

PLASTICS PRODUCT REVIEW

Note from PPR- This report is designed to be concise and to the point. It does not contain data you can find elsewhere. This report is the only spot where you can find this information. Everything we state in this report is backed up by data and hours of testing. We believe in quality reports with hard hitting facts as opposed to piles of information with little meaning. The testing conducted for this report took seventy-two hours to complete. You have made a wise choice, which will make your purchasing decisions easier.

Gantry Style Robots

Nearly everyone jumped into this test. Perhaps this is because the robot industry needs a uniform system of benchmarking. Sure a robot can travel a million miles an hour, but only if it has two miles to accelerate. In the real world, robots travel over a short distance so acceleration is key. Our test keys in on a robot's speed, accuracy, and ease of use ranking each in a quantitative fashion.

This report will cover the advantages and disadvantages of each robot based on the test results. At the completion of the main body of the report we will present our recommendations. The separate How and What We Test section describes exactly what variables are evaluated. This section also goes on to describe how and why variables are examined. The data itself is presented in a chart format at the conclusion of the report.

Test Results



Companies with this emblem next to their name have earned the Plastics Product Review Seal of Approval based on their upper echelon test results.

AEC



AEC's robot tested slightly above average, which is impressive when factoring in its low price. The robot exhibited top notch positional consistency as its chief strength. Disadvantages include relatively low speeds and long setup times. When factoring in all three aspects, this robot's composite score is 4.66 (1 being the best, 10 the worst).

Battenfeld

This robot is a speed demon, but faltered elsewhere. Its speed rating is good enough for second place. This robot would have traveled even faster if not for the inertia created, which shook the robot stand even though it was bolted into the floor. Its positional consistency and set up time values trail the rest of the pack. The overall composite rating of this robot is 7.33.

Conair



Conair's robot placed solidly in the middle. Its strength is speed, placing third out of ten. Disadvantages include slightly below average positional consistency and set up time values. Overall, the composite score of this robot is 5.00.

Engel



This sturdy, solid robot tested well. Advantages to this robot include positional consistency and speed of set up. Its speed is not a disadvantage, but, coming in slightly above average, it cannot be considered an advantage either. Engel's robot earned a composite score of 3.00.

Husky



Our choice as one of the two best robots. If you are buying a Husky molding machine, don't think about purchasing your robot elsewhere. This robot has the fastest speed by far, perfect positional consistency, and quick set up times. The only minor complaint we had was the use of a non-Husky control pendant when programming the robot apart from the molding machine controller. Husky's robot came in on top with a composite rating of 1.00.

Ranger

This cost-effective offering tested slightly below average. Its ease of setup is an advantage, but the speed is slightly below average while the positional consistency is in the bottom tier. Factor in price with this robot though. It is cost effective with an easy to use controller. The composite score of Ranger's robot is 6.66.

Remak

Remak's robot did not test very well. The robot's only bright spot in this test is perfect positional consistency at the 90 percent speed setting. Otherwise, the robot fell in the bottom tier for all other criteria. Overall, the composite score of this robot is 7.66

Ventax

Ventax's robot had some problems in our test. It earned an overall composite score of 8.33.

Wittmann



This is one of two robots that we recommend above the others. Wittmann offers the best ease of use as witnessed by the set up time test. This is coupled with above average speed and positional consistency. The differentiating factor of this robot is its controller, which is easy to use and powerful. Wittman's robot displayed a composite score of 3.33.

Yushin

Yushin's robot came in slightly below average in our test. Its overall set up time ranking was its chief positive. On the other hand, it faltered in the speed and positional consistency portions of the evaluation. Overall, the composite score of Yushin's robot is 5.66.

Conclusions

Based on these test results we recommend a purchase of either a Husky or Wittmann robot. You won't be disappointed.

How and What We Test

What We Test

Accuracy- This tests the robot's ability to return to a point in space.

Speed- This is self explanatory. How long does it take to make the robot perform a set series of motions.

Time to Setup- PPR examines the time it take to make the robot perform a basic series of moves.

