ITT(호(5)
(ITTC mbols)

수조시험연구회(KTTC)

국제수조회의(International Towing Tank [illegible]서는 오래전부터 기호 및 용어위원회(Symbols & Terminology Group)를 구성하여 ITTC [illegible]를 작성해 왔다.

19차 ITTC('90.9. 스페인)에서 채택된 "ITTC 표준기호"는 3가지 주제－General Mechanics, Ships in General, Special Craft－로 분류되어 있다. 본 내용에서는 이러한 표준기호를 나누어 소개하고자 한다(참고문헌 : "Standard Symbols and Terminology", 19th ITTC, Sept. 1990, Madrid, Spain).

SECTION 2 SHIPS IN GENERAL

2.2 RESISTANCE AND PROPULSION

2.2.1 Hull Resistance

Standard Symbol	Computer Symbol	Name of Concept	Definition of Explanation	SI Unit
C_A	CA	Incremental resistance coefficient for model ship correlation.	$\frac{R_A}{\frac{1}{2}\rho V^2 S}$	1
C_{AA}	CAA	Air or wind resistance coefficient	$\frac{R_{AA}}{\frac{1}{2}\rho V_R^2 A_V}$	1
C_D	CD	Drag coefficient	$\frac{D}{\frac{1}{2}\rho V^2 S}$	1
C_F	CF	Frictional resistance coefficient of a body	$\frac{R_F}{\frac{1}{2}\rho V^2 S}$	1
C_{FO}	CFO	Frictional resistance coefficient of a plate	$\frac{R_{FO}}{\frac{1}{2}\rho V^2 S}$	1
C_P	CP	Local pressure coefficient		1
C_{PR}	CPR	Pressure resistance coefficient, including wave effect.		1

Standard Symbol	Computer Symbol	Name of Concept	Definition of Explanation	SI Unit
C_{PV}	CPV	Viscous pressure resistance coefficient	$\frac{R_{PV}}{\frac{1}{2}\rho V^2 S}$	1
C_R	CR	Residuary resistance coefficient	$\frac{R_R}{\frac{1}{2}\rho V^2 S}$	1
C_S	CS	Spray resistance coefficient	$\frac{R_S}{\frac{1}{2}\rho V^2 S}$	1
C_T	CT	Total resistance coefficient	$\frac{R_T}{\frac{1}{2}\rho V^2 S}$	1
C_{TL}	CTL	Telfer's resistance coefficient	$\frac{gRL}{\Delta V^2}$	1
C_{TQ}	CTQ	Qualified resistance coefficient	$\frac{C_{T\nabla}}{\eta_H \eta_R}$	
$C_{T\nabla}$	CTVOL	Resistance displacement	$\frac{R_T}{\frac{1}{2}\rho V^2 \nabla^{2/3}}$	1
C_V	CV	Total viscous resistance coefficient	$\frac{R_V}{\frac{1}{2}\rho V^2 S}$	1
C_W	CW	Wavemaking resistance coefficient	$\frac{R_W}{\frac{1}{2}\rho V^2 S}$	1
C_{WP}	CWP	Wave pattern resistance coefficient, by wave analysis		1
Ⓒ	CIRCC	R.E. Froude's resistance coefficient	$\frac{1000R}{\nabla K^3}$	1
C_τ	CFUL	Local friction coefficient based on velocity at the edge of the boundary layer at $y=\delta$	$C_\tau = \frac{\tau_w}{\frac{1}{2}\rho U_\delta^2}$	1
d	DJWS	Jones wake strength		1
Ⓕ	CIRCF	R.E. Froude's frictional resistance coefficient	$\frac{1000R_F}{\Delta K^2}$	1
k	C3	Three dimensional form factor on flat plate friction	$\frac{C_V - C_{FO}}{C_{FO}}$	1
Ⓚ	CIRCK	R.E. Froude's speed displacement coefficient	$\sqrt{4\pi} \cdot F_{n\nabla}$	

