FERNSTRUM®
R.W. Fernstrum & Company

February 9, 1990

The following is a summary of two model tests on three different planing hulls conducted by the Vienna Model Basin. In the first test the GRIDCOOLER® Keel Coolers were mounted in a recess on the hull, and in the second test the GRIDCOOLER Keel Coolers were mounted externally to the hull (not recessed) with fairing blocks fore and aft of each GRIDCOOLER unit.

All models were based on twin engines with twin screws. The GRIDCOOLER Keel Coolers were sized for 85 degree F. sea water with a 10 knot minimum hull speed under full power. Due to an error in translation by the Vienna Model Basin, models 1499B and 1499C were only tested up to ½ power. However, the keel cooling scaled on all models were capable of handling 110% of the full engine power rating requested.

	Hull Model No. 1499A	**Hull Model No. 1499B**	**Hull Model No. 1499C**
Length BETW – Ship	35.00 M	12.00 M	24.00 M
– Model	2.9167 M	3.40 M	6.00 M
Displacement Mass	190 T	10 T	87 T
Wetted Surface	244 SQM	37 SQM	146 SQM
Engine Power Rating	1125 KW	*150 KW	*800 KW
GRIDCOOLER Model	D20120-E1	*B1642U-E1	*D1684-E1

On completion of tests the Vienna Model Basin stated that “The Gridcoolers fitted in respective recess, practically do not influence the resistance of a ship.”

Please refer to the attached summary reports for the test results.

The original test reports are on file at R.W. Fernstrum & Co. and photo copies will be provided upon request.

*Due to an error in translation by the Vienna Model Basin, models 1499B and 1499C were only tested up to ½ power.

phone: 906.863.5553
P.O. Box 97 • 1716 11th Avenue • Menominee, MI 49858 • USA
fernstrum.com

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On behalf of R. W. Fernstrum and Company 3 different models were tested with and without gridcoolers in order to find out the influence of gridcollers on the model's resistance.

The body plans of the 3 tested models are shown in appendix 1.

Appendix 2 shows the way the gridcoolers were fitted at each tested model.

The tables in appendix 3 show the results of Resistance Tests without and with gridcoolers; the resistance power P_E in kW is printed as function of the speed for each tested condition.

Due to the gridcoolers fitted on the models the resistance increase at model A is 4 %, at model B 2,9 % and at model C 7,5 %, all values taken as an average.

Appendix 4 shows the loss in speed because of fitted gridcoolers for the three tested models.

Summarizing the results of the performed tests it can be stated, that the gridcoolers fitted in a respective recess, practically do not influence the resistance of a ship.

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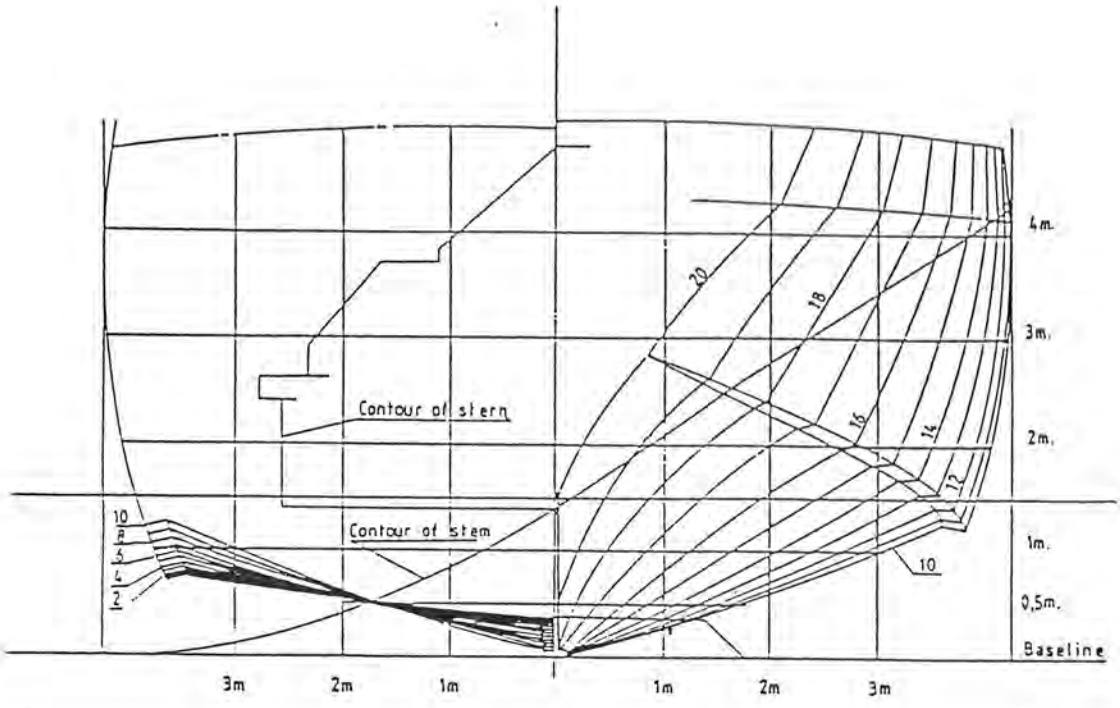
Main Characteristics of Model No. 1499A



$\lambda = 12$

		SHIP		MODEL
Length betw. perpendiculars	Lpp	35.00 m		2.9167 m
Breadth moulded	B	8.50 m		0.7083 m
Draught at FP	Tf	1.48 m		0.1233 m
Draught at AP	Ta	1.48 m		0.1233 m
Draught midships	Tm	1.48 m		0.1233 m
Length in the WL	Lwl	34.95 m		2.9125 m
Displacement volume	∇	185 m^3		0.1072 m^3
Displacement mass	Δ	190 t		0.1072 m^3
Wetted surface	S	244 m^2		1.6924 m^2
Cbpp			0.4206	
Cbwl			0.4212	
Ca			0.00028	

Appendix 1

SCHIFFBAUTECHNISCHE VERSUCHSANSTALT IN WIEN
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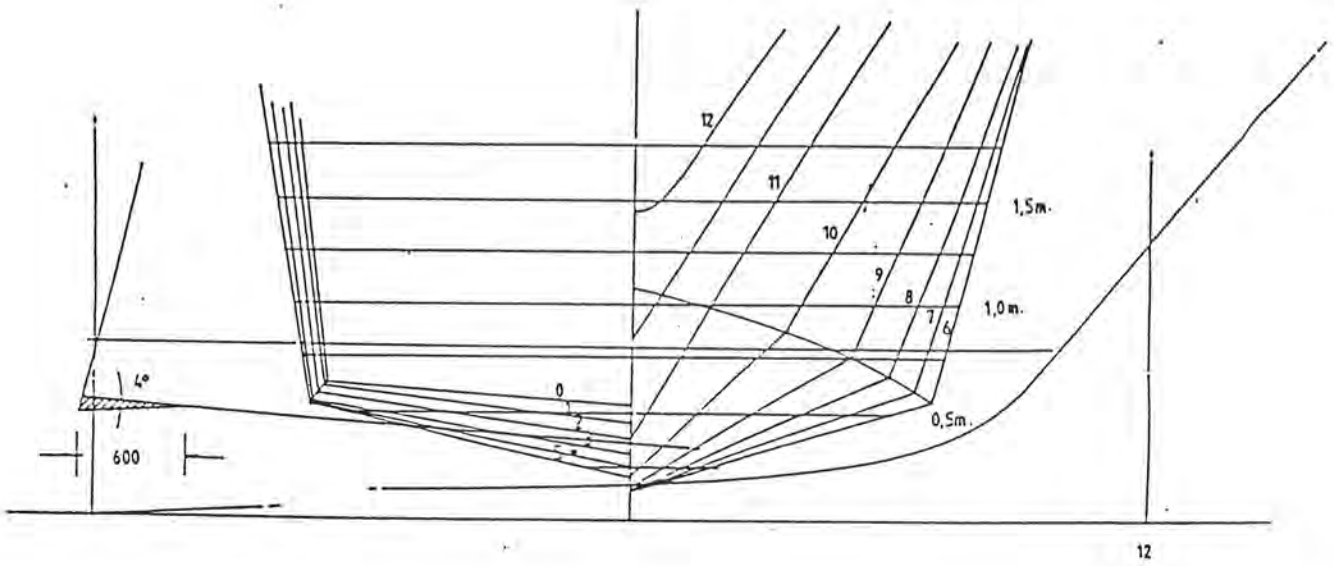
Main Characteristics of Model No. 1499B



