



TITLE	SPECIFICATION FOR CRIMPED CONNECTING LUGS AND FERRULES	REFERENCE CP_TSSPEC_022	REV 5
		PAGE: 1	OF 29
		REVISION DATE: AUGUST 2021	

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**SPECIFICATION FOR CRIMPED
CONNECTING LUGS AND FERRULES**

REFERENCE

REV

CP_TSSPEC_022

5

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FOREWORD

This specification was prepared by the following Work Group members:

Zolani Ngqwala Technology Services

The Work Group was appointed by the Distribution Study Committee, which, at the time of approval, comprised the following members:

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Recommendations for corrections, additions or deletions should be addressed to the:

Technology Services General Manager
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INTRODUCTION

This specification covers the requirements for crimped cable lugs and ferrules, used with crimping tools for the terminating of cable cores and the joining of cable cores for through connections.

1 SCOPE

This specification covers City Power's requirements for bare, crimped cable lugs and ferrules for use in the terminating and joining of solid, stranded, and multiple-stranded copper and aluminium conductors by compression, using special tools.

This specification is not applicable to pre-insulated lugs or to compression joints for overhead conductors.

2 NORMATIVE REFERENCES

The following documents contain provisions that, through reference in the text, constitute requirements of this specification. At the time of publication, the editions indicated were valid. All standards and specifications are subject to revision, and parties to agreements based on this specification are encouraged to investigate the possibility of applying the most recent editions of the documents listed below.

SANS 61238-1 Compression and mechanical connectors for power cables with copper or aluminium conductors - Part 1: Test methods and requirements.

NRS 074-1 Low voltage (600/1000V) cable systems for underground electrical distribution- Part 1: Cables.

ISO 9001- Quality management

ISO 14001- Environmental management

OHSAS 18001: Health and safety management

3 REQUIREMENTS

3.1 Material

3.1.1 The connectors shall be "class A" as per SANS 61238-1.

3.1.2 The material of the connectors shall be capable of withstanding, without deterioration, the normal operating currents and short-circuit currents to which the electrical system shall be subjected.

3.1.3 The material of the connectors shall be electrolytic copper.

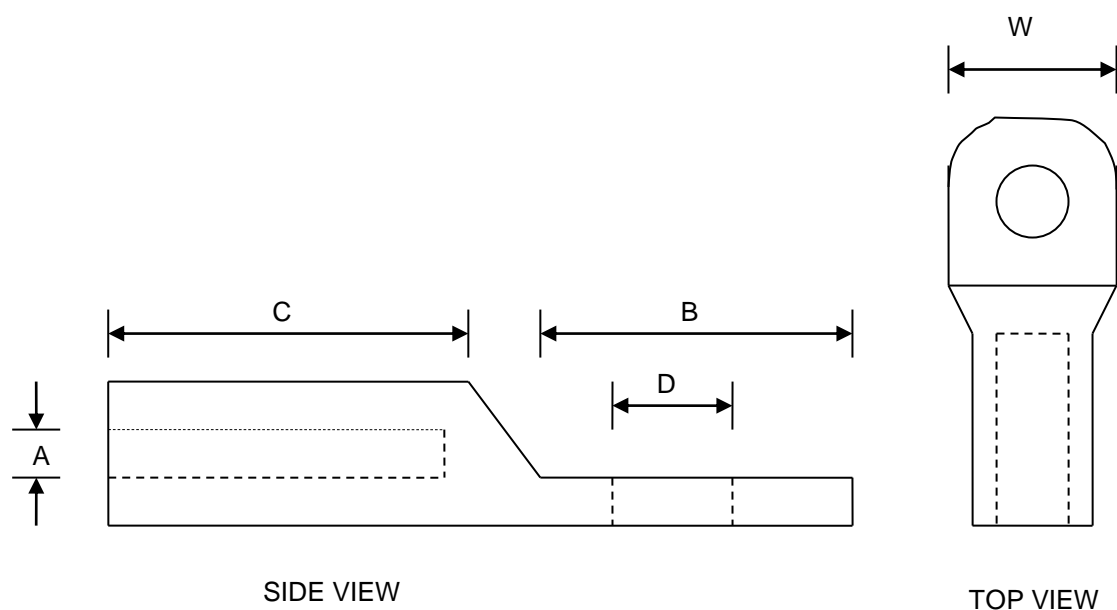
3.1.4 The electrolytic copper connector shall be tinned.

