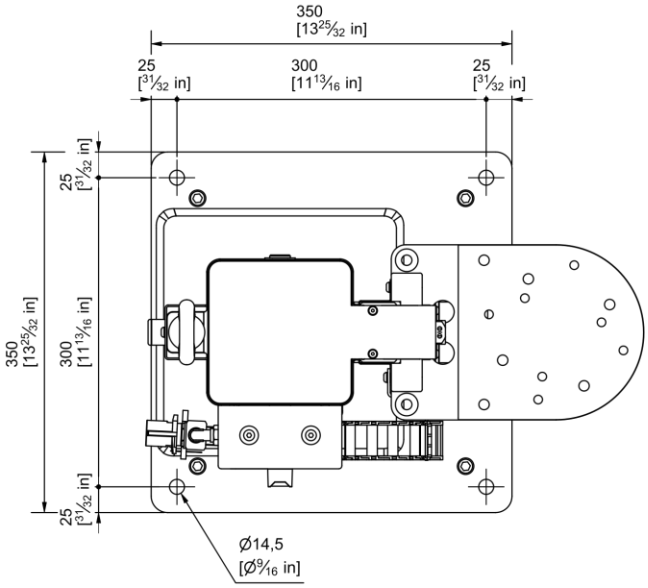
The D100 Column is designed for lifting 3Arm equipment, such as weightless arms of different series and manipulators, manufactured by Tecnospiro Machine Tool, S.L.U.

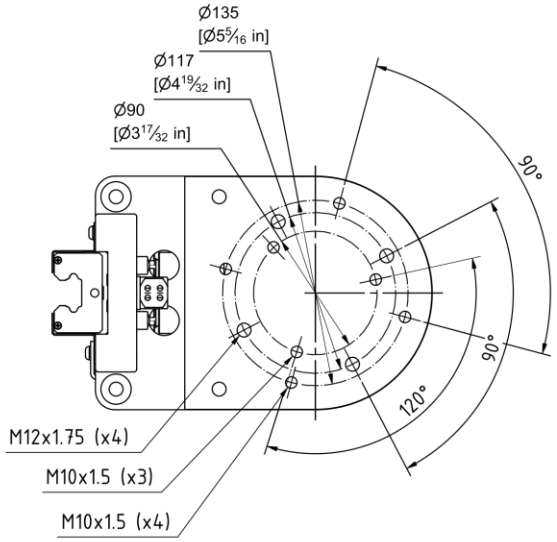
A pneumatic cylinder together with a double steel cable will move the support platform along the intended guide in an upward or downward direction depending on whether push buttons (1) or (2) are actuated respectively.

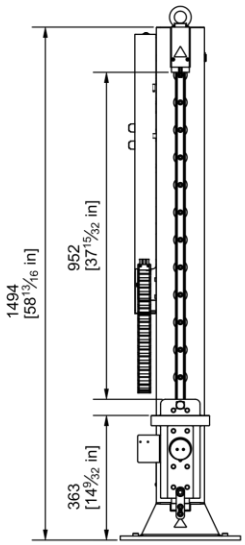
An automatic pneumatic lock will keep the support platform stationary in the proper position according to job conditions.



