Table 2 — Residual marine fuels

Characteristic		Unit	Limit	Category ISO-F-											Test method reference
				RMA	RMB	RMD	RME	RMG				RMK			
				10[a]	30	80	180	180	380	500	700	380	500	700	
Kinematic viscosity at 50 °C[b]		mm^2/s	max.	10,00	30,00	80,00	180,0	180,0	380,0	500,0	700,0	380,0	500,0	700,0	ISO 3104
Density at 15 °C		kg/m^3	max.	920,0	960,0	975,0	991,0	991,0				1010,0			see 7.1 ISO 3675 or ISO 12185
CCAI		—	max.	850	860	860	860	870				870			see 6.3 a)
Sulfur[c]		mass %	max.	Statutory requirements											see 7.2 ISO 8754 ISO 14596
Flash point		°C	min.	60,0	60,0	60,0	60,0	60,0				60,0			see 7.3 ISO 2719
Hydrogen sulfide[d]		mg/kg	max.	2,00	2,00	2,00	2,00	2,00				2,00			IP 570
Acid number[e]		mg KOH/g	max.	2,5	2,5	2,5	2,5	2,5				2,5			ASTM D664
Total sediment aged		mass %	max.	0,10	0,10	0,10	0,10	0,10				0,10			see 7.5 ISO 10307-2
Carbon residue: micro method		mass %	max.	2,50	10,00	14,00	15,00	18,00				20,00			ISO 10370
Pour point (upper)[f]	winter quality	°C	max.	0	0	30	30	30				30			ISO 3016
	summer quality	°C	max.	6	6	30	30	30				30			ISO 3016
Water		volume %	max.	0,30	0,50	0,50	0,50	0,50				0,50			ISO 3733
Ash		mass %	max.	0,040	0,070	0,070	0,070	0,100				0,150			ISO 6245
Vanadium		mg/kg	max.	50	150	150	150	350				450			see 7.7 IP 501, IP 470 or ISO 14597
Sodium		mg/kg	max.	50	100	100	50	100				100			see 7.8 IP 501 IP 470

Table 2 (*continued*)

Characteristic	Unit	Limit	Category ISO-F-										Test method reference
			RMA	RMB	RMD	RME	RMG				RMK				
			10[a]	30	80	180	180	380	500	700	380	500	700	
Aluminium plus silicon	mg/kg	max.	25	40	40	50	60				60			see 7.9 IP 501, IP 470 or ISO 10478
Used lubricating oils (ULO): calcium and zinc; or calcium and phosphorus	mg/kg	—	The fuel shall be free from ULO. A fuel shall be considered to contain ULO when either one of the following conditions is met: calcium > 30 and zinc > 15; or calcium > 30 and phosphorus > 15											see 7.10 IP 501 or IP 470 IP 500

[a] This category is based on a previously defined distillate DMC category that was described in ISO 8217:2005, Table 1. ISO 8217:2005 has been withdrawn.

[b] 1 mm^2/s = 1cSt.

[c] The purchaser shall define the maximum sulfur content in accordance with relevant statutory limitations. See 0.3 and Annex C.

[d] Due to reasons stated in Annex D, the implementation date for compliance with the limit shall be 1 July 2012. Until such time, the specified value is given for guidance.

[e] See Annex H.

[f] Purchasers shall ensure that this pour point is suitable for the equipment on board, especially if the ship operates in cold climates.

Table 1 — Distillate marine fuels

Characteristics		Unit	Limit	Category ISO-F-				Test method reference
				DMX	DMA	DMZ	DMB	
Kinematic viscosity at 40 °C[a]		mm^2/s	max.	5,500	6,000	6,000	11,00	ISO 3104
			min.	1,400	2,000	3,000	2,000	
Density at 15 °C		kg/m^3	max.	—	890,0	890,0	900,0	see 7.1 ISO 3675 or ISO 12185
Cetane index		—	min.	45	40	40	35	ISO 4264
Sulfur[b]		mass %	max.	1,00	1,50	1,50	2,00	see 7.2 ISO 8754 ISO 14596
Flash point		°C	min.	43,0	60,0	60,0	60,0	see 7.3 ISO 2719
Hydrogen sulfide[c]		mg/kg	max.	2,00	2,00	2,00	2,00	IP 570
Acid number		mg KOH/g	max.	0,5	0,5	0,5	0,5	ASTM D664
Total sediment by hot filtration		mass %	max.	—	—	—	0,10[e]	see 7.4 ISO 10307-1
Oxidation stability		g/m^3	max.	25	25	25	25[f]	ISO 12205
Carbon residue: micro method on the 10 % volume distillation residue		mass %	max.	0,30	0,30	0,30	—	ISO 10370
Carbon residue: micro method		mass %	max.	—	—	—	0,30	ISO 10370
Cloud point		°C	max.	–16	—	—	—	ISO 3015
Pour point (upper)[d]	winter quality	°C	max.	–6	–6	–6	0	ISO 3016
	summer quality	°C	max.	0	0	0	6	ISO 3016
Appearance		—	—	Clear and bright[f]			c, f, g	see 7.6
Water		volume %	max.	—	—	—	0,30[c]	ISO 3733
Ash		mass %	max.	0,010	0,010	0,010	0,010	ISO 6245
Lubricity, corrected wear scar diameter (wsd 1,4) at 60 °C[h]		µm	max.	520	520	520	5209	ISO 12156-1

