

# High voltage current limiting Fuse links type CEF-S

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## 1. General

As seen in the data table, high-voltage current limiting fuse links type CEF-S has a minimum current value ( $I_{0,1\text{sec}}$ ) which allows the fuse link to interrupt the fault current within 100ms. This ensures very good protection and prevents faults in low-voltage switch-gears. The current value for the different fuse link types is shown for the total maximum breaking time of 100ms. For bigger fault currents the maximum total breaking time will be shorter. CEF-S

fuses are specially designed to achieve the lowest possible breaking current value at 100ms. However, this results in a reduced margin, which for standard CEF fuses, prevents fuse link operation due to inrush currents developed when an unloaded power transformer is energized.

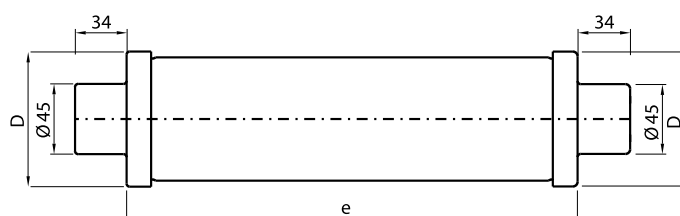
At any given value of  $I_{0,1\text{sec}}$ , the total breaking time is a maximum of 100ms – this value includes maximum pre-arcing time, arcing time and production tolerance.

## 2. Ordering table, dimensions and electrical data of CEF-S

| New smartcode CEF                            | $I_n$ | $I_1$ | $I_3$ | $I_{0,1s}$ | $P_n$ | Pre-arcing<br>integral $I^2t$ | Operating<br>integral $I^2t$ | $R_0$  | D    | Weight | Catalogue<br>No. CEF-S | Catalogue<br>No. CEF-S-TCU |
|----------------------------------------------|-------|-------|-------|------------|-------|-------------------------------|------------------------------|--------|------|--------|------------------------|----------------------------|
|                                              | [A]   | [kA]  | [A]   | [A]        | [W]   | [A <sup>2</sup> s]            | [A <sup>2</sup> s]           | [mΩ]   | [mm] | [kg]   |                        |                            |
| Rated voltage: 6/12 kV Length "e": 292 mm    |       |       |       |            |       |                               |                              |        |      |        |                        |                            |
| 1YMB741216M2611                              | 10    | 50    | 55    | 48         | 27    | 20                            | 2520                         | 187.00 | 65   | 2.3    | 1YMB531011M0001        | 1YMB531861M0001            |
| 1YMB741218M2611                              | 16    | 50    | 55    | 80         | 38    | 80                            | 2930                         | 108.5  | 65   | 2.3    | 1YMB531011M0002        | 1YMB531861M0002            |
| 1YMB741219M2611                              | 20    | 50    | 72    | 120        | 39    | 200                           | 3200                         | 72.3   | 65   | 2.3    | 1YMB531011M0003        | 1YMB531861M0003            |
| 1YMB741221M2611                              | 25    | 50    | 72    | 160        | 45    | 390                           | 7400                         | 46.5   | 65   | 2.3    | 1YMB531011M0004        | 1YMB531861M0004            |
| 1YMB741225M2611                              | 40    | 50    | 100   | 240        | 54    | 940                           | 17600                        | 24.5   | 65   | 2.3    | 1YMB531011M0005        | 1YMB531861M0005            |
| 1YMB741227M2611                              | 50    | 50    | 190   | 330        | 70    | 2030                          | 27000                        | 18.8   | 65   | 2.3    | 1YMB531011M0006        | 1YMB531861M0006            |
| Rated voltage: 10/24 kV Length "e": 442 mm   |       |       |       |            |       |                               |                              |        |      |        |                        |                            |
