ARCO Zeus A225S High Output Alternator Instruction Manual

Contents

1 ARCO Zeus A225S High Output Alternator
2 Background and overview
3 Units Tested
4 Cold Power Curve Overview
5 Cold power Curve Results in Large Frame
6 Warm Power Curve Overview
7 warm power curve results
8 Appendix: Power curve samples
9 Documents / Resources
9.1 References
10 Related Posts

ARCO Zeus A225S High Output Alternator

Background and overview

Testing Protocol

- ARCO internally developed tests to assess components for its high-output alternator line. These tests are designed to identify the highest-performing components, replicating real-world conditions for accuracy.

Comparative Analysis

- ARCO applies the same testing procedures to compare its new alternators with popular market models, ensuring a comprehensive evaluation of performance.

In-House Testing

- ARCO conducts all tests in-house, maintaining full control over the evaluation process.

Quality Assurance Measures

- ARCO takes all reasonable measures to minimize errors and biases, though the possibility of honest mistakes is acknowledged.

Transparency and Consistency

- Enhancing transparency and consistency in alternator testing benefits customers by highlighting the highest-performing products.

Strategic Sampling

- Unable to test every alternator on the market, ARCO selects representative examples for comparison, all of which are new units.

ARCO Testing Equipment

Units Tested

- ARCO Zeus A275L
- ARCO Zeus A225S
- American Power Systems APS 360
- Balmar XT250
- Balmar XT170
- Nations XP280
- Mechman 250

Cold Power Curve Overview

Testing Procedure

- Alternator output is tested at 7 RPM speeds using a Motoplat CV-623A Alternator Tester.

Consistency Assurance

- Tests are repeated on 3 separate days with overlapping RPM intervals to ensure data consistency.

Standardization Efforts

- Where possible, a uniform 44mm, 6-groove pulley is used to reduce variables, although variations exist in shaft diameter and pulley nut thread pitch.
- Where lack of compatibility prevented the installation of the 44mm pulley, the manufacturer’s original pulley was measured, used, and input into the tester to ensure the accuracy of results.

Outlier Handling

- Clear outliers from the power curve data are removed for accuracy.

Controlled Environment

- Tests are conducted in a climate-controlled building with an ambient temperature of 19-24°C, ensuring consistent conditions.
- It is worth noting that minor discrepancies in ambient temperature can make minor impacts on “Cold” curves, while any such ambient temperature discrepancies make zero tangible impacts on “Hot” curves.

