

## Program for bare hull PMM tests in shallow water

### KVLCC2

The tests will be carried out in unconfined water, which means that the ship will feel the seabed, while the remaining boundaries will be far away from the hull. Here the non-dimensional water depth is defined as the ratio  $\frac{h}{T_m}$  where  $T_m$  is the mean draft and  $h$  is the water depth (see Figure 1). With this definition  $\frac{h}{T_m}$  will range from infinity in deep water to 1 in shallow water, when the bottom of the ship touches the seabed. Four different water depths will be included, see Table 1 below. These water depths should provide enough information to study how the forces and moments behave as function of the water depth when going from deep to shallow water.

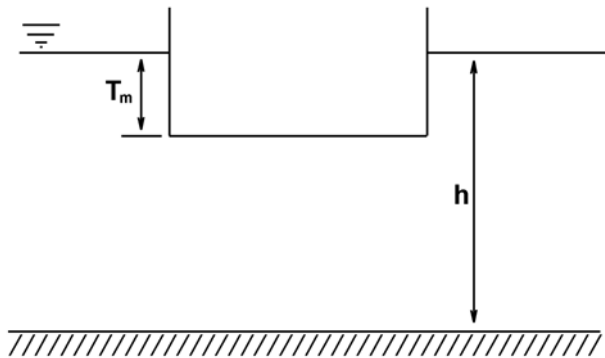


Figure 1. Water depth definition.

The tests shall be conducted as bare hull tests i.e. without propeller or rudder. The approach speed for the shallow water tests shall be 7.0 kn. The water depths in Table 1 and in the following test program are based on a model of KVLCC2 with a scale of 1:45.71 i.e.  $L_{pp} = 7.0\text{ m}$  and  $T_m = 0.46\text{ m}$ .

Table 1. Water depths

Name	$\frac{h}{T_m}$	$T_m$	$h$
--	[-]	[m]	[m]
$h_1$	1.2	0.46	0.55
$h_2$	1.5	0.46	0.68
$h_3$	3.0	0.46	1.37
$h_4$	$\geq 10$	0.46	$\geq 4.55$

To provide data for determination of the precision limits in the uncertainty assessment repeat runs have been included for a number of selected test cases.

On the following pages, the test program for each water depth is outlined.

## Program for bare hull PMM tests in shallow water

PMM Tests at water depth $h_1$		ship	model	
$h_1: h/T_m = 1.2$		Lpp (m)	320.00	7.000
		T (m)	20.80	0.455
		U0 (kn)	7.00	1.035
	scale 1: 45.71	U0 (m/s)	3.60	0.533

**Static Drift:**

U/U0	Fn	Uc (m/s)	Drift angles $\beta$ (deg)	No. of repet.	No. of runs
1.00	0.064	0.533	-6, -4, -2, -1, -1/2, 0, 1/2, 1, 2, 4, 6	1	11
Total:					11

**Pure Sway:**

U/U0	Fn	Uc (m/s)	Corresp. $\beta$ (deg)	$v'_{max}$	No. of runs
1.00	0.064	0.533	4	0.07	1
Total:					1

**Pure Yaw:**

U/U0	Fn	Uc (m/s)	Drift angles $\beta$ (deg)	$r'_{max}$	No. of runs
1.00	0.064	0.533	0	0.39	1
1.00	0.064	0.533	0	0.26	1
1.00	0.064	0.533	0	0.13	1
Total:					3

**Yaw-and-Drift:**

U/U0	Fn	Uc (m/s)	Drift angles $\beta$ (deg)	$r'_{max}$	No. of runs
1.00	0.064	0.533	4	0.39	1
Total:					1

Total number of runs for this water depth: 16

## Program for bare hull PMM tests in shallow water

PMM Tests at water depth $h_2$		ship		model	
		$h_2: h/T_m = 1.5$		Lpp (m)	320.00
scale 1: 45.71		T (m)	20.80	0.455	
		U0 (kn)	7.00	1.035	
		U0 (m/s)	3.60	0.533	

**Static Drift:**

U/U0	Fn	Uc (m/s)	Drift angles $\beta$ (deg)	No. of repet.	No. of runs
1.00	0.064	0.533	-6, -4, -2, -1, -1/2, 0, 1/2, 1, 2, 4, 6	1	11
1.00	0.064	0.533	4	11	11
1.57	0.101	0.837	0, 2, 4, 6	1	4
2.21	0.142	1.179	0, 2, 4, 6	1	4
					30

**Pure Sway:**

U/U0	Fn	Uc (m/s)	Corresp. $\beta$ (deg)	$v'_{max}$	No. of runs
1.00	0.064	0.533	4	0.07	1
NB $\beta$ setting = 0 in Pure Sway					1

**Pure Yaw:**

U/U0	Fn	Uc (m/s)	Drift angles $\beta$ (deg)	$r'_{max}$	No. of runs
1.00	0.064	0.533	0	0.39	12
1.00	0.064	0.533	0	0.26	1
1.00	0.064	0.533	0	0.13	1
1.57	0.101	0.837	0	0.39	1
2.21	0.142	1.179	0	0.39	1
					16

**Yaw-and-Drift:**

U/U0	Fn	Uc (m/s)	Drift angles $\beta$ (deg)	$r'_{max}$	No. of runs
1.00	0.064	0.533	4	0.39	1
					1

Total number of runs for this water depth: 48

## Program for bare hull PMM tests in shallow water

<b>PMM Tests at water depth h3</b>  h3: h/Tm = 3.0  scale 1: 45.71		ship	model
	Lpp (m)	320.00	7.000
	T (m)	20.80	0.455
	U0 (kn)	7.00	1.035
	U0 (m/s)	3.60	0.533

**Static Drift:**

U/U0	Fn	Uc (m/s)	Drift angles $\beta$ (deg)	No. of repet.	No. of runs
1.00	0.064	0.533	-6, -4, -2, -1, -1/2, 0, 1/2, 1, 2, 4, 6	1	11
Total:					11

**Pure Sway:**

U/U0	Fn	Uc (m/s)	Corresp. $\beta$ (deg)	$v'_{max}$	No. of runs
1.00	0.064	0.533	4	0.07	1
Total:					1

**Pure Yaw:**

U/U0	Fn	Uc (m/s)	Drift angles $\beta$ (deg)	$r'_{max}$	No. of runs
1.00	0.064	0.533	0	0.39	1
1.00	0.064	0.533	0	0.26	1
1.00	0.064	0.533	0	0.13	1
Total:					3

**Yaw-and-Drift:**

U/U0	Fn	Uc (m/s)	Drift angles $\beta$ (deg)	$r'_{max}$	No. of runs
1.00	0.064	0.533	4	0.39	1
Total:					1

Total number of runs for this water depth: 16

## Program for bare hull PMM tests in shallow water

PMM Tests at water depth $h_4$		ship	model
$h_4: h/T_m = 10.0$ (deep)		Lpp (m)	320.00
		T (m)	20.80
		U0 (kn)	7.00
	scale 1: 45.71	U0 (m/s)	3.60

**Static Drift:**

U/U0	Fn	Uc (m/s)	Drift angles $\beta$ (deg)	No. of repet.	No. of runs
1.00	0.064	0.533	-6, -4, -2, -1, -1/2, 0, 1/2, 1, 2, 4, 6	1	11
					11

**Pure Sway:**

U/U0	Fn	Uc (m/s)	Corresp. $\beta$ (deg)	$v'_{max}$	No. of runs
1.00	0.064	0.533	4	0.07	1
					1

**Pure Yaw:**

U/U0	Fn	Uc (m/s)	Drift angles $\beta$ (deg)	$r'_{max}$	No. of runs
1.00	0.064	0.533	0	0.39	1
1.00	0.064	0.533	0	0.26	1
1.00	0.064	0.533	0	0.13	1
					3

**Yaw-and-Drift:**

U/U0	Fn	Uc (m/s)	Drift angles $\beta$ (deg)	$r'_{max}$	No. of runs
1.00	0.064	0.533	4	0.39	1
					1

Total number of runs for this water depth: 16