$\lambda = 5.2$

		SHIP		MODEL
Length betw. perpendiculars	Lpp	12.00 m		2.3077 m
Breadth moulded	B	3.40 m		0.6538 m
Draught at FP	Tf	0.80 m		0.1538 m
Draught at AP	Ta	0.80 m		0.1538 m
Draught midships	Tm	0.80 m		0.1538 m
Length in the WL	Lwl	11.50 m		2.2115 m
Displacement volume	∇	10 m³		0.0725 m³
Displacement mass	Δ	10 t		0.0725 m³
Wetted surface	S	37 m²		1.3609 m²
Cbpp			0.3125	
Cbwl			0.3261	
Ca			0.00033	

Appendix 1

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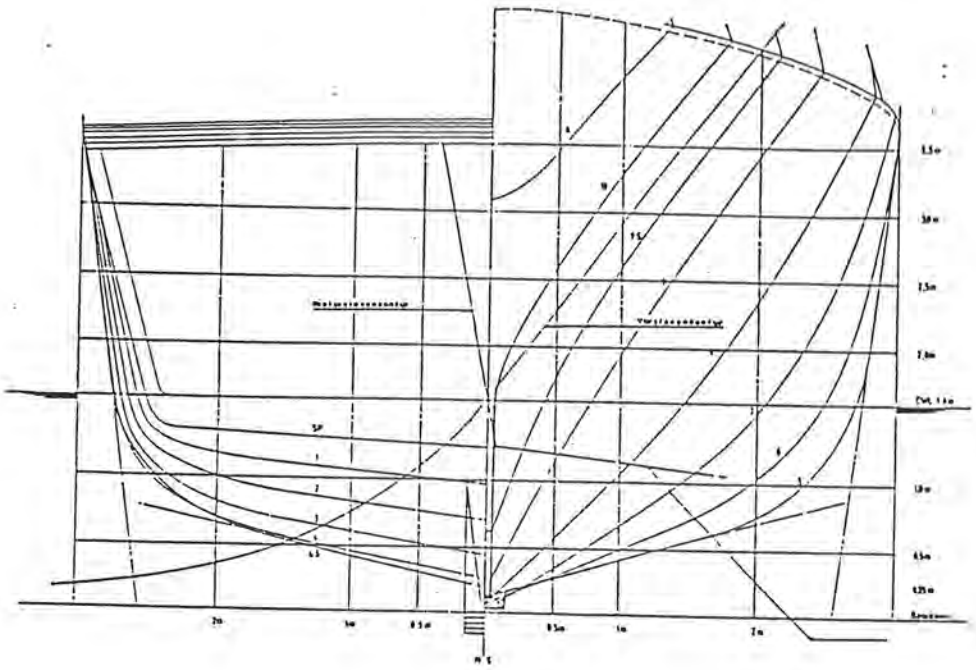
Main Characteristics of Model No. 1499C



λ = 6.5

		SHIP		MODEL
Length betw. perpendiculars	Lpp	24.00 m		3.6923 m
Breadth moulded	B	6.00 m		0.9231 m
Draught at FP	Tf	1.60 m		0.2462 m
Draught at AP	Ta	1.60 m		0.2462 m
Draught midships	Tm	1.60 m		0.2462 m
Length in the WL	Lwl	24.33 m		3.7431 m
Displacement volume	∇	85 m³		0.3089 m³
Displacement mass	Δ	87 t		0.3089 m³
Wetted surface	S	146 m²		3.4462 m²
Cbpp			0.3681	
Cbwl			0.3631	
Ca			0.00030	