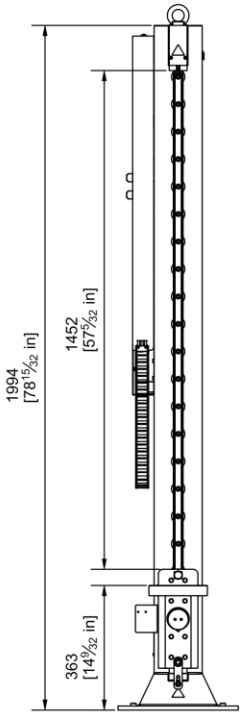
4.3 DIMENSIONS



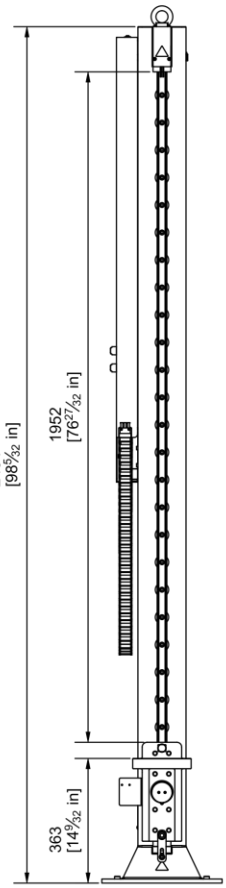




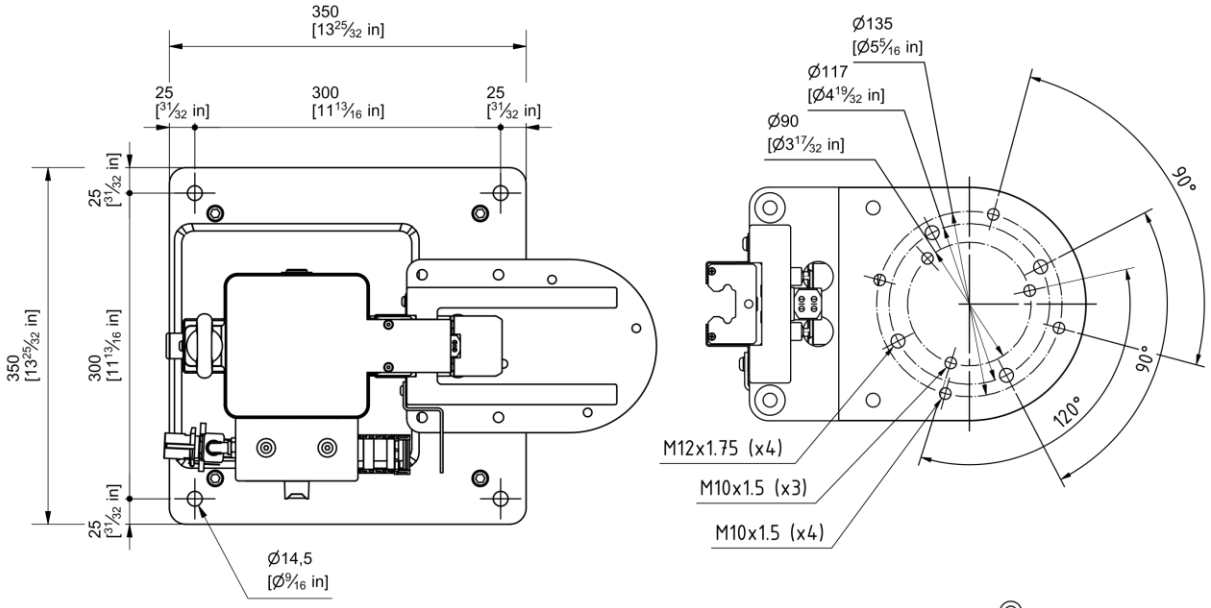
Column 1500 D100

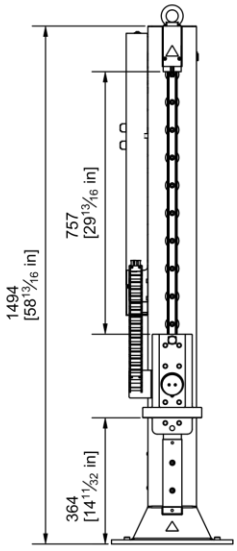


Column 2000 D100

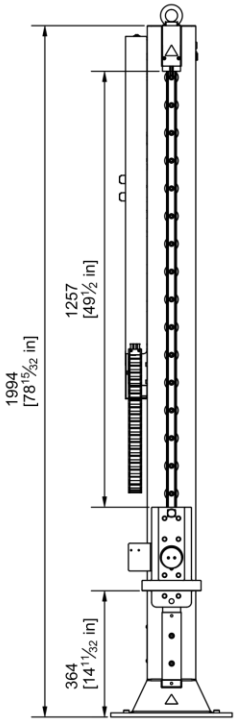


Column 2500 D100

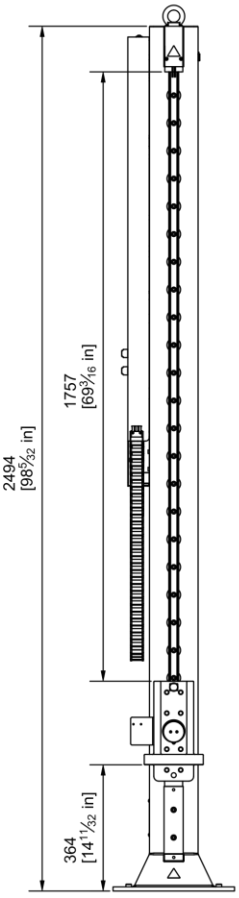




Column 1500 D100
Ceiling-mounted



Column 2000 D100
Ceiling-mounted



Column 2500 D100
Ceiling-mounted

4.4 TECHNICAL SPECIFICATIONS

GENERAL TECHNICAL SPECIFICATIONS		
Load capacity		
	Load range (BS)	0 - 120 Kg *(0 - 265 lb)*
Stroke		
	Column 1500 D100	952 mm *(37.5")*
	Column 2000 D100	1452 mm *(57.2 ")*
	Column 2500 D100	1952 mm *(76.8 ")*
	Column 1500 D100 ceiling	757 mm *(29.8 ")*
	Column 2000 D100 ceiling	1257 mm *(49.5 ")*
	Column 2500 D100 ceiling	1757 mm *(69.2 ")*
Weight		
	Column 1500 D100	79 kg *(174 lb)*
	Column 2000 D100	95 kg *(209 lb)*
	Column 2500 D100	111 kg *(245 lb)*
Pneumatic specifications		
	Power fluid	Pressurised air
	Max. working pressure	0.8 MPa *(8 bar)*
	Max. working pressure	0.7 MPa *(7 bar)*
	Min. working pressure	0,6 MPa *(6 bar)*
Operating conditions		
	Temperature	-10 to +50 ºC
	Relative humidity	Max. 70%
	Environment	Industrial environments

4.5 IDENTIFICATION

A metal plate riveted to the supporting structure, or indelible adhesive, identifies your D100 Column and indicates the following characteristics.

CE Marking, Manufacturer (name, address and company name), Date of manufacture, Serial number, Model, Designation, Maximum working load, Maximum working pressure.

4.6 LOAD SET UP

Depending on the equipment intended to be used in conjunction with the column, the column will be factory set to a specific SET UP load or settings load.