How We Test

Accuracy- Each robot is trained to do a series of moves and come down on a dial indicator to an approximate distance of .03. The robot is required to repeat the motion thirty times. After each motion, the dial indicator measurement is recorded. Testing is conducted both at 50% and 90% speeds. A standard deviation, average, maximum, and minimum are tabulated for each thirty shot grouping.

The robot moves in the following motion for this test:

Traverse- 1,471 mm.

Vertical- 107 mm.

Pull Out- 217 mm.

Speed- Our testers set the robot up to simulate a part take out and a zig-zag at 100% speed. At the end of the zig-zag the robot hits a limit switch ending the timer. The process is run in full automatic with the timer measuring each series of motions to one hundredth of a second. A standard deviation, average, maximum, and minimum value are given for each robot. The robot moves the following distances for this test:

Note: Moves listed in sequential order in this format, moves 1 to 6 are repeated in automatic

Move	Pull out	Vertical	Traverse
1	0	0	0
2	138	0	1506
3	138	184	1506
4	138	0	1506
5	0	0	479
6	268	0	479

Time to Setup- Starting immediately from power up our testers start a clock. The clock does not end until the robot moves the following distances and returns:

Traverse- 300 mm.

Vertical- 25 mm.

Pull out- 50 mm.

The test is conducted three times with the intention of seeing how times improve with familiarity. Keep in mind that the initial test was conducted without any knowledge whatsoever about the controller or the robot. Then the second and third trials are based on the knowledge gained in the first trial. Three times for each robot are included for each tester

Robots					
Specifications	AEC	Battenfeld	Conair	Engel	Husky
Model #	AE-91-E3S	UNIROB R10	3011 B2	ERC33/I-C	TE3
Pull Out Travel (mm)	350	400	375	400	500
Vertical Travel (mm)	800	1000	800	1000	950
Traverse Travel (mm)	1400	2200	1500	1640	1900
Drive Types	Servo	Servo	Servo	Servo	Servo
Price	\$36,785	\$58,630	\$44,500	\$56,560	\$53,900
Speed (seconds)					
Average	4.162 (8)	2.883 (2)	3.238 (3)	3.586 (5)	2.162 (1)
Minimum	4.14	2.88	3.20	3.56	2.16
Maximum	4.18	2.89	3.28	3.65	2.17
St. Deviation	0.009	0.004	0.015	0.017	0.004
Positional Consistency (in.)					
50%					
Average	0.0300	0.0310	0.0300	0.0300	0.0260
Minimum	0.030	0.030	0.030	0.030	0.026
Maximum	0.030	0.032	0.030	0.030	0.026
St. Deviation	0.00000	0.00691	0.00000	0.00000	0.00000
90%					
Average	0.0300	0.0300	0.0282	0.0300	0.0260
Minimum	0.030	0.030	0.028	0.030	0.026
Maximum	0.030	0.031	0.030	0.030	0.026
St. Deviation	0.00000	0.00254	0.00484	0.00000	0.00000
Average Consistency Ranking	(1)	(10)	(6)	(1)	(1)
Set Up Time					
1st run Tester 2	1 hr., 21 min.	1 hr., 24 min.	2 hr., 13 min.	1 hr., 49 min.	33 min., 26 sec.
2nd run Tester 2	5 min., 4 sec.	6 min., 45 sec.	4 min., 28 sec.	1 min., 8 sec.	3 min., 27 sec.
3rd run Tester 2	4 min., 14 sec.	5 min., 59 sec.	3 min., 34 sec.	52 sec.	2 min., 25 sec.
Average Set Up Time Ranking	(5)	(10)	(6)	(3)	(1)
Composite Average Ranking					
	4.66 (4)	7.33 (8)	5.00 (5)	3.00 (2)	1.00 (1)

Robots (cont.)