Standard Symbol	Computer Symbol	Name of Concept	Definition of Explanation	SI Unit
K_R	KR	Resistance coefficient corresponding to K Q, K_Q, K_T	$\frac{R}{\rho^2 D^4}$	1
R_A	RA	Model−ship correlation allowance	Incremental resistance to be added to the smooth ship resistance to complete the model−ship prediction	
R_{AA}	RAA	Air or wind resistance		N
R_{AP}	RAP	Appendage resistance		N
R_{AR}	RAR	Roughness resistance		N
m	BLCK	Blockage parameter	Maximum transverse area of model ship divided by tank cross section area.	
R_C	RC	Resistance corrected for difference in temperature between resistance and self −propulsion tests	$\frac{(1+K)C_{FMC}+C_R}{(1+K)C_{FM}+C_R}R_{TM}$	N
R_F	RF	Frictional resistance of a body.	Where C_{FMC} is the frictional coefficient at the temperature of the self propulsion test.	N
R_{FO}	RFO	Frictional resistance of a plate.	Due to fluid friction on the surface of the body	N
R_P	RP	Pressure resistance	Due to the normal stresses over the surface of a body	N
R_{PV}	RPV	Viscous pressure resistance	Due to normal stress related to viscosity and turbulence	N
R_R	RR	Residuary resistance	R_T-R_F or R_T-R_{FO}	N
R_S	RS	Spray resistance	Due to generation of spray	N
R_T	RT	Total resistance	Total towed resistance	N
R_V	RV	total viscous resistance	R_F+R_{PV}	N
R_W	RW	Wavemaking resistance	Due to formation of surface waves.	N
R_{WB}	RWB	Wavebreaking resistance	Associated with the break down of the bow wave.	N
S_H	THL	Total head loss		m
$\triangle C_F$	DELCF	Roughness allowance	(obsolete, see C_A)	1
V	V	Speed of the model of the ship		m\s

Standard Symbol	Computer Symbol	Name of Concept	Definition of Explanation	SI Unit
V_R	VR	Wind velocity, relative		m/s
τ_W	LSF	Local skin friction		N/m^2

2.2.2 Ship Performance

Standard Symbol	Computer Symbol	Name of Concept	Definition of Explanation	SI Unit
a	RAUG	Resistance augment fraction	$\frac{T-R_T}{R_T}+F_P$	1
$C_{D\nabla}$	CDVOL	Power – displacement coefficient	$\frac{P_D}{\frac{1}{2}\rho V^3 \nabla^{2/3}}$	1
C_N	CN	Trial correction for propeller rate of revolution at speed identity.	$\frac{n_T}{n_S}$	1
C_{NP}	CNP	Trial correction for propeller rate of revolution at power identity.		1
C_P	CP	Trial correction for delivered power	$\frac{P_{DT}}{P_{DS}}$	1
$\triangle C_{FC}$	DELCFC	Ship model correlation factor with respect to $\triangle C_{FC}$ formula of ITTC 1978 method.		1
F_D	FD	Towing force applied to the model in a self propulsion test carried out at the ship propulsion point.		N
F_P	FP	Pull or towing force of a ship		N
F_{PO}	FPO	Pull during bollard test		N
K_1	C1	Ship model correlation factor for propulsive efficiency.	$\frac{\eta_{DS}}{\eta_{DM}}$	1
K_2	C2	Ship model correlation factor for propeller rate revolution	$\frac{\eta_S}{\eta_M}$	1
C_{ADM}	CADM	Admiralty coefficient	$\frac{\nabla^{2/3}V^3}{P_Z}$	
n	N	Frequency or commonly rate of revolution		H_Z
P_B	PB	Brake power		W

