

*Logistics Group*

*Material Management Section*

# **TECHNICAL SPECIFICATION**

**N° 601**

**Date: 10 May 2005**

**HARNESS CABLE + CONNECTORS  
(CMS BARREL and FORWARD RPC)**

**N° SCEM 04.70.07.040.0**

## CONTENTS

1	GENERAL.....	3
1.1	SCOPE .....	3
1.2	CLASSIFICATION .....	3
1.3	DELIVRABLES.....	3
2	APPLICABLE DOCUMENTS.....	3
3	CABLE CONSTRUCTION .....	4
3.1	Type 40x28AWG cable (SCEM 04.71.06.400.0) .....	4
3.2	CABLE PERFORMANCES.....	5
3.3	TYPE 40xAWG28 CABLE CONNECTOR ASSEMBLY DESCRIPTION	5
3.4	TESTING .....	8
3.5	MARKING .....	8
3.6	PACKAGING .....	8
4	QUALITY CONTROL.....	8
4.1	GENERAL.....	8
4.2	INSPECTION STAGES .....	8

## 1 GENERAL

### 1.1 SCOPE

This specification concerns the realisation of pixel type IV cables, including cutting cables to specified lengths, mounting of connectors (supplied by CERN), electrical and mechanical tests, and marking.

### 1.2 CLASSIFICATION

All standardized cables at CERN have an internal reference known as the SCEM number.

SCEM	Designation
04.70.07.040.0	HARNESS RPC CABLE + CONNECTOR

### 1.3 DELIVRABLES

For the series, CERN shall deliver to the successful contractor:

- Type 40XAWG28 CABLES
- Labels to identify the cables
- Other material (heat shrinkable tubes, tooling) to be delivered by successful contractor!

## 2 APPLICABLE DOCUMENTS

This specification makes reference to the following publications:

CERN/FC/1814-II	(1975)	General conditions of CERN contracts
CERN/IS41	(1995)	The Use of Plastic and other Non-Metallic Materials at CERN with respect to Fire Safety and Radiation Resistance
IEC 60189-1	(1992)	Low frequency cables and wires with PVC insulation and PVC sheath <u>Par1</u> : General test and measuring methods
IEC 60811		Common test methods for insulating and sheathing materials of electric cables
IEC 60885		Electrical test methods for electric cables
IEC 60885-1	(1987)	<u>Part 1</u> : Electrical tests for cables, cords and wires for voltages up to 450/750V

### 3 CABLE CONSTRUCTION

The type 40xAWG28 harness cable is composed of one cable section cut to a specified length with a defined connector attached at each end and two unique labels placed on each cable as shown in Figure 1. There will be 8600 cables in total, with different lengths with a range between 5m and 25m. The actual lengths and the quantities will be provided at the time the purchase order is placed. The tolerance on the cable length for each cable is  $\pm 10$  cm. The repetition of the error is important. It shall be the same for all cables of a same batch with a tolerance of  $\pm 1$  cm.