| 1YMB742416M4611                              | 10    | 25    | 55    | 48         | 54    | 20                            | 1450                         | 373.3  | 65   | 3      | 1YMB531012M0001        | 1YMB531862M0001            |
| 1YMB742418M4611                              | 16    | 25    | 55    | 80         | 67    | 90                            | 2910                         | 186.6  | 65   | 3      | 1YMB531012M0002        | 1YMB531862M0002            |
| 1YMB742419M4611                              | 20    | 25    | 72    | 120        | 69    | 240                           | 3960                         | 124.4  | 65   | 3      | 1YMB531012M0003        | 1YMB531862M0003            |
| 1YMB742421M4611                              | 25    | 25    | 72    | 160        | 70    | 340                           | 6140                         | 93.3   | 65   | 3      | 1YMB531012M0004        | 1YMB531862M0004            |
| 1YMB742425M4611                              | 40    | 25    | 110   | 240        | 122   | 930                           | 13300                        | 48.8   | 65   | 3      | 1YMB531012M0005        | 1YMB531862M0005            |
| Rated voltage: 30/40.5 kV Length "e": 537 mm |       |       |       |            |       |                               |                              |        |      |        |                        |                            |
| 1YMB744014M5611                              | 6.3   | 20    | 50    | 43         | 47    | 20                            | 2350                         | 927    | 65   | 3.1    | 1YMB531112M0001        | 1YMB531962M0001            |
| 1YMB744016M5611                              | 10    | 20    | 66    | 54         | 100   | 30                            | 3000                         | 615    | 65   | 3.1    | 1YMB531112M0002        | 1YMB531962M0002            |
| 1YMB744018M5611                              | 16    | 20    | 52    | 87         | 121   | 200                           | 3400                         | 313    | 65   | 3.1    | 1YMB531112M0003        | 1YMB531962M0003            |
| 1YMB744019M5611                              | 20    | 20    | 77    | 122        | 134   | 270                           | 4620                         | 207    | 65   | 3.1    | 1YMB531112M0004        | 1YMB531962M0004            |
| 1YMB744021M5611                              | 25    | 20    | 134   | 118        | 162   | 300                           | 3880                         | 175    | 65   | 3.1    | 1YMB531112M0005        | 1YMB531962M0005            |
| 1YMB744024M5611                              | 31.5  | 20    | 265   | 202        | 132   | 1050                          | 11900                        | 89.56  | 65   | 3.1    | 1YMB531112M0006        | 1YMB531962M0006            |
| 1YMB744025M5811                              | 40    | 20    | 172   | 324        | 126   | 2480                          | 36100                        | 60.3   | 87   | 6.2    | 1YMB531112M0007        | 1YMB531962M0007            |
| 1YMB744027M5811                              | 50    | 20    | 251   | 500        | 132   | 6600                          | 76800                        | 39.76  | 87   | 6.2    | 1YMB531112M0008        | 1YMB531962M0008            |
| 1YMB744029M5811                              | 63    | 20    | 334   | 655        | 164   | 9460                          | 110000                       | 29.7   | 87   | 6.2    | 1YMB531112M0009        | 1YMB531962M0009            |

