



BENCHTOP 24V D-ROBOTS OPERATION MANUAL

Table of Contents

SECTION 1: INTRODUCTION	3
1.1 INTRODUCTION.....	4
1.2 SAFETY PRECAUTIONS	4
1.3 PACKAGE CONTENTS.....	5
1.4 CONNECTOR AND SWITCH LOCATIONS.....	6
SECTION 2: MACHINE SETUP	11
2.1 UNPACKING THE ROBOT.....	12
2.2 SETUP.....	12
SECTION 3: EQUIPMENT OPERATION	13
3.1 USING THE TEACH PENDANT.....	14
3.2 CHANGING THE PROGRAM NUMBER.....	17
3.3 CHANGING FROM TEACH MODE TO RUN MODE	17
SECTION 4: BASIC ERROR MESSAGES AND RESOLUTION	18
4.1 <i>Point Closed Error</i>	19
4.2 <i>Need Line Start Point</i>	19
4.3 <i>Need Step & Repeat</i>	19
4.4 <i>Unlock Program</i>	19
4.5 <i>Address Over Memory</i>	20
4.6 <i>Move Over Memory</i>	20
4.7 <i>System Error</i>	20
4.8 <i>Over Speed Error</i>	20
SECTION 5: SPECIFICATIONS.....	21
5.1 I/O SPECIFICATIONS	22
5.2 SYSTEM SPECIFICATIONS.....	29
5.3 MACHINE DIMENSIONS	30
SECTION 6: MAINTENANCE, ACCESSORIES & SPARE PART.....	36
6.1 MAINTENANCE.....	37
6.2 ACCESSORIES & SPARE PARTS	39
SECTION 7: EQUIPMENT WARRANTY.....	40
7.1 EQUIPMENT WARRANTY	41

SECTION 1: Introduction

1.1 Introduction

Welcome to the Henkel Benchtop Robots operation manual, this manual is an instructional guide designed for system operators, technicians and engineers. It provides a complete tour for how to operate the Henkel Benchtop Robot.

Please check the Henkel Benchtop Robot software manual 8902886 if you need instructions for how to program.

1.2 Safety Precautions

In order to meet the requirements of the European Community (CE) safety directives, the robot must be placed in an enclosure¹ supplied by Henkel.

- 1.1 Make sure the robot is connected to a properly grounded power source before operating.
- 1.2 Keep away from any moving parts while the robot is running.
- 1.3 Loading and unloading of parts and material must only be done when the robot is at a complete stop.
- 1.4 Changing of fixtures or tooling must be done with the power source disconnected.
- 1.5 The robots should only be operated in an environment between 0 and 40 degrees Celsius with humidity of 20 to 95 percent and no visible condensation.
- 1.6 Do not store or setup the robot in an area where it is directly exposed to sunlight.
- 1.7 Do not operate the robot where electrical noise is present.
- 1.8 Only use a neutral chemical for cleaning the robot. Do not use alcohol, benzene or thinner as it may damage the paint on the robot.

¹ The light curtain enclosure or safety door enclosure will prevent the operator from entering the robot's work area and will generate an emergency stop signal if the light curtain is interrupted or the enclosure's door switch is opened while the robot is running.

1.3 Package Contents

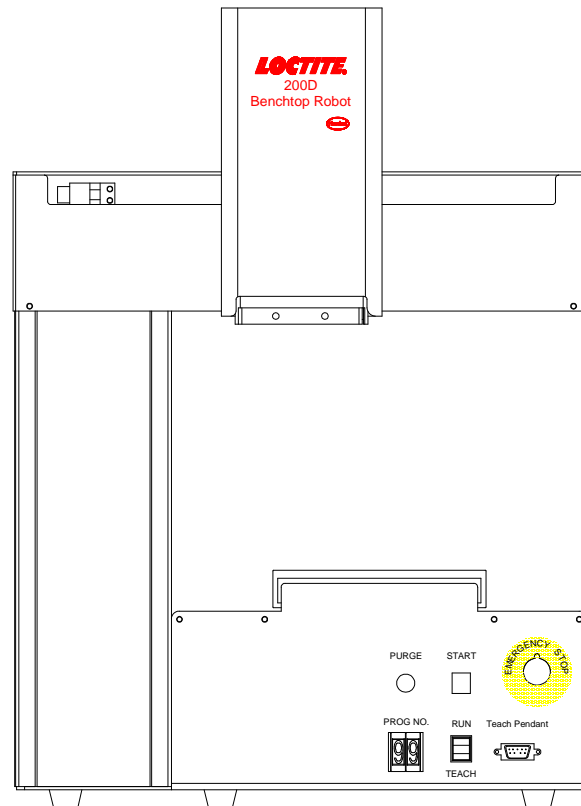
In addition to this operating manual, the following items should be included with the robot:

1. Main Unit (200D/300D/400D/500D)
2. Syringe Holder, 30-55ml, Fixed
3. External Control Shorted Connector
4. Dispensing Cable
5. Mounting Screw for Syringe Holder
6. Power Cord
7. USB memory stick