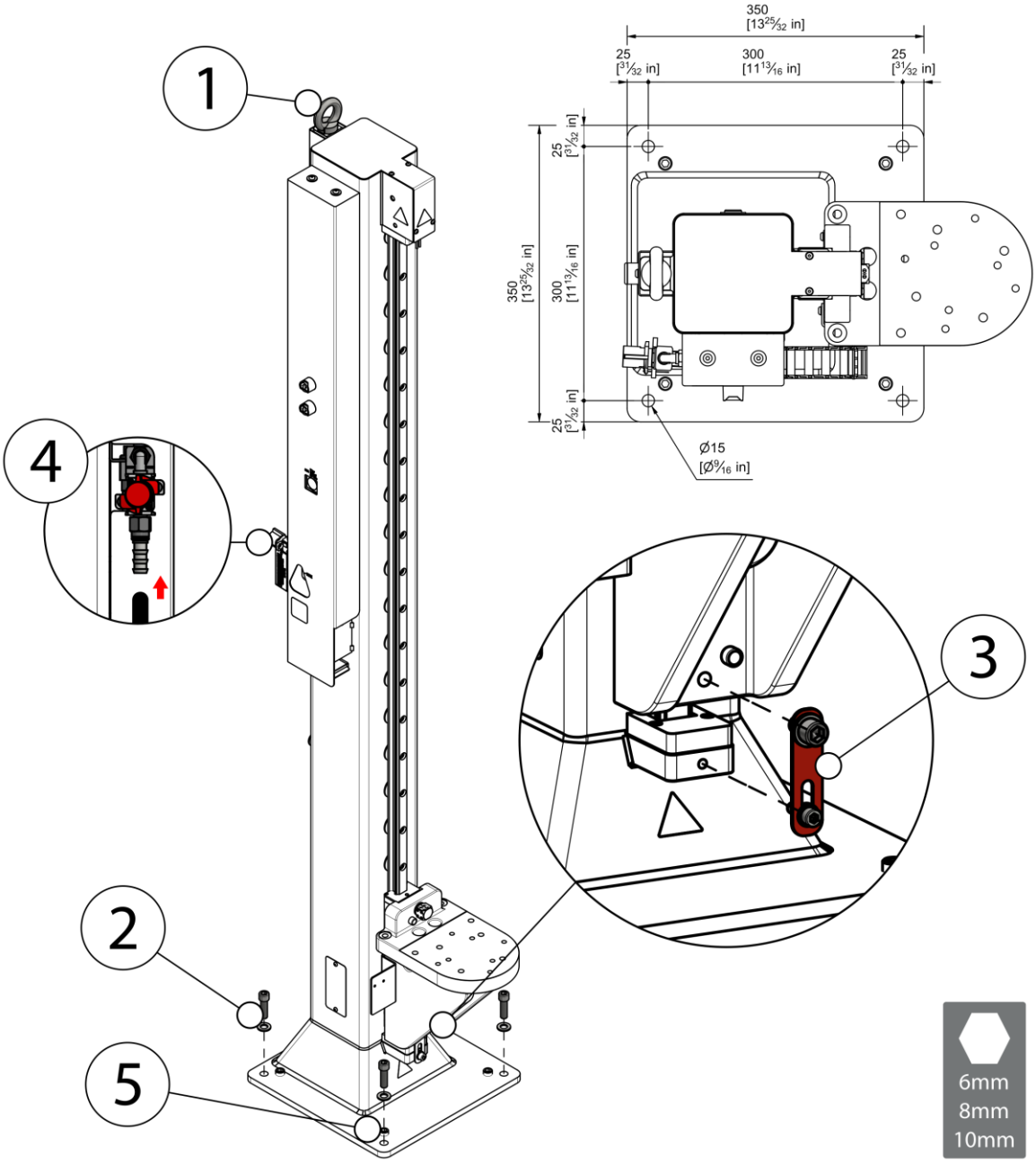
This means that the column is prepared and correctly adjusted for this SET UP load without the need for additional adjustments.

The SET UP load value is engraved next to the nameplate *[See IDENTIFICATION page 15]*

Should the equipment be installed on the column head needs to be changed in the future, if the weight is different from the original, this load must be readjusted *[See ADJUSTMENTS page 19].*

5 INSTALLATION

1. Remove the column from the original packaging using the eyebolt (1).
2. **Fasten the column** to the surface by means of screws (2) suitable for the chosen location or by means of a similar fastening system under the approval of the integrator.
3. **Remove the red locking link** (3) (6 and 8mm Allen key) from the lower part of the column (This is a packing element, used only for transporting the equipment).
4. **Connect the air supply (4) (tube Ø12 mm).**
5. **Install your equipment**[1]to the column bracket using the screws supplied.
6. **Adjust the studs (5)** to avoid slight twisting due to unevenness of the floor.



[1] See attached 3Arm® equipment manual

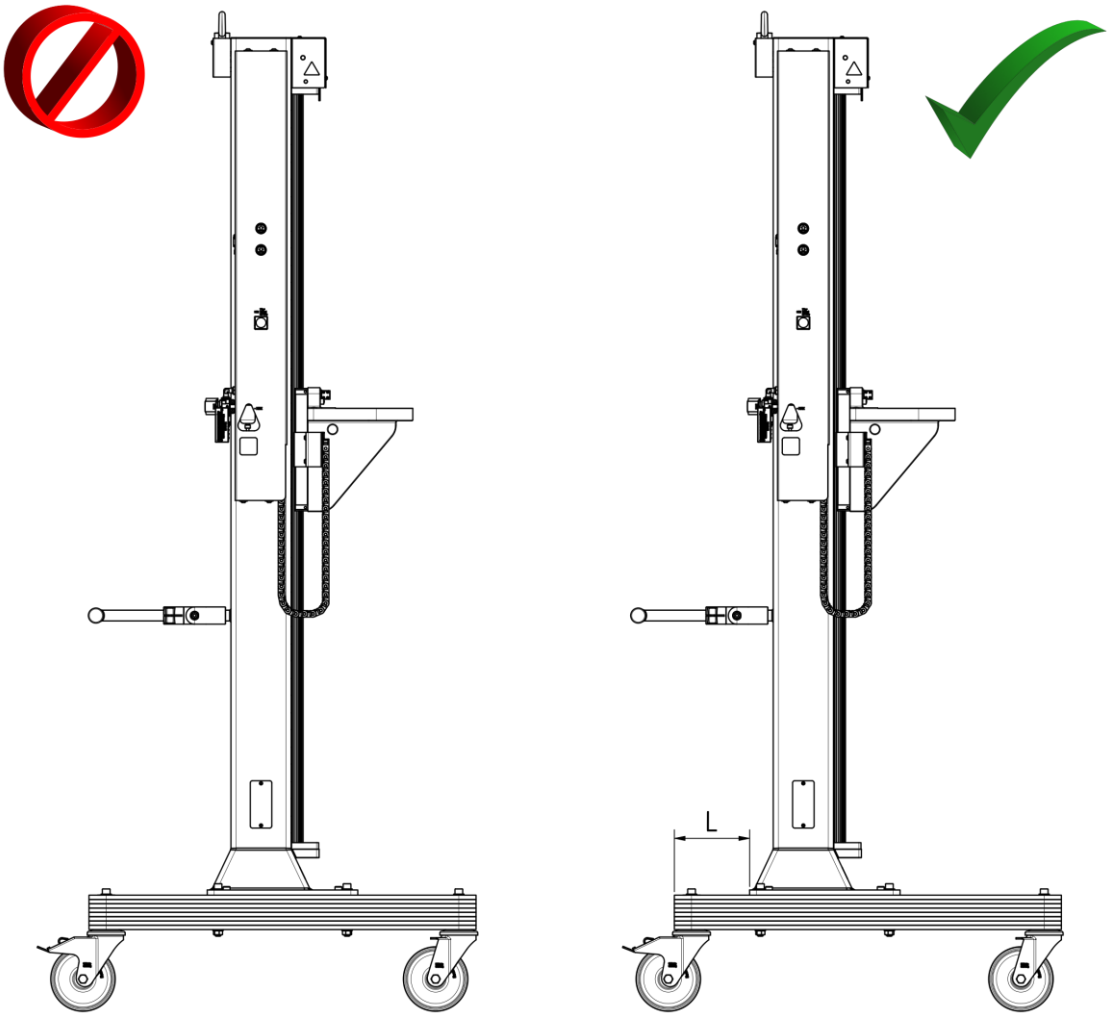
INSTALLATION SITE

The elevator must be installed on a horizontal floor with a minimum thickness of 150mm of concrete with resistance 30N/mm^2 (C25/30).
Furthermore, the ground must be flat and properly levelled.
In case of special applications, consult the contractor (mason).
Do not install the equipment in environments such as:

- ✓ *Areas with explosion or fire hazards*
- ✓ *Exterior areas*
- ✓ *Corrosive areas*
- ✓ *Areas with extreme temperatures (very high or very low)*
- ✓ *Areas with high humidity*
- ✓ *Areas with high electromagnetic emissions*

5.1 INSTALLATION SAFETY CONSIDERATIONS

When the D100 Column is installed on the trolley, ensure it is correctly placed, as detailed below.



INSTALLATION

- ✓ The column must be installed 100 mm from the centre of the trolley.
- ✓ For safety reasons, verify that the indicated measure L corresponds to the values shown in the following table before finalising the installation. Note that the distance L must be measured from the side which has the wheels with the brake lever.

L Values:

	L (mm)
Carriage 700x700	75 mm *(2.9")*
Carriage 800x800	125mm *(4.9")*
Carriage 900x900	175 mm *(6.8")*

6 ADJUSTMENTS

6.1 6.1UP-DOWN SPEED SETTING19

It is possible to regulate the up and down speed to suit the working conditions.

6.1.1 Previous

1- Shut off the air supply by closing the valve (1).
2- Remove the protective cover (2), previously removing the screws (3) that hold it in place.
3- Resume air supply by opening the valve (1).

6.1.2 Upward movement regulation

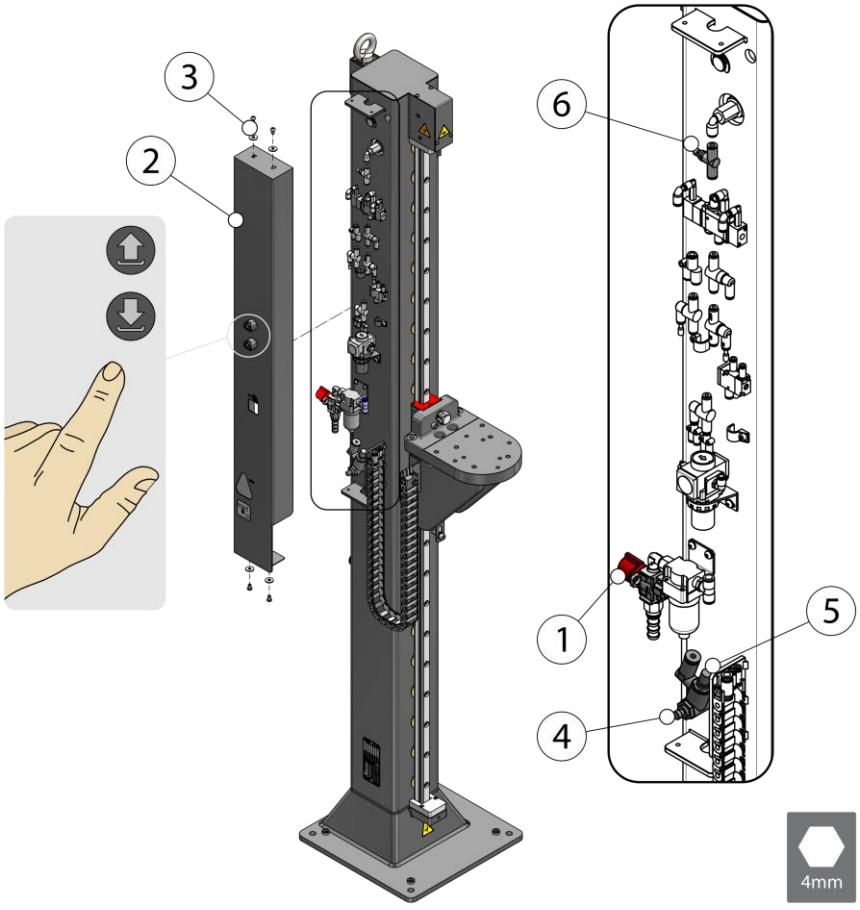
1- Adjust the pressure gauge to suit the working load.
2- Close or open the exhaust regulator (4) until a suitable rate of ascent is achieved.

6.1.3 Downward movement regulation

1- Regulate the pressure between 2-3 bar of the pressure regulator (5).
2- Close or open the exhaust regulator (6) until a suitable rate of descent is achieved.