### Legend:

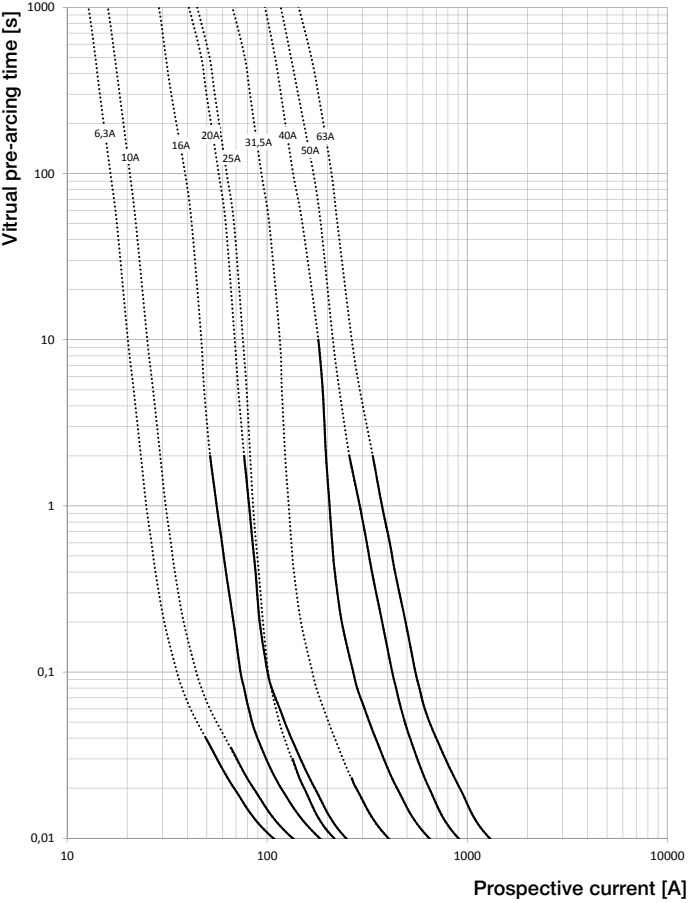
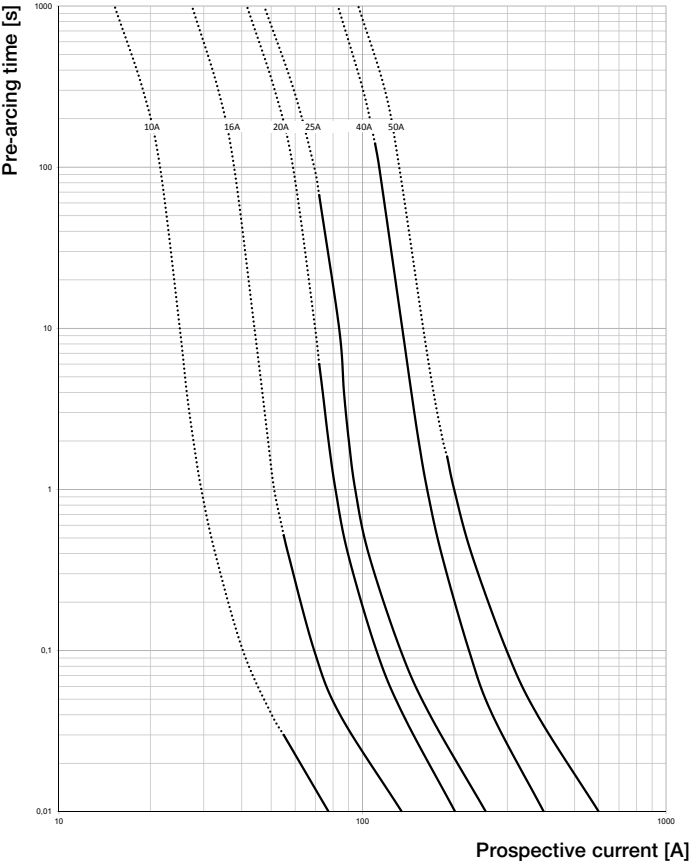
|            |                                        |
|------------|----------------------------------------|
| $I_n$      | rated current                          |
| $I_1$      | rated maximum breaking current         |
| $I_3$      | rated minimum breaking current         |
| $I_{0,1s}$ | minimal breaking current within 100 ms |
| $P_n$      | rated power                            |
| $R_0$      | resistance                             |
| D          | diameter                               |



