TRUEPROP™

Independent and widely compatible software for propeller inspection & repair

Interpreting Your Propeller Scan Report

Propellers are a critical piece of boating equipment. Many boat-owners know the cringing sound of a propeller strike - whether it's a log, rope, or running aground, that impact resonates across the deck, through your shoes, and right to your wallet. To get back on the water, you might choose to have the prop repaired at a reputable propeller shop. (P.S. The National Marine Propeller Association, NMPA.org, can help you find a certified shop in your area!) These shops utilize computer-assisted measuring equipment to inspect and repair damaged propellers to better-than-new condition.

It's often said that propeller repair is a blend of both art and science. This is absolutely true, and experienced repair professionals can save heavily damaged propellers. Many shops, proud of their work, provide inspection reports to customers to document the before and after conditions of the propeller. These reports contain a wealth of information, but many boat-owners have questions when reviewing them. In this article, we will go over the format of a standard propeller scan report, as well as discuss a few tips on how to interpret it. Let's start with the first part of the report you read, the heading.

The Report Heading

The heading gives information about the repair shop, the customer, and equipment used, as well as the date and whether the report is for the initial condition or the final condition.

Inspection Criteria

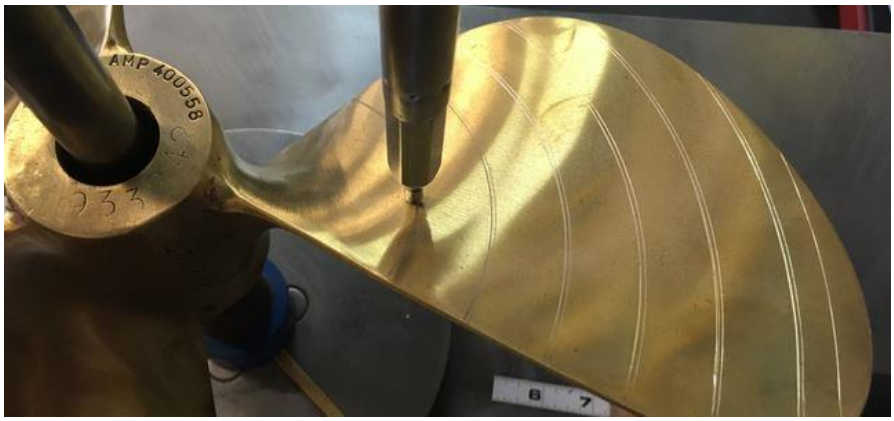
When a shop inspects your propeller, most times they are checking the position and size of each blade in multiple locations. The positions and sizes should match from blade to blade, within some acceptable margin. This margin is known as a tolerance. For inspecting propellers, the tolerances for the geometric accuracy are based on the International Standard Organization's rules for propeller manufacturing. The standard is ISO-484 and it has 4 levels of increasingly tighter tolerance "classes".

- Class 3 - Wide tolerances
- Class 2 - Medium accuracy
- Class 1 - High accuracy
- Class S - Very high accuracy

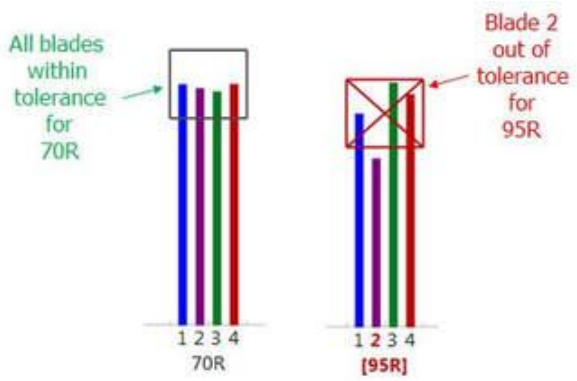
ISO International Organization for Standardization

Measurements Positions

The pressure face of the propeller is measured at several pre-defined locations. These locations are described as a percentage of the blade's length (or more accurately, the blade's radius). You may see data reported for these positions; for example, "70R" indicates the measurements are taken at 70% of the blade's length. The higher the class accuracy, the more measurement positions are required.