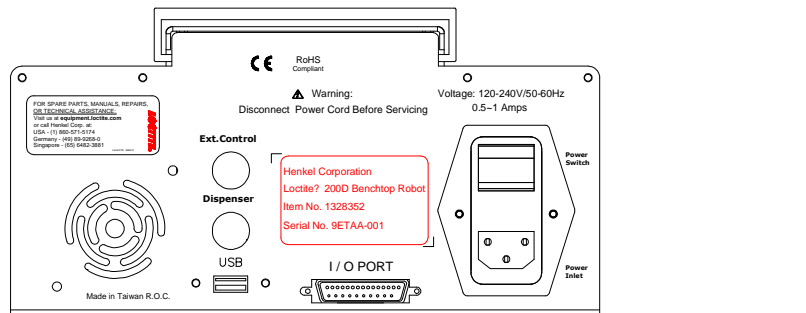
1.4 Connector and Switch Locations

1.4.1 200D

Front View

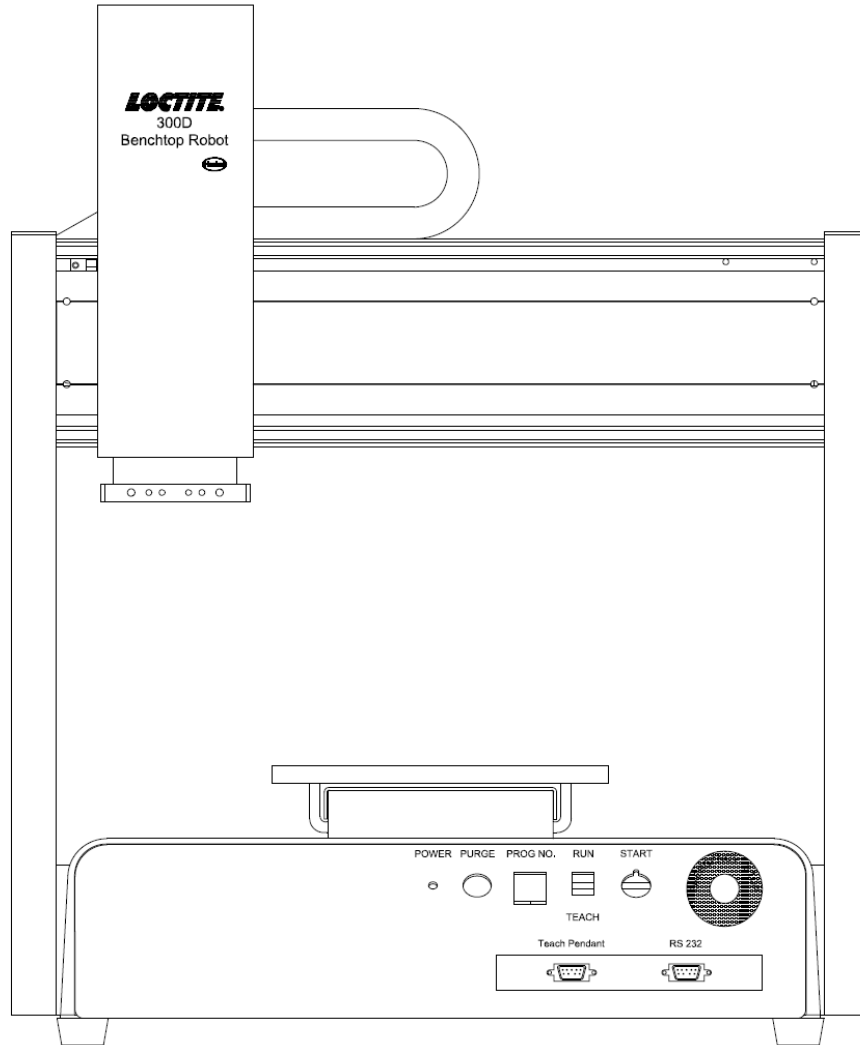


Rear View

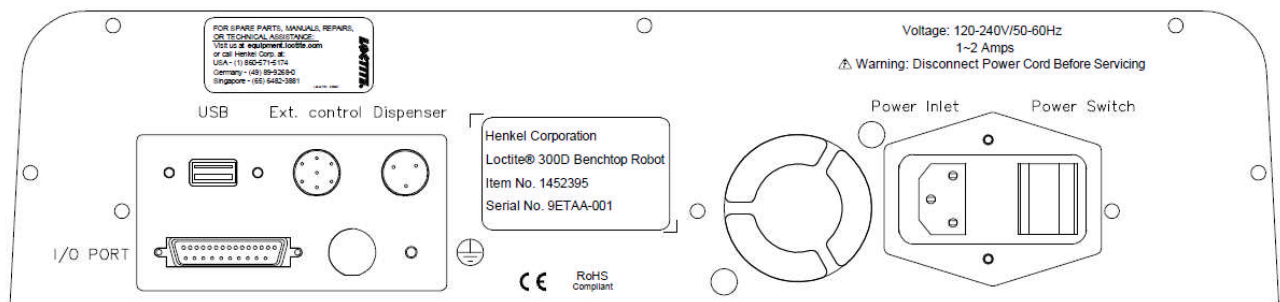


1.4.2 300D

Front View

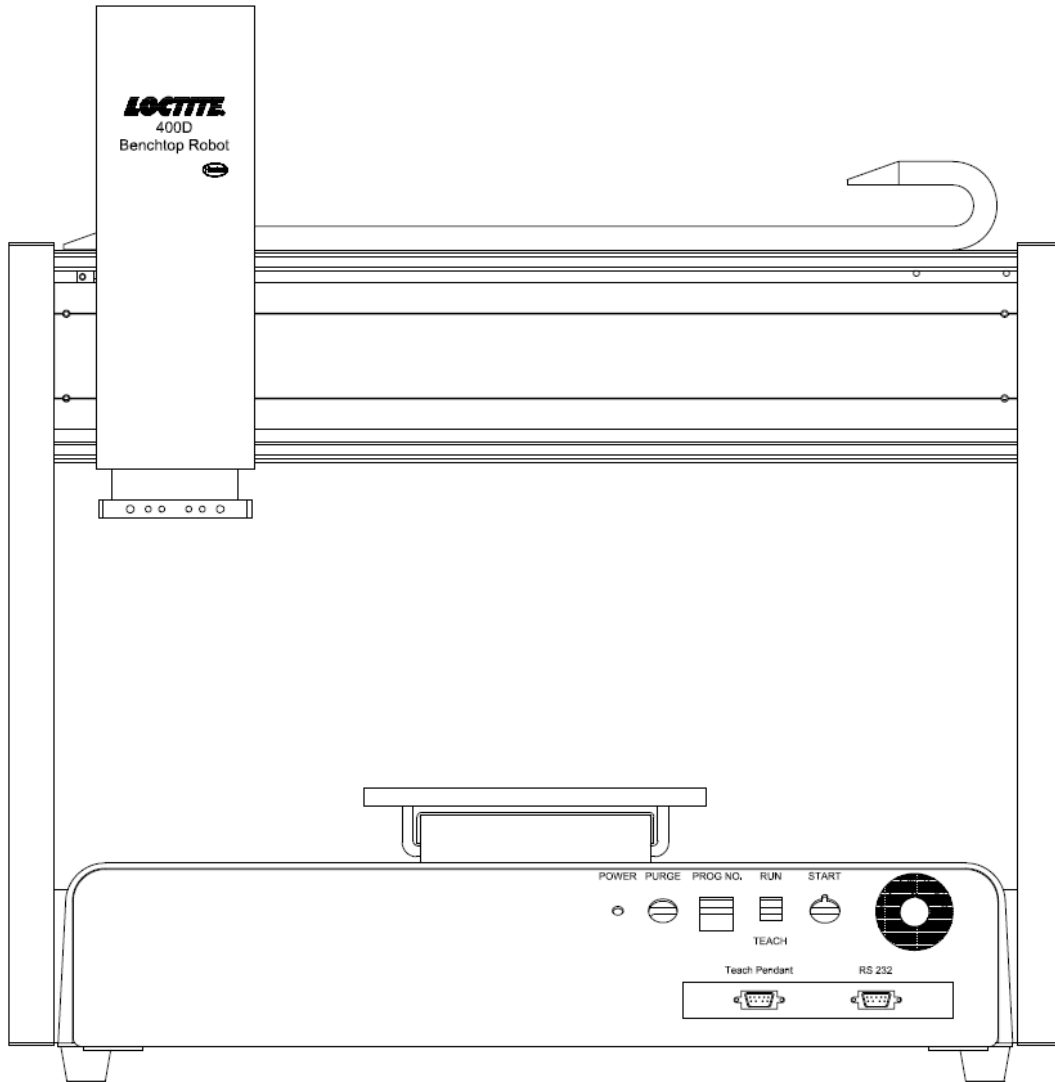


Rear view

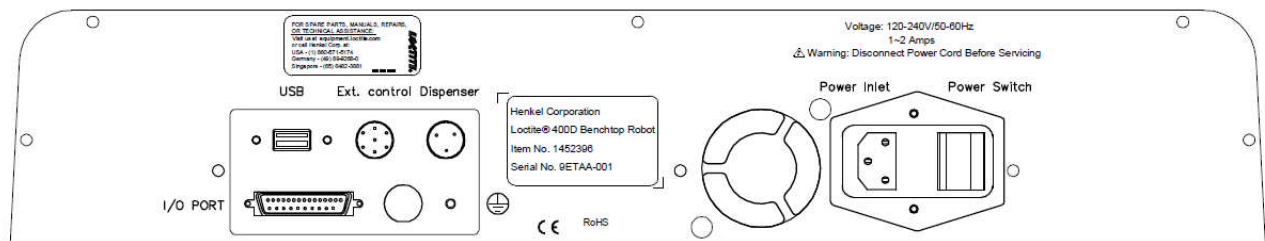


1.4.3 400D

Front View

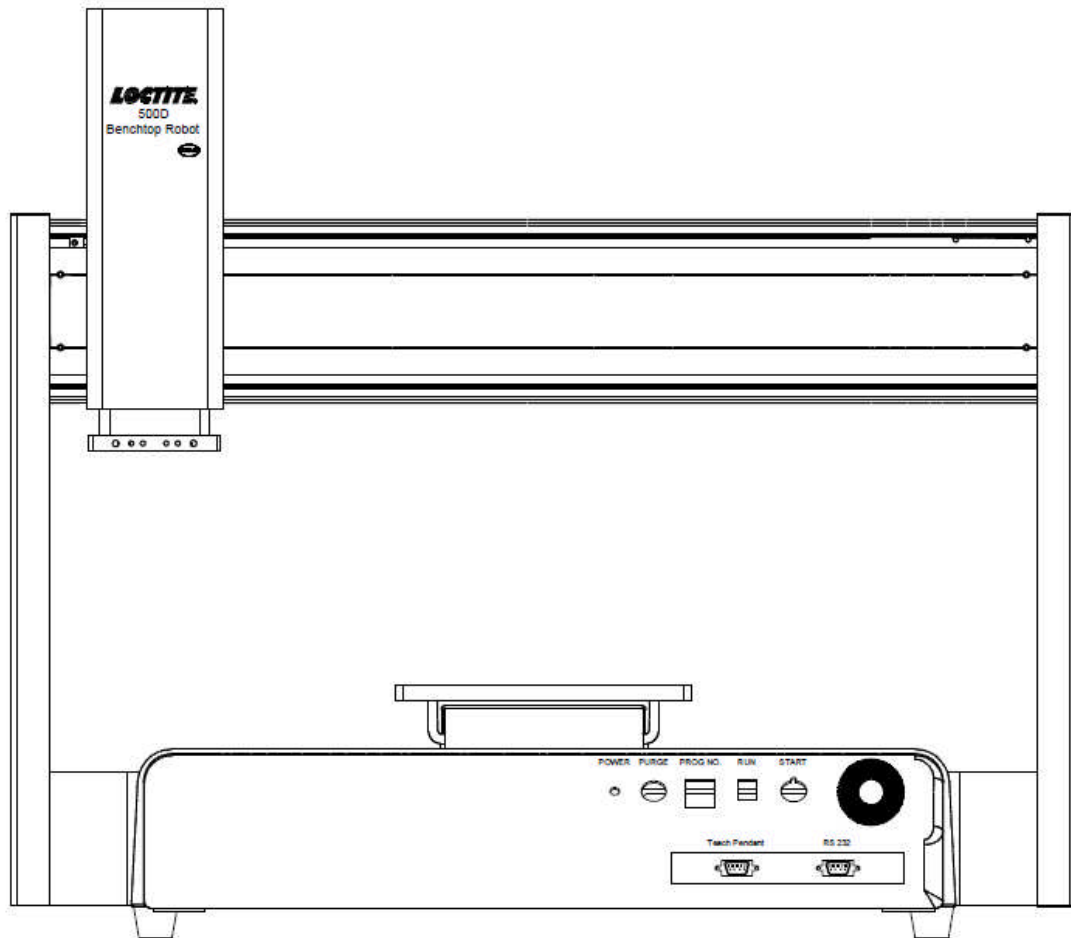


Rear View

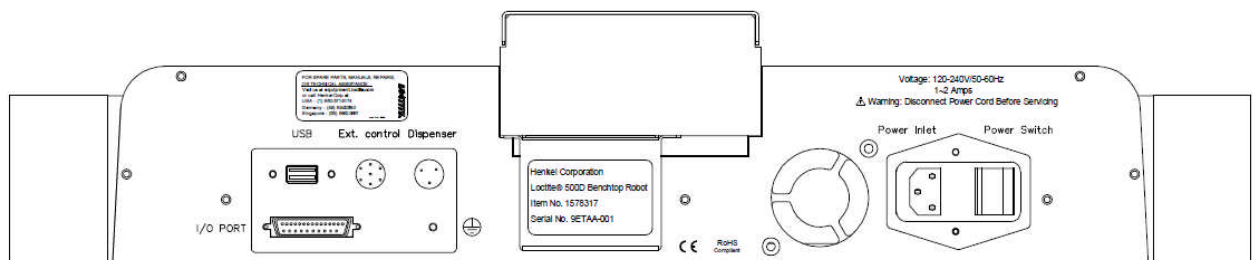


1.4.4 500D

Front View



Rear View



SECTION 2: Machine Setup

2.1 Unpacking the Robot

- Always lift the robot from its base. Never lift the robot from the cross member.
- Remove all accessories from the shipping package before attempting to remove the robot.
- Place the robot on a stable workbench before operating

If you can, do not discard the packing material as these items may be needed if the robot is shipped or moved in the future.

2.2 Setup

The robots are available with different configurations. The setup of each machine with its accessories will depend on the customer's application.

1. Connect the external start / stop box and door switch or light curtain to the External Control connector on the main unit. For further information, see **SECTION 5.1.2: External Control Connector**.

If an enclosure is NOT being used, the enclosure door switch may be bypassed by connecting the plug labeled SHORTED (included in the robot accessories box) to the External Control Connector.

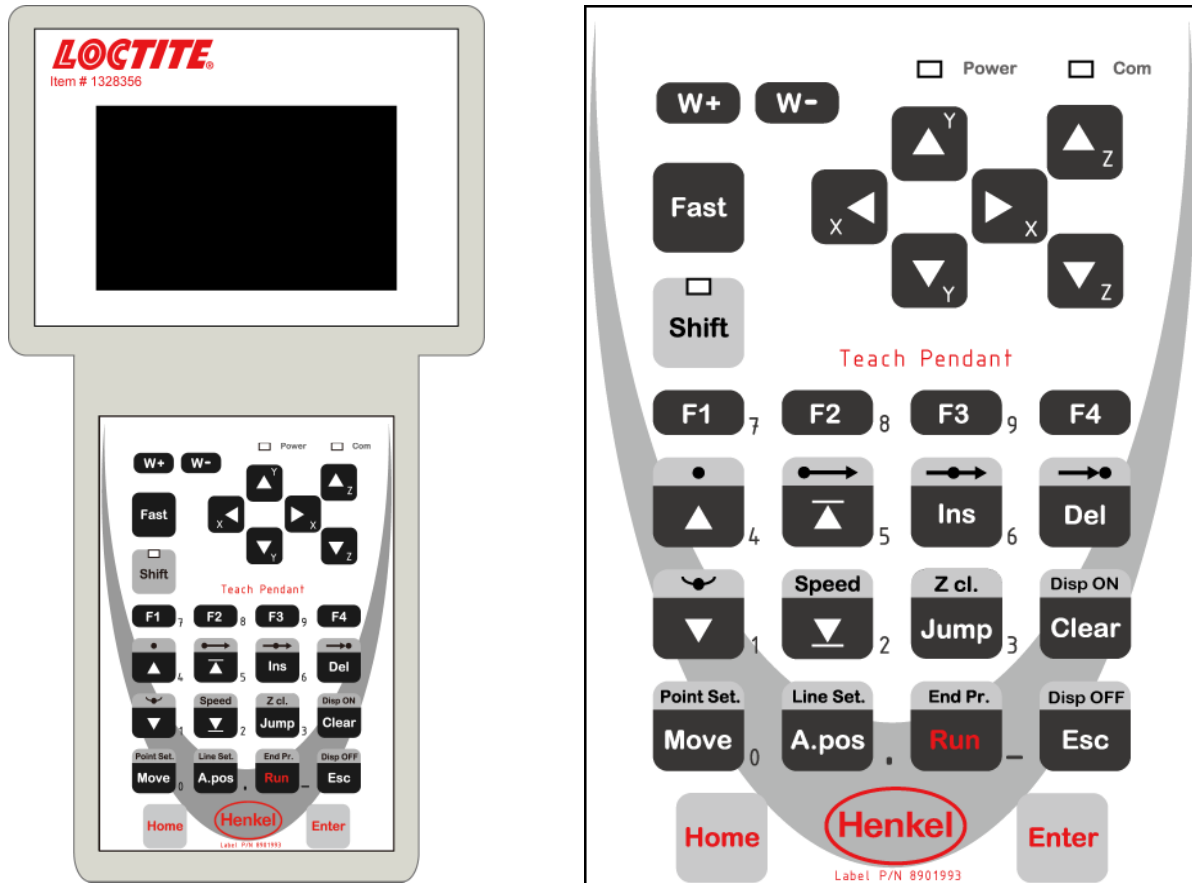
2. Remove the *shipping bracket*² by removing the screws that secure it. Keep the shipping bracket and screws in a safe place for future use.
3. Connect one end of the Teach Pendant cable to the Teach Pendant and the other end to the Teach Pendant connection on the robot.
4. Connect the power cord of the robot to the power socket on the robot. Be sure to use the correct power cord and power source for the robot model you are using (110 V or 220 V).
5. Tie back all cables and air lines so that they will not interfere with the robot's motion when the robot is operating. Be sure that the cables and air lines do not restrict the motion of the robot's head and the robot's table and make sure that they can not become jammed as the robot moves through the work area.

²The robots are shipped from the factory with a shipping bracket installed. The shipping bracket secures the worktable to the X/Z head to prevent movement and damage during shipment.

SECTION 3: Equipment Operation

3.1 Using the Teach Pendant

The teach pendant enables the user to jog robot to input program data.







3.1.1 Key Selection








There are several functions assigned to most keys on the Teach pendant. When a key is pressed alone, the function shown in the dark grey colored area on the key is executed. For example, **Ins**, **Del**, **Jump**, **Clear** and **Esc** are the default key functions, which are executed when that key is pressed alone.



To access the function shown in the light grey area at the top of a key, press and release the **Shift** key first (the LED on the **Shift** key will be flashing), then press the desired key. For example, to select the **Speed** function, press and release **Shift**, then press the **Speed** key.

When a number is required, the teach pendant will automatically switch to numeric entry mode. The number represented by each key is shown in the lower right corner of the key.






3.1.2 Key Assignments

Menu Keys	
	Opens the Point registration menu Select the options shown on the display
	Opens F2 Menu Select the options shown on the display
	Opens F3 Menu Select the options shown on the display
	Opens the F4 Setup menu Select the options shown on the display

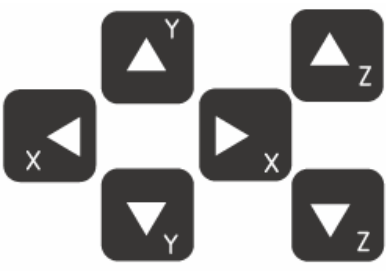

Jog Keys	
	Jogs the X-axis in the left direction.
	Jogs the X-axis in the right direction.
	Jogs the Y-axis in the backward direction.
	Jogs the Y-axis in the forward direction.
	Jogs the Z-axis UP.
	Jogs the Z-axis DOWN.
	Accelerates jog speed – used with X+, X-, Y+, Y-, Z Up, Z Down

Navigation Display	
	Moves forward (1) memory address.
	Moves backward (1) memory address.