3.2 Circular lugs

3.2.1 The lugs shall have a clean finish and be free of surface and internal defects such as burrs, cracks, rolled seams, blisters, twists, press and chatter marks.

3.2.2 The connector lug shall be of one piece in construction.

- 3.2.3 The flat faces of the palms of lugs shall be parallel and straight.
- 3.2.4 The barrel of the connectors shall be marked with the nominal cross-sectional area of the conductor to be crimped.
- 3.2.4 The bore of the barrel of connectors shall be profiled to facilitate easy conductor entry.
- 3.2.5 The connecting lug range and fixing hole is specified in table 1 and figure 1 below.



CONDUCTOR SIZE	TYPE OF CABLE	A	B	C	D	W
2.5 mm ²	Stranded copper	12.00	9.00		M6	9.50
4 mm ²	Stranded copper	2.7	13.00	10.00	M6	10.00
10 mm ²	Stranded copper	4.4	13.00	15.00	M6	10.00
16 mm ²	Stranded copper	5.50	17.00	20.00	M10	24.00

Table 1: Size range and fixing holes of connecting lugs

3.3 Circular ferrules

- 3.3.1 The ferrules shall have a clean finish and be free of surface and internal defects such as burrs, cracks, rolled seams, blisters, twists, press and chatter marks.
- 3.3.2 The ferrule shall be of one piece construction
- 3.3.3 The barrel of the connectors shall be marked with the nominal cross-sectional area of the conductor to be crimped.
- 3.3.4 All ferrules shall be separated by means of a solid centre (barrier type) or dimple type. Refer to table 2 and figure 2 below.

3.3.4 The bore of the barrel of connectors shall be profiled to facilitate easy conductor entry.

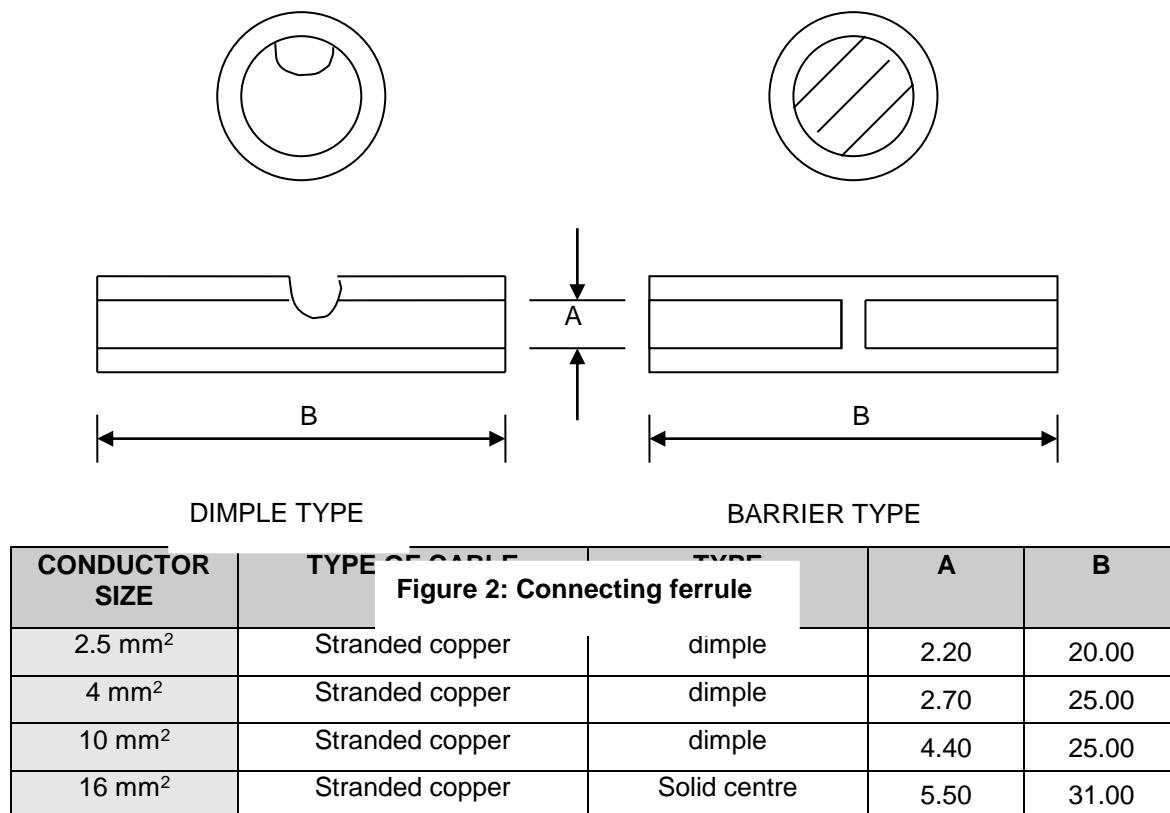


Table 2: Size range and type of ferrule

4 LOAD RATING

The connecting lugs and ferrules shall be rated on the current carrying capacity (load rating) of the larger copper conductor.