## Nameplate

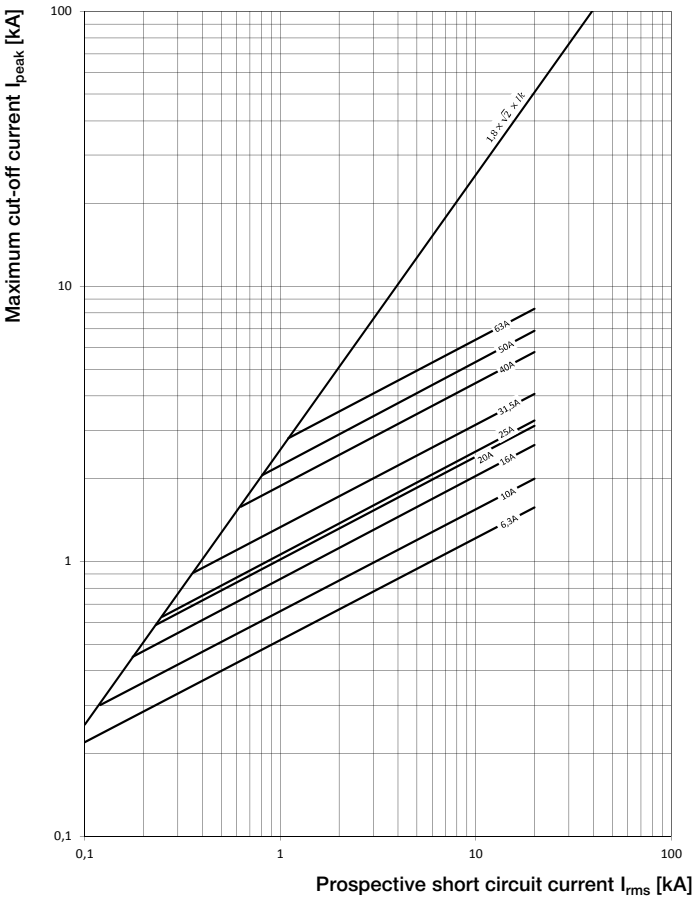
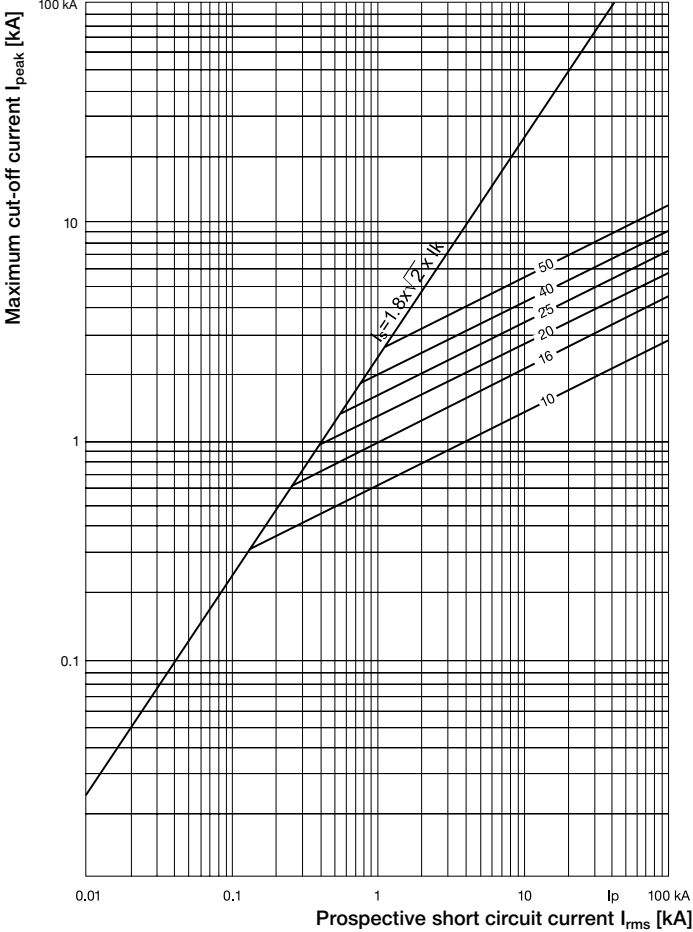
|                                  |                                                           |
|----------------------------------|-----------------------------------------------------------|
| <b>ABB</b>                       |                                                           |
| <b>CEF – S</b>                   |                                                           |
| <b>HV Back-up type fuse-link</b> |                                                           |
| $U_n = 6/12\text{kV}$            | IEC60282 – 1 DIN43625                                     |
| $I_n = 16\text{A}$               | Indoor / Outdoor                                          |
| $I_1 = 50\text{kA}$              | Temperature Control Unit                                  |
| $I_3 = 55\text{A}$               | Prod. year: 02 – 2015                                     |
| $I_{0,1s} = 80\text{A}$          | Cat. no: 1YMB741218M2611                                  |
|                                  | Rated resistance: $R_{20} = 108,5\text{m}\Omega \pm 12\%$ |
| Striker 80N (MEDIUM)             |                                                           |
| Made in ABB                      | Serial number 1YMP015C0100256                             |

3. Time-current characteristics



Melting times

The presented curves refer to indicated ranges of voltages, i.e. 12/24 and 30/40.5 kV, taken under cold conditions.