MAXIMUM SPEED

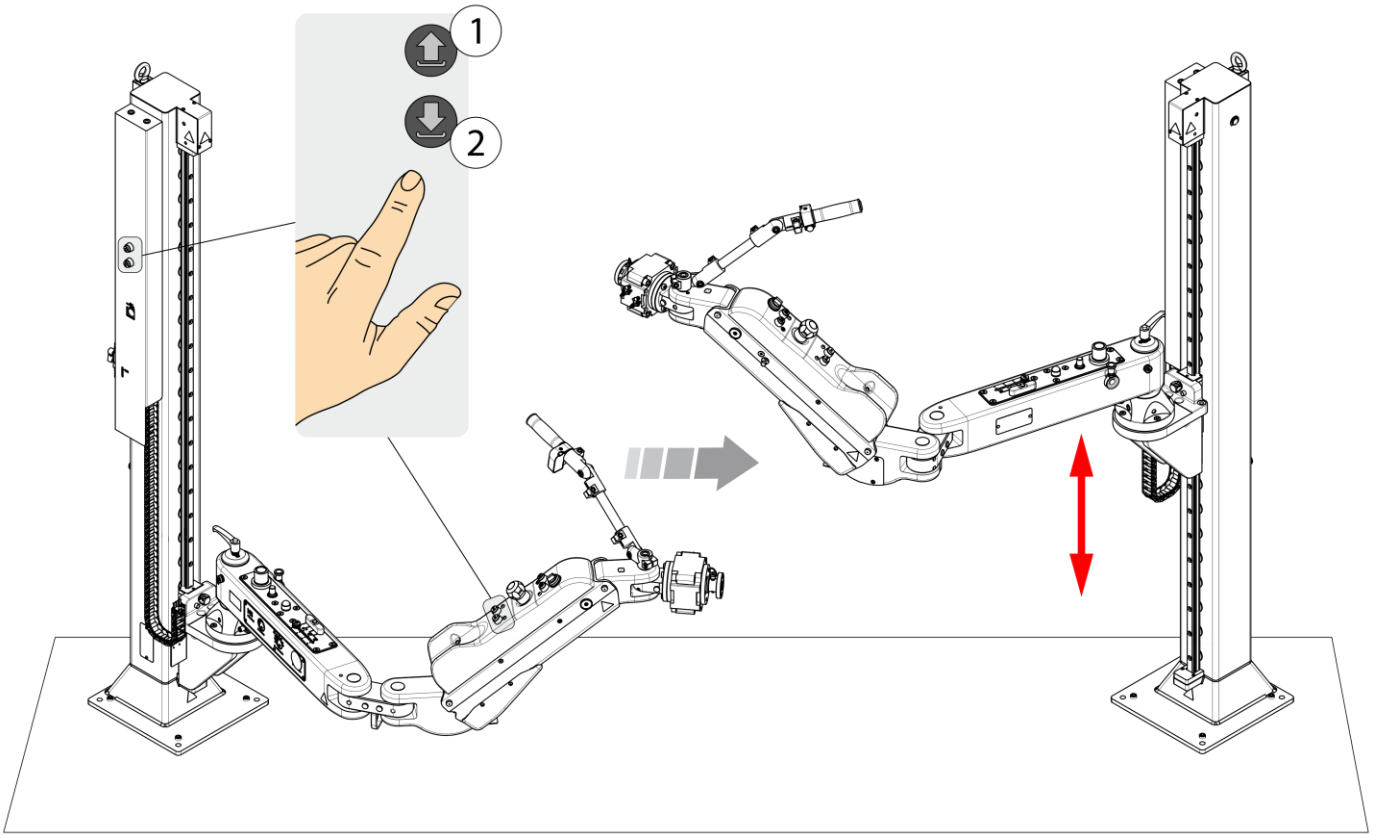
✓ In no case may the maximum speed exceed 9 m/min.



7 OPERATIVE

The column can be operated from the control cover and its 3Arm® equipment (double drive).

Press and hold the button (Black or White) until the appropriate position is reached:
- Push-button (1): Upward movement.
- Push-button (2): Downward movement.



CAUTION

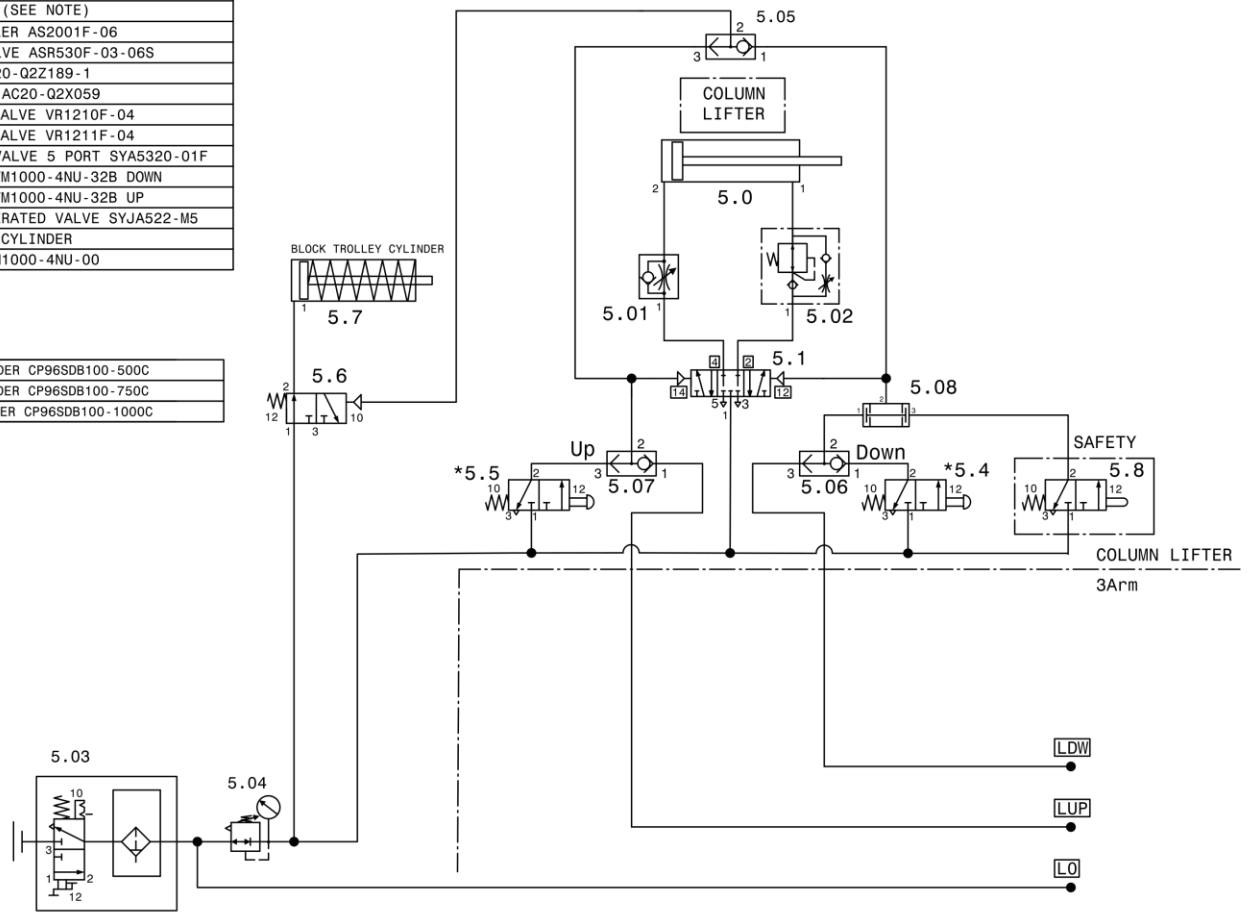
- ✓ It is recommended to hold the black push-button (1) in order to fill the piston with air a little and thus avoid an abrupt descent at the beginning of the downward movement.
- ✓ During periods of prolonged inactivity, the support platform must be positioned at the lower end of the column.