Bar Graphs



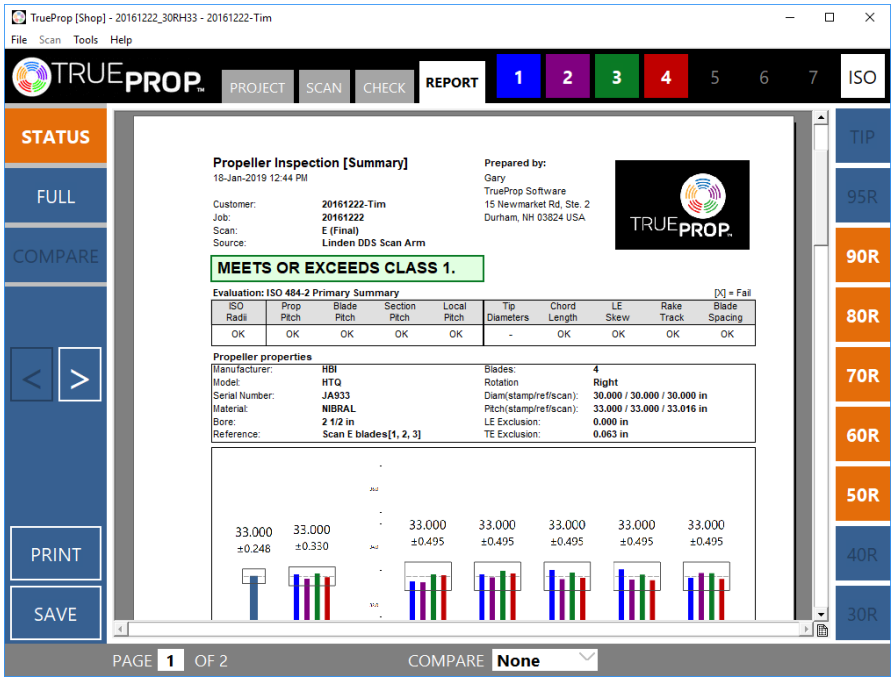
The ISO criteria require inspection of many different parameters of the blades. Propeller performance is greatly influenced by the propeller's pitch, or the angle of the blade. There is an average pitch for the entire propeller, as well as a pitch for each blade. There is also pitch reported for each blade's measurement locations (i.e. 50R, 70R, 90R). The reports tend to use Bar graphs to report the Pitch of each blade at the measurement locations (ex. "70R" will have a pitch value and bar graph for each blade). Overlaid on the bar graph results is the tolerance window, which gives us the minimum and maximum acceptable pitch for the desired Class. Measurements of pitch that exceed the tolerance window must be adjusted and repaired to meet the desired Class. The measurement locations (i.e. 70R) can also be broken up into smaller segments to ensure the pitch is consistent from the leading edge (forward edge) of the blade to the trailing edge of the propeller (aft-most edge). This is known as local pitch and is required for the higher repair classes.

Other Criteria

While pitch is an important parameter, ISO-484 includes other checks on the blade shape and position. The length of the blade at each measurement location is known as the chord length. Chord length is reviewed because it is important to maintain the same surface area for each blade. The spacing between blades as well as the position of the leading edge of each blade is checked for consistency. Blade spacing is important for smooth and quiet propeller performance. Lastly, the axial position of each blade is checked. This ensures that each blade is raked (or swept backward) the same amount. (This is sometimes referred to as propeller track.)

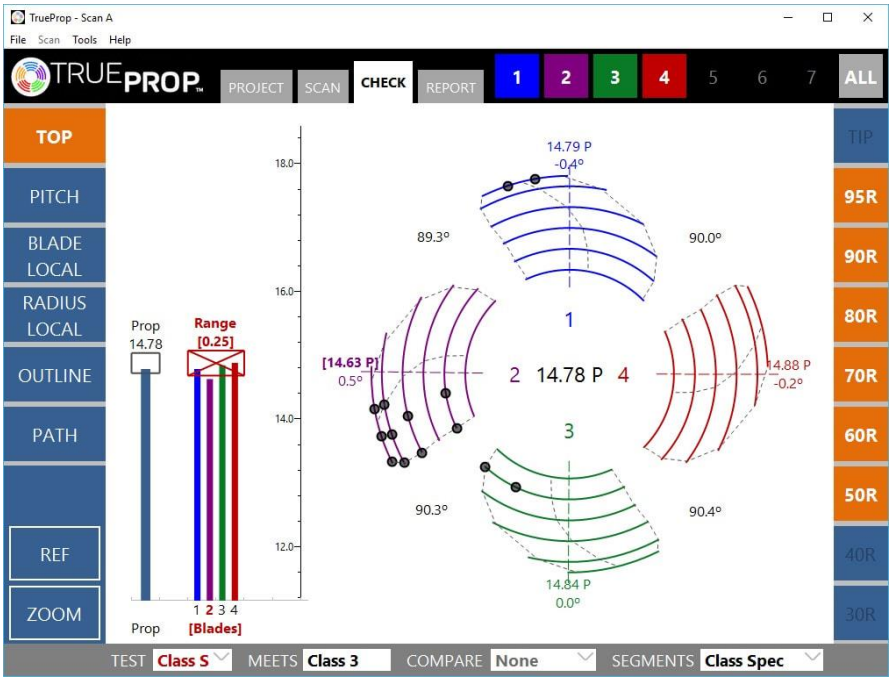
Compliance Summary

There is typically a statement of compliance (or non-compliance) near the top of the report that gives the overall pass/fail status of the propeller with respect to the desired Class accuracy.



Evaluation Summary

In addition to the overall compliance, sometimes the compliance of an individual criterion (pitch, chord, blade spacing, track, etc.) is detailed. This provides a nice overview of the work required for damaged propellers or the work performed on repaired propellers.

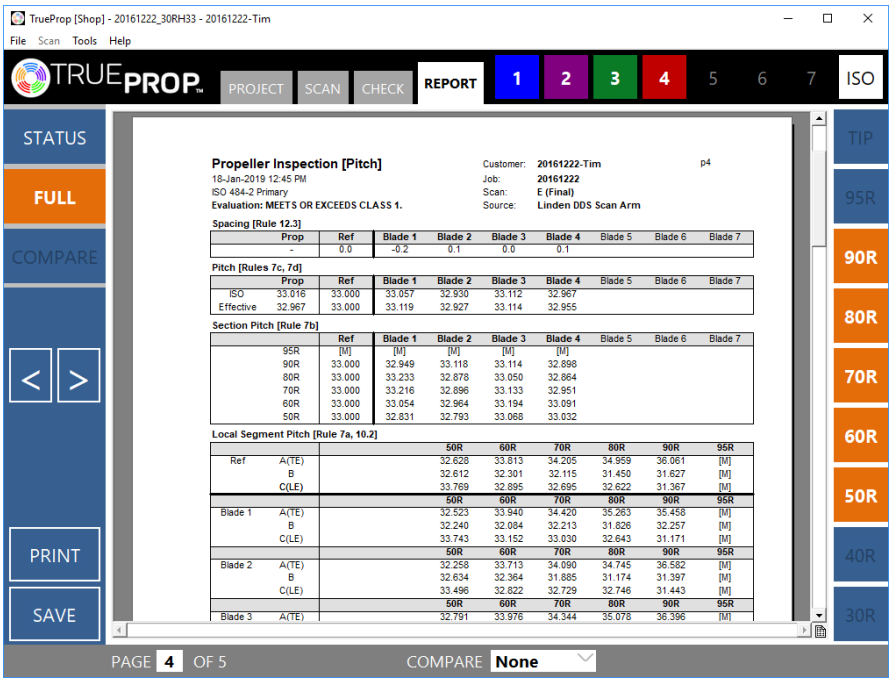


Wheel View

Some software, such as TrueProp, includes a wheel view that displays the shape of the propeller as seen from above. This view is great for finding the damaged regions on the propeller, which are usually marked with a different color or large dot. The wheel view often includes the spacing between blades, as well as reporting pitch values for each blade and the average of the propeller as a whole.