#### 4. Fuse selection table for transformer protection

| Transformer<br>rated<br>voltage [kV]      | Transformer rating [kVA]            |      |      |      |      |     |     |     |     |     |     |     |      |      |      |      |      |      |      |  | Fuse rated<br>voltage<br>[kV] |
|-------------------------------------------|-------------------------------------|------|------|------|------|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|------|--|-------------------------------|
|                                           | 25                                  | 50   | 75   | 100  | 125  | 160 | 200 | 250 | 315 | 400 | 500 | 630 | 800  | 1000 | 1250 | 1600 | 2000 | 2500 | 3000 |  |                               |
|                                           | Fuse link rating I <sub>n</sub> [A] |      |      |      |      |     |     |     |     |     |     |     |      |      |      |      |      |      |      |  |                               |
| 3                                         | 16                                  | 25   | 40   | 50   |      |     |     |     |     |     |     |     |      |      |      |      |      |      |      |  | 6/12                          |
| 5                                         | 10                                  | 20   | 25   | 40   | 40   | 50  |     |     |     |     |     |     |      |      |      |      |      |      |      |  |                               |
| 6                                         | 10                                  | 16   | 20   | 25   | 40   | 40  | 50  |     |     |     |     |     |      |      |      |      |      |      |      |  |                               |
| 10                                        | 10*                                 | 10   | 16   | 20   | 20   | 25  | 40  | 40  | 50  |     |     |     |      |      |      |      |      |      |      |  |                               |
| 11                                        | 10*                                 | 10   | 16   | 20   | 20   | 25  | 40  | 40  | 40  | 50  |     |     |      |      |      |      |      |      |      |  |                               |
| 12                                        | 10*                                 | 10   | 16   | 16   | 20   | 20  | 25  | 40  | 40  | 50  |     |     |      |      |      |      |      |      |      |  |                               |
| 15                                        | 10*                                 | 10*  | 10   | 16   | 16   | 20  | 20  | 25  | 40  | 40  |     |     |      |      |      |      |      |      |      |  | 10/24                         |
| 20                                        | 10*                                 | 10*  | 10*  | 10   | 16   | 16  | 20  | 20  | 25  | 40  | 40  |     |      |      |      |      |      |      |      |  |                               |
| 22                                        | 10*                                 | 10*  | 10*  | 10   | 16   | 16  | 20  | 20  | 20  | 40  | 40  | 40  |      |      |      |      |      |      |      |  |                               |
| 24                                        | 10*                                 | 10*  | 10*  | 10   | 16   | 16  | 16  | 20  | 20  | 25  | 40  | 40  |      |      |      |      |      |      |      |  |                               |
| 30                                        | 6.3*                                | 6.3* | 6.3* | 6.3* | 6.3  | 10  | 16  | 16  | 20  | 40  | 40  | 40  | 40   | 40   | 40   | 50   | 63   | 63   |      |  | 30/40.5                       |
| 36                                        | 6.3*                                | 6.3* | 6.3* | 6.3* | 6.3  | 6.3 | 10  | 16  | 16  | 20  | 40  | 40  | 40   | 40   | 40   | 50   | 50   | 63   | 63   |  |                               |
| 38.5                                      | 6.3*                                | 6.3* | 6.3* | 6.3* | 6.3* | 6.3 | 10  | 16  | 16  | 20  | 20  | 40  | 40   | 40   | 40   | 40   | 50   | 50   | 63   |  |                               |
| 40.5                                      | 6.3*                                | 6.3* | 6.3* | 6.3* | 6.3* | 6.3 | 10  | 16  | 16  | 20  | 20  | 40  | 40   | 40   | 40   | 40   | 50   | 50   | 63   |  |                               |
| Max. gG<br>fuse link<br>at LV side<br>[A] | 40                                  | 80   | 125  | 160  | 160  | 200 | 250 | 250 | 300 | 400 | 400 | 800 | 1000 | 1000 | 1000 | 1000 | 1250 | 1250 | 1250 |  |                               |

The table was calculated according to standards IEC 60787 and IEC 62271-105. The following transformer work conditions were assumed:

- Maximum long-lasting transformer overload – 120%,
- Magnetizing inrush current for transformers up and including 630kVA –  $12 \times I_n$  during 100ms,
- Magnetizing inrush current for transformers above 630kVA –  $10 \times I_n$  during 100ms,
- Standard ambient working conditions of fuses,
- For ratings marked with "\*" transformer maximum short-circuit current at LV side, transferred to HV side, is below fuse link minimum breaking current  $I_3$ .

The table above details the rated current of a particular fuse link for a given line voltage and transformer rating. For different criteria, the fuse selection must be recalculated.

#### 5. Fuse power losses at transformer rated current

For different transformer ratings, power losses are shown in the table below. The table is valid for fuses selected according to the fuse selection table. The measurements were done at the rated transformer power and air cooling according to IEC 60282-1:2002.