7.1 PNEUMATIC DIAGRAM

REF	QUANT	CODE	DESCRIPTION
5.0	1	-	COLUMN LIFTER (SEE NOTE)
5.01	1	NH027746	SPEED CONTROLLER AS2001F-06
5.02	1	NH113500	AIR SAVING VALVE ASR530F-03-06S
5.03	1	NH123100	AIR FILTER AC20-Q2Z189-1
5.04	1	CL128200	AIR REGULATOR AC20-Q2X059
5.05-5.07	3	NH026196	FUNCTION "O" VALVE VR1210F-04
5.08	1	NH101300	FUNCTION "&" VALVE VR1211F-04
5.1	1	CL106300	AIR OPERATED VALVE 5 PORT SYA5320-01F
5.4	1	M3171800	BUTTON VALVE VM1000-4NU-32B DOWN
5.5	1	M3153100	BUTTON VALVE VM1000-4NU-32B UP
5.6	1	CL106200	3 PORT AIR OPERATED VALVE SYJA522-M5
5.7	1	MV405504	BLOCK TROLLEY CYLINDER
5.8	1	NH030236	MICRO VALVE VM1000-4NU-00

NOTE:

1500	NH118600 - AIR CYLINDER CP96SDB100-500C
2000	NH102800 - AIR CYLINDER CP96SDB100-750C
2500	NH115200 - AIR CYLINDER CP96SDB100-1000C



DESCRIPTION	CODE
PNEUMATIC SCHEME D100 COLUMN LIFTER DUAL CONTROL	CL137100-PN

*	Buttons 5.4 and 5.5 changed.

	NAME	DATE	REVISION
DRAWN BY	OSCAR	24/11/2021	2
APPROVED BY	D. Gil	15/09/2022	

TECNOSPIRO MACHINE TOOL SLU

8 MAINTENANCE

8.1 MAINTENANCE LOCKING SYSTEM

In the event of a malfunction of the linear guide carriage locking system, carry out the following checks in the order in which they are presented.

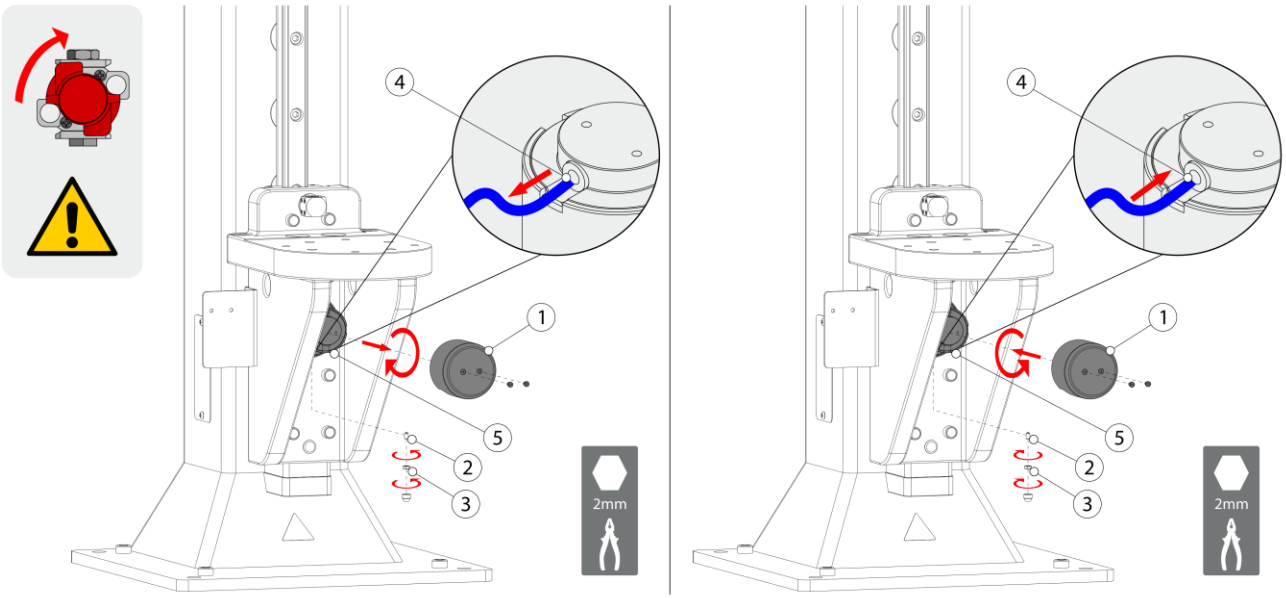
8.1.1 Air under delivery check

- Check that the sub-supply pressure must be 6-7 bar.
- Verify that the pressure gauge is in good condition and set to a range of 6-7 bar.
- Verify that the locking cylinder receives air.