Conductor size	Load rating (A) as per SANS 1339
2.5 mm ²	34
4 mm ²	35
10 mm ²	75
16 mm ²	94

Table 3: Current carrying capacity

5 TESTS

5.1 Type test

5.1.1 The connecting lug and ferrule shall be type tested as per SANS 611238-1.

5.1.2 The test report shall include the following information:

- connector class (see Clause 1);
- conductor used (see 5.1);
- connector and tooling (see 5.2);
- installation (for example see 6.1.1);
- current at equilibrium temperature (see 6.3.1);
- for Class A, the short-circuit parameters (see 6.3.4);
- electrical test results;
- mechanical test results.

5.1.3 Type tests shall be performed by an accredited laboratory and shall not be limited to the following:

- Electrical test and
- Mechanical test

5.2 Routine test

5.2.1 Checks for compliance with the manufacturer's standard dimensions shall be performed on each production batch comprising 1 000 identical connecting lug and ferrule.

5.2.2 The number of items subjected to testing shall be 10 per 1 000 manufactured.

6 MARKING, LABELING AND PACKING

6.1 Marking

6.1.1 All connecting lugs and ferrules shall have the size marked on the barrel.

6.1.2 The marking shall be indented into the barrel.

6.2 Labeling

6.2.1 The labeling shall have the sizes of the connecting lugs and ferrules.

6.2.2 The label shall contain the manufacturers name, trademark and part number.

6.2.3 The connecting lugs and ferrules shall bear City Power's SAP number.

6.3 Packing

All connecting lugs and ferrules shall be individually packed in boxes, according to their size range and type.

7 DOCUMENTATION

- 7.1 Documentation shall be provided for each type of connecting lug and ferrule supplied.
- 7.2 Documentation shall be submitted in a technical catalogue format.
- 7.3 The catalogue shall specify the sizes, dimensions, reference numbers, and the size range of the cables the connecting lugs and ferrules connect.

8 QUALITY MANAGEMENT

A quality management plan shall be set up in order to assure the proper quality management of the crimped lugs and ferrules during design, development, production, installation and servicing phases. Guidance on the requirements for a quality management plan may be found in the ISO 9001:2015. The details shall be subject to agreement between City Power and the Supplier.

9 ENVIRONMENTAL MANAGEMENT

An environmental management plan shall be set up in order to assure the proper environmental management of the crimped lugs and ferrules throughout its entire life cycle (i.e. during design, development, production, installation, operation and maintenance, decommissioning and disposal phases). Guidance on the requirements for an environmental management system may be found in ISO 14001:2015 standards. The details shall be subject to agreement between City Power and the Supplier. This is to ensure that the asset created conforms to environmental standards and City Power SHERQ Policy

10 HEALTH AND SAFETY

A health and safety plan shall be set up in order to ensure proper management and compliance of the crimped lugs and ferrules during installation operation, maintenance, and decommissioning phases. Guidance on the requirements of a health and safety plan may be found in OHSAS 18001:2007 standards. This is to ensure that the asset conforms to standard operating procedures and City Power SHERQ Policy. The details shall be subject to agreement between City Power and the Supplier.

Annex A - Bibliography

SANS 1507: 2007 – Electric cables with extruded solid dielectric insulation for fixed installations

(300/500 V to 900/3300 V)

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Annex B - Revision information

DATE	REV. NO.	NOTES
Nov. 2002	0	First issue
Jan. 2005	1	3.3.4) Add barrier type and dimple type
Feb. 2006	2	Foreword: New list of committee members
		Table 1: Added 95 mm ²
		Table 3: Added 95 mm ²
		Annex C: Added Item 15
		Annex D: Added item 15

Sep 2014

3

New list of committee members

SABS to SANS

Table 1: Size range and type of connecting lugs is from : 2.5 Sq mm to 16 sq mm

Table 2: Size range connecting ferrules is from: 2.5 Sq mm to 16 Sq mm.

Table 3: Load rating: 2.5 Sq mm to 16 Sq mm.

8. Added Quality Management.

9. Added Environmental Management

Annex C: from 2.5 Sq mm to 16 Sq mm

Annex D: Stock items, Lugs and Ferrules from 2.5 Sq mm to 16 Sq mm

April 2020

4

Added new Study Committee

General editing, NRS 028 Removed and added clause 10-Safety and Health

August
2021

5

Added new workgroup

Listed type test

ANNEX C – Item 1: FRL 2,5 CU CIR DC – SAP. NO. 6015

Schedule A: Purchaser's specific requirements

Schedule B: Guarantees and technical particulars of equipment offered

Item	Sub clause of CP_TSSPEC_022	Description		Schedule A	Schedule B
1		Manufacturer		Required	
2	3.1	Connectors rated class "A"	Yes	Yes	
3	3.3.4	Do the dimensions comply?	Yes	Yes	
4	4	Full load current rating of connectors	A	Required	
5	5.1	Type test report supplied with tender	Yes	Yes	
6	7.2	Technical catalogue provided with tender	Yes	Yes	

Note: Ticks, Cross [✓, X], Asterick [*], Word [Noted] or TBA ["To Be Advice"] will not be accepted**

Tender Number: _____

Tenderer's Authorised Signatory: _____
Name in block letters Signature

Full name of company: _____

Item 1: FRL 2,5 CU CIR DC – SAP. NO. 6015

Deviation schedule

Any deviations offered to this specification shall be listed below with reasons for deviation. In addition, evidence shall be provided that the proposed deviation will at least be more cost-effective than that specified by City Power.

Item	Sub clause of CP_TSSPEC_022	Proposed deviation

Tender Number: _____

Tenderer's Authorised Signatory: _____
Name in block letters Signature

Full name of company: _____

ANNEX C – Item 2: FRL 4 CU CIR DC – SAP. NO. 6014

Schedule A: Purchaser's specific requirements

Schedule B: Guarantees and technical particulars of equipment offered

Item	Sub clause of CP_TSSPEC_022	Description		Schedule A	Schedule B
1		Manufacturer		Required	
2	3.1	Connectors rated class "A"	Yes	Yes	
3	3.3.4	Do the dimensions comply?	Yes	Yes	
4	4	Full load current rating of connectors	A	Required	
5	5.1	Type test report supplied with tender	Yes	Yes	
6	7.2	Technical catalogue provided with tender	Yes	Yes	

Note: Ticks, Cross [√, X], Asterick [*], Word [Noted] or TBA ["To Be Advice"] will not be accepted

Tender Number: _____

Tenderer's Authorised Signatory: _____
Name in block letters Signature

Full name of company: _____

Item 2: FRL 4 CU CIR DC – SAP. NO. 6014

Deviation schedule

Any deviations offered to this specification shall be listed below with reasons for deviation. In addition, evidence shall be provided that the proposed deviation will at least be more cost-effective than that specified by City Power.

Item	Sub clause of CP_TSSPEC_022	Proposed deviation

Tender Number: _____

Tenderer's Authorised Signatory: _____
Name in block letters Signature

Full name of company: _____

ANNEX C – Item 3: FRL 10 CU CIR DC – SAP. NO. 6070

Schedule A: Purchaser's specific requirements

Schedule B: Guarantees and technical particulars of equipment offered

Item	Sub clause of CP_TSSPEC_022	Description	Schedule A	Schedule B
1		Manufacturer	Required	
2	3.1	Connectors rated class “A”	Yes	
3	3.3.4	Do the dimensions comply?	Yes	
4	4	Full load current rating of connectors	A	Required
5	5.1	Type test report supplied with tender	Yes	Yes
6	7.2	Technical catalogue provided with tender	Yes	Yes

Note: Ticks, Cross [✓, X], Asterick [*], Word [Noted] or TBA [“To Be Advice”] will not be accepted

Tender Number: _____

Tenderer's Authorised Signatory: _____
Name in block letters Signature

Full name of company: _____

Item 3: FRL 10 CU CIR DC – SAP. NO. 6070

Deviation schedule

Any deviations offered to this specification shall be listed below with reasons for deviation. In addition, evidence shall be provided that the proposed deviation will at least be more cost-effective than that specified by City Power.		
Item	Sub clause of CP_TSSPEC_022	Proposed deviation

Tender Number: _____

Tenderer's Authorised Signatory: _____
Name in block letters Signature

Full name of company: _____

ANNEX C – Item 4: FRL 16 CU CIR SC – SAP. NO. 6061

Schedule A: Purchaser's specific requirements

Schedule B: Guarantees and technical particulars of equipment offered

Item	Sub clause of CP_TSSPEC_022	Description		Schedule A	Schedule B
1		Manufacturer		Required	
2	3.1	Connectors rated class "A"	Yes	Yes	
3	3.3.4	Do the dimensions comply?	Yes	Yes	
4	4	Full load current rating of connectors	A	Required	
5	5.1	Type test report supplied with tender	Yes	Yes	
6	7.2	Technical catalogue provided with tender	Yes	Yes	

Note: Ticks, Cross [√, X], Asterick [*], Word [Noted] or TBA ["To Be Advice"] will not be accepted

Tender Number: _____

Tenderer's Authorised Signatory: _____
Name in block letters Signature

Full name of company: _____

Item 4: FRL 16 CU CIR SC – SAP. NO. 6061

Deviation schedule

Any deviations offered to this specification shall be listed below with reasons for deviation. In addition, evidence shall be provided that the proposed deviation will at least be more cost-effective than that specified by City Power.

Item	Sub clause of CP_TSSPEC_022	Proposed deviation

Tender Number: _____

Tenderer's Authorised Signatory: _____
Name in block letters Signature

Full name of company: _____

ANNEX C – Item 8: LUG 2,5 CU CIR M6 – SAP. NO. 6277

Schedule A: Purchaser's specific requirements

Schedule B: Guarantees and technical particulars of equipment offered

Item	Sub clause of CP_TSSPEC_022	Description		Schedule A	Schedule B
1		Manufacturer		Required	
2	3.1	Connectors rated class "A"	Yes	Yes	
3	3.2.5	Do the dimensions comply?	Yes	Yes	
4	4	Full load current rating of connectors	A	Required	
5	5.1	Type test report supplied with tender	Yes	Yes	
6	7.2	Technical catalogue provided with tender	Yes	Yes	

Note: Ticks, Cross [√, X], Asterick [*], Word [Noted] or TBA ["To Be Advice"] will not be accepted

Tender Number: _____

Tenderer's Authorised Signatory: _____
Name in block letters Signature

Full name of company: _____

Item 8: LUG 2,5 CU CIR M6 – SAP. NO. 6277

Deviation schedule

Any deviations offered to this specification shall be listed below with reasons for deviation. In addition, evidence shall be provided that the proposed deviation will at least be more cost-effective than that specified by City Power.

Item	Sub clause of CP_TSSPEC_022	Proposed deviation

Tender Number: _____

Tenderer's Authorised Signatory: _____
Name in block letters Signature

Full name of company: _____

ANNEX C – Item 9: LUG 4 CU CIR M6 – SAP. NO. 6278

Schedule A: Purchaser's specific requirements

Schedule B: Guarantees and technical particulars of equipment offered

Item	Sub clause of CP_TSSPEC_022	Description		Schedule A	Schedule B
1		Manufacturer		Required	
2	3.1	Connectors rated class "A"	Yes	Yes	
3	3.2.5	Do the dimensions comply?	Yes	Yes	
4	4	Full load current rating of connectors	A	Required	
5	5.1	Type test report supplied with tender	Yes	Yes	
6	7.2	Technical catalogue provided with tender	Yes	Yes	

Note: Ticks, Cross [✓, X], Asterick [*], Word [Noted] or TBA ["To Be Advice"] will not be accepted

Tender Number: _____

Tenderer's Authorised Signatory: _____
Name in block letters Signature

Full name of company: _____

Item 9: LUG 4 CU CIR M6 – SAP. NO. 6278

Deviation schedule

Any deviations offered to this specification shall be listed below with reasons for deviation. In addition, evidence shall be provided that the proposed deviation will at least be more cost-effective than that specified by City Power.

Item	Sub clause of CP_TSSPEC_022	Proposed deviation

Tender Number: _____

Tenderer's Authorised Signatory: _____
Name in block letters Signature

Full name of company: _____

ANNEX C – Item 10: LUG 10 CU CIR M6 – SAP. NO. 5387

Schedule A: Purchaser's specific requirements

Schedule B: Guarantees and technical particulars of equipment offered

Item	Sub clause of CP_TSSPEC_022	Description	Schedule A	Schedule B
1		Manufacturer	Required	
2	3.1	Connectors rated class "A" Yes	Yes	
3	3.2.5	Do the dimensions comply? Yes	Yes	
4	4	Full load current rating of connectors A	Required	
5	5.1	Type test report supplied with tender Yes	Yes	
6	7.2	Technical catalogue provided with tender Yes	Yes	

Note: Ticks, Cross [√, X], Asterick [*], Word [Noted] or TBA ["To Be Advice"] will not be accepted

Tender Number: _____

Tenderer's Authorised Signatory: _____
Name in block letters Signature

Full name of company: _____

Item 10: LUG 10 CU CIR M6 – SAP. NO. 5387

Deviation schedule

Any deviations offered to this specification shall be listed below with reasons for deviation. In addition, evidence shall be provided that the proposed deviation will at least be more cost-effective than that specified by City Power.

Item	Sub clause of CP_TSSPEC_022	Proposed deviation

Tender Number: _____

Tenderer's Authorised Signatory: _____
Name in block letters Signature

Full name of company: _____

ANNEX C – Item 11: LUG 16 CU CIR M10 – SAP. NO. 6184

Schedule A: Purchaser's specific requirements

Schedule B: Guarantees and technical particulars of equipment offered

Item	Sub clause of CP_TSSPEC_022	Description		Schedule A	Schedule B
1		Manufacturer		Required	
2	3.1	Connectors rated class "A"	Yes	Yes	
3	3.2.5	Do the dimensions comply?	Yes	Yes	
4	4	Full load current rating of connectors	A	Required	
5	5.1	Type test report supplied with tender	Yes	Yes	
6	7.2	Technical catalogue provided with tender	Yes	Yes	

**Note: Ticks, Cross [✓, X], Asterick [*], Word [Noted] or TBA ["To Be Advice"] will not be
accepted**

Tender Number: _____

Tenderer's Authorised Signatory: _____
Name in block letters Signature

Full name of company: _____

Item 11: LUG 16 CU CIR M10 – SAP. NO. 6184

Deviation schedule

Any deviations offered to this specification shall be listed below with reasons for deviation. In addition, evidence shall be provided that the proposed deviation will at least be more cost-effective than that specified by City Power.		
Item	Sub clause of CP_TSSPEC_022	Proposed deviation

Tender Number: _____

Tenderer's Authorised Signatory: _____
Name in block letters Signature

Full name of company: _____

Annex D – Stock Items

Material Group: CONT-FRL

Item	SAP No.	SAP Short Description	SAP Long Description
1	6015	FRL 2,5 CU CIR DC	FERRULE TINNED COPPER, 2,5 MM SQ, CIRCULAR WITH DIMPLE CRIMPED. ITEM SPECIFICATION NO.CP_TSSPEC_022
2	6014	FRL 4 CU CIR DC	FERRULE TINNED COPPER, 4 MM SQ, CIRCULAR WITH DIMPLE CRIMPED. ITEM SPECIFICATION NO.CP_TSSPEC_022
3	6070	FRL 10 CU CIR DC	FERRULE TINNED COPPER, 10 MM SQ, CIRCULAR WITH DIMPLE CRIMPED. ITEM SPECIFICATION NO.CP_TSSPEC_022
4	6061	FRL 16 CU CIR SC	FERRULE TINNED COPPER, 16 MM SQ, CIRCULAR WITH SOLID CENTER. ITEM SPECIFICATION NO.CP_TSSPEC_022

Annex D – Stock Items

Material Group: CONT-LUG

Item	SAP No.	SAP Short Description	SAP Long Description
5	6277	LUG 2,5 CU CIR M6	LUG, TINNED COPPER, 2,5 MM SQ, CIRCULAR WITH AN M6 FIXING HOLE, WITHOUT AN INSPECTION HOLE. ITEM SPECIFICATION NO. CP_TSSPEC_022
6	6278	LUG 4 CU CIR M6	LUG, TINNED COPPER, 4 MM SQ, CIRCULAR WITH AN M6 FIXING HOLE, WITHOUT AN INSPECTION HOLE. ITEM SPECIFICATION NO. CP_TSSPEC_022
7	5387	LUG 10 CU CIR M6	LUG, TINNED COPPER, 10 MM SQ, CIRCULAR WITH AN M6 FIXING HOLE, WITHOUT AN INSPECTION HOLE. ITEM SPECIFICATION NO. CP_TSSPEC_022
8	6184	LUG 16 CU CIR M10	LUG, TINNED COPPER, 16 MM S, CIRCULAR WITH AN M10 FIXING HOLE, WITHOUT AN INSPECTION HOLE. ITEM SPECIFICATION NO. CP_TSSPEC_022