ANHUI FEICHUN SPECIAL CABLE CO., LTD.

# Flat Festoon Cables — FC-FLAT F & FC-FLAT CF 300/500 V EPR / CR Rubber, Unscreened and Screened

Technically equivalent construction to (N)GFLGÖU and (N)GFLCGÖU flat cables for shipyard crane festoon systems

Uo/U 300/500 V | EPR insulation | CR (Neoprene) sheath | Festoon up to 180 m/min | TCWB screen option

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Prepared for: TPC Wire & Cable — Hanwha Ocean Philly Shipyard

## 1. Scope and application

This data sheet covers FeiChun flat rubber festoon cables offered in two constructions: **FC-FLAT F** (unscreened, equivalent to (N)GFLGÖU) and **FC-FLAT CF** (screened with a tinned copper wire braid, equivalent to (N)GFLCGÖU). Both are designed for the moving parts of cranes, hoists, conveyors, trolleys and lifts where the cable bends in one plane only and space for the bending radius is limited.

### Typical applications

- Shipyard gantry and jib crane festoon runs
- Cable trolley and C-rail systems
- Floor conveyors, stacker and transfer cars
- Lifts, hoists and elevator trailing runs

### Service conditions

- Dry, damp and wet locations; outdoor use permitted
- Resistant to oil, ozone, UV and weathering
- Not suitable for torsional (twisting) duty
- Screened version suppresses electromagnetic interference from VFD-driven drives

**Project reference**

- Crane festoon cables, Hanwha Ocean Philly Shipyard
- 11 items, 4-core and 12-core, 2.5–95 mm²
- Screened and unscreened variants both supplied
- Minimum order 300 m per specification

## 2. Construction

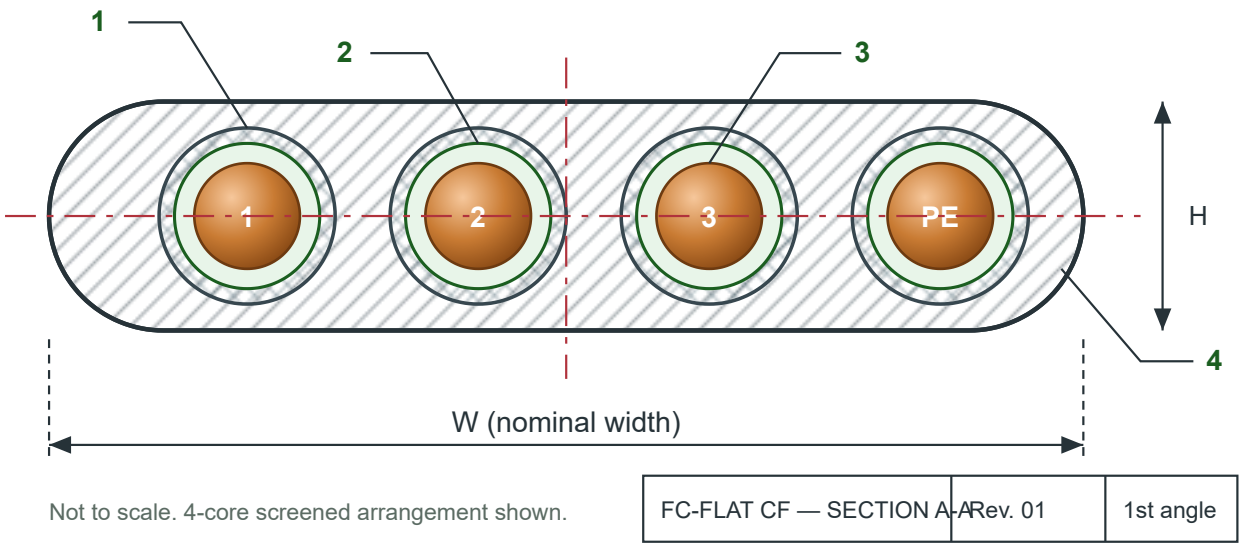



Figure 1 — Cross-section, FC-FLAT CF screened flat festoon cable (4-core arrangement). The unscreened FC-FLAT F is identical without item 2.

| Pos. | Element | Material |
|---|---|---|
| 1 | Conductor | Plain annealed electrolytic copper; Class 6 up to 25 mm², Class 5 from 25 mm² upwards |
| 2 | Screen (CF only) | Tinned copper wire braid (TCWB) over each core, ≥ 80 % optical coverage |
| 3 | Insulation | EPR — ethylene propylene rubber, type 3GI3 |
| 4 | Sheath | CR — chloroprene rubber (Neoprene) type 5GM3, matt black |

Cores are laid parallel in one plane and bonded within the sheath so the cable flexes on one axis only.