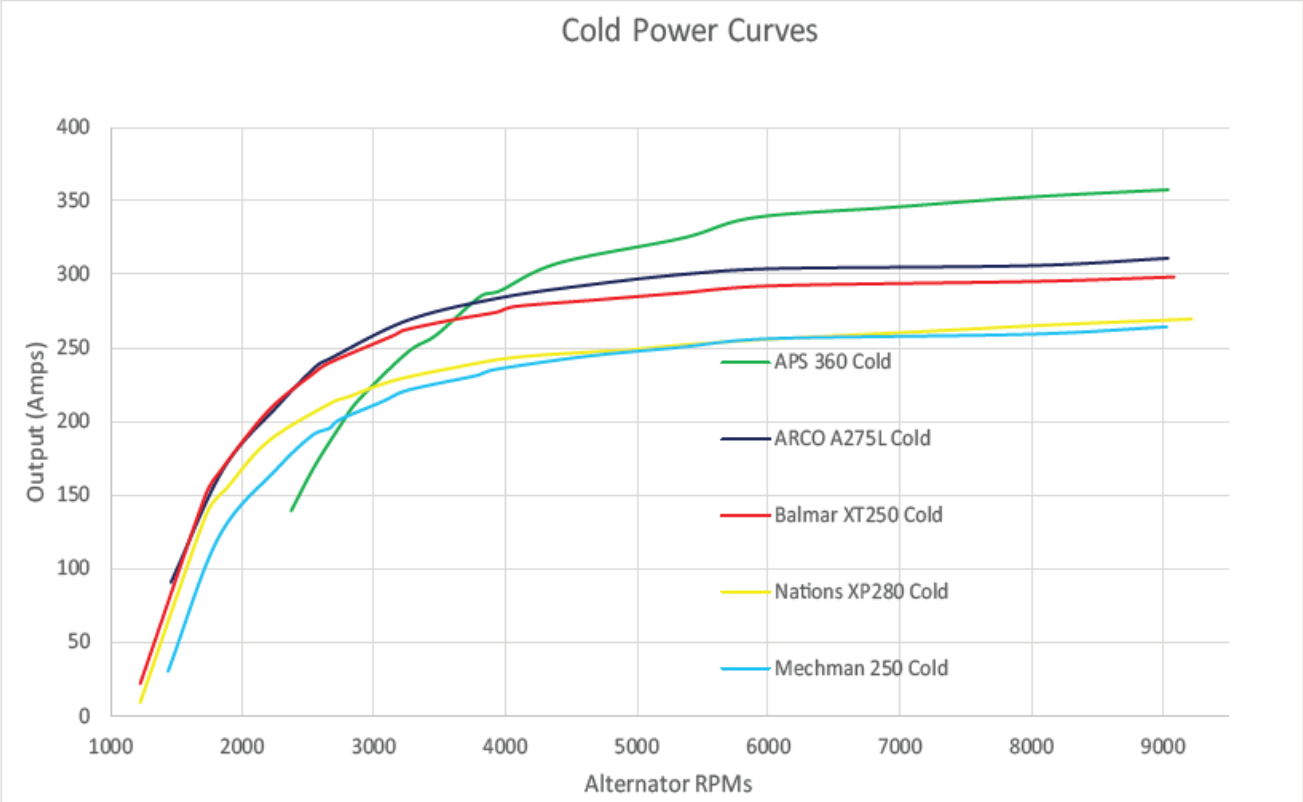
Cold power Curve Results in Large Frame

ARCO A275L at Idle

- The ARCO A275L exhibited the highest amperage output at idle speeds.

APS 360 Comparison

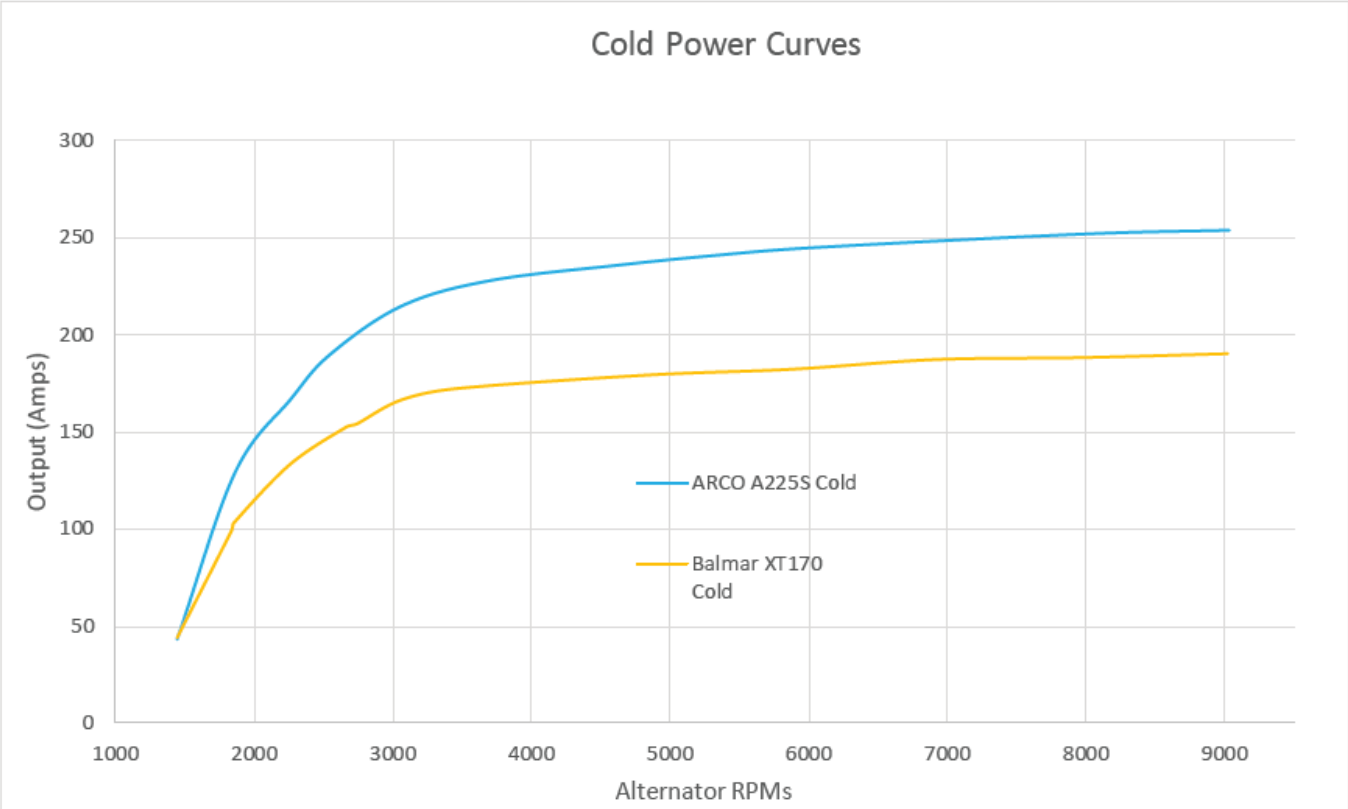
- While the APS 360 recorded the most amps at over 4,300 alternator RPMs, it demonstrated the lowest output at low idle speeds.