The losses mentioned are per single fuse. If the fuse link is to be used in compact switchgears where cooling is limited, the supplier must be contacted regarding maximum permitted power losses and required fuse derating.

| Transformer<br>rated<br>voltage [kV] | Transformer rating [kVA]                                     |     |     |      |     |      |      |      |      |      |      |      |      |      |      |      |      |       |       |  |
|--------------------------------------|--------------------------------------------------------------|-----|-----|------|-----|------|------|------|------|------|------|------|------|------|------|------|------|-------|-------|--|
|                                      | 25                                                           | 50  | 75  | 100  | 125 | 160  | 200  | 250  | 315  | 400  | 500  | 630  | 800  | 1000 | 1250 | 1600 | 2000 | 2500  | 3000  |  |
|                                      | Fuse link power dissipation at transformer rated current [W] |     |     |      |     |      |      |      |      |      |      |      |      |      |      |      |      |       |       |  |
| 3                                    | 3.4                                                          | 6.7 | 7   | 10.4 |     |      |      |      |      |      |      |      |      |      |      |      |      |       |       |  |
| 5                                    | 2.3                                                          | 3.3 | 5.4 | 4.5  | 7   | 9.6  |      |      |      |      |      |      |      |      |      |      |      |       |       |  |
| 6                                    | 1.6                                                          | 3.4 | 5.1 | 6.7  | 4.9 | 8    | 10.4 |      |      |      |      |      |      |      |      |      |      |       |       |  |
| 10                                   | 0.6                                                          | 2.3 | 2.8 | 3.3  | 5.1 | 6.1  | 4.5  | 7    | 9.3  |      |      |      |      |      |      |      |      |       |       |  |
| 11                                   | 0.5                                                          | 1.9 | 2.3 | 2.7  | 4.2 | 5.1  | 3.7  | 5.8  | 9.2  | 12.3 |      |      |      |      |      |      |      |       |       |  |
| 12                                   | 0.4                                                          | 1.6 | 1.9 | 3.4  | 3.5 | 5.8  | 6.7  | 4.9  | 7.8  | 10.4 |      |      |      |      |      |      |      |       |       |  |
| 15                                   | 0.5                                                          | 2   | 4.5 | 3.9  | 6.1 | 6.5  | 10.2 | 10.4 | 11.2 | 18.1 |      |      |      |      |      |      |      |       |       |  |
| 20                                   | 0.3                                                          | 1.1 | 2.5 | 4.5  | 3.4 | 5.6  | 5.8  | 9    | 9.3  | 10.2 | 15.9 |      |      |      |      |      |      |       |       |  |
| 22                                   | 0.2                                                          | 0.9 | 2.1 | 3.7  | 2.8 | 4.6  | 4.8  | 7.4  | 11.6 | 8.4  | 13.1 | 20.8 |      |      |      |      |      |       |       |  |
| 24                                   | 0.2                                                          | 0.8 | 1.8 | 3.1  | 2.4 | 3.9  | 6.1  | 6.2  | 9.9  | 10.4 | 11.0 | 17.5 |      |      |      |      |      |       |       |  |
| 30                                   | 0.7                                                          | 2.0 | 3.9 | 6.3  | 9.2 | 13.6 | 10.8 | 15.8 | 17.8 | 7.7  | 11.3 | 16.7 | 25.0 | 36.3 | 52.6 | 57.3 | 70.3 | 102.5 |       |  |
| 36                                   | 0.5                                                          | 1.5 | 2.8 | 4.6  | 6.8 | 10.2 | 14.6 | 11.6 | 17.2 | 19.5 | 8.3  | 12.3 | 18.4 | 26.8 | 38.8 | 42.3 | 61.4 | 75.3  | 102.5 |  |
| 38.5                                 | 0.5                                                          | 1.3 | 2.5 | 4.1  | 6.0 | 9.2  | 13.0 | 10.4 | 15.3 | 17.4 | 25.4 | 10.9 | 16.4 | 23.9 | 34.7 | 52.4 | 54.9 | 79.9  | 91.4  |  |
| 40.5                                 | 0.5                                                          | 1.2 | 2.3 | 3.8  | 5.5 | 8.4  | 11.9 | 9.5  | 14.1 | 16.0 | 23.3 | 10.0 | 15.1 | 22.0 | 31.9 | 48.1 | 50.4 | 73.3  | 83.9  |  |