Appendix 1

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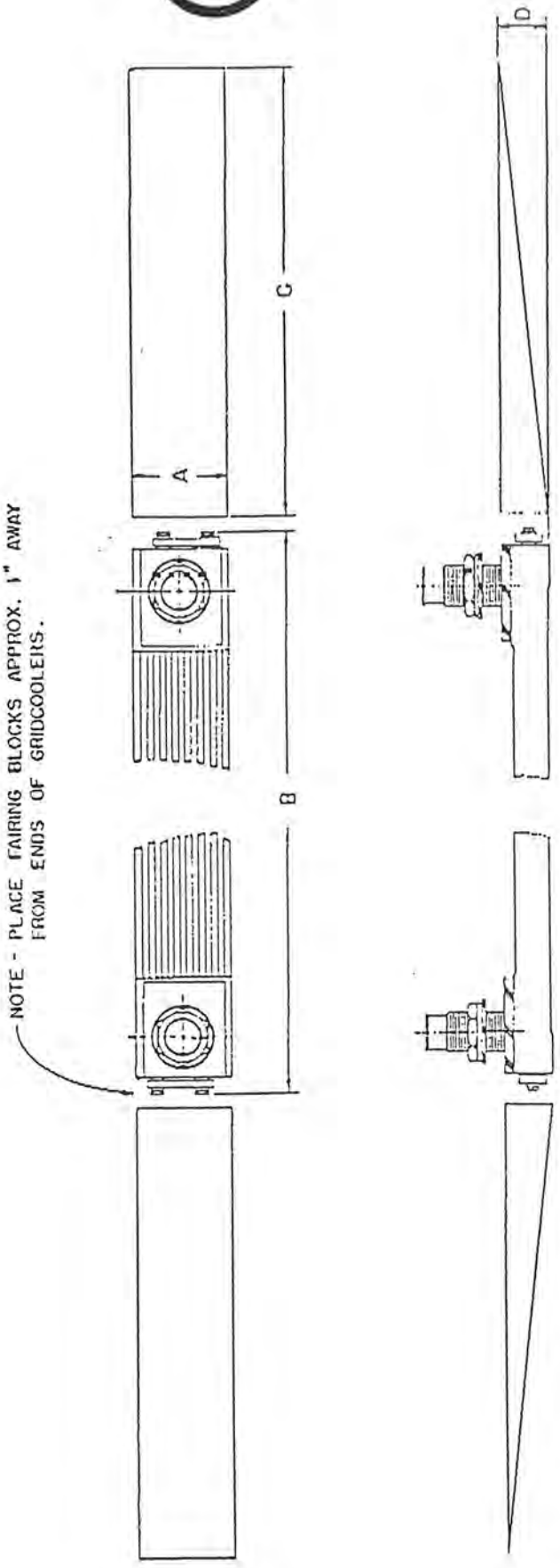

Appendix 2

SCHIFFBAUTECHNISCHE VERSUCHSANSTALT IN WIEN
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Model No. 1499/A4

V_S (Kn)	P_E (kW)		%
	without gridcoolers	with gridcoolers	
20	1282	1347	+ 5,1
22	1499	1567	+ 4,5
24	1739	1812	+ 4,2
26	2009	2075	+ 3,3
28	2296	2369	+ 3,2
30	2616	2704	+ 3,4

Model No. 1499/B4

V_S (Kn)	P_E (kW)		%
	without gridcoolers	with gridcoolers	
10	42	43	+ 2,4
12	67	68	+ 1,5
14	88	91	+ 3,4
16	109	113	+ 3,7
18	137	142	+ 3,6
20	177	182	+ 2,8

Model No. 1499/C4

V_S (Kn)	P_E (kW)		%
	without gridcoolers	with gridcoolers	
10	68	72	+ 5,9
12	155	158	+ 1,9
14	354	375	+ 5,9
16	556	615	+10,6
18	712	785	+10,3
20	859	950	+10,6

Appendix 3

SCHIFFBAUTECHNISCHE VERSUCHSANSTALT IN WIEN
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Model No. 1499/A

P_E (kW)	speed (Kn)	
	without gridcoolers	with gridcoolers
1500	22,08	21,40
2000	25,98	25,45
2500	29,28	28,80

Model No. 1499/B

P_E (kW)	speed (Kn)	
	without gridcoolers	with gridcoolers
50	10,68	10,52
100	15,12	14,90
150	18,70	18,45

Model No. 1499/C

P_E (kW)	speed (Kn)	
	without gridcoolers	with gridcoolers
200	12,56	12,50
400	14,40	14,20
600	16,56	15,96
800	19,16	18,11

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