Cold power Curve Results in Small Frame

ARCO A225S Outperforms

- The ARCO A225S significantly outperforms similarly sized alternators across all speeds.



Low RPm endurance test overview

Operational Conditions

- Alternators were run at 3,000 RPMs for 60 minutes beneath a plexiglass shield to simulate engine compartment conditions. During the 60-minute test, alternators typically reached 100°C, with temperatures inside the shield hitting 60°C.

Performance Trend

- All alternators exhibited a significant output drop within the first 10 minutes, followed by a gradual decline over the next 20 minutes, stabilizing for the remaining 30 minutes.

ARCO A275L Performance

- The ARCO A275L demonstrated the highest amp production at idle speeds. While initially matching the ARCO A275L's performance, the Balmar XT250 experienced a more pronounced output decline as it heated up.

Low RPM Endurance Tests		Amps						
Time	ALT RPM	ARCO A275L	ARCO A225S	Balmar XT250	Mechman 250	Balmar XT170	Nations XP280	APS 360
0	3,000	256	205	256	210	163	225	237
5	3,000	223	171	214	187	136	200	210
10	3,000	207	160	197	175	126	189	200
15	3,000	196	151	187	169	122	181	195
20	3,000	193	149	183	165	119	178	192
30	3,000	190	146	180	162	118	174	187
40	3,000	191	143	179	161	116	172	186
50	3,000	190	143	178	160	116	172	185
60	3,000	190	142	178	159	116	172	184

Hot power curve overview

Simulation of Extended Idle Conditions

- The alternator undergoes a 60-minute test at 3,000 RPMs under a plexiglass shield, replicating prolonged idle speed conditions.

Power Curve Analysis

- Immediately post-endurance test, the machine conducts 3 overlapping and redundant power curve tests, charting output at various RPMs.

Data Refinement

- Overlaying the 3 power curves allows for outlier identification, with any clear outliers removed for accuracy. The resulting curve reflects the expected alternator output during extended periods at a given speed.

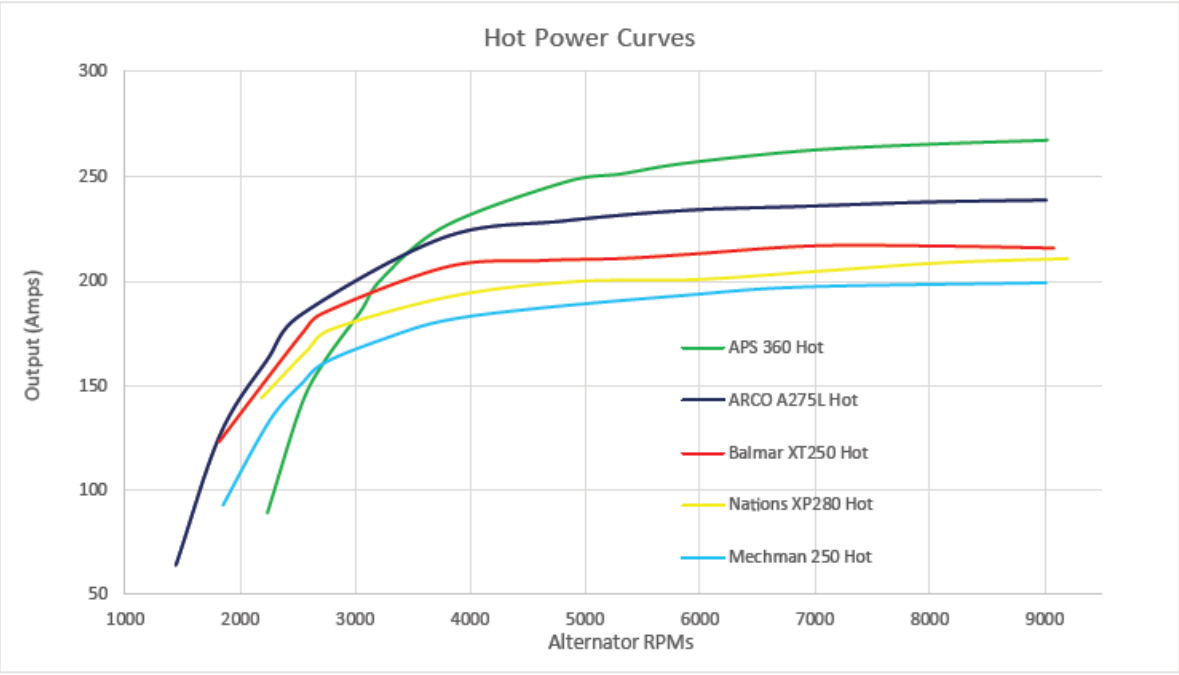
Hot power curve results from large frame

