

Table 1 — Distillate marine fuels

| Characteristics   | Unit               | Limit | Category ISO-F-               |       |       |                   | Test method reference            |          |
|---|--------------------|-------|-------------------------------|-------|-------|-------------------|----------------------------------|----------|
|   |                    |       | DMX                           | DMA   | DMZ   | DMB               |                                  |          |
| Kinematic viscosity at 40 °C <sup>a</sup>                               | mm <sup>2</sup> /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 <sup>3</sup>  | max.  | —                             | 890,0 | 890,0 | 900,0             | see 7.1<br>ISO 3675 or ISO 12185 |          |
| Cetane index  | —                  | min.  | 45                            | 40    | 40    | 35                | ISO 4264                         |          |
| Sulfur <sup>b</sup>   | mass %             | max.  | 1,00                          | 1,50  | 1,50  | 2,00              | see 7.2<br>ISO 8754<br>ISO 14596 |          |
| Flash point   | °C                 | min.  | 43                            | 60    | 60    | 60                | see 7.3<br>ISO 2719              |          |
| Hydrogen sulfide <sup>c</sup>   | 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 <sup>e</sup> | see 7.4<br>ISO 10307-1           |          |
| Oxidation stability   | g/m <sup>3</sup>   | max.  | 25                            | 25    | 25    | 25 <sup>f</sup>   | 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) <sup>d</sup>   | winter quality     | °C    | max.                          | −6    | −6    | −6                | 0                                | ISO 3016 |
|   | summer quality     | °C    | max.                          | 0     | 0     | 0                 | 6                                | ISO 3016 |
| Appearance  | —                  | —     | Clear and bright <sup>l</sup> |       |       | e, f, g           | see 7.6                          |          |
| Water   | volume %           | max.  | —                             | —     | —     | 0,30 <sup>e</sup> | 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 <sup>h</sup> | µm                 | max.  | 520                           | 520   | 520   | 520 <sup>g</sup>  | ISO 12156-1                      |          |

Table 1 (continued)

| Characteristics | Unit   | Limit | Category ISO-F- |     |     |     | Test method reference |
|-----------------|--|-------|-----------------|-----|-----|-----|-----------------------|
|                 |  |       | DMX             | DMA | DMZ | DMB |                       |
| a               | 1 mm <sup>2</sup> /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 %).  |       |                 |     |     |     |                       |
| j               | 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 <sup>a</sup>        | 30    | 80    | 180   | 180   | 380   | 500   | 700   | 380    | 500   | 700   |  |          |
| Kinematic viscosity at 50 °C <sup>b</sup> | mm <sup>2</sup> /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 <sup>3</sup>  | max.  | 920,0                  | 960,0 | 975,0 | 991,0 | 991,0 |       |       |       | 1010,0 |       |       | see 7.1<br>ISO 3675 or<br>ISO 12185          |          |
| CCAI                                      | —                  | max.  | 850                    | 860   | 860   | 860   | 870   |       |       |       | 870    |       |       | see 6.3 a)                                   |          |
| Sulfur <sup>c</sup>                       | mass %             | max.  | Statutory requirements |       |       |       |       |       |       |       |        |       |       | see 7.2<br>ISO 8754<br>ISO 14596             |          |
| Flash point                               | °C                 | min.  | 60,0                   | 60,0  | 60,0  | 60,0  | 60,0  |       |       |       | 60,0   |       |       | see 7.3<br>ISO 2719                          |          |
| Hydrogen sulfide <sup>d</sup>             | mg/kg              | max.  | 2,00                   | 2,00  | 2,00  | 2,00  | 2,00  |       |       |       | 2,00   |       |       | IP 570                                       |          |
| Acid number <sup>e</sup>                  | mg<br>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<br>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<br>(upper) <sup>f</sup>        | 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<br>IP 501,<br>IP 470 or<br>ISO 14597 |          |
| Sodium                                    | mg/kg              | max.  | 50                     | 100   | 100   | 50    | 100   |       |       |       | 100    |       |       | see 7.8<br>IP 501<br>IP 470                  |          |

Table 2 (continued)

| Characteristic  | Unit  | Limit | Category ISO-F-  |     |     |     |     |     |     |     |     |     | Test method reference                        |
|---|-------|-------|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
|   |       |       | RMA  | RMB | RMD | RME | RMG |     |     |     | RMK |     |  |
|   |       |       | 10 <sup>a</sup>  | 30  | 80  | 180 | 180 | 380 | 500 | 700 | 380 | 500 |  |
| Aluminium plus silicon  | mg/kg | max.  | 25   | 40  | 40  | 50  | 60  |     |     |     | 60  |     | see 7.9<br>IP 501,<br>IP 470 or<br>ISO 10478 |
| Used lubricating oils (ULO):<br><br>calcium and zinc; or<br>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:<br><br>calcium > 30 and zinc > 15; or<br>calcium > 30 and phosphorus > 15 |     |     |     |     |     |     |     |     |     | see 7.10<br>IP 501 or<br>IP 470<br>IP 500    |
| <p><sup>a</sup> 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.</p> <p><sup>b</sup> 1 mm<sup>2</sup>/s = 1cSt.</p> <p><sup>c</sup> The purchaser shall define the maximum sulfur content in accordance with relevant statutory limitations. See 0.3 and Annex C.</p> <p><sup>d</sup> 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.</p> <p><sup>e</sup> See Annex H.</p> <p><sup>f</sup> Purchasers shall ensure that this pour point is suitable for the equipment on board, especially if the ship operates in cold climates.</p> |       |       |  |     |     |     |     |     |     |     |     |     |  |