3.1.3 Navigation Menu

Once the menu is open, use the up and down arrows to move through the items on the menu.	 
Use left and right arrows to change to the next page or previous page of the menu.	 
Press ENTER to select the current item.	

3.1.4 Jogging

The tip is jogged by pressing the jog buttons	
<p>If the FAST button is pressed and held first, then one of the jog buttons is pressed, the axis will be jogged at the maximum jog speed.</p> <p>If one of the jog buttons is pressed first, then the FAST button is pressed, the jog motion will accelerate.</p> <p>If the FAST button is released, the jog motion will decelerate.</p>	

3.1.5 Data Entry

If a numeric value is required, the teach pendant will automatically switch to numeric mode. Use the keys 0 – 9, (.) and the minus sign (-) to enter numbers.

3.1.6 Running a Program

Press the  key to run the program.

3.2 *Changing the Program Number*

The program number is selected by the program number selection switches on the main unit's control panel.



Press the + and – buttons to select the program number.

Note: Program 99 is designed for “autorun” on Run mode. When starting the robot with this program, the robot starts automatically **without** pressing the Start/Home key for initialization.

3.3 *Changing from Teach Mode to Run Mode*

To change from Teach mode to Run mode, change the position of the mode switch on the main unit's control panel.

When the machine is in Run mode, the teaching box (teach pendant) is not required. Programs can be selected and run using the switches on the front control panel of the main unit.

To get detail information for how to programming and more help for the software, please read Henkel D-Robot Software Manual 8902886.

SECTION 4: Basic Error Messages and Resolution

4.1 Point Closed Error

This message occurs when two adjacent line or arc points are registered at exactly the same XYZ location.

Resolution: Do not register two line points one after the other at exactly the same XYZ location.

4.2 Need Line Start Point

An attempt was made to register a Line Passing point, an Arc point or a Line End point without first registering a Line Start point.

Resolution: Register a Line Start point before registering a Line Passing point, Arc point or a Line End point.

4.3 Need Step & Repeat

The Expand Step & Repeat command was given but there is no Step & Repeat instruction currently in the display.

Resolution: Select the Step & Repeat function you want to expand before selecting Expand Step & Repeat.

4.4 Unlock Program

An attempt was made to edit a program in Teach mode, which is locked. The program cannot be edited until it is unlocked.

Resolution: Unlock the program in **F2 Menu → Utility Menu → Lock Program**.

4.5 Address Over Memory

An attempt was made to copy data but the copy would exceed the maximum memory address.

Resolution: Reduce the data to be copied.

4.6 Move Over Memory

An attempt was made to move data but the move would exceed the maximum memory address.

Resolution: Reduce the data to be moved.

4.7 System Error

This message indicates a problem with the Main PC Control Board.

Resolution: Please contact your dealer.

4.8 Over Speed Error

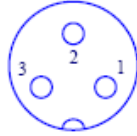
This message indicates the setting speed of the address showed on the screen are over the maximum allow speed for the robot. This error may caused by high speed running for very short path, shaft corner or small arc/circle.

Note: When an error occurs, it will be displayed on the Teach Pendant. If the Teach Pendant is not connected to the robot, you will first have to turn off the robot, then connect the Teach Pendant to the robot for it to properly function.

SECTION 5: Specifications

5.1 I/O Specifications

5.1.1 Dispenser Connector:



<i>Pin #</i>	<i>Description</i>
1	NO
2	COM
3	EARTH

Notes:

The MAXIMUM Current	The MAXIMUM Voltage
12A	125 VAC
7A	250 VAC
7A	30 VDC

5.1.2 Ext. Control Connector:

The pin assignments for the external control connector are as follows:

<i>Pin #</i>	<i>Description</i>
1	Start Signal
2	Start Signal
3	Door Switch (COM)
4	Door Switch (NC)
5	Door Switch (NO)
6	Emergency Stop
7	Emergency Stop

5.1.3 Output Signals

Pin #	Description
14	DISP START OUT -
15	OUT #2
16	OUT #3
17	OUT #4
18	OUT #5
19	OUT #6
20	OUT #7
21	OUT #8
22	RESERVE
23	RESERVE
24	+24V
25	+24V

Output Type: Photo-coupler

Output Power:

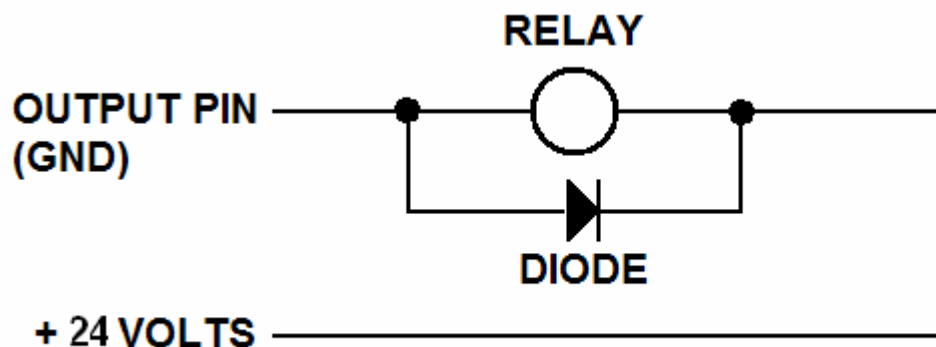
- Output signals are able to provide a maximum of 24 volts.
- Output signals are able to provide a maximum of 250 milliamps per pin.

Function:

- When the output signal is closed, the circuit between the output pin (pin #14 - #21) and the +24 Volt power supply (pin # 24 - #25) is closed.
- The output pin (pin #14 - #21) is connected to the power supply GROUND.
- Pins #24 - #25 are all the same. They are all connected to the +24 volt power supply.

IMPORTANT NOTES:

1. Output signals should be used only to drive external relays. Do not power external devices directly through output signals. Electrical noise will damage the output signal relay.
2. If an inductive load (such as a relay) is connected to an output signal, be sure to install a diode as shown to prevent damage to the output photocoupler:



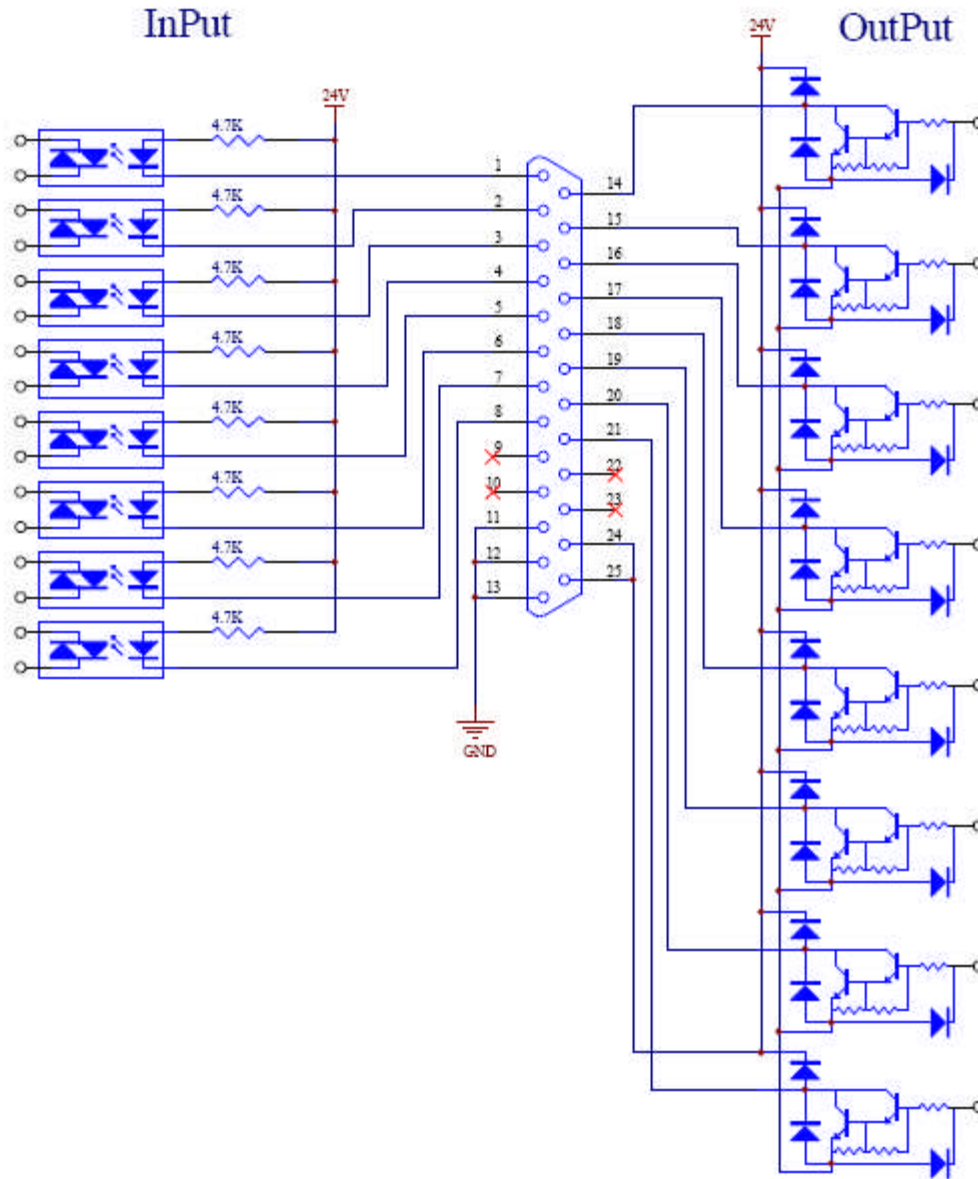
5.1.4 Input Signals

Pin #	Description
1	IN # 1
2	IN # 2
3	IN # 3
4	DISP READY IN +
5	IN # 5
6	IN # 6
7	LOW LEV IN +
8	IN # 8
9	RESERVE
10	RESERVE
11	COM GND
12	COM GND
13	COM GND