Heat Build-Up

- Extended idle operation leads to significant alternator heating without adequate fan cooling, resulting in reduced performance.

ARCO A275L Dominance

- The ARCO A275L demonstrated superior performance, surpassing all alternators below 3,500 RPMs and outperforming all except the APS 360 above this threshold.



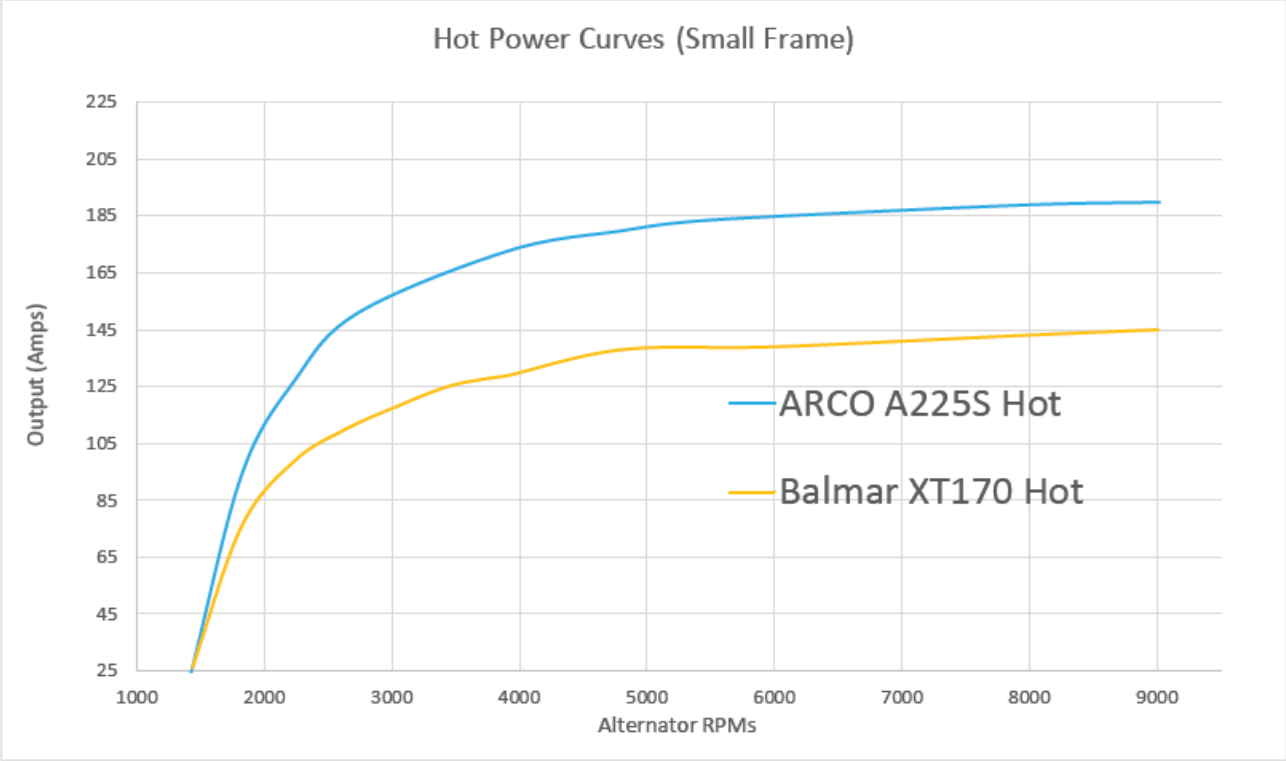
The hot power curve results small frame

Product Comparison

- The smaller ARCO unit, A225S, was compared against a popular unit of the same size, the Balmar XT170.

Performance Differential

- The ARCO A225S boasts approximately 30% more power output compared to the similarly sized Balmar XT170.