	Ranger	Remak	Ventax	Wittmann	Yushin
Specifications					
Model #	RT-300 S3/T	RF 5S 2000	VMR3-400	V420-STS-325	VN-EA-150SL
Pull Out Travel (mm)	660	500	400	500	560
Vertical Travel (mm)	915	1000	1150	800	800
Traverse Travel (mm)	1560	2000	1600	1750	1700
Drive Types	Servo	Servo	Servo	Servo	Servo
Price	\$41,500	\$52,800	\$48,000	\$48,150	\$47,280
Speed (seconds)					
Average	3.606 (6)	4.421 (9)	5.263 (10)	3.256 (4)	3.611 (7)
Minimum	3.59	4.33	5.21	3.24	3.60
Maximum	3.68	4.52	5.32	3.29	3.62
St. Deviation	0.013	0.057	0.021	0.009	0.011
Positional Consistency (in.)					
50%					
Average	0.0294	0.0358	0.0347	0.0300	0.0287
Minimum	0.028	0.035	0.030	0.030	0.028
Maximum	0.030	0.036	0.038	0.030	0.029
St. Deviation	0.00062	0.00370	0.00231	0.00000	0.00046
90%					
Average	0.0294	0.0360	0.0261	0.0294	0.0281
Minimum	0.029	0.036	0.023	0.029	0.028
Maximum	0.030	0.036	0.029	0.030	0.029
St. Deviation	0.00049	0.00000	0.00180	0.00050	0.00040
Average Consistency Ranking	(8)	(5)	(9)	(4)	(6)
Set Up Time					
1st run Tester 2	1 hr., 7 min.	1 hr., 22 min.	1 hr., 1 min.	31 min., 12 sec.	3 hr., 2 min.
2nd run Tester 2	5 min., 31 sec.	5 min., 18 sec.	9 min., 51 sec.	4 min., 2 sec.	3 min., 16 sec.
3rd run Tester 2	5 min., 24 sec.	5 min., 31 sec.	4 min., 16 sec.	3 min., 7 sec.	1 min., 30 sec.
Average Set Up Time Ranking	(6)	(9)	(6)	(2)	(4)
Composite Average Ranking	6.66 (7)	7.66 (9)	8.33 (10)	3.33 (3)	5.66 (6)

Explanation of Robot Chart and Data

The numbers in parenthesis represent each product's ranking in that category in comparison to the other machines. A product ranked (2) in a six product test was the second best out of the six in that category. The "Composite Average Ranking" is the average of the rankings in each category. A product with a "Composite Average Ranking" of 3.25 averaged a little worse than third best as a whole.

The chart starts with specifications. We will start the explanation with the test data itself.

Speed- This is a test of the robot's speed in performing a series of motions.

Average- The average speed. This is how fast the robot travels. The lower this number, the faster the robot.

Minimum- The fastest speed the robot travels over 50 cycles.

Maximum- The slowest speed the robot travels over 50 cycles.

St. Deviation- The deviation in cycle times (over 50 cycles) during the speed test. The lower this deviation the more consistent the robot's speed.

Accuracy- This is a measure of the robot's ability to return to the same point in space on a consistent basis. This is tested at both a 50% and 90% speed setting.

Average- The average position on the dial indicator to which the travels. This is irrelevant because this is simply the point at which we ask the robot to travel. This is the baseline for future placement of the robot.

Minimum- The minimum distance measured by our dial indicator.

Maximum- The maximum distance measured by our dial indicator.

St. Deviation- This is the important number. It is the deviation in the robot's placement. This is measured by the dial indicator and is displayed in inches.

Average Accuracy Ranking- This ranks the robots according to their St. Deviation at each speed setting (50% and 90%).

Set Up Time- The time it takes our tester to set the robot up to run a series of motions. The tester has no previous knowledge of the robot and uses only the manual.

1st run Tester 2- Initially there were two testers, but one tester was not able to complete the testing. Thus, Tester 2's information is presented. This is the time it took our tester to set up the robot initially. This includes a steep learning curve. The 1st run time particularly measures the ease of use of the controller.

2nd run Tester 2- This is the second run through with our tester having already learned to run the robot in the first run through.

3rd run Tester 3- At this point the tester is relatively proficient at setting up the robot. This can be considered to be the time necessary to set up the robot after training is completed.

Average Set Up Time Ranking- The average ranking based on the three separate set up times.

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