8.1.2 Pneumatic cylinder adjustment

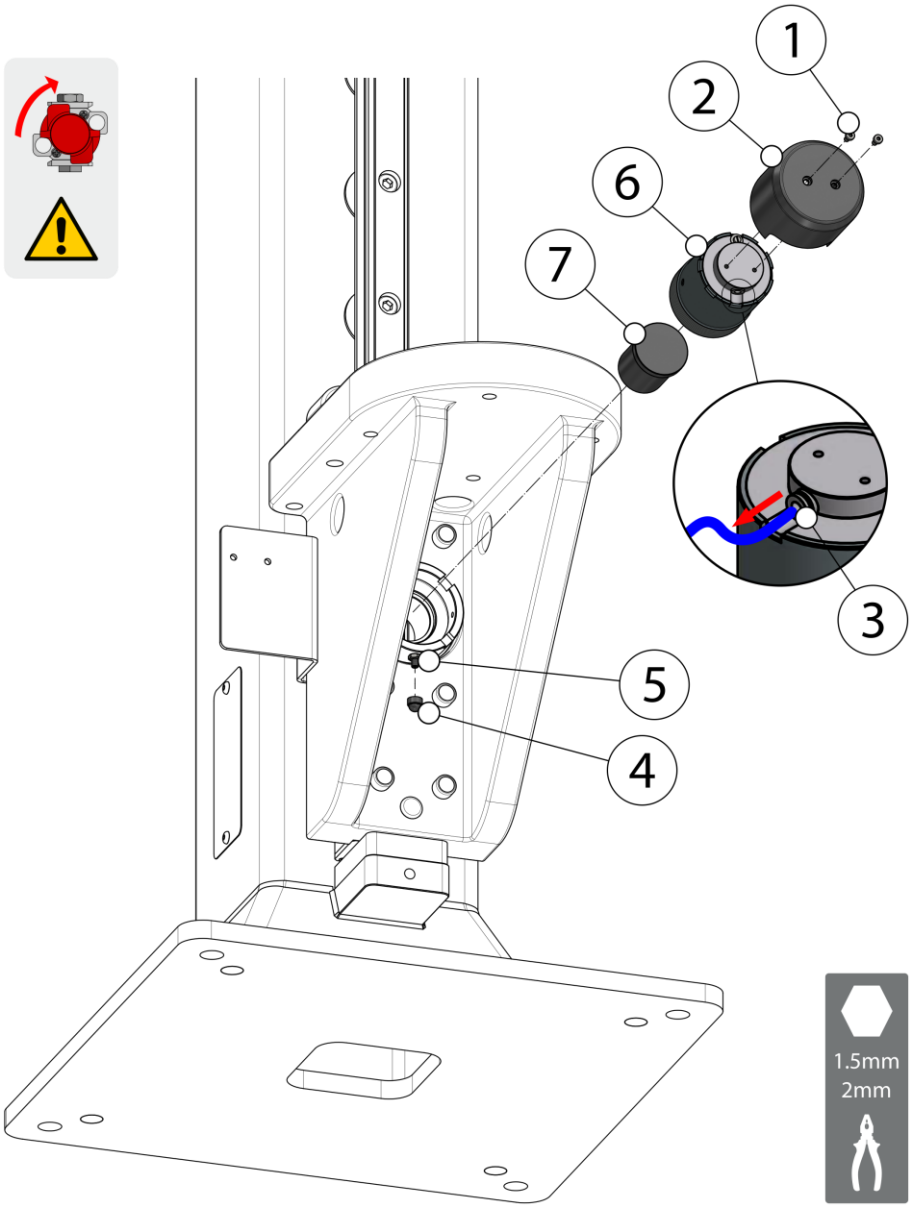
Follow the steps below to adjust the pneumatic locking cylinder.

1. Release the air pressure in the column.
2. Remove the cap (1), previously removing its screws (Allen key 2 mm) and disconnect the air supply tube (4).
3. Loosen the nut (3) and the stud bolt (2). (Allen key 2 mm).
4. Screw the cylinder (5) clockwise until it stops.
5. Slightly unscrew the cylinder (5) anticlockwise (approx. 1/12 turn).
6. Replace the stud bolt (2) and nut (3), the feeding tube and insert the cap (1) and its screws.
7. Connect the column to the air sub-supply and check the locking function again.



8.1.3 Replacement of the locking cylinder and/or pads

1- Release the air pressure in the column.
2- Remove the screws (1) (2mm Allen key) and remove the cap (2).
3- Disconnect the air supply tube from the coupling (3) that supplies the cylinder.
4- Remove the cap (4) and loosen the screw (5) (1.5mm Allen key).
5- Unscrew the cylinder (5) and remove it.
6- Remove the pad (7) and replace it if necessary.
7- Screw the cylinder assembly (7) all the way on and unscrew it slightly, anticlockwise (approx. 1/12 turn).
8- Tighten the screw (5) (1.5mm Allen wrench) and place the cap (4).
9- Reconnect the cylinder supply tube (3), replace the cap (2) and tighten the screws (1) (2mm Allen key).
10- Turn on the air pressure and check the operation of the lock.



8.2 LINEAR GUIDING SYSTEMS (Rails, skids, ...)

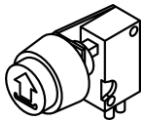
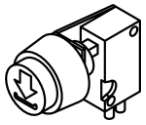
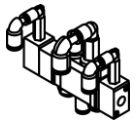
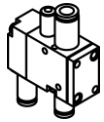
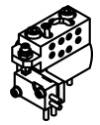
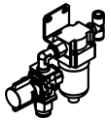
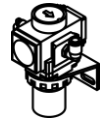
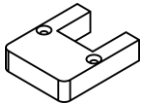
As with any other bearing, linear guides need a sufficient supply of lubricant. In theory, both oil and grease can be used for lubrication. Lubricants reduce wear, protect against contamination, reduce corrosion and their properties extend service life. Dirt can accumulate on unprotected rails. This dirt must be removed periodically.

Check the surface of the rails weekly to ensure regular periodic cleaning.
Grease skids approximately every 50 km of travel.