High rpm endurance test overview

High-Speed Evaluation

- Each alternator underwent a 60-minute test at 9,000 alternator RPMs, catering to those focused on performance at extreme speeds.

Enhanced Performance at High RPMs

- Higher RPMs result in increased alternator output, fan speed, improved air circulation, and cooler alternator temperatures compared to idle speeds.

Performance Rankings

- For those prioritizing high RPM performance, the APS 360 emerged as the top performer, followed closely by the ARCO A275L.

High RPM Endurance Tests		Amps						
Time	ALT RPM	ARCO A275L	ARCO A225S	Balmar XT250	Mechman 250	Balmar XT170	Nations XP 280	APS 360
0	9,000	312	245	295	260	185	265	355
5	9,000	252	208	243	224	164	236	305
10	9,000	248	198	235	216	158	229	295
15	9,000	247	196	234	214	156	227	292
20	9,000	247	195	231	213	156	226	289
30	9,000	245	194	231	212	154	225	290
40	9,000	244	194	130	212	153	225	297
50	9,000	244	194	228	212	152	225	284
60	9,000	244	193	228	211	152	225	281

Warm Power Curve Overview

Testing Procedure

- Immediately after the high RPM Endurance test, which runs the alternator at 9,000 RPMs for 60 minutes, alternator output is evaluated at various RPMs.

Standardization Effort

- All alternators are tested with a uniform 44mm, 6-groove pulley to eliminate variables. Where lack of compatibility prevented the installation of the 44mm pulley, the manufacturer’s original pulley was measured, used, and input into the tester to ensure the accuracy of results.

Data Refinement

- Three power curve tests are conducted, and the resulting curves are overlaid to identify and remove outlier data points.

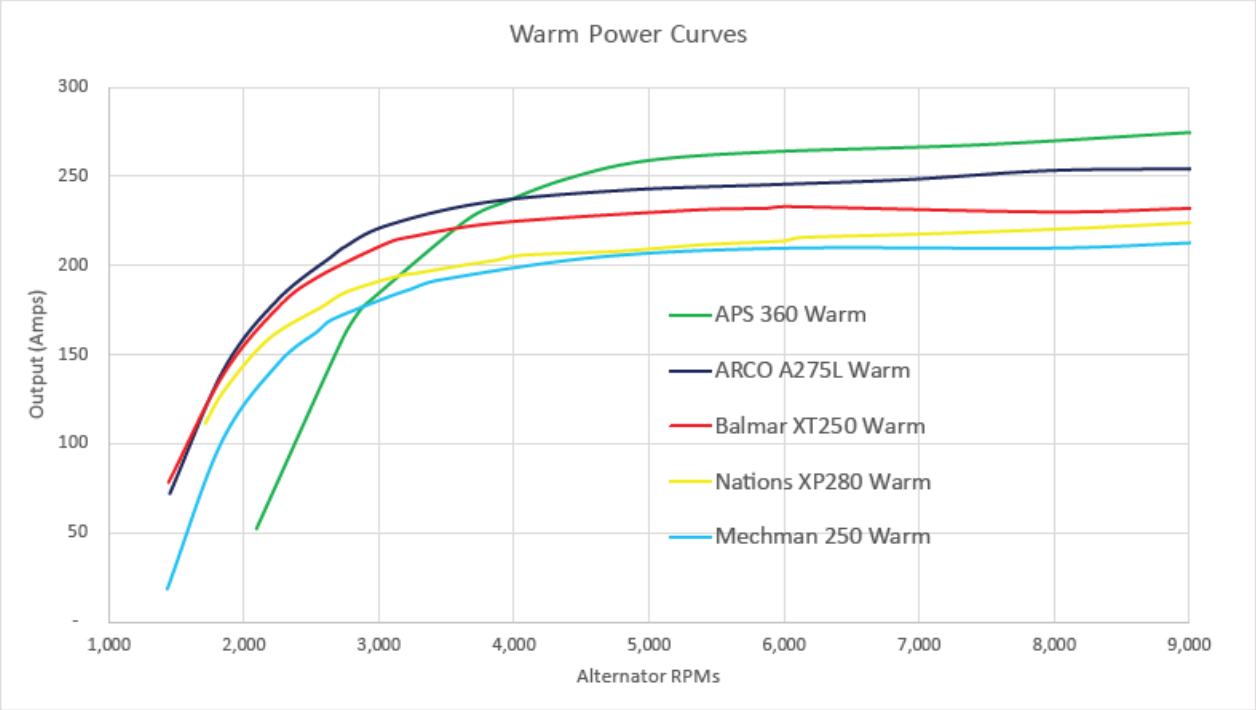
warm power curve results

Consistent Performance

- Performance across all units showed slight improvement but remained very similar to the results after an hour of running at low RPMs.

