JUNCTION BOX SYSTEM + THE BS5733 MF LOGO + AGGREGATE CURRENT

INSTRUCTION ON THE CONNEXBOX JUNCTON BOXES

What is the MF logo?

The MF logo was introduced in BS5733:2010 "General Requirements for electrical accessories" as a marking that can be used on accessories to indicate that the accessory doesn't require further inspection, testing or maintenance after installation.

What is BS5733:2010?

BS5733 is a British Standard which specifies tests to check the safety in normal use of electrical accessories not covered by other specific British standards.

Is the MF logo mentioned in BS7671: Requirements for Electrical Installations?

Yes, the MF logo is mentioned in BS7671 Amendment No. 1. 2011 in Section 526.3 (vi).

Section 5 deals with the Selection and Erection of Equipment. Subsection 526. Electrical Connections: Requirement 526.3 Every connection shall be accessible for inspection, testing and maintenance except for the following: ... 526.3(vi) Equipment complying with BS5733 for a maintenance free accessory and marked with the symbol MF and installed in accordance with the manufacturers instructions.

How has this changed from the previous edition of BS7671?

In the previous edition of BS7671 the regulation 526.3(v) was "A joint forming part of the equipment complying with the appropriate product standard."

This was widely accepted as a BSEN60670-22 junction box with maintenance free terminals as this is indicated in Appendix 15 of BS7671: Ring and Radial final circuit arrangements: "A junction box to BSEN60670-22 with screw terminals must be accessible for inspection, testing and maintenance or alternatively use maintenance free terminals."

The Connexbox and Wago terminals continue to be Maintenance Free that hasn't changed. It's BS7671 that has changed and now also requires the accessory to use terminals tested to BS5733 for Maintenance Free screwless terminals.

So is BSEN60670-22 not an applicable junction box standard anymore?

BSEN60670-22 is still the applicable standard for junction boxes and continues to be referenced in many places within BS7671.

What does the MF mark mean?

The MF mark indicates that an accessory "does not require further inspection, testing or maintenance after installation in a circuit and incorporates screwless terminals (re: 14.5 Terminals for use within maintenance free accessories) and cable clamps to secure associated cables" (From section 3.31 BS5733:2010). Section 14.5 within the BS5733:2010 details a number of tests that need to be performed on the screwless terminals to establish that they are appropriate for use in a MF marked accessory. These tests include long duration tests, vibration tests and current overload tests which stress the terminals beyond normal operating parameters.

Does the Connexbox have the MF mark?

Yes. From October 2012 you will be able to purchase the Connexbox with the BS5733 MF mark. The new Connexbox will be supplied with an extended set of installation instructions that will explain how the Connexbox and the Wago 773 and 222 terminals can be used together to construct a BS5733 Maintenance Free accessory.

Why have the installation instructions been extended?

The Connexbox junction box system in normal use is a BSEN60670-22 compliant system. In order to meet the requirements of BS5733 for a Maintenance Free accessory different limitations and instructions need to be adhered to when installing the Connexbox.

What are the extra BS5733 Maintenance Free limitations?

BS5733 for a maintenance free accessory limits both the maximum current and the aggregate current of an accessory.

What are the maximum current limits?

The testing required by BS5733 for a maintenance free accessory involves stressing the accessory significantly in excess of it's normal operating limits. In order to meet the provisions of the standard the maximum current rating of the Connexbox plus terminals needs to be aligned with the testing and performance requirements of the standard. Consequently the Wago terminals must be de-rated to meet the requirements of the standard.

Connexbox Ratings for BS5733 MF:

Terminal Models	Max Terminal Current Rating	Max Cable csa mm²	Max Aggregate Current (Max I_{ag})
773-102 773-104 773-106 773-108	20A	2.5	50A
222-412 222-413 222-415	20A	2.5	50A
773-173	32A	6.0	64A

Is de-rating the terminals a bad thing?

No. De-rating a device is normal practice to ensure the safety of a circuit in exceptional circumstances. De-rating can be done to cope with many factors that can effect circuits within an installation including the presence of thermal insulation, cable grouping and raised ambient temperatures.

Why are the 222's de-rated to 20A?

The 222's are rated at 32A with 4mm² flex. The Connexbox cable clamp will only clamp cables maximum overall diameter of 8mm. 4mm² Flex typically has an overall diameter of ≥13mm and cannot be used within the Connexbox. Consequently the largest cable size that can be used is 2.5mm² and this restricts the rating of the 222's within the Connexbox to 20A. It should be noted that the de-rating is applicable only to the use of the Wago terminals with the Connexbox for a BS5733 maintenance free accessory.