Table 1 (*continued*)

Characteristics	Unit	Limit	Category ISO-F-				Test method reference
			DMX	DMA	DMZ	DMB	
a 1 mm²/s = 1 cSt.							
b Notwithstanding the limits given, the purchaser shall define the maximum sulfur content in accordance with relevant statutory limitations. See Annex C.							
c Due to reasons stated in Annex D, the implementation date for compliance with the limit shall be 1 July 2012. Until such time, the specified value is given for guidance. For distillate fuels the precision data are currently being developed.							
d Purchasers should ensure that this pour point is suitable for the equipment on board, especially if the ship operates in cold climates.							
e If the sample is not clear and bright, the total sediment by hot filtration and water tests shall be required, see 7.4 and 7.6.							
f If the sample is not clear and bright, the test cannot be undertaken and hence the oxidation stability limit shall not apply.							
g If the sample is not clear and bright, the test cannot be undertaken and hence the lubricity limit shall not apply.							
h This requirement is applicable to fuels with a sulfur content below 500 mg/kg (0,050 mass %).							
i If the sample is dyed and not transparent, then the water limit and test method as given in 7.6 shall apply.							

Table 2 — Residual marine fuels

Characteristic		Unit	Limit	Category ISO-F-											Test method reference
				RMA	RMB	RMD	RME	RMG				RMK			
				10[a]	30	80	180	180	380	500	700	380	500	700	
Kinematic viscosity at 50 °C[b]		mm^2/s	max.	10,00	30,00	80,00	180,0	180,0	380,0	500,0	700,0	380,0	500,0	700,0	ISO 3104
Density at 15 °C		kg/m^3	max.	920,0	960,0	975,0	991,0	991,0				1010,0			see 7.1 ISO 3675 or ISO 12185
CCAI		—	max.	850	860	860	860	870				870			see 6.3 a)
Sulfur[c]		mass %	max.	Statutory requirements											see 7.2 ISO 8754 ISO 14596
Flash point		°C	min.	60,0	60,0	60,0	60,0	60,0				60,0			see 7.3 ISO 2719
Hydrogen sulfide		mg/kg	max.	2,00	2,00	2,00	2,00	2,00				2,00			see 7.11 IP 570
Acid number[d]		mg KOH/g	max.	2,5	2,5	2,5	2,5	2,5				2,5			ASTM D664
Total sediment aged		mass %	max.	0,10	0,10	0,10	0,10	0,10				0,10			see 7.5 ISO 10307-2
Carbon residue: micro method		mass %	max.	2,50	10,00	14,00	15,00	18,00				20,00			ISO 10370
Pour point (upper)[e]	winter quality	°C	max.	0	0	30	30	30				30			ISO 3016
	summer quality	°C	max.	6	6	30	30	30				30			ISO 3016
Water		volume %	max.	0,30	0,50	0,50	0,50	0,50				0,50			ISO 3733
Ash		mass %	max.	0,040	0,070	0,070	0,070	0,100				0,150			ISO 6245
Vanadium		mg/kg	max.	50	150	150	150	350				450			see 7.7 IP 501, IP 470 or ISO 14597

[a] This category is based on a previously defined distillate DMC category that was described in ISO 8217:2005, Table 1. ISO 8217:2005 has been withdrawn.

[b] $1\ mm^2/s = 1\ cSt$.

[c] The purchaser shall define the maximum sulfur content in accordance with relevant statutory limitations. See 0.3 and Annex C.

[d] See Annex H.

[e] Purchasers shall ensure that this pour point is suitable for the equipment on board, especially if the ship operates in cold climates.