8.3 MAINTENANCE PROGRAMME

DESCRIPTION ITEM	ACTION	PERIOD
Greasing and lubrication of skids	Add about 5 cm^3 of universal lithium grease to each side lock.	Every 50kms or every year, whichever occurs first
Cable condition	Inspect the two cables that hold the support platform, especially at their anchor points, check the condition of the cable along the route making sure that there are no signs of deterioration or frayed, bent or crushed sections. If the cable is in bad condition you must contact your 3Arm® dealer to arrange a replacement.	Before each use
Cable cleaning and greasing	Position the support platform on its lower part, clean the visible part of the cable and then lightly grease both cables using universal lithium grease.	Annually
Filter regulator with pressure gauge	Detection of breaks, scratches or any deterioration of the transparent resin vessel on the air filter, regulator periodically. - Replace the filter cartridge every 2 years or when the pressure drop is 0.1 MPa, whichever occurs first. Remove moisture before it reaches maximum capacity. Manually open and close the air filter bleed tap. Using tools can damage the product.	Periodically
Screws and fasteners	Check tightening and functionality of the securing elements.	Periodically.
General cleaning	When dirty, clean with a mild household product. Do not use other cleaning agents, as they may cause damage.	Periodically.
General check of the pneumatic circuit and pneumatic connections	Carry out a general check of the fixings and housings between tubes. Check there is no air leakage and that the connectors are working correctly.	Periodically

9 SPARE PARTS

CODE	DESCRIPTION	PICT.	CODE	DESCRIPTION	PICT.
M3153100R	UP PUSH-BUTTON		**M3171800R**	DOWN PUSH-BUTTON	
CL106300R	5-WAY ACTUATED VALVE		**NH027746**	FLOW REGULATOR	
CL106200R	3-WAY ACTUATED VALVE		**NH026196**	SELECTOR VALVE "O	
NH101300	"Y" SELECTOR VALVE		**CL142900R**	SAFETY BRAKE	
MV405504	LOCKING CYLINDER		**MV405903**	CLAO COVER CIL 42	
NH123100	SAFETY VALVE AND FILTER		**CL128200**	AIR REGULATOR	
CL112900	SILICON STOPPER D100		**NH113500**	FLOW REGULATOR	
CL01A305R	PAD COLUMN		**CL150500R**	ANTI-TWIST STOPPER (M5 and S7)	

10 GUIDELINES FOR PACKAGING, TRANSPORT AND DISMANTLING

10.1 PACKAGING

Follow the instructions below for packing the machine for location changes or shipments for repair and maintenance.

10.1.1 Preparatory measures

The machine must be set to out of service mode. Assembling the "transport safety elements" will prevent movement during transport and thus possible damage to the installation. Block the movement of the carriage.

10.1.2 Choice of packaging

For long transport distances, the components of the production installation must be packed in such a way that they are protected from atmospheric conditions.

10.1.3 Packaging inscriptions

Observe the specific provisions of the country in which the equipment is transported. In fully closed packaging, an indication must be placed on the packaging indicating where the top is.

10.1.4 Packaging procedure.

Place the components of the machine on manufactured wooden pallets. Use lashing straps to ensure the components are secured against possible falls. Attach all the technical documentation that must accompany the machine.

10.2 TRANSPORT

The following data must be taken into account for transport.

- ✓ External dimensions depending on the segment (width x height x depth), approx.
- 1500 D100: 1632x682x452mm
- 2000 D100: 2132x682x452mm
- 2500 D100: 2632x682x452mm

- ✓ Total weight depending on the segment: approx.
- 1500 D100: 125 Kg
- 2000 D100: 150 Kg
- 2500 D100: 176 Kg

10.3 DISASSEMBLY

- ✓ The equipment must be taken out of service by duly trained and authorised personnel.
- ✓ The machine must be dismantled taking the safety instructions, waste disposal and recycling into account.
- ✓ Protect the environment. The machine must be disposed of pursuant to current regulations and guidelines on safety, noise prevention, environmental protection and accident prevention.

11 3ARM COMPATIBILITY TABLE

Accessory	SERIES – 3arm								
D100 Column	S0	S1	S2	S3	S4	S6	S7	M3	M5
	●	●	●	●	●	●	●	*	●

12 COMPATIBILITY TABLE ACCESSORIES

	COLUMN D100
EXTENSION 600	●
EXTENSION 1000	*
TROLLEY	●
COLUMN PR	⦸
LIFT PR	⦸
FLOOR RAIL	●

● = Compatible
⦸ = NOT Compatible
* = Please ask

COMPATIBILITY

✓ The equipment has been designed to be used in conjunction with 3arm® products as well as compatible 3arm® accessories. The manufacturer assumes no liability for damage resulting from the use of the equipment for other purposes.

13 ADDITIONAL ACCESSORIES

COMPRESSOR	
A compressor can be supplied together with the D100 column assembly and the forklift truck to supply air to the D100 column without the need for a compressed air installation. The compressor offers an autonomy of two continuous job cycles (2 up + 2 down), thanks to its 4-litre boiler.	

SAFETY CONSIDERATIONS - ACCESSORIES

TROLLEY: Possible movements of the column due to the incorporation of the trolley must be taken into account; the floor must be well levelled to avoid drifting of the equipment. Appraise (end customer) the need to interlock the brakes according to the work to be performed and the possible risks due to these movements.

RAIL FLOOR: The possible movements of the column due to rail mounting must be taken into account: the floor must be well levelled to avoid drifting of the equipment. Evaluate (end customer), the need to lock the brakes according to the work to be performed and the possible risks due to these movements.

TROLLEY WITH COMPRESSOR: The possible movements of the column due to the incorporation of the trolley must be taken into account; the floor must be well levelled to avoid drifting of the equipment. Evaluate (end customer) the need to interlock the brakes according to the work to be performed and the possible risks due to these movements. See the compressor manufacturer's instruction manual supplied with your order.

CE STATEMENT OF COMPLIANCE

The manufacturer:

Company:	TECNOSPIRO MACHINE TOOL, S.L.U.
Address:	P.I. Pla dels Vinyats I, s/n nau 1
City:	Sant Joan de Vilatorrada
Country:	Spain - EU

Declares that this product:

Designation:	Lift
Model:	D100 Column
Serial number:	001-011 - and consecutive

It is classified as a machine according to the Machinery Directive 2006/42/EC and to which this Declaration refers, and complies with the following European EC Directives, and their applicable Essential Health and Safety Requirements (EHSR):

2006/42/EC – Machinery Directive

2014/68/EU – Pressure Equipment Directive

Authorised for documentation:

Mr Ramon Jou Parrot of TECNOSPIRO MACHINE TOOL, S.L.U.

Sant Joan de Vilatorrada, Wednesday, 22 February 2023

Ramon Jou Parrot, Technical Director