Notes:

1. To close an input signal, short the circuit between the input pin (1 – 8) and a GND / ground pin (any pin # 11 - pin 13).
2. Input signals are powered by the robot internal power supply: 24 volts, maximum 50 mA.
3. Check the status of an input signal using the SET I/O command (see *Error! Reference source not found.* - *Error! Reference source not found.*). When the input pin (pin 1 – 8) is connected to a GND pin (pin #11 - #13), the value of the input is 0.

5.1.5 Input / Output Schematic

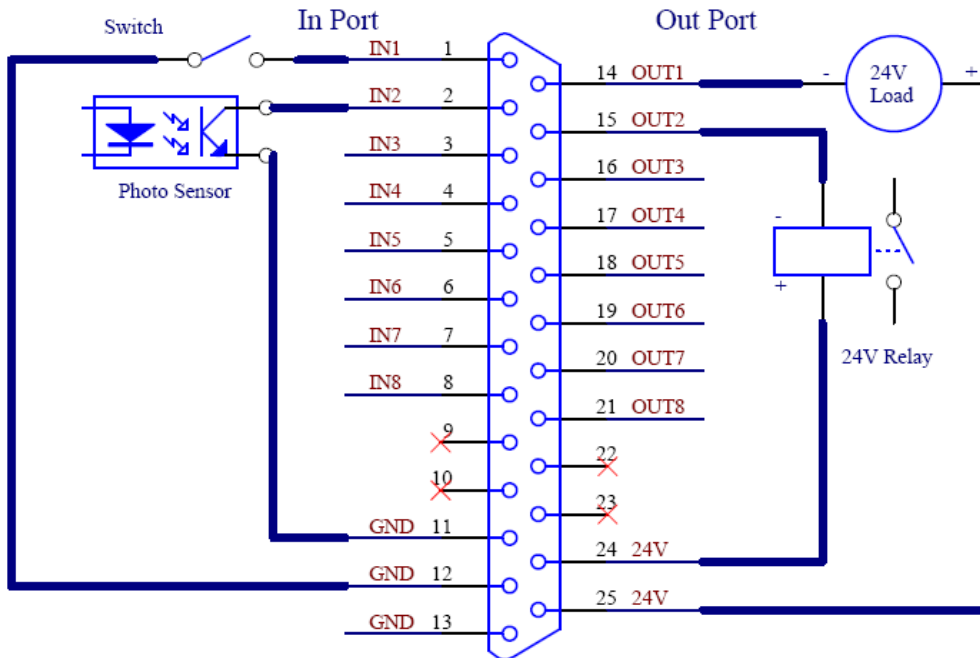


5.1.6 Input / Output Power Specifications

200D/300D/400D/500D		
	Inputs (Internal Power Supply)	Outputs (Internal Power Supply)
MAXIMUM Voltage	24 VDC	24 VDC
MAXIMUM Current	50 mA	250 mA

Example:

IO PORT

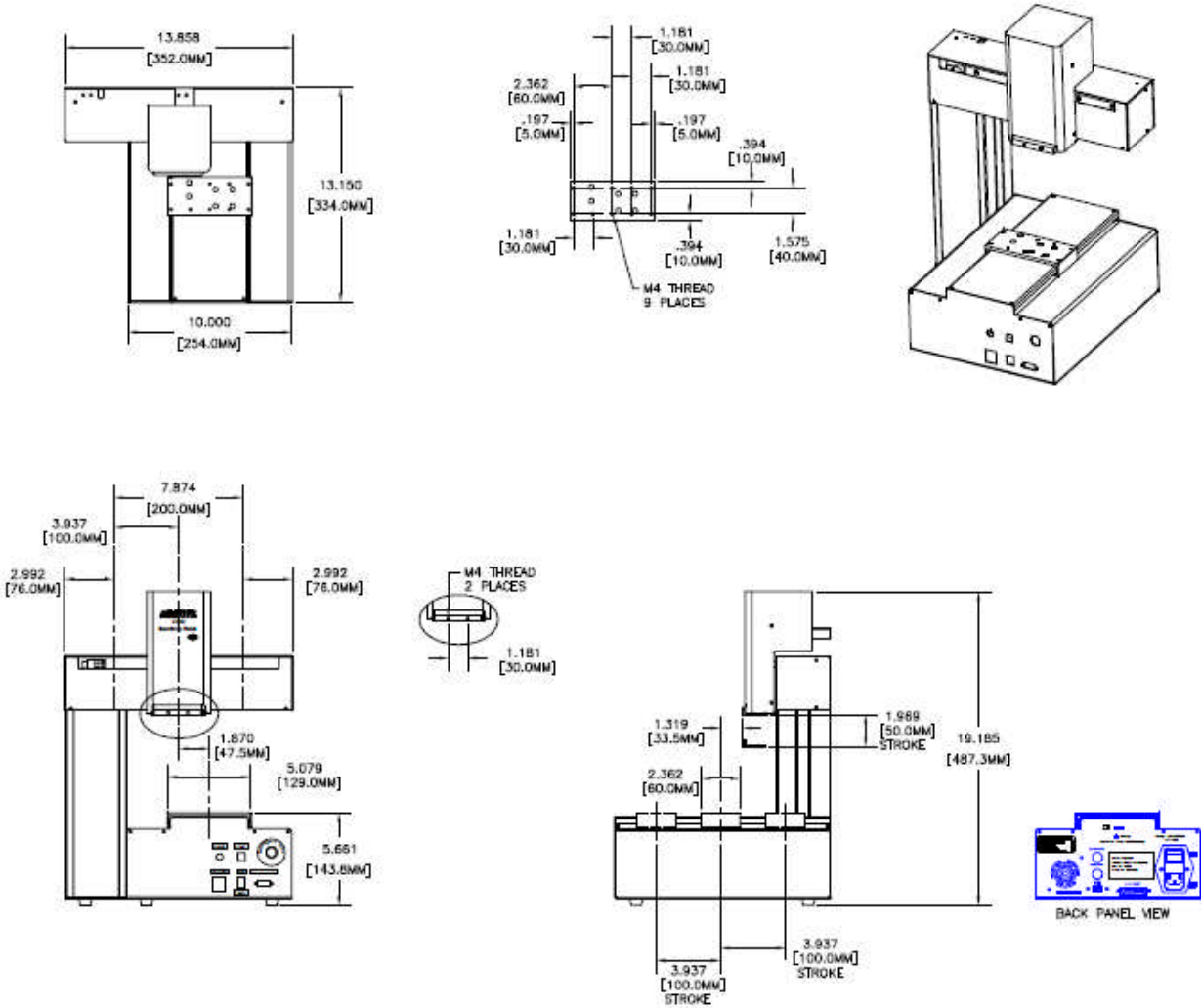


5.2 System Specifications

	200D	300D	400D	500D
Working Area X/Y/Z (mm)	200 / 200 / 50	300 / 300 / 100	400 / 400 / 100	500 / 500 / 100
Load Worktable / Tool	3.0kg / 2.0kg	10.0kg / 5.0kg		
Maximum Speed X&Y/Z (mm/sec)	400 / 200	600 / 320		
Repeatability	+/- 0.04mm/Axis	+/- 0.01mm/ Axis		
Resolution	0.02mm/Axis	0.001mm/Axis		
Data Memory capacity	4000 points/program 100 programs			
Processor	32 Bit			
Display	Teach Pendant LCD			
Drive System /Stepping Motor	Micro stepping 3-Phase			
Motion Control	PTP & CP			
Linear / Circular Interpolation	3 axes			
Teaching Method	Teach Pendant			
I/O Signals	8 Inputs / 8 Outputs			
External Interface	RS232			
Power Supply	Auto-switching: AC95-132V 240W AC180-250V 240W			
Working Temperature	0 – 40 °C			
Relative Humidity (no condensation)	20 – 90%			
Dimensions (WxDxH) (mm)	350 x 330 x 490	485 x 500 x 600	585 x 600 x 600	685 x 701x 600
Weight	18 kg	32 kg	40 kg	45 kg