Low RPM Dominance

- The ARCO A275L demonstrated the highest output at low RPMs. The APS 360 excelled at high RPMs but performed poorest at low RPMs.



Test results summary table

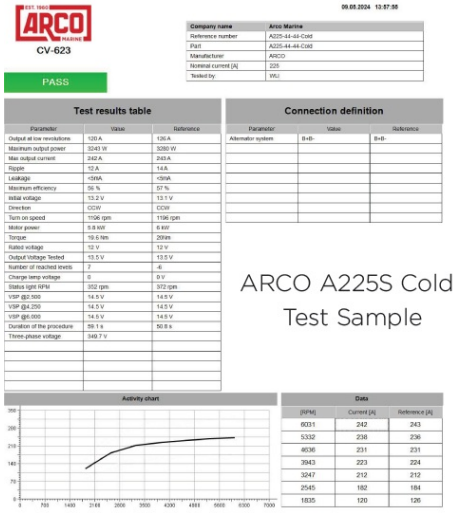
	ARCO A275L	ARCO A225S	Balmar XT250	Mechman 250	Balmar XT170	Nations XP280	APS 360
Max Cold Output	311	254	298	264	190	270	358
Max Warm Output (After High RPM Endurance Test)	246	197	232	213	152	200	255
Max Hot Output (After Low RPM Endurance Test)	239	189	217	199	145	216	267
1 Hour Idle Output (At 3,000 Alt RPMs)	198	151	188	167	122	180	193
1 Hour Cruising Output (At 9,000 RPMs)	249	198	218	216	156	228	294
Alternator Weight	15.27 Lbs	12.45Lbs**Prototype	14.79Lbs	15.249 Lbs	12.45 Lbs	16.03Lbs	15.21Lbs
Turn on RPMs	1080	1196	1077	1268	1170	2432	1736

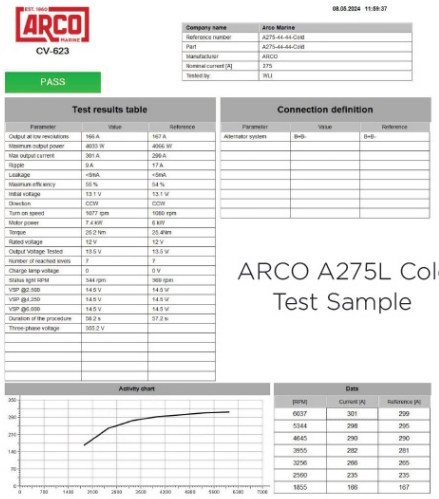
Performance Comparisons

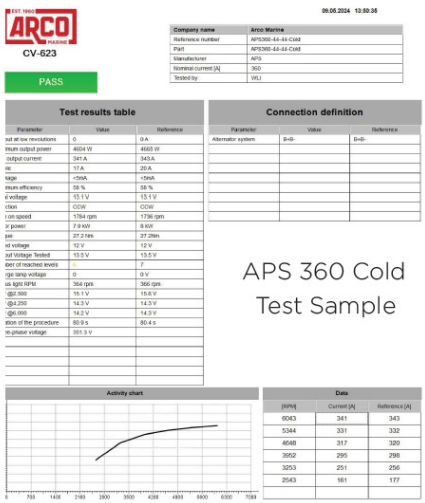
- ARCO alternators outperformed units of similar size, delivering the highest amperage at lower RPMs.
- The APS 360 excelled in amperage output at higher RPMs but demonstrated the least output at idle speeds.
- The Nations XP280 required the highest RPMs for activation.

Appendix: Power curve samples

- These results are from the second test of each alternator, referencing the original test conducted on a different day for the same alternator.