The table only shows 2.5 and 6mm² cable, what about smaller cables?

The table shows the maximum rating of the terminals within the Connexbox so smaller cables with lower current ratings can be used with the appropriate terminal.

What is Max Aggregate Current?

As the Connexbox is a configurable accessory the total current that could pass through the Connexbox will vary for different configurations of the terminals, this is called the Aggregate Current (I_{ag}).

Consider these two circuit configurations using 773-106 Wago terminals:

In Fig. 1 the maximum I_{ag} is 40A, in Fig.2 the maximum I_{ag} is 60A.

For any accessory in a circuit it is important that the maximum Iag is not exceeded. With the Connexbox in **normal operation in an accessible situation** it is not possible to exceed this limit within the physical constraints

of Connexbox with any practical circuit configuration.

The tests specified in BS5733 for maintenance free terminals include stressing the terminals within the Connexbox significantly in excess of their normal operating limits. Consequently the calculation of the terminal current ratings and the maximum I_{ag} needed to be reconsidered.

Table 1 shows the maximum I_{ag} allowed when a Connexbox is installed in an inaccessible location.

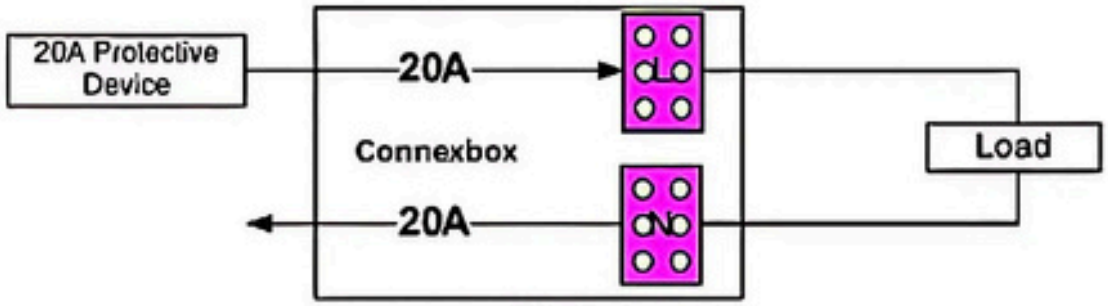

Fig. 1

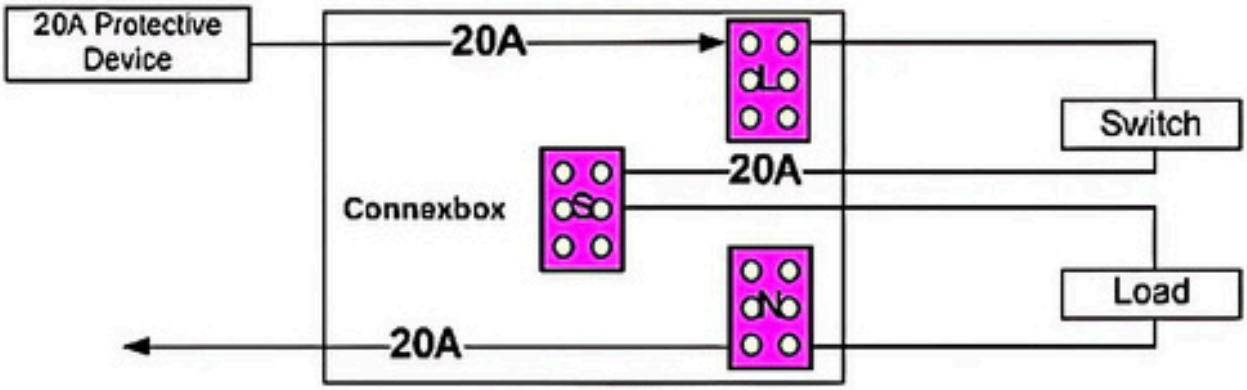

Fig. 2

What does the Max Aggregate Current mean in practice?

Consider the circuit in Fig. 2 on page 3. The maximum potential I_{ag} through the Connexbox is 60A as the load current passes through the junction box three times (through the **L**ive terminal, the **S**witch live terminal and the **N**eutral terminal). From table 1 we can see that the maximum permitted aggregate current through the Connexbox when using the 773-106 terminals in a maintenance free location is 50A, so this circuit configuration would not be permitted in a maintenance free situation as the potential maximum I_{ag} exceeds the limit for BS5733 maintenance free compliance.

Now lets consider the same circuit with a 16A protective device.

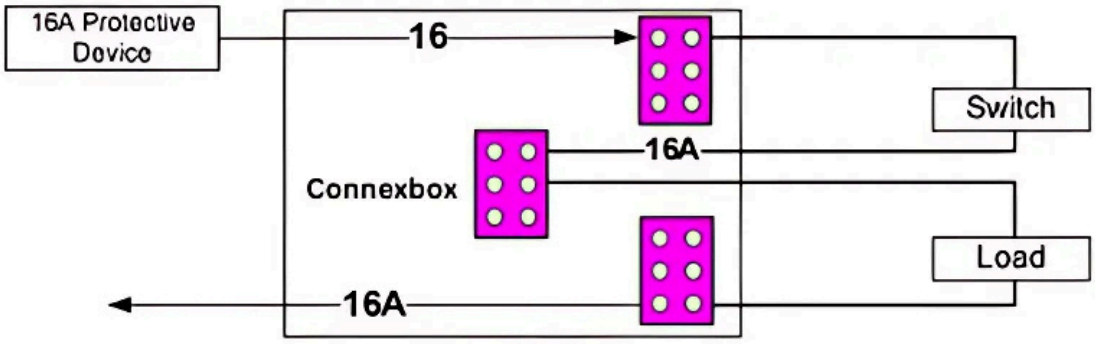

Fig. 4

In Fig. 4 the aggregate current through the Connexbox is now 48A and this is now less than the maximum permitted I_{ag} of 50A so this is acceptable in a maintenance free situation as the potential maximum I_{ag} is less than the limit required for BS5733 maintenance free compliance.

Is there a BS5733 Maintenance Free simple rule of thumb for the Connexbox ?

The following table lists the cable and terminal selections that will provide a maintenance free accessory in circuits where the max I_{ag} is no more than 2 or 3 times the rating of the protective device.

Cable csa mm²	Connexbox Terminals	Circuit Protective Device Rating
1.0	773-102,104,106 & 222 series	6A
1.5	773-102,104,106 & 222 series	10A
2.5	773-173 & 222 series	16A
2.5	773-173	20A
4.0	773-173	20A
6.0	773-173	32A

For lighting circuits that are cabled up using 1.0mm² and 1.5mm² and protected by 6A or 10A circuit protective devices then 773-102,104, 106 and 222 series can be used.

For power circuits cabled using 2.5mm² cable use the 222 or 773-173 with a 16A or 20A circuit protective device as appropriate. For circuits using 4.0mm² or 6.0mm² twin and earth use the 773-173 with a 20A or 32A circuit protective device as appropriate.

(Note that as the Connexbox can only accommodate two 773-173 terminals the Max I_{ag} will not exceed 2x 32A for 6.0mm² cable)

How do I work out the Max aggregate current for a Connexbox with a mixture of terminals?

The important terminals are the phase terminals as these are the current carrying components. So the maximum I_{ag} is selected using the lowest rated of the phase terminals:

Eg: if you are using a mixture of 773's and 222's then the maximum I_{ag} is 50A. Note: for a 773-173 configuration that uses a 773-102 or 773-104 for the earth wire then the maximum I_{ag} is 64A as the Earth is not a phase terminal.

Can I use a Connexbox to extend a ring main in an inaccessible location?

Yes, In a maintenance free situation the maximum I_{ag} limitation will require two separate Connexboxes to be used as the maximum potential I_{ag} is 64A when using a single Connexbox and this exceeds the BS5733-MF limitation on the box.

When using **two** Connexbox enclosures either the 773 or 222 terminals can be used as the maximum I_{ag} in each Connexbox will not exceed 40A.

So can I use the Wago 773 and 222 terminals in any enclosure and be BS5733 Maintenance Free?

No. The requirements of BS5733 for a maintenance free accessory extend to the terminals, the enclosure and most importantly the performance of the enclosure with the terminals. There are some important design features of that Connexbox that make it's assembly deterministic and easily repeatable:

1. The cable clamps are integral
2. The distance from the terminal to the cable clamp is fixed
3. The orientation of the terminals is fixed
4. The separation of the insulation of the conductors from the body of the terminals is assured (The insulation around the cables cannot come into contact with or become wrapped around the terminals).
5. The terminals are held in position so that they cannot be disconnected within the enclosure
6. Lateral movement of the terminals is severely restricted

These Connexbox features make possible the level of conformity required for a BS5733 maintenance free accessory.

What about multiple circuits?

The Connexbox can be used for multiple circuits as per BSEN60670-22. (See BS7671: 521.8.3) For maintenance free applications the Max I_{ag} limitation must be applied to all circuits in combination.
Note: BS5733 is only applicable to single phase circuits.

Any Questions?

If you have any queries regarding the information in this application note please don't hesitate to get in touch via phone: 01353 666011. Or by Email: support@connexbox.com