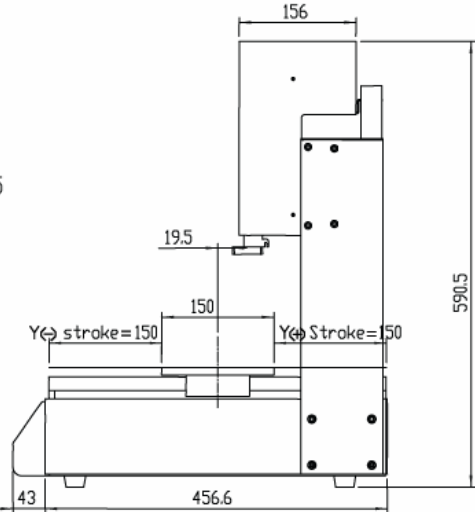
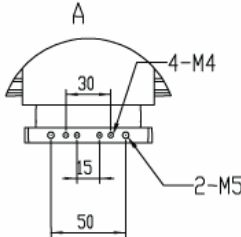
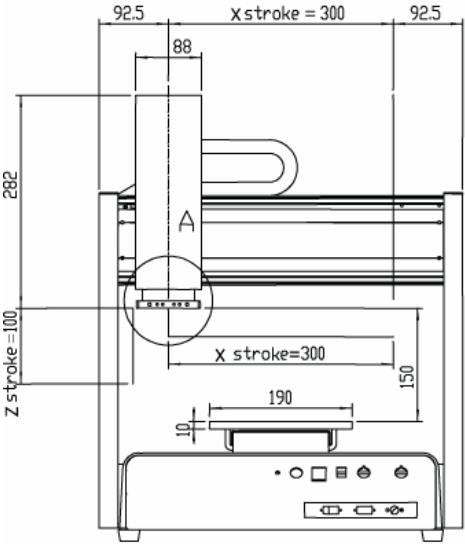
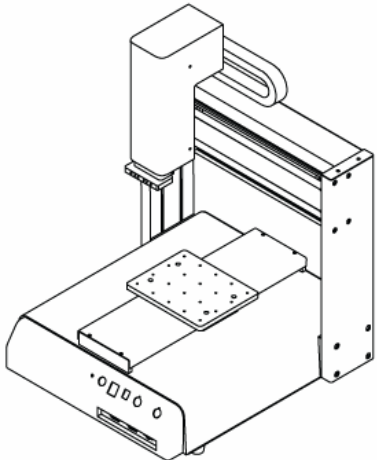
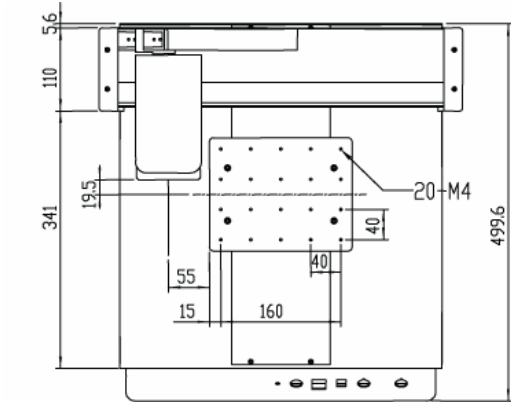
5.3 Machine Dimensions

5.3.1 200D Dimensions



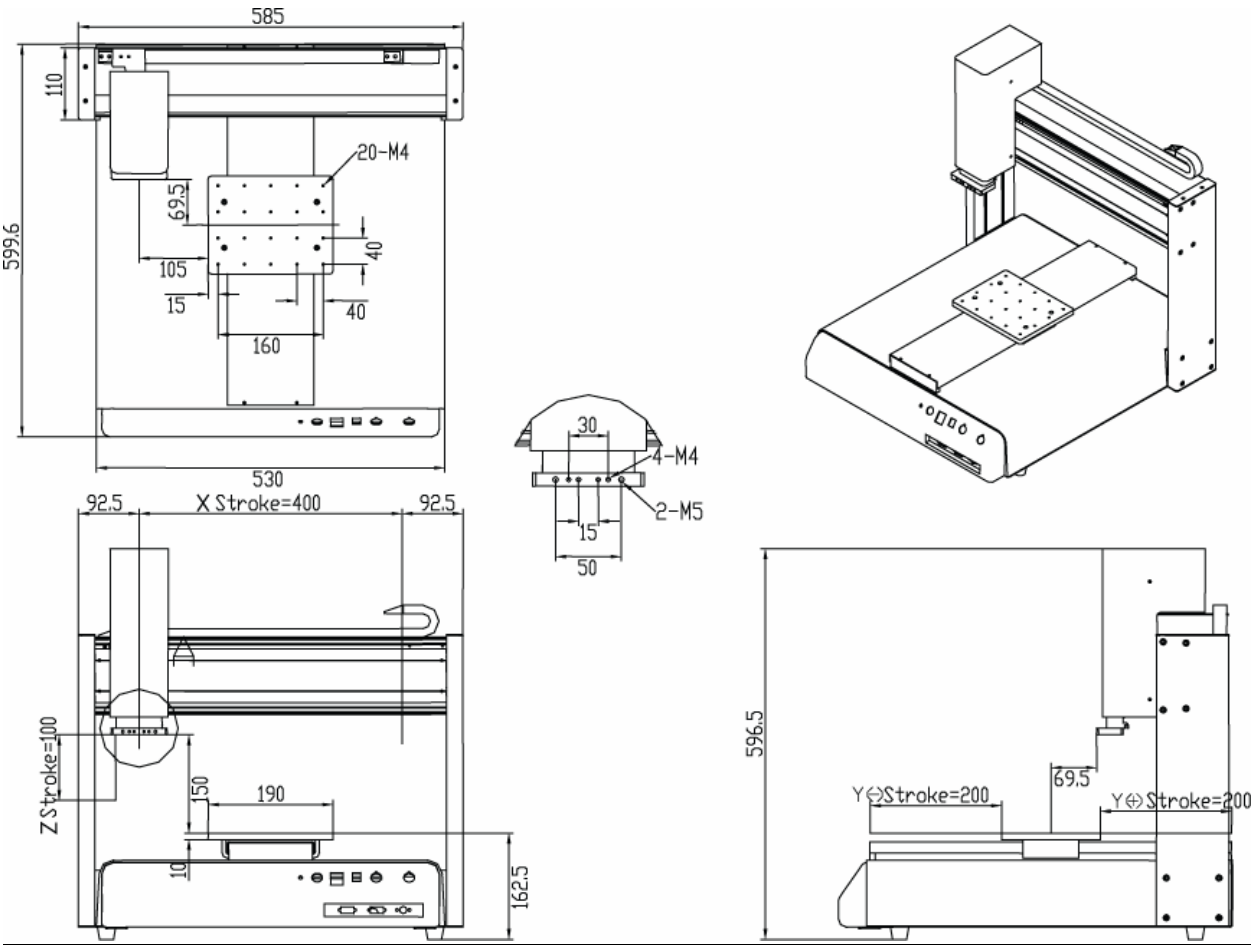
5.3.2 300D Dimensions

UNIT: millimeters (mm)



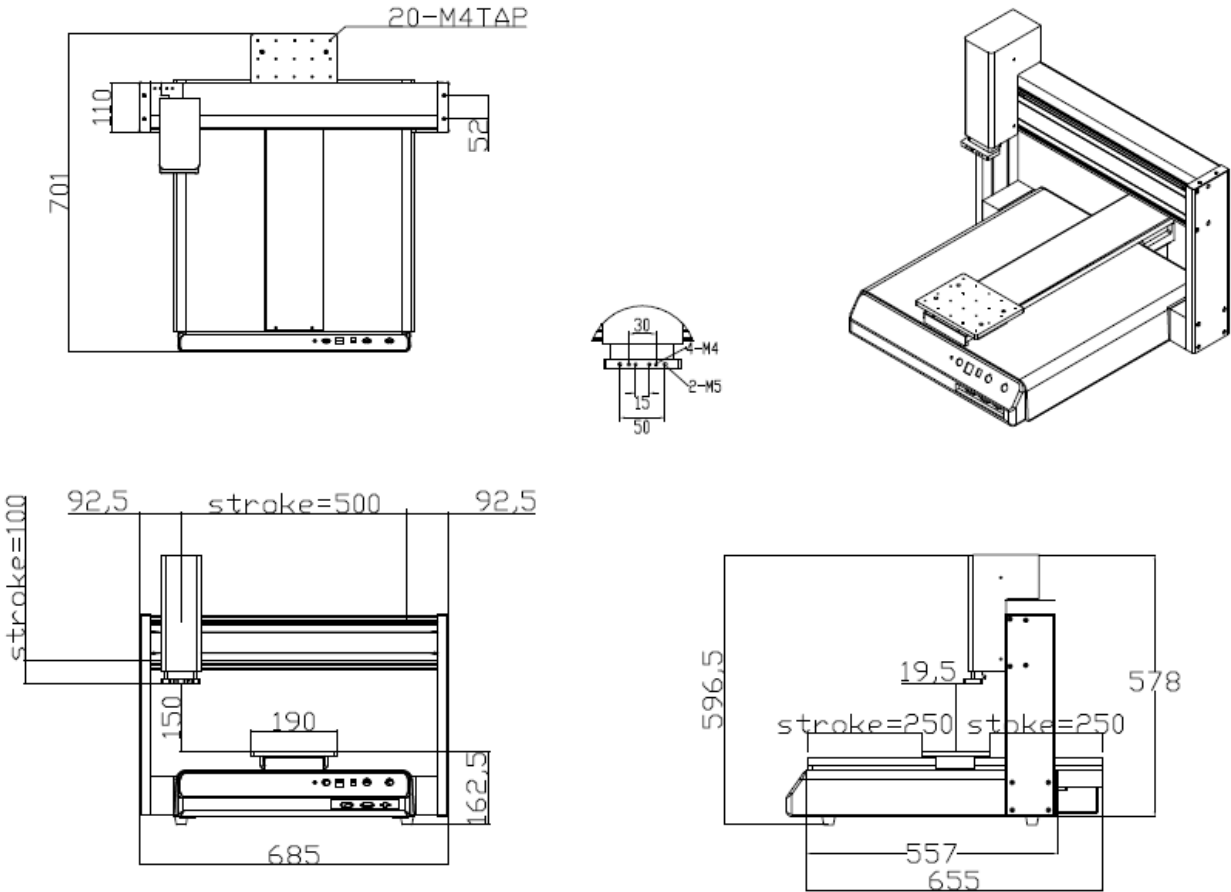
5.3.3 400D Dimensions

UNIT: millimeters (mm)



5.3.4 500D Dimensions

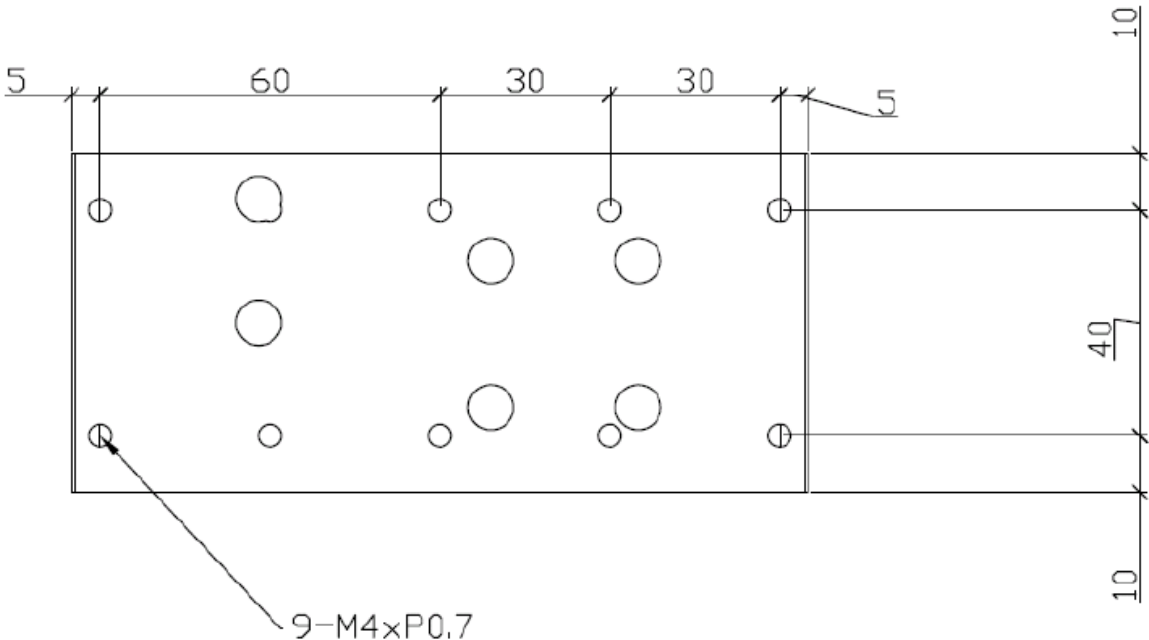
UNIT: millimeters (mm)



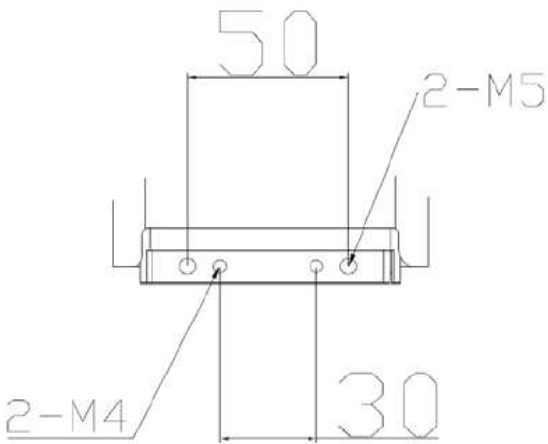
5.3.5 Work Table Dimensions

200D Work Table Dimensions

UNIT: millimeters (mm)

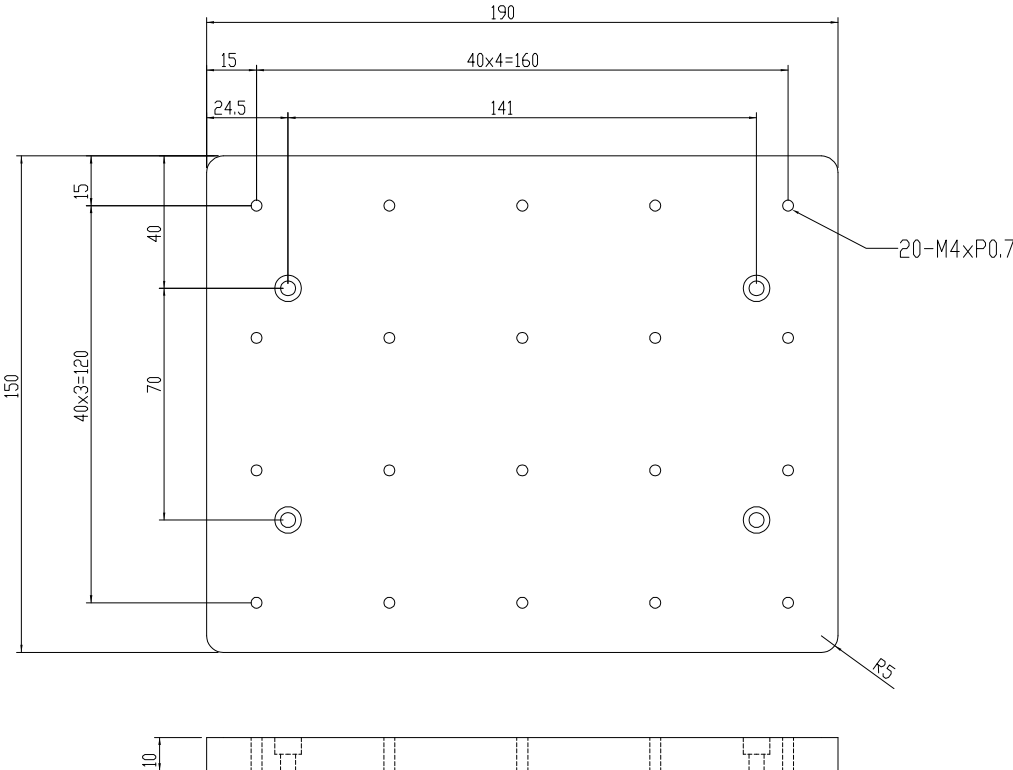


Dimensional drawing of z-axis plate

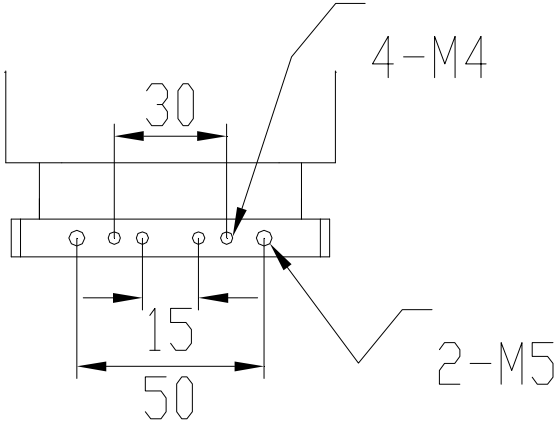


300D/ 400D/ 500D Work Table Dimensions

UNIT: millimeters (mm)



Dimensional drawing of z-axis plate



SECTION 6: Maintenance, Accessories & Spare Part

6.1 Maintenance

6.1.1 General Consideration

It is essential to correctly and periodically inspect and maintain the robot to prevent unexpected failures or malfunctions, thus ensuring safe operation and lengthening the machine's life.