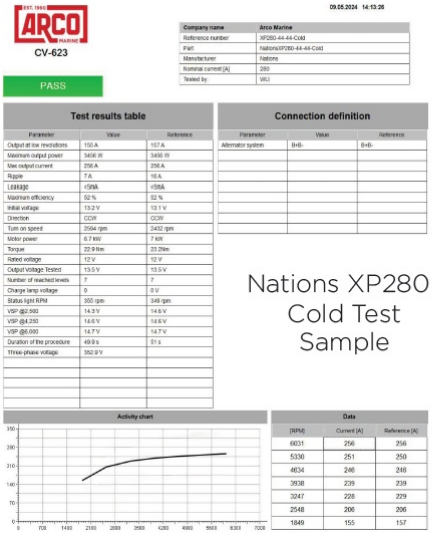


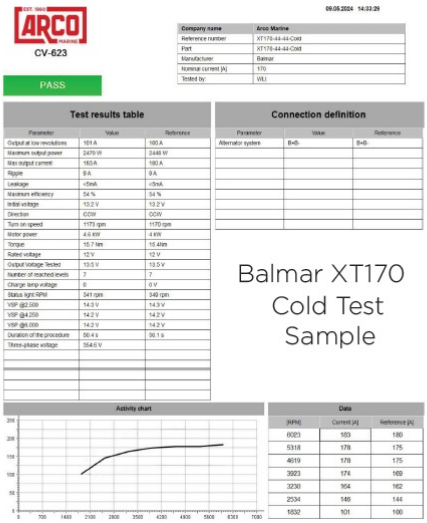


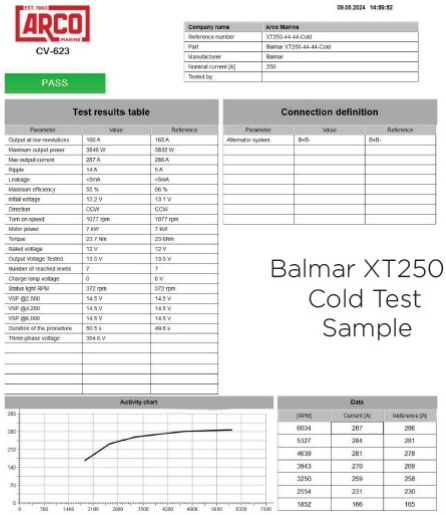


Appendix: Power curve samples

- Results were compared to the original test to confirm the absence of significant deviations.
- The second test served solely to validate the original test, utilizing data from the initial assessment.







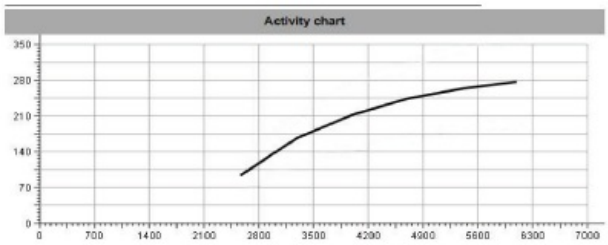
Appendix: testing extreme rpm ranges

Speed Range Extension

- The CV-623, originally set to test 7 data points from 1,800 to 6,000 alternator RPMs, was adapted with a false pulley ratio setting to capture more data across a wider speed spectrum.

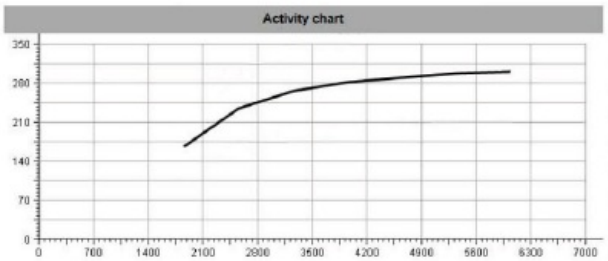
Result Adjustment

- Following testing, the results were exported to Excel and recalibrated to align with the actual alternator speeds. The examples below are cold power curves from an ARCO A275L.



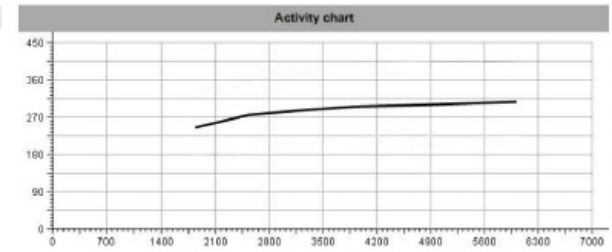
Data		
[RPM]	Current [A]	Reference [A]
6095	277	279
5410	264	265
4705	244	238
4000	213	210
3290	167	160
2565	94	91

Pulley Setting: 25mm
Actual Pulley Size: 44mm
Speed Adjustment: 56.8%



Data		
[RPM]	Current [A]	Reference [A]
6037	301	299
5344	298	295
4645	290	290
3955	282	281
3256	266	265
2560	235	235
1855	166	167

Pulley Setting: 44mm
Actual Pulley Size: 44mm
Speed Adjustment: None



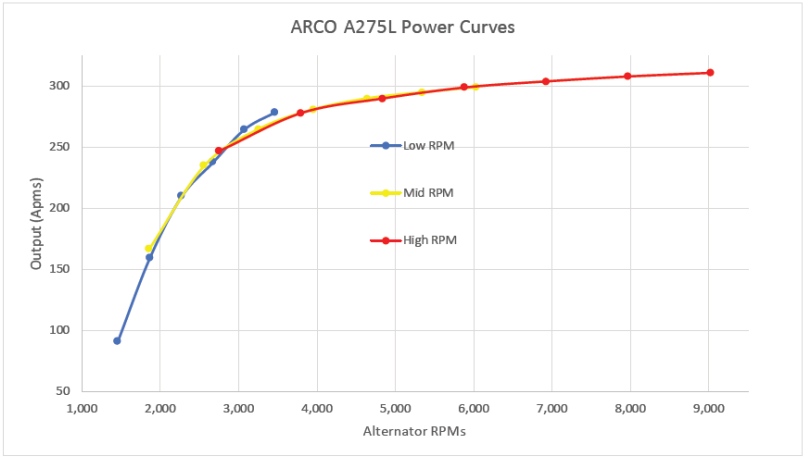
Data		
[RPM]	Current [A]	Reference [A]
6021	307	311
5316	303	308
4619	299	304
3926	296	299
3227	287	290
2532	276	278
1837	245	247

Pulley Setting: 66mm
Actual Pulley Size: 44mm
Speed Adjustment: 150%

Appendix: combining data

- The data from the previous page was converted into actual RPM values to ensure accuracy in analysis.
- Overlaying three distinct power curves, covering different yet overlapping RPM ranges, facilitates comprehensive result validation and aids in outlier detection.

Crank Pulley Size	125			
Alternator Pulley Size	44			
Actual Pulley Ratio	2.84			
Displayed RPM	Pulley Setting	Crank RPM	Actual RPM	Amps
6095	25	1,219	3,463	279
5410	25	1,082	3,074	265
4705	25	941	2,673	238
4000	25	800	2,273	210
3290	25	658	1,869	160
2565	25	513	1,457	91
6037	44	2,125	6,037	299
5344	44	1,881	5,344	295
4645	44	1,635	4,645	290
3955	44	1,392	3,955	281
3256	44	1,146	3,256	265
2560	44	901	2,560	235
1855	44	653	1,855	167
6021	66	3,179	9,032	311
5316	66	2,807	7,974	308
4619	66	2,439	6,929	304
3926	66	2,073	5,889	299
3227	66	1,704	4,841	290
2532	66	1,337	3,798	278
1837	66	970	2,756	247



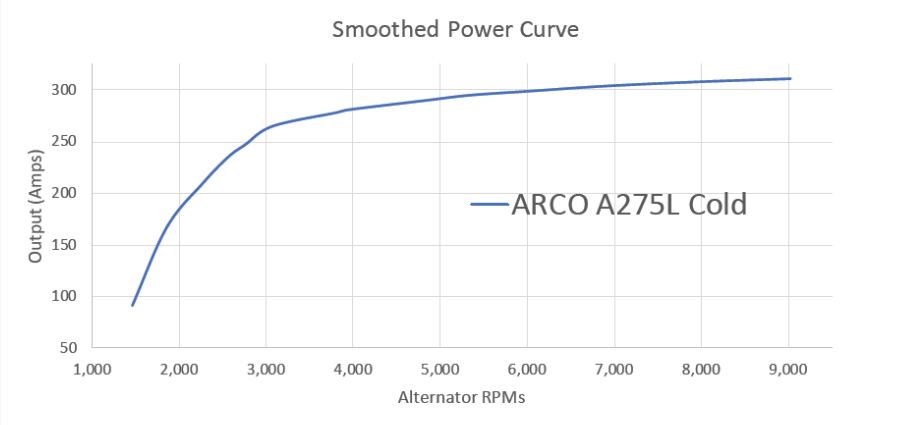
Appendix: power curve protocols

- The three separate datasets are merged and sorted based on alternator RPMs, streamlining the analysis process. Outlier points are systematically identified and removed from the dataset to ensure data integrity.

Example

- The data point indicating 279 amps at 3,463 RPMs was eliminated as it was identified as an outlier, despite being a positive outlier for ARCO.

Alternator RPM	Amps
9,032	311
7,974	308
6,929	304
6,037	299
5,344	295
4,841	290
3,955	281
3,798	278
3,074	265
2,756	247
2,560	235
2,273	210
1,855	167
1,457	91



Documents / Resources

	ARCO Zeus A225S High Output Alternator [pdf] Instruction Manual Zeus A225S, Zeus A225S High Output Alternator, High Output Alternator, Output Alternator, Alternator

References

- User Manual