Tabular Data

In a full report (not usually provided to the customer), the dimensional values for the blade parameters are listed. The repair technician can compare these values to the expected values in order to determine how to repair the propeller. While this data is extensive and hard for a boat-owner to understand, it is essentially a tabular version of the bar graphs and wheel plot data. If you are interested in learning more about this propeller data, we encourage you to talk with your repair professional or contact the author.



So next time you damage your propeller, remember that often the propeller can be repaired to better-than-new condition by a professional propeller repair shop. They say: “knowledge is more valuable than money,” and this extends to high-quality propeller repairs as well. The inspection information provided by repair shops can be intimidating and non-intuitive for boat-owners, but a little knowledge about the inspection process and standards can help you interpret your own scan report and ensure your propeller has been repaired to as-good or better-than-new condition.

TRUEPROP™ SOFTWARE
next-generation propeller inspection

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Propeller Inspection [Summary]

27-Feb-2025 04:59 PM

Prepared by:

Customer: **DEMO**
Vessel:
Job: **DEMO**
Scan: **A (27-Feb-2025 04:55 PM)**
Source: **Metrology-Grade 3D Laser Scanner**

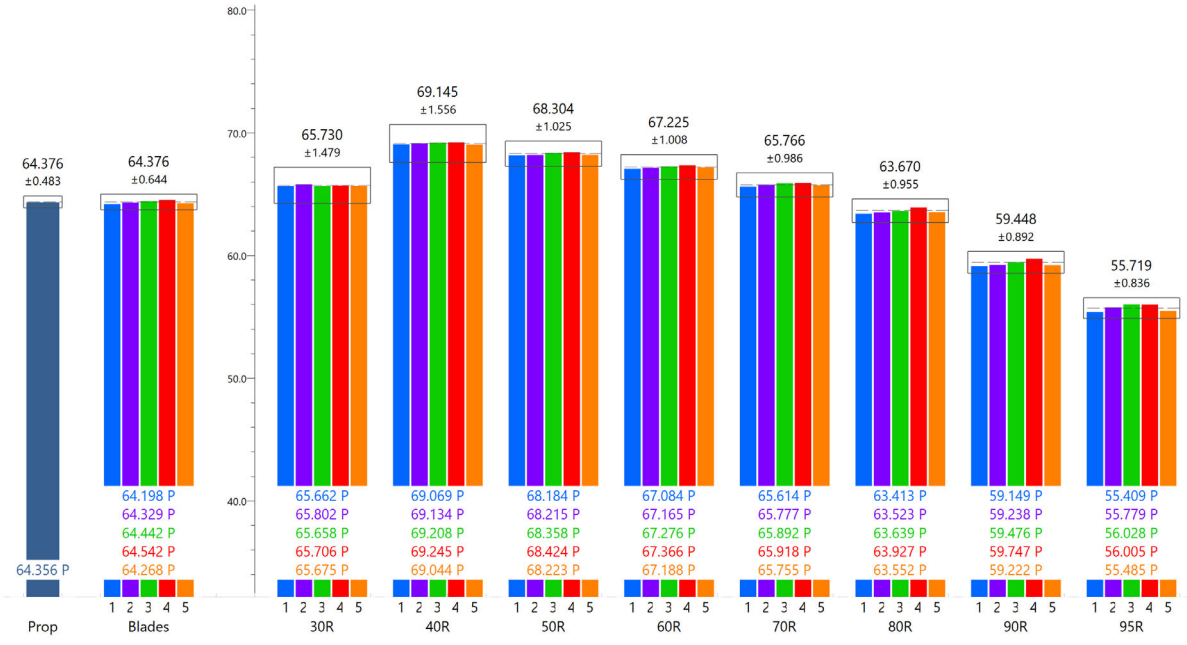
MEETS OR EXCEEDS CLASS 1.