The outside parts of the machine should be kept clean. Use vacuum cleaner or soft cloth to clean the machine. Do not use compressed air or chemical products to clean the machine, as they can damage the internal cables, timing belts and other components of the unit.

Use only the greasing materials recommended by the manufacturer of the machine.

6.1.2 Check Cycles and Points

The check cycles of the machine are classified in the following categories:

- Daily check
- Weekly check
- Check after every 3 months of operation
- Check after every 3 years of operation

The checkpoints are as follows:

CHECK POINT	CHECK CYCLE			
	Daily	Weekly	Every 3 months	Every 3 years
Tilt or deviation of machine	X			
Status of cables and hoses	X			
Appearance	X			
Stability on the work bench	X			
Motor running condition		X		
Motions, connections and joints			X	
Unfastened / loose bolts and screws			X	
Internal wires and connectors			X	
Accuracy and precision			X	
Ball screw assembly, LM guide, slide guide			X	
Overhaul				X

6.1.3 Check Methods

Check point	Check action (See if)	Corrective action
Tilt or deviation of machine	<ul style="list-style-type: none"> • Robot working position is tilted or inclined 	<ul style="list-style-type: none"> • Set the machine in a proper vertical position
Status of cables and hoses	<ul style="list-style-type: none"> • Electrical cables and pneumatic hoses are excessively twisted, bent, or squeezed • Air leakage between pneumatic hoses and fittings 	<ul style="list-style-type: none"> • Remove the causes of twisting, bending, or squeezing • Cut away the damaged parts of hoses and make connections
Appearance	<ul style="list-style-type: none"> • Damage on the robot's head from clashes during operation 	<ul style="list-style-type: none"> • Pay attention to working area of robot and remove any obstacle
Stability on work bench	<ul style="list-style-type: none"> • The robot is too close to the edge of the work table 	<ul style="list-style-type: none"> • Rearrange the position of the robot on the table • Remove sources causing table vibration
Motor running condition	<ul style="list-style-type: none"> • Infiltration of grease • Performance degradation due to overload 	<ul style="list-style-type: none"> • Replace motor (see agent)
Motions, connections, and joints	<ul style="list-style-type: none"> • The axes are not moving smoothly • Noises, vibrations, and / or shakes 	<ul style="list-style-type: none"> • Grease up • Reset and adjust gains (contact agent for setting)
Unfastened / loose bolts and screws	<ul style="list-style-type: none"> • Loose or broken bolts and nuts 	<ul style="list-style-type: none"> • Tighten loose bolts and nuts. Take corrective action to remove the cause
Internal wires and connectors	<ul style="list-style-type: none"> • Stripped or damaged external cover or shield on cable and/or connectors 	<ul style="list-style-type: none"> • Replace the damaged cables or connectors with new ones (see agent)
Accuracy and precision	<ul style="list-style-type: none"> • Z run out over X or Y larger than 0.2mm • Wear on timing belt 	<ul style="list-style-type: none"> • Contact agent • Replace timing belt (see agent)
Ball screw (worm) assembly, LM guide, slide guide	<ul style="list-style-type: none"> • Lack of grease on shaft, LM guide and / or slide guide surfaces • Deflection of the shaft 	<ul style="list-style-type: none"> • Apply grease on grease-hole of worm, LM guide, and slide guide surfaces (see section 9:2) • Replace the shaft (contact agent)
Overhaul	<ul style="list-style-type: none"> • Diagnose the whole system and make decision for the overhaul 	<ul style="list-style-type: none"> • Contact agent

6.2 Accessories & Spare Parts

Loctite Item Number	Description
Accessories	
1328355	Teach Pendant, D Series Robot
1329222	Interface Cable, D Series Robot
1461974	I-O Junction Box, D Series Robot 24V
988000	Solenoid Valve Module, 24V, D Series Robot
1569523	Needle Calibration Kit
Mounting Bracket	
1328355	Syringe Holder, 30-55ml, Fixed
98316	30ml Syringe Mounting Bracket Kit
98318	300ml Cartridge Mounting Bracket Kit
98326	98009 and 98013 Valve Mounting Bracket Kit
98327	97113 and 97114 Valve Mounting Bracket Kit
98406	983914 and 986300 Poppet Valve Mounting Bracket Kit
98441	98520 Spray and 98084 Micro Needle Valve Mounting Bracket Kit
98646	Universal Syringe Bracket for Posi-Link™
98647	50ml Dual Cartridge Bracket for Posi-Link™
98669	98591 and 98595 LED Mounting Bracket Kit
1034030	98601, 98665, 976418 and 976420 LED Mounting Bracket Kit
3, 5 and 10ml Syringe Adapters	
98320	10ml Adapter for Use with 98316
98321	5ml Adapter for Use with 98316
98322	3ml Adapter for Use with 98316
360 Degree Rotation Kit	
98325	360 Degree Rotation Kit
Tip Locator Brackets*	
98332	Tip Locator Bracket for 30ml Syringes
98333	Tip Locator Bracket for 300ml Cartridge
98334	Tip Locator Bracket for 98009 and 98013 Valves
98335	Tip Locator Bracket for 97113 and 97114 Valves
98407	Tip Locator Bracket for 983914 and 986300 Poppet Valve
Z Height Adjustment Plate	
98357	Z Height Adjustment Plate
929541	Z Height Adjustment Plate – Posi-Link™ 200 – 400 Nests
Mounting Rails	
98328	3¾ Inch Bar with Two Cap Screws
98329	8¾ Inch Bar with Two Cap Screws
98330	12 Inch Bar with Two Cap Screws

* These are sized for 25 gauge needles and must be modified by the user for larger gauge sizes.

SECTION 7: Equipment Warranty

7.1 Equipment Warranty

For Loctite® D-Series Benchtop Robot

Henkel expressly warrants that all products referred to in this Instruction Loctite® D-Series Benchtop Robots (hereafter called “Products”) shall be free from defects in materials and workmanship. Liability for Henkel shall be limited, at its option, to replacing those Products which are shown to be defective either in materials or workmanship or to credit to the purchaser the amount of the purchase price thereof (plus freight and insurance charges paid therefore by the user). The purchaser’s sole and exclusive remedy for breach of warranty shall be such replacement or credit.

A claim of defect in materials or workmanship in any Products shall be allowed only when it is submitted to Henkel in writing within one month after discovery of the defect or after the time the defect should reasonably have been discovered and in any event, within twelve months after the delivery of the Products to the purchaser. No such claim shall be allowed in respect of Products which have been neglected or improperly stored, transported, handled, installed, connected, operated, used or maintained or in the event of unauthorized modification of the Products including, where products, parts or attachments for use in connection with the Products are available from Henkel, the use of products, parts or attachments which are not manufactured by Henkel.

No Products shall be returned to Henkel for any reason without prior written approval from Henkel. Products shall be returned freight prepaid, in accordance with instructions from Henkel.

NO WARRANTY IS EXTENDED TO ANY EQUIPMENT WHICH HAS BEEN ALTERED, MISUSED, NEGLECTED, OR DAMAGED BY ACCIDENT.

EXCEPT FOR THE EXPRESS WARRANTY CONTAINED IN THIS SECTION, HENKEL MAKES NO WARRANTY OF ANY KIND WHATSOEVER, EXPRESS OR IMPLIED, WITH RESPECT TO THE PRODUCTS.

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THIS SECTION SETS FORTH EXCLUSIVELY ALL OF LIABILITY FOR HENKEL TO THE PURCHASER IN CONTRACT, IN TORT OR OTHERWISE IN THE EVENT OF DEFECTIVE PRODUCTS.

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Operating Manual

Section 7: Equipment Warranty

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Manual P/N: 8902566 Rev B Date: 07/2011