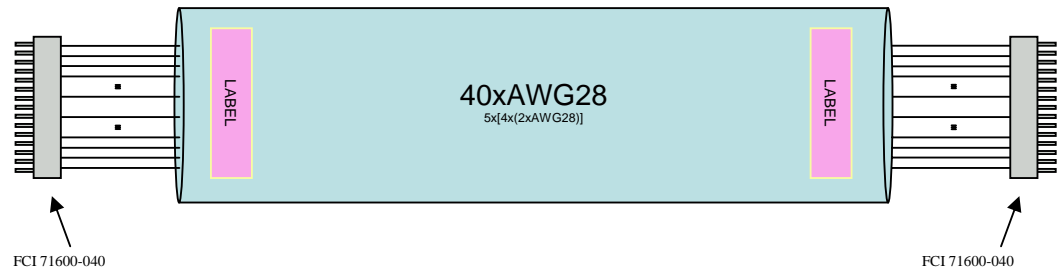


Figure 1: Type 40xAWG28 cable with connectors and labels

#### 3.1 Type 40x28AWG cable (SCEM 04.71.06.400.0)

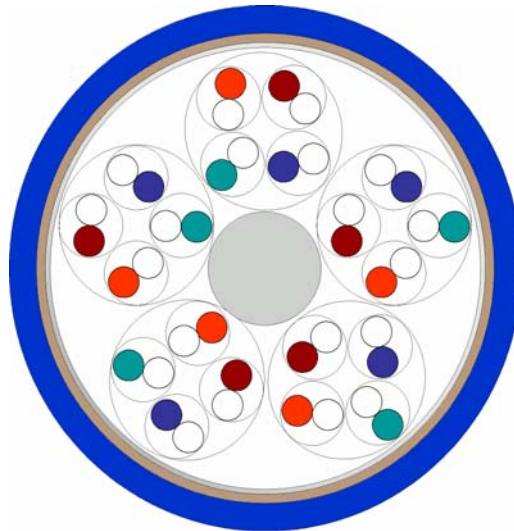


Figure 2: Type 40xAWG28 cable Construction Cross-Section

### 3.2 CABLE PERFORMANCES

#### 3.2.1 Electrical properties

Operating voltage	150Vrms
Test voltage conductor/conductor	1.0kVdc
Test voltage conductor/shield	1.0kVdc
Maximum conductor resistance (20°C)	AWG28 : < 220Ohm/km
Characteristic impedance (f ≥1MHz - 100MHz)	110Ohm +- 10Ohm
Skew time between pairs	<1ns/25m

The main electrical characteristic of this cable is the low skew time between pairs. For this reason, the repetition of the error as specified in §3.1 is important !

#### 3.2.2 Mechanical properties

Core	Stranded tinned copper
Section	AWG28/7
Insulation	High density polyethylene, LSZH Individual conductor and insulation suitable for IDC type connector of 1.27mm pitch. Diameter over insulation 0,7mm
Pairs	Each group of 4 pairs white/blue; white/orange; white/green / white brown
Lay-up	Pairs twisted in 5 groups of 4 pairs, diameter over assembly 3,10mm
Screen	Al-PET-foil on the total and glass fibre as flame barrier + tinned copper braid, coverage > 75%
Outer sheath	Thermoplastic LSZH flame retardant compound - Blue RAL 5015
Max. outer diameter	10mm

#### 3.2.3 Thermal properties

Operating temperatures : - 65°C to + 70°C

### 3.3 TYPE 40xAWG28 CABLE CONNECTOR ASSEMBLY DESCRIPTION

The cable will be fitted on each end with the same FCI71600-040 connector with IDC terminations.

Each wire shall be connected on the same termination on each connector :

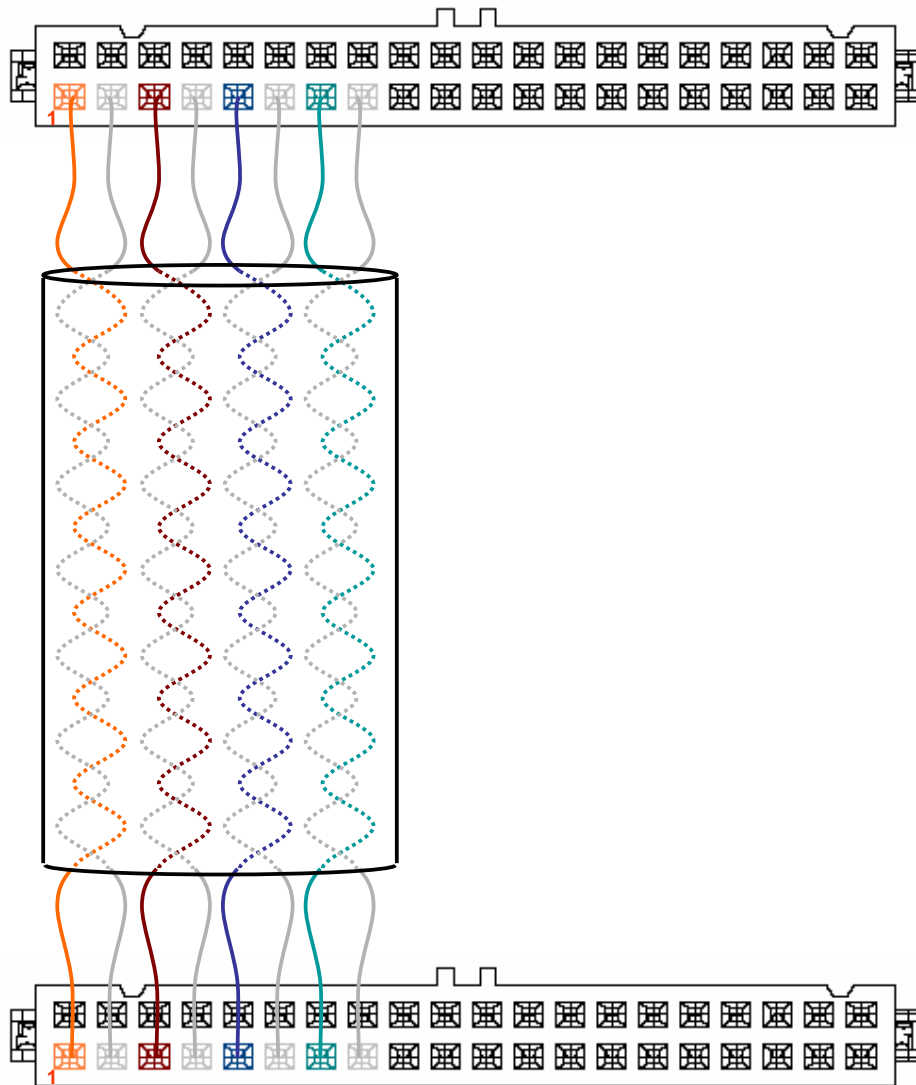


Figure 3: Wire connectivity

The group lay-up shall be removed on maximum 4cm on each side. The length of lay-up removed shall be the same for each group of a cable and for each cable of a batch with a tolerance of  $\pm 1$ cm (see remark in §3.2.1)