Table 2 *(continued)*

Characteristic	Unit	Limit	Category ISO-F-										Test method reference
			RMA	RMB	RMD	RME	RMG				RMK		
			10[a]	30	80	180	180	380	500	700	380	500	700	
Sodium	mg/kg	max.	50	100	100	50	100				100			see 7.8 IP 501 IP 470
Aluminium plus silicon	mg/kg	max.	25	40	40	50	60				60			see 7.9 IP 501, IP 470 or ISO 10478
Used lubricating oils (ULO): — calcium and zinc; or — calcium and phosphorus	mg/kg	—	The fuel shall be free from ULO. A fuel shall be considered to contain ULO when either one of the following conditions is met: — calcium > 30 and zinc > 15; or — calcium > 30 and phosphorus > 15											see 7.10 IP 501 or IP 470 IP 500

[a] This category is based on a previously defined distillate DMC category that was described in ISO 8217:2005, Table 1. ISO 8217:2005 has been withdrawn.

[b] 1 mm^2/s = 1cSt.

[c] The purchaser shall define the maximum sulfur content in accordance with relevant statutory limitations. See 0.3 and Annex C.

[d] See Annex H.

[e] Purchasers shall ensure that this pour point is suitable for the equipment on board, especially if the ship operates in cold climates.

Table 1 — Distillate marine fuels

Characteristic		Unit	Limit	Category ISO-F-				Test method reference
				DMX	DMA	DMZ	DMB	
Kinematic viscosity at 40 °C[a]		mm^2/s	max.	5,500	6,000	6,000	11,00	ISO 3104
			min.	1,400	2,000	3,000	2,000	
Density at 15 °C		kg/m^3	max.	—	890,0	890,0	900,0	see 7.1 ISO 3675 or ISO 12185
Cetane index		—	min.	45	40	40	35	ISO 4264
Sulfur[b]		mass %	max.	1,00	1,50	1,50	2,00	see 7.2 ISO 8754 ISO 14596
Flash point		°C	min.	43,0	60,0	60,0	60,0	see 7.3 ISO 2719
Hydrogen sulfide		mg/kg	max.	2,00	2,00	2,00	2,00	see 7.11 IP 570
Acid number		mg KOH/g	max.	0,5	0,5	0,5	0,5	ASTM D664
Total sediment by hot filtration		mass %	max.	—	—	—	0,10[d]	see 7.4 ISO 10307-1
Oxidation stability		g/m^3	max.	25	25	25	25[e]	ISO 12205
Carbon residue: micro method on the 10 % volume distillation residue		mass %	max.	0,30	0,30	0,30	—	ISO 10370
Carbon residue: micro method		mass %	max.	—	—	—	0,30	ISO 10370
Cloud point		°C	max.	–16	—	—	—	ISO 3015
Pour point (upper)[c]	winter quality	°C	max.	—	–6	–6	0	ISO 3016
	summer quality	°C	max.	—	0	0	6	ISO 3016
Appearance		—	—	Clear and bright[h]			d, e, f	see 7.6

[a] 1 mm^2/s = 1 cSt.

[b] Notwithstanding the limits given, the purchaser shall define the maximum sulfur content in accordance with relevant statutory limitations. See Annex C.

[c] Purchasers should ensure that this pour point is suitable for the equipment on board, especially if the ship operates in cold climates.

[d] If the sample is not clear and bright, the total sediment by hot filtration and water tests shall be required, see 7.4 and 7.6.

[e] If the sample is not clear and bright, the test cannot be undertaken and hence the oxidation stability limit shall not apply.

[f] If the sample is not clear and bright, the test cannot be undertaken and hence the lubricity limit shall not apply.

[g] This requirement is applicable to fuels with a sulfur content below 500 mg/kg (0,050 mass %).

[h] If the sample is dyed and not transparent, then the water limit and test method as given in 7.6 shall apply.

Table 1 *(continued)*

Characteristic	Unit	Limit	Category ISO-F-				Test method reference
			DMX	DMA	DMZ	DMB	
Water	volume %	max.	—	—	—	0,30[d]	ISO 3733
Ash	mass %	max.	0,010	0,010	0,010	0,010	ISO 6245
Lubricity, corrected wear scar diameter (wsd 1,4) at 60 °C[h]	µm	max.	520	520	520	520[g]	ISO 12156-1

[a] 1 mm^2/s = 1 cSt.

[b] Notwithstanding the limits given, the purchaser shall define the maximum sulfur content in accordance with relevant statutory limitations. See Annex C.

[c] Purchasers should ensure that this pour point is suitable for the equipment on board, especially if the ship operates in cold climates.

[d] If the sample is not clear and bright, the total sediment by hot filtration and water tests shall be required, see 7.4 and 7.6.

[e] If the sample is not clear and bright, the test cannot be undertaken and hence the oxidation stability limit shall not apply.

[f] If the sample is not clear and bright, the test cannot be undertaken and hence the lubricity limit shall not apply.

[g] This requirement is applicable to fuels with a sulfur content below 500 mg/kg (0,050 mass %).

[h] If the sample is dyed and not transparent, then the water limit and test method as given in 7.6 shall apply.