### Core identification

- 4 cores: green/yellow, brown, black, grey
- 5 cores: green/yellow, blue, brown, black, grey
- 7 cores and above: black with white numerals plus one green/yellow

### Marking

- Embossed sheath marking with manufacturer, type, core configuration and voltage rating
- Sequential metre marking
- Customer-specific legend available on request

### Sheath colour

- Standard: black
- Optional: yellow, orange or safety-red on request (minimum run applies)

## 3. Technical characteristics

### Electrical

| | |
|---|---|
| Rated voltage Uo/U | **300/500 V** |
| Test voltage | **2 000 V AC, 5 min** |
| Insulation resistance | **≥ 200 MΩ·km at 20 °C** |
| Max. conductor operating temp. | **90 °C** |
| Max. short-circuit temp. | **250 °C (5 s max.)** |

### Thermal

| | |
|---|---|
| Fixed installation | **−40 °C to +90 °C** |
| Flexing (unscreened) | **−35 °C to +90 °C** |
| Flexing (screened) | **−50 °C to +90 °C** |
| Mobile (screened) | **−30 °C to +90 °C** |

### Mechanical

| | |
|---|---|
| Bending radius, fixed | **5 × overall height** |
| Bending radius, moving | **10 × overall height** |
| Max. tensile load, static | **15 N/mm²** |
| Travel speed, festoon | **up to 180 m/min** |
| Reeling / gantry drum | **Not applicable** |
| Torsion | **Not permitted** |

### Fire, oil and weather

- Flame retardant to IEC 60332-1-2 / VDE 0482-332-1-2
- Oil resistant to EN 60811-404
- Ozone, UV and weather resistant
- Halogen-free variant available on request

### Reference standards

Design and testing follow DIN VDE 0250-809 and VDE 0293 (HD 308) for core identification, with type testing to DIN VDE 0472 series, DIN VDE 0298-3 for current ratings, and HD/EN/IEC 60811-2-1 for elastomer properties. The cables comply with the Low Voltage Directive 2014/35/EU, RoHS Directive 2015/65/EU and REACH Regulation EC 1907/2006.

> **UL / UL 508 note for the Philly Shipyard package**
>
> The construction described here is a VDE/IEC-based equivalent. FeiChun can supply this cable with a UL-listed construction (UL 2277 or UL 62 flexible cord) where the end user requires listed product for the crane control panel interface. Please confirm at order stage which items must carry a UL mark, as the conductor class, insulation compound and marking change accordingly and the price is adjusted.

## 4. Dimensions and weights — FC-FLAT F (unscreened)

| FeiChun part no. | No. of cores | Cross-section mm² | Nominal width mm | Nominal height mm | Nominal weight kg/km | Tensile strength N |
|---|---|---|---|---|---|---|
| **FCF-040015** | 4 | 1.5 | 17.5 | 6.2 | 200 | 90 |
| **FCF-040025** | 4 | 2.5 | 21.1 | 7.5 | 280 | 150 |
| **FCF-040040** | 4 | 4 | 26.1 | 9.1 | 410 | 240 |
| **FCF-040060** | 4 | 6 | 29.1 | 9.5 | 600 | 360 |
| **FCF-040100** | 4 | 10 | 33.1 | 11.1 | 800 | 600 |
| **FCF-040160** | 4 | 16 | 37.8 | 12.9 | 1 150 | 960 |
| **FCF-040250** | 4 | 25 | 49.5 | 15.1 | 1 700 | 1 500 |
| **FCF-040350** | 4 | 35 | 54.9 | 17.1 | 2 200 | 2 100 |
| **FCF-040500** | 4 | 50 | 62.8 | 18.9 | 3 000 | 3 000 |
| **FCF-040700** | 4 | 70 | 71.2 | 22.1 | 3 910 | 4 200 |
| **FCF-040950** | 4 | 95 | 79.8 | 24.8 | 5 300 | 5 700 |
| **FCF-041200** | 4 | 120 | 85.8 | 27.2 | 6 400 | 7 200 |
| **FCF-050015** | 5 | 1.5 | 21.5 | 6.2 | 240 | 112 |
| **FCF-050025** | 5 | 2.5 | 27.1 | 7.5 | 332 | 187 |
| **FCF-050040** | 5 | 4 | 32.1 | 9.1 | 560 | 300 |
| **FCF-050060** | 5 | 6 | 35.1 | 9.5 | 650 | 450 |
| **FCF-050100** | 5 | 10 | 44.1 | 11.1 | 1 135 | 750 |
| **FCF-050160** | 5 | 16 | 49.8 | 12.9 | 1 450 | 1 200 |
| **FCF-050250** | 5 | 25 | 59.8 | 16.1 | 2 200 | 1 875 |
| **FCF-070015** | 7 | 1.5 | 29.1 | 6.2 | 360 | 157 |
| **FCF-070025** | 7 | 2.5 | 34.9 | 7.5 | 520 | 262 |
| **FCF-070040** | 7 | 4 | 41.9 | 9.1 | 700 | 420 |