Evaluation: ISO 484-2 Primary Summary [X] = Fail

ISO Radii	Prop Pitch	Blade Pitch	Section Pitch	Local Pitch	Tip Diameters	Chord Length	LE Skew	Rake Track	Blade Spacing
PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS

Propeller properties

Manufacturer:		Blades:	**5**
Model:		Rotation	**Right**
Serial Number:		Diam(stamp/ref/scan):	**46.000 / 46.000 / 45.979 in**
Material:		Pitch(stamp/ref/scan):	**64.376 / 64.376 / 64.356 in**
Bore:		LE Exclusion:	**0.460 in**
Reference:	**Scan A blades[1, 2, 3, 4, 5]**	TE Exclusion:	**0.460 in**
Eff. Pitch:	**65.036 in**	Eff. FCR:	**0.0115**
Estim. EAR:	**0.948**		



Red box and bold text indicates pitch out-of-tolerance

Propeller Inspection [Graphs]

27-Feb-2025 04:59 PM
ISO 484-2 Primary
Evaluation: MEETS OR EXCEEDS CLASS 1.

Customer: **DEMO**
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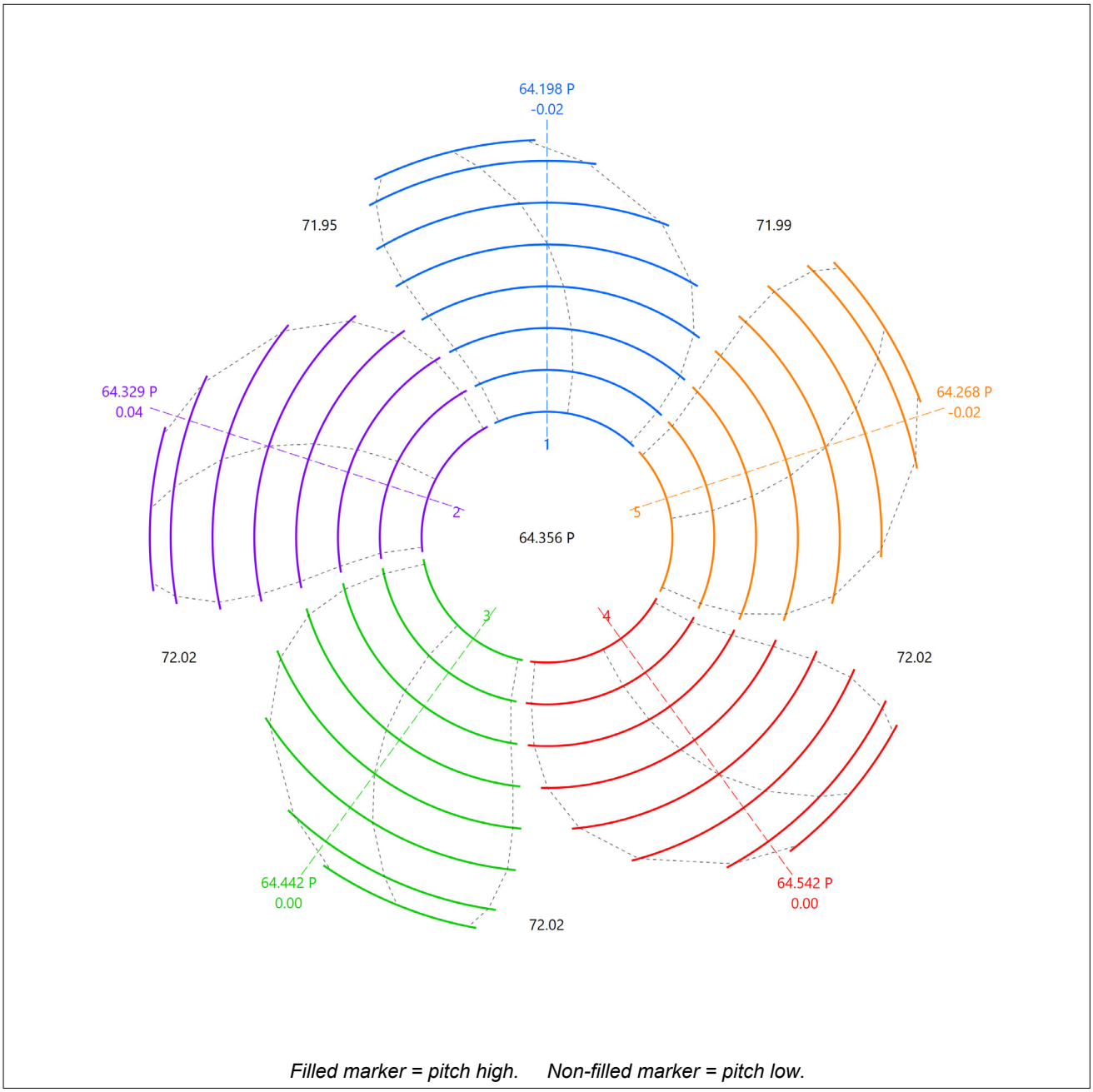

Filled marker = pitch high. Non-filled marker = pitch low.

Propeller Inspection [Graphs]

27-Feb-2025 04:59 PM
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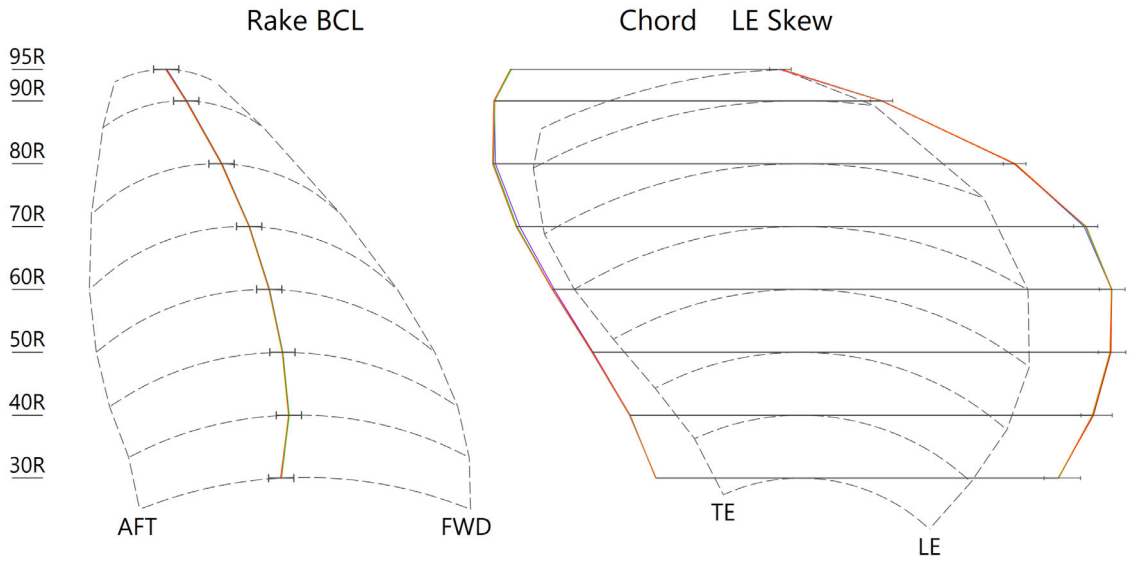
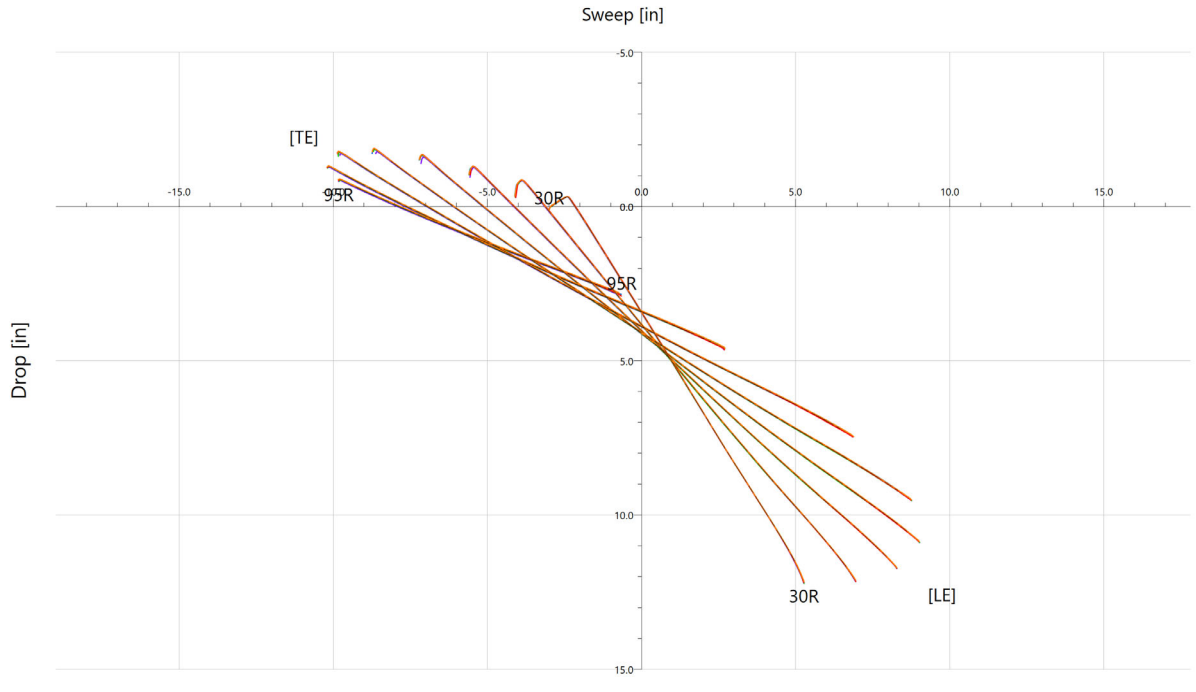


Marker number indicates blade out-of-tolerance for shown radial position



Propeller Inspection [Diam & Pitch]

27-Feb-2025 04:59 PM
ISO 484-2 Primary
Evaluation: MEETS OR EXCEEDS CLASS 1.

Customer: **DEMO**
Job: **DEMO**
Scan: **A (27-Feb-2025 04:55 PM)**
Source: **Metrology-Grade 3D Laser Scanner**

Diameter [Rule 8]

	Prop	Ref	Blade 1	Blade 2	Blade 3	Blade 4	Blade 5	Blade 6	Blade 7
	45.979	46.000	45.974	45.922	45.985	45.989	46.026		

Spacing [Rule 12.3]

	Prop	Ref	Blade 1	Blade 2	Blade 3	Blade 4	Blade 5	Blade 6	Blade 7
	-	0.0	-0.02	0.04	0.00	0.00	-0.02		

Pitch [Rules 7c, 7d]

	Prop	Ref	Blade 1	Blade 2	Blade 3	Blade 4	Blade 5	Blade 6	Blade 7
ISO	64.356	64.376	64.198	64.329	64.442	64.542	64.268		
Effective	64.268	65.059	64.876	64.985	65.113	65.239	64.966		

Section Pitch [Rule 7b]

		Ref	Blade 1	Blade 2	Blade 3	Blade 4	Blade 5	Blade 6	Blade 7
	95R	55.719	55.409	55.779	56.028	56.005	55.485		
	90R	59.448	59.149	59.238	59.476	59.747	59.222		
	80R	63.670	63.413	63.523	63.639	63.927	63.552		
	70R	65.766	65.614	65.777	65.892	65.918	65.755		
	60R	67.225	67.084	67.165	67.276	67.366	67.188		
	50R	68.304	68.184	68.215	68.358	68.424	68.223		
	40R	69.145	69.069	69.134	69.208	69.245	69.044		
	30R	65.730	65.662	65.802	65.658	65.706	65.675		

Local Segment Pitch [Rule 7a, 10.2]

		30R	40R	50R	60R	70R	80R	90R	95R
Ref	A(TE)	57.331	70.391	71.152	71.313	70.682	69.149	64.775	60.259
	B	70.590	69.498	68.570	67.290	65.447	62.807	58.124	54.238
	C(LE)	70.566	67.580	65.309	63.253	61.364	59.236	55.576	52.739
		30R	**40R**	**50R**	**60R**	**70R**	**80R**	**90R**	**95R**
Blade 1	A(TE)	57.498	70.267	70.974	71.161	70.539	68.924	64.359	59.904
	B	70.385	69.246	68.447	67.142	65.397	62.648	58.001	54.164
	C(LE)	70.320	67.722	65.244	63.131	61.106	58.854	55.212	52.240
		30R	**40R**	**50R**	**60R**	**70R**	**80R**	**90R**	**95R**
Blade 2	A(TE)	57.361	70.405	71.125	71.242	70.686	69.113	64.608	60.269
	B	70.442	69.506	68.413	67.287	65.477	62.649	57.953	54.257
	C(LE)	70.912	67.527	65.226	63.149	61.366	58.997	55.285	52.888
		30R	**40R**	**50R**	**60R**	**70R**	**80R**	**90R**	**95R**
Blade 3	A(TE)	57.127	70.582	71.329	71.469	70.906	69.225	64.946	60.549
	B	70.621	69.702	68.692	67.400	65.533	62.849	58.118	54.383
	C(LE)	70.567	67.388	65.185	63.152	61.440	59.035	55.500	53.232
		30R	**40R**	**50R**	**60R**	**70R**	**80R**	**90R**	**95R**
Blade 4	A(TE)	57.053	70.516	71.228	71.399	70.833	69.240	64.937	60.469
	B	70.908	69.551	68.683	67.377	65.515	62.866	58.163	54.410
	C(LE)	70.537	67.702	65.477	63.496	61.598	59.842	56.263	53.214
		30R	**40R**	**50R**	**60R**	**70R**	**80R**	**90R**	**95R**
Blade 5	A(TE)	57.471	70.161	70.980	71.234	70.586	68.928	64.570	60.235
	B	70.482	69.473	68.509	67.200	65.451	62.725	57.977	54.081
	C(LE)	70.305	67.531	65.293	63.307	61.417	59.181	55.252	52.227

Propeller Inspection [Sections]

27-Feb-2025 04:59 PM
ISO 484-2 Primary
Evaluation: MEETS OR EXCEEDS CLASS 1.

Customer: **DEMO**
Job: **DEMO**
Scan: **A (27-Feb-2025 04:55 PM)**
Source: **Metrology-Grade 3D Laser Scanner**

Chord [Rule 11]

	Ref	Blade 1	Blade 2	Blade 3	Blade 4	Blade 5	Blade 6	Blade 7
95R	9.871	9.888	9.823	9.858	9.929	9.859		
90R	14.177	14.179	14.157	14.162	14.192	14.195		
80R	19.067	19.076	19.008	19.038	19.089	19.126		
70R	20.807	20.785	20.734	20.828	20.839	20.849		
60R	20.453	20.475	20.396	20.472	20.454	20.465		
50R	18.956	18.975	18.923	18.969	18.965	18.949		
40R	16.942	16.952	16.943	16.924	16.962	16.928		
30R	14.723	14.724	14.730	14.739	14.714	14.706		

LE Skew [Rule 12.2]

	Ref	Blade 1	Blade 2	Blade 3	Blade 4	Blade 5	Blade 6	Blade 7
95R	-0.739	-0.696	-0.809	-0.733	-0.698	-0.757		
90R	2.966	2.991	2.923	2.964	2.963	2.988		
80R	7.830	7.840	7.824	7.802	7.816	7.870		
70R	10.430	10.390	10.442	10.446	10.426	10.448		
60R	11.405	11.416	11.402	11.408	11.391	11.410		
50R	11.394	11.400	11.386	11.395	11.394	11.394		
40R	10.831	10.835	10.826	10.824	10.834	10.834		
30R	9.572	9.580	9.556	9.580	9.562	9.582		

Rake BCL [Rule 13]

	Ref	Blade 1	Blade 2	Blade 3	Blade 4	Blade 5	Blade 6	Blade 7
95R	1.068	1.071	1.095	1.073	1.060	1.043		
90R	1.804	1.805	1.824	1.812	1.797	1.780		
80R	3.098	3.098	3.115	3.107	3.093	3.075		
70R	4.111	4.114	4.123	4.119	4.104	4.094		
60R	4.839	4.844	4.855	4.845	4.828	4.823		
50R	5.327	5.329	5.340	5.340	5.316	5.312		
40R	5.557	5.557	5.566	5.574	5.547	5.542		
30R	5.280	5.288	5.291	5.290	5.256	5.276		