The cable screen shall be connected to a female cable lug type CEMBRE RF-F608 (or any equivalent halogen free cable lug size 6,3x0,8x22mm):

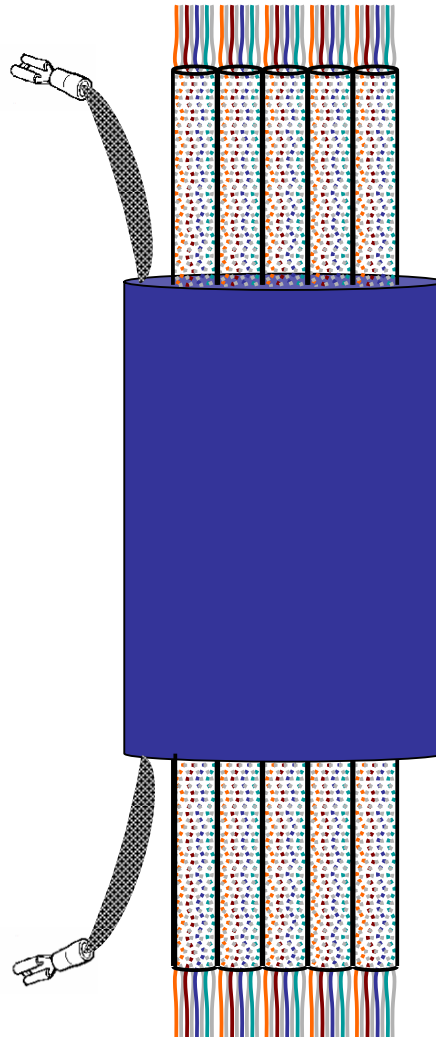


Figure 3: Braid connectivity

The outer sheath shall be removed on specified length on each side. The length of outer sheath to be removed shall be specified for each cable at the time the purchase order is placed.

State of the art rules shall be applied to ensure the electrical continuity, insulation resistance and dielectric strength. The insulation resistance and dielectric strength of the original cables and connectors must be guaranteed, referring to IEC 60189-1 sub clauses 5.2 and 5.3.





The tests of table 3 shall be executed on cable parts or on the finished cable in the supplier's works or place to be agreed, if requested in the presence of a representative of CERN.

The supplier is responsible for providing the test equipment and inspection facilities which shall be of sufficient accuracy, quality and quantity to permit the required tests in accordance with the relevant standards.

Table 3: Tests on Cable Components

Properties to be evaluated	Test method	Requirem. Par. N°
<u>Group 1 - Mechanical tests</u>		
- Visual inspection and dimensions	IEC 60811-1-1 sub-clause 8	3
- Tensile strength, finished cable		3
<u>Group 2 - Electrical tests</u>		
- Dielectric strength	IEC 60189-1 sub-clause	3
- Insulation resistance	5.2	3
- Linear resistance	IEC 60189-1 sub-clause	3
- Electrical continuity	5.3	3
	IEC 60189-1 sub-clause	
	5.1	
	IEC 60189-1 sub-clause	
	5.1	

#### 4.2.2 Quality conformance inspection

Each partial or complete delivery shall be subjected to the constant quality test.

The tests of table 4 must be executed on the finished cable in the supplier's works or a place to be agreed, if requested in the presence of a representative of CERN.

Table 4: Finished Cable Tests

Properties to be evaluated	Test method	Requirem. Par. N°
<u>Group 1 - Mechanical tests</u>		
- Visual inspection and dimensions	IEC 60811-1-1 sub-clause 8	3.3
- Tensile strength, finished cable		3.3
<u>Group 2 - Electrical tests</u>		
- Dielectric strength	IEC 60189-1 sub-clause	3
- Electrical continuity	5.3	3
<u>Group 3 - Marking and Packaging</u>		
		3.5; 3.6

The supplier shall send, by separate post, a test report to the technical responsible at CERN mentioned in the commercial documents.

4.2.3 Packing inspection

Each partial or complete delivery shall be subjected to a packing inspection (see sub-clause 3.5)