

## 3-phase Delta External Power Line Filter for Frequency Converters

# FCD Series



UL Recognized



6FCD10

## FCD Series

- Suitable to meet the latest EMC standards
- Insulated safety terminals
- Suitable for EMC troubleshooting in the field
- Very high attenuation
- High insertion loss
- BS models optimized for very high insertion loss
- BS models suitable for infeed/regenerative (ER) applications
- Touch safe terminals provide easy connections and prevent inadvertent contact for safety in the most demanding applications

## Ordering Information

|     |     |    |                                 |     |
|-----|-----|----|---------------------------------|-----|
| 150 | FCD | 10 | BS                              | -95 |
|     |     |    | Terminal Block Option           |     |
|     |     |    | -95 – 95mm terminal block       |     |
|     |     |    | <i>available on 150A only</i>   |     |
|     |     |    | omit for standard terminals     |     |
|     |     |    | Filter Type                     |     |
|     |     |    | B – Single stage                |     |
|     |     |    | BS – High performance           |     |
|     |     |    | Single stage.                   |     |
|     |     |    | Omit for dual stage             |     |
|     |     |    | Input / Output Style            |     |
|     |     |    | 10 – Terminal Block             |     |
|     |     |    | FCD Series                      |     |
|     |     |    | Current Rating                  |     |
|     |     |    | 6, 12, 16, 25, 36, 50, 80, 110, |     |
|     |     |    | 150, 180 or 230A                |     |

## Specifications

### Maximum leakage current

#### voltage drop to virtual N to PE/V:

|                   |           |
|-------------------|-----------|
| 6FCD10:           | .26 mA/V  |
| 12 & 16FCD10:     | .45 mA/V  |
| 25, 36 & 50FCD10: | .52 mA/V  |
| 12 & 16FCD10B:    | .46 mA/V  |
| 25 & 36FCD10B:    | .52 mA/V  |
| 50FCD10B:         | .57 mA/V  |
| 80 & 110FCD10B:   | .62 mA/V  |
| 150FCD10B:        | .63 mA/V  |
| 180 & 230FCD10B:  | .92 mA/V  |
| FCD10BS:          | 3.25 mA/V |

### Hipot rating (one minute):

|                 |          |
|-----------------|----------|
| Line to Ground: | 2250 VDC |
| Line to Line:   | 1450 VDC |

### Rated Voltage (max):

|                            |         |
|----------------------------|---------|
| Phase to Phase:            | 480 VAC |
| Phase to Neutral / Ground: | 277 VAC |

### Operating Frequency:

50/60 Hz

### Rated Current:

6 to 230A

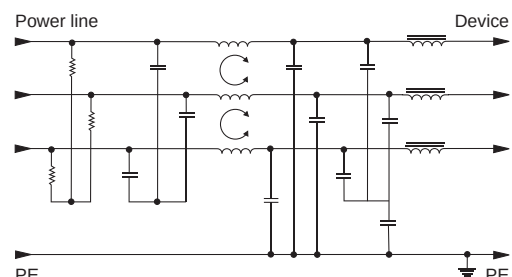
### Operating Ambient Temperature Range

(at rated current  $I_r$ ): -10°C to +40°C

In an ambient temperature ( $T_a$ ) higher than +40°C the maximum operating current ( $I_o$ ) is calculated as follows:  $I_o = I_r \sqrt{(85 - T_a)/45}$

## Electrical Schematics

### 6FCD10

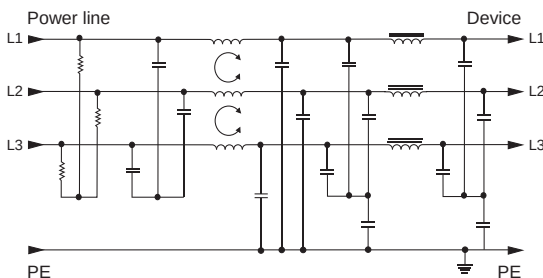


### 3-phase Delta External Filter for Frequency Converters *(continued)*

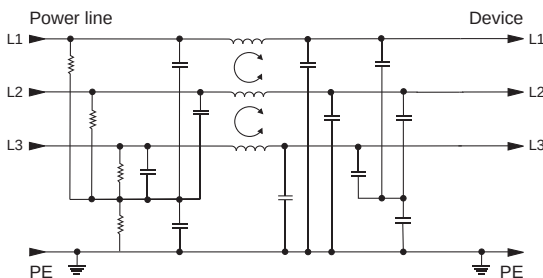
## FCD Series

### Electrical Schematics *(continued)*

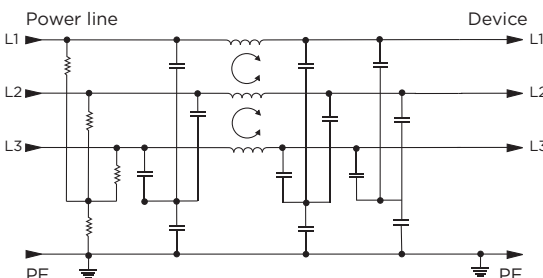
#### 12 to 50A FCD10



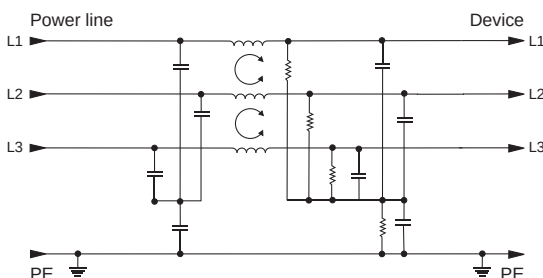
#### 12 to 50A FCD10B



#### 80 to 230A FCD10B



#### FCD10BS

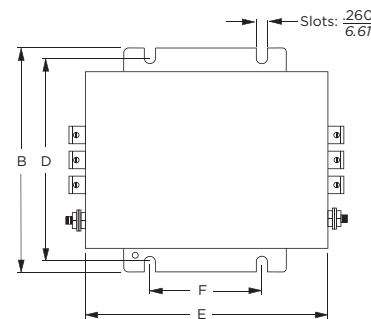


### Available Part Numbers

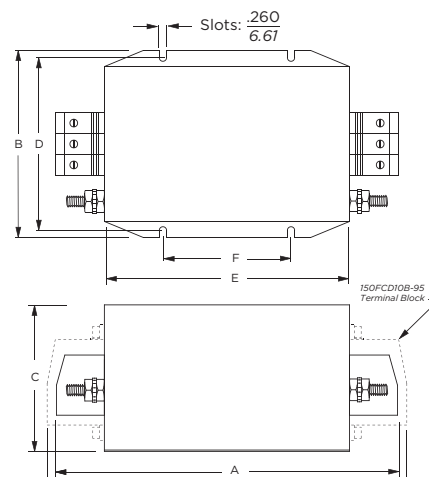
|         |              |               |
|---------|--------------|---------------|
| 6FCD10  | 12FCD10B     | 50FCD10BS     |
| 12FCD10 | 16FCD10B     | 80FCD10BS     |
| 16FCD10 | 25FCD10B     | 110FCD10BS    |
| 25FCD10 | 36FCD10B     | 150FCD10BS    |
| 36FCD10 | 50FCD10B     | 150FCD10BS-95 |
| 50FCD10 | 80FCD10B     | 180FCD10BS    |
|         | 110FCD10B    | 230FCD10BS    |
|         | 150FCD10B    |               |
|         | 150FCD10B-95 |               |
|         | 180FCD10B    |               |
|         | 230FCD10B    |               |

### Case Styles

#### 6 to 50A FCD10 & FCD10B



#### 80 to 150A FCD10B 50 to 150A FCD10BS

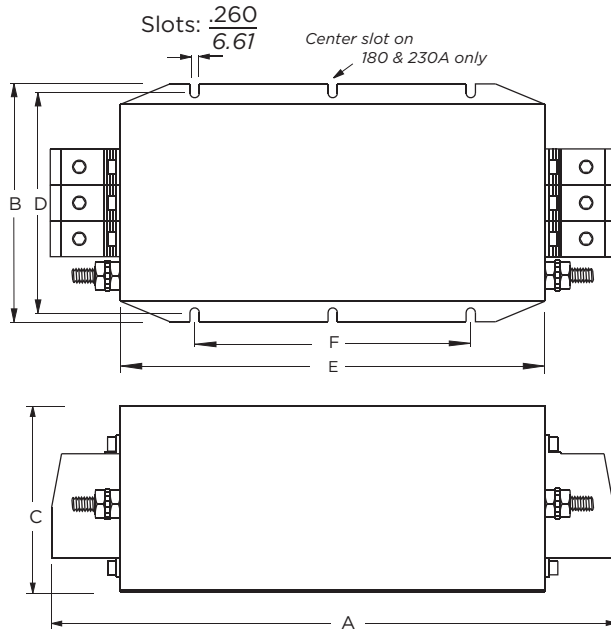


### 3-phase Delta External Filter for Frequency Converters *(continued)*

## FCD Series

### Case Styles *(continued)*

#### 180 to 230FCD10B\BS



### Terminals

| Part No.                                        | Terminal  | Size                                | Torque max.<br>lbf-in [N-m] |
|-------------------------------------------------|-----------|-------------------------------------|-----------------------------|
| 6FCD10                                          | Ground    | 8-32                                | 20.7 [2.34]                 |
|                                                 | Line/Load | 4mm <sup>2</sup><br>terminal block  | 7.08 [0.8]                  |
| 12FCD10/10B<br>16FCD10/10B                      | Ground    | M5                                  | 26.58 [3.0]                 |
|                                                 | Line/Load | 4mm <sup>2</sup><br>terminal block  | 7.08 [0.8]                  |
| 25FCD10/10B<br>36FCD10/10B                      | Ground    | M5                                  | 26.58 [3.0]                 |
|                                                 | Line/Load | 6mm <sup>2</sup><br>terminal block  | 15.93 [1.8]                 |
| 50FCD10/10B                                     | Ground    | M5                                  | 26.58 [3.0]                 |
|                                                 | Line/Load | 10mm <sup>2</sup><br>terminal block | 15.93 [1.8]                 |
| 50FCD10BS                                       | Ground    | M10                                 | 88.5 [10.0]                 |
|                                                 | Line/Load | 16mm <sup>2</sup><br>terminal block | 20.36 [2.3]                 |
| 80 to 150FCD10B<br>80 to 150FCD10BS             | Ground    | M10                                 | 88.5 [10.0]                 |
|                                                 | Line/Load | 50mm <sup>2</sup><br>terminal block | 70.80 [8.0]                 |
| 150FCD10B/BS-95<br>180FCD10B/BS<br>230FCD10B/BS | Ground    | M10                                 | 88.5 [10.0]                 |
|                                                 | Line/Load | 95mm <sup>2</sup><br>terminal block | 177.0 [20.0]                |

### Case Dimensions

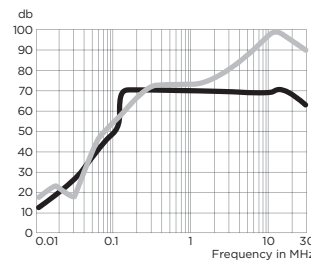
| Part No.                                    | A<br>(max.) | B<br>(max.) | C<br>(max.) | D<br>±.02<br>±.5 | E<br>(max.) | F<br>±.02<br>±.5 |
|---------------------------------------------|-------------|-------------|-------------|------------------|-------------|------------------|
| 6FCD10                                      | 6.18        | 4.33        | 2.32        | 3.74             | 5.16        | 2.76             |
|                                             | 157.0       | 110.0       | 59.0        | 95.0             | 131.0       | 70.0             |
| 12FCD10/10B<br>16FCD10/10B                  | 6.97        | 5.51        | 2.56        | 4.92             | 5.94        | 2.76             |
|                                             | 177.0       | 140.0       | 65.0        | 125.0            | 151.0       | 70.0             |
| 25FCD10/10B<br>36FCD10/10B<br>50FCD10/10B   | 9.69        | 6.26        | 2.52        | 5.71             | 8.43        | 4.53             |
|                                             | 246.0       | 159.0       | 64.0        | 145.0            | 214.0       | 115.0            |
| 50FCD10BS                                   | 11.41       | 6.61        | 3.54        | 6.10             | 8.70        | 4.53             |
|                                             | 290.0       | 168.0       | 90.0        | 155.0            | 221.0       | 115.0            |
| 80FCD10B/BS<br>110FCD10B/BS<br>150FCD10B/BS | 12.09       | 6.61        | 5.55        | 6.10             | 8.70        | 4.53             |
|                                             | 307.0       | 168.0       | 141.0       | 155.0            | 221.0       | 115.0            |
| 150FCD10B-95<br>150FCD10BS-95               | 12.6        | 6.61        | 5.55        | 6.10             | 8.70        | 4.53             |
|                                             | 320.0       | 168.0       | 141.0       | 155.0            | 221.0       | 115.0            |
| 180FCD10B/BS<br>230FCD10B/BS                | 15.71       | 6.61        | 5.55        | 6.10             | 11.81       | 6.50             |
|                                             | 399.0       | 168.0       | 141.0       | 155.0            | 300.0       | 165.0            |

### Performance Data

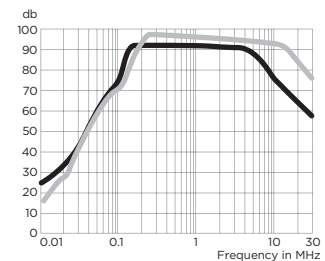
#### Typical Insertion Loss

Measured in closed 50 Ohm system

6FCD10



12FCD10



— Common Mode / Asymmetrical (L-G)  
 — Differential Mode / Symmetrical (L-L)

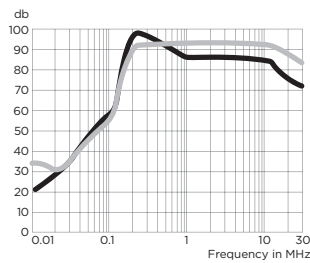
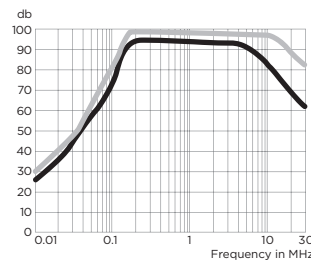
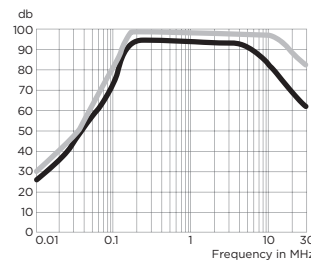
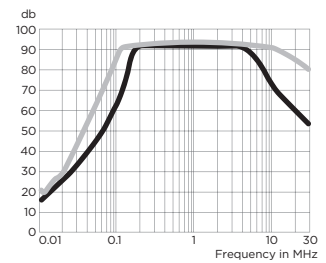
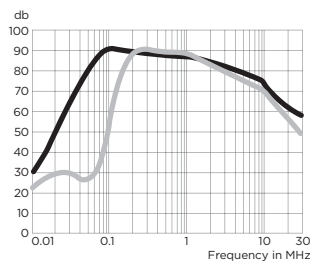
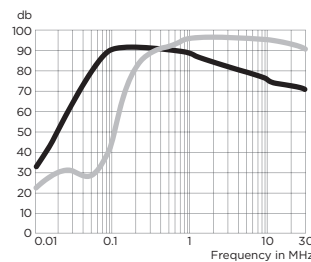
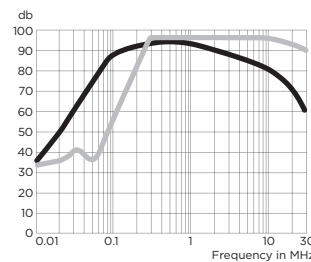
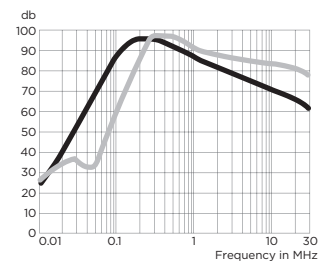
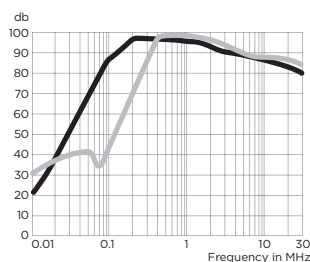
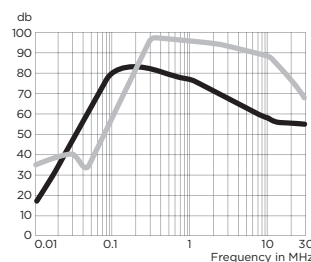
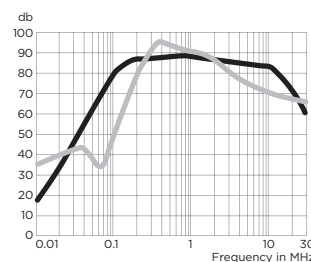
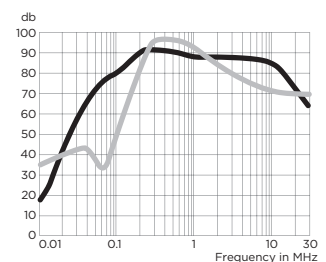
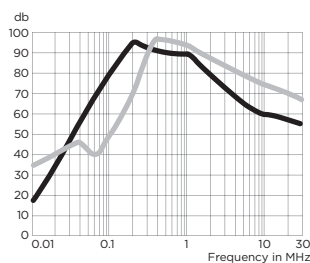
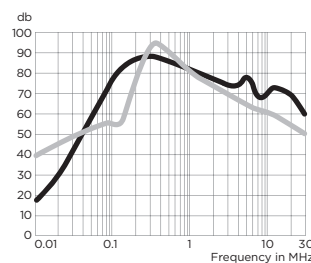
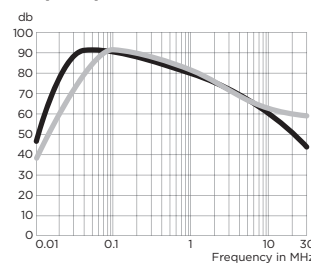
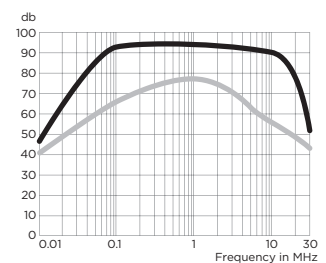
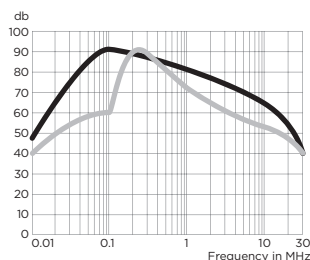
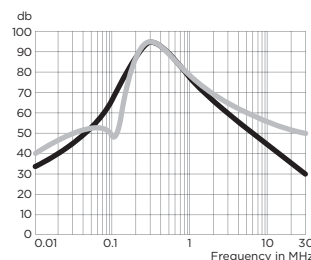
### 3-phase Delta External Filter for Frequency Converters *(continued)*

## FCD Series

### Performance Data *(continued)*

#### Typical Insertion Loss *(continued)*

Measured in closed 50 Ohm system

**16FCD10**

**25FCD10**

**36FCD10**

**50FCD10**

**12FCD10B**

**16FCD10B**

**25FCD10B**

**36FCD10B**

**50FCD10B**

**80FCD10B**

**110FCD10B**

**150FCD10B**

**180FCD10B**

**230FCD10B**

**50/80/110FCD10BS**

**150FCD10BS**

**180FCD10BS**

**230FCD10BS**


— Common Mode / Asymmetrical (L-G)  
— Differential Mode / Symmetrical (L-L)

### 3-phase Delta External Filter for Frequency Converters *(continued)*

## FCD Series

### Performance Data *(continued)*

#### Minimum Insertion Loss

Measured in closed 50 Ohm system

Common Mode / Asymmetrical (Line to Ground)

| Part No.     | Frequency –MHz |     |     |    |    |    |    |    |    |
|--------------|----------------|-----|-----|----|----|----|----|----|----|
|              | .01            | .03 | .05 | .1 | .5 | 1  | 5  | 10 | 30 |
| 6FCD10       | 2              | 14  | 23  | 39 | 56 | 52 | 48 | 45 | 33 |
| 12 & 16FCD10 | 13             | 30  | 36  | 45 | 75 | 75 | 52 | 45 | 35 |
| 25FCD10      | 13             | 30  | 36  | 45 | 75 | 75 | 52 | 45 | 35 |
| 36FCD10      | 9              | 26  | 32  | 40 | 75 | 75 | 52 | 45 | 35 |
| 50FCD10      | 9              | 26  | 32  | 40 | 75 | 75 | 52 | 45 | 35 |
| 12FCD10B     | 18             | 45  | 59  | 75 | 73 | 65 | 49 | 47 | 26 |
| 16FCD10B     | 18             | 45  | 59  | 75 | 73 | 65 | 49 | 47 | 26 |
| 25FCD10B     | 18             | 45  | 60  | 49 | 83 | 75 | 58 | 56 | 28 |
| 36FCD10B     | 8              | 38  | 52  | 70 | 77 | 70 | 54 | 50 | 47 |
| 50FCD10B     | 3              | 34  | 49  | 67 | 76 | 70 | 59 | 58 | 37 |
| 80FCD10B     | 2              | 35  | 49  | 67 | 74 | 67 | 59 | 58 | 27 |
| 110FCD10B    | 2              | 35  | 49  | 66 | 72 | 65 | 59 | 58 | 18 |
| 150FCD10B    | 1              | 36  | 50  | 66 | 69 | 63 | 59 | 58 | 9  |
| 180FCD10B    | -              | 36  | 50  | 66 | 67 | 60 | 59 | 58 | -  |
| 230FCD10B    | -              | 25  | 40  | 58 | 73 | 66 | 58 | 52 | 21 |
| 50FCD10BS    | 40             | 66  | 70  | 69 | 65 | 60 | 53 | 51 | 24 |
| 80FCD10BS    | 35             | 63  | 67  | 66 | 63 | 58 | 52 | 49 | 23 |
| 110FCD10BS   | 30             | 61  | 69  | 69 | 66 | 60 | 53 | 53 | 25 |
| 150FCD10BS   | 32             | 61  | 67  | 67 | 62 | 56 | 48 | 46 | 16 |
| 180FCD10BS   | 30             | 60  | 65  | 65 | 61 | 55 | 47 | 46 | 16 |
| 230FCD10BS   | 27             | 58  | 62  | 63 | 59 | 54 | 46 | 45 | 15 |

Differential Mode / Symmetrical (Line to Line)

| Part No.     | Frequency –MHz |     |     |    |    |    |    |    |    |
|--------------|----------------|-----|-----|----|----|----|----|----|----|
|              | .01            | .03 | .05 | .1 | .5 | 1  | 5  | 10 | 30 |
| 6FCD10       | 9              | 8   | 24  | 40 | 62 | 57 | 50 | 48 | 38 |
| 12 & 16FCD10 | 9              | 13  | 24  | 55 | 75 | 75 | 75 | 65 | 60 |
| 25FCD10      | 9              | 13  | 26  | 55 | 75 | 75 | 75 | 65 | 60 |
| 36FCD10      | 9              | 13  | 26  | 46 | 75 | 75 | 75 | 65 | 60 |
| 50FCD10      | 9              | 13  | 26  | 46 | 75 | 75 | 75 | 65 | 60 |
| 12FCD10B     | 6              | 13  | 9   | 37 | 90 | 86 | 74 | 78 | 34 |
| 16FCD10B     | 6              | 13  | 9   | 37 | 60 | 86 | 74 | 78 | 34 |
| 25FCD10B     | 10             | 16  | 12  | 41 | 89 | 87 | 69 | 86 | 43 |
| 36FCD10B     | 17             | 24  | 24  | 38 | 87 | 81 | 63 | 66 | 24 |
| 50FCD10B     | 15             | 24  | 27  | 21 | 88 | 74 | 51 | 69 | 52 |
| 80FCD10B     | 17             | 25  | 28  | 23 | 87 | 71 | 50 | 62 | 45 |
| 110FCD10B    | 18             | 27  | 30  | 25 | 86 | 69 | 49 | 56 | 39 |
| 150FCD10B    | 19             | 28  | 31  | 28 | 85 | 66 | 49 | 49 | 32 |
| 180FCD10B    | 21             | 29  | 33  | 30 | 84 | 63 | 48 | 43 | 26 |
| 230FCD10B    | 22             | 31  | 35  | 36 | 78 | 60 | 46 | 41 | 26 |
| 50FCD10BS    | 25             | 31  | 26  | 59 | 73 | 64 | 50 | 45 | 19 |
| 80FCD10BS    | 25             | 31  | 26  | 59 | 73 | 64 | 50 | 45 | 19 |
| 110FCD10BS   | 24             | 31  | 24  | 55 | 72 | 65 | 51 | 46 | 26 |
| 150FCD10BS   | 25             | 33  | 32  | 51 | 71 | 61 | 47 | 42 | 22 |
| 180FCD10BS   | 25             | 33  | 32  | 51 | 71 | 61 | 47 | 42 | 22 |
| 230FCD10BS   | 25             | 33  | 32  | 51 | 71 | 61 | 47 | 42 | 22 |

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