Standard Symbol	Computer Symbol	Name of Concept	Definition or Explanation	St Unit
P_D	PD	Delivered power at propeller	$2\pi Qn$	W
P_E	PE	Effective power	RV	W
P_I	PI	Indicated power	Determined from pressure measured by indicator	W
P_S	PS	Shaft power	Power measured on the shaft	W
P_T	PT	Thrust power	TV_A	W
Q	Q	Torque	Corresponding to delivered power P_D	Nm
S	MSIN	Mean sinkage, dynamic	Mean variation of draft, fore ad aft, divided by length	1
t	TRIM	Trim, dynamic	Variation of the trim due to dynamic condition, divided by length	1
t	THDF	Thrust deduction fraction	$\frac{(T-R_T+F_P)}{T}$	1
W	WFT	Taylor wake fraction in general.	$\frac{(V-V_A)}{V}$	1
W	WFF	Froude wake fraction	$\frac{(V-V_A)}{V_A}$	1
W_Q	WFTQ	Taylor wake fraction determined from torque identity.	Speed Va determined by a comparison between an openwater propeller test and a self propulsion test, K_Q having the same values in both tests.	1
W_T	WFTT	Taylor wake fraction determined from thrust identity.	Speed Va determined by a comparison between an openwater propeller test and a self propulsion test, K_T having the same value in both tests.	1
$\triangle W$	DELWC	Ship−model correlation factor for wake fraction.	$W_{T,M}-W_{T,S}$	1
$\triangle W_C$	DELWC	Ship-model correlation factor with respect to $W_{T,S}$ method formula of ITTC 1978 method.		1
X	XLO	Load fraction in power prediction.	$\frac{\eta_D P_D}{P_E}-1$	1
Z_V	ZV	Sinkage of model or ship		m

Standard Symbol	Computer Symbol	Name of Concept	Definition or Explanation	St Unit
β	APSF	Appendage scale effect factor.	Ship appendage devided by model appendage resistance.	1
γ_R	GAMWR	Wind direction, relative.		1
η_B	ETAB	Propeller efficiency behind ship	$\frac{P_T}{P_D} = \frac{TV_A}{2\pi Qn}$	1
η_D	ETAD	Propulsive efficiency or quasi−propulsive coefficient.	$\frac{P_E}{P_D}$	1
η_G	ETAG	Gearing efficiency		1
η_H	ETAH	Hull efficiency	$\frac{(1-t)}{(1-w)}$	1
η_M	ETAM	Mechanical efficiency	$\frac{P_S}{P_I}$ or $\frac{P_B}{P_I}$	1
η_R	ETAR	Relative rotative efficiency.	$\frac{\eta_S}{\eta_O}$	1
η_S	ETAS	Shafting efficiency	$\frac{P_D}{P_S}$	1
B_P	BP	Taylor's propeller coefficient base on delivered horse power	$\frac{nP_d^{1/2}}{V_A^{2 1/2}}$	1
			where n is revs/min, P_d in horsepower, V_A in knots(obsolete)	1
B_U	BU	Taylor's propeller coefficient based on thrust horsepower	$\frac{nP_T^{1/2}}{V_A^{2 1/2}}$	
			where n is revs/min, P_T in horsepower, V_A in knots(obsolete)	
C_P	CP	Power loading coefficient	$\frac{P_D}{\frac{1}{2}\rho V_A^3 \frac{\pi D^2}{4}}$	1
C_{Q^*}	CQS	Torque index	$\frac{Q}{\frac{1}{2}\rho(V_A^2+(0.7\pi nD)^2)(\frac{\pi D}{4})}$	1
C_{Th}	CTH	Thrust loading coefficient	$\frac{T}{\frac{1}{2}\rho V_A(\frac{\pi D^2}{4})}$	1
C_{T^*}	CTHS	Thrust index	$\frac{T}{\frac{1}{2}\rho(V_A^2+(0.7\pi nD)^2)(\frac{\pi D}{4})}$	1
J	ADVC	Advance coefficient or advance number of propeller	$\frac{V_A}{nD}$	1