| FeiChun part no. | No. of cores | Cross-section mm² | Nominal width mm | Nominal height mm | Nominal weight kg/km | Tensile strength N |
|---|---|---|---|---|---|---|
| **FCF-070060** | 7 | 6 | 42.1 | 9.5 | 850 | 630 |
| **FCF-070250** | 7 | 25 | 79.7 | 16.1 | 2 930 | 2 625 |
| **FCF-070350** | 7 | 35 | 88.2 | 17.1 | 3 820 | 3 675 |
| **FCF-080015** | 8 | 1.5 | 31.5 | 6.2 | 370 | 180 |
| **FCF-080025** | 8 | 2.5 | 39.1 | 7.5 | 550 | 300 |
| **FCF-100015** | 10 | 1.5 | 39.9 | 6.5 | 460 | 225 |
| **FCF-100025** | 10 | 2.5 | 47.9 | 8.1 | 680 | 375 |
| **FCF-120015** | 12 | 1.5 | 47.1 | 6.5 | 620 | 270 |
| **FCF-120025** | 12 | 2.5 | 56.1 | 8.1 | 800 | 450 |
| **FCF-160015** | 16 | 1.5 | 51.2 | 6.5 | 900 | 360 |
| **FCF-240015** | 24 | 1.5 | 55.1 | 12.5 | 1 300 | 540 |
| **FCF-240025** | 24 | 2.5 | 68.2 | 16.2 | 1 480 | 900 |

Dimensions are nominal. Manufacturing tolerance on width and height is ±5 %; weights are indicative and vary with the copper draw batch.

## 5. Dimensions and weights — FC-FLAT CF (screened)

| FeiChun part no. | No. of cores | Cross-section mm² | Overall dimensions H × W, mm | | Nominal weight kg/km |
|---|---|---|---|---|---|
| | | | Minimum | Maximum | |
| **FCCF-040015** | 4 | 1.5 | 6.2 × 17.8 | 7.2 × 20.4 | 220 |
| **FCCF-040025** | 4 | 2.5 | 7.2 × 21.6 | 8.3 × 24.8 | 320 |
| **FCCF-040040** | 4 | 4 | 10.1 × 27.8 | 11.6 × 31.9 | 505 |
| **FCCF-040060** | 4 | 6 | 10.1 × 29.8 | 11.6 × 34.1 | 605 |
| **FCCF-040100** | 4 | 10 | 11.0 × 34.6 | 12.7 × 39.6 | 840 |
| **FCCF-040160** | 4 | 16 | 13.0 × 39.8 | 14.9 × 45.7 | 1 180 |
| **FCCF-040250** | 4 | 25 | 14.4 × 45.1 | 16.5 × 51.7 | 1 605 |
| **FCCF-040350** | 4 | 35 | 16.3 × 52.8 | 18.7 × 60.5 | 2 520 |
| **FCCF-040500** | 4 | 50 | 19.1 × 61.8 | 21.7 × 66.0 | 2 860 |
| **FCCF-040700** | 4 | 70 | 20.8 × 71.8 | 24.75 × 75.8 | 4 790 |
| **FCCF-040950** | 4 | 95 | 23.25 × 80.2 | 27.25 × 84.0 | 5 950 |
| **FCCF-041200** | 4 | 120 | 28.05 × 91.8 | 31.05 × 96.8 | 7 750 |
| **FCCF-050015** | 5 | 1.5 | 5.95 × 26.55 | 7.95 × 28.55 | 440 |
| **FCCF-050025** | 5 | 2.5 | 7.25 × 30.65 | 9.25 × 32.65 | 590 |
| **FCCF-050040** | 5 | 4 | 8.55 × 34.75 | 10.55 × 36.75 | 770 |
| **FCCF-050060** | 5 | 6 | 9.15 × 37.75 | 11.15 × 39.75 | 920 |
| **FCCF-050100** | 5 | 10 | 10.65 × 45.25 | 12.65 × 47.25 | 1 290 |
| **FCCF-050250** | 5 | 25 | 14.85 × 61.45 | 16.85 × 63.45 | 2 490 |
| **FCCF-070015** | 7 | 1.5 | 5.95 × 34.85 | 7.95 × 36.85 | 570 |
| **FCCF-070025** | 7 | 2.5 | 7.25 × 40.35 | 9.25 × 42.35 | 790 |
| **FCCF-070040** | 7 | 4 | 8.55 × 45.85 | 10.55 × 47.85 | 1 010 |
| **FCCF-070060** | 7 | 6 | 9.15 × 50.05 | 11.15 × 52.05 | 1 220 |
| **FCCF-070100** | 7 | 10 | 10.0 × 57.6 | 12.0 × 59.6 | 1 550 |

| FeiChun part no. | No. of cores | Cross-section mm² | Overall dimensions H × W, mm | | Nominal weight kg/km |
|---|---|---|---|---|---|
| | | | Minimum | Maximum | |
| **FCCF-070250** | 7 | 25 | 15.0 × 82.8 | 17.0 × 84.8 | 3 350 |
| **FCCF-070350** | 7 | 35 | 16.3 × 94.8 | 18.7 × 99.8 | 4 500 |
| **FCCF-080015** | 8 | 1.5 | 7.2 × 34.6 | 8.3 × 39.6 | 470 |
| **FCCF-080025** | 8 | 2.5 | 7.25 × 43.2 | 9.25 × 45.2 | 830 |
| **FCCF-100015** | 10 | 1.5 | 7.55 × 47.9 | 8.55 × 49.9 | 810 |
| **FCCF-120015** | 12 | 1.5 | 8.1 × 52.0 | 9.1 × 54.0 | 796 |
| **FCCF-120025** | 12 | 2.5 | 7.75 × 65.1 | 9.6 × 69.0 | 1 020 |
| **FCCF-240015** | 24 | 1.5 | 8.15 × 112.6 | 9.15 × 114.6 | 1 930 |
| **FCCF-240025** | 24 | 2.5 | 9.05 × 130.6 | 11.05 × 132.6 | 2 760 |

Screened dimensions are given as a minimum–maximum band because braid build-up varies with wire diameter and lay angle.

## 6. Electrical characteristics

| Cross-section mm² | Max. conductor resistance at 20 °C Ω/km | Current rating in air at 30 °C, 4-core A | Current rating, 8-core A | Current rating, 12-core A |
|---|---|---|---|---|
| 1.5 | 13.3 | 23 | 16 | 12 |
| 2.5 | 7.98 | 31 | 22 | 17 |
| 4 | 4.95 | 42 | — | — |
| 6 | 3.30 | 54 | — | — |
| 10 | 1.91 | 75 | — | — |
| 16 | 1.21 | 100 | — | — |
| 25 | 0.780 | 127 | — | — |
| 35 | 0.554 | 158 | — | — |
| 50 | 0.386 | 192 | — | — |
| 70 | 0.272 | 246 | — | — |
| 95 | 0.206 | 298 | — | — |
| 120 | 0.129 | 346 | — | — |

Ratings apply to free-hanging cable in air at 30 °C ambient with all cores loaded. For festoon loops with cables lying close together, apply the grouping factors of DIN VDE 0298-3. Voltage drop over long crane runs should be checked at design stage.

## 7. Testing and quality control

**Routine tests, every drum**

- Conductor DC resistance
- High-voltage spark test on the insulated cores
- AC voltage withstand 2 000 V, 5 min
- Insulation resistance
- Dimensional check on width, height and sheath thickness

**Type and sample tests**

- Tensile strength and elongation of EPR and CR compounds, before and after ageing
- Ozone resistance and hot set
- Oil immersion to EN 60811-404
- Flame propagation to IEC 60332-1-2
- Cold bend and cold impact at −35 °C / −50 °C

### Flex-life verification

- Festoon travel simulation on a horizontal loop rig
- Bending radius set to 10 × cable height
- Continuity and insulation monitored throughout the cycle count
- Witness testing by the customer or a third party can be arranged

### Documentation supplied with each shipment

Works test certificate per drum, certificate of conformity, packing list with drum numbers and metre marks, RoHS and REACH declarations, and a mill certificate for the copper. Third-party inspection (SGS, BV, TÜV) can be arranged at the buyer's account.

## 8. Ordering information

Please quote the FeiChun part number, the number of cores and cross-section, and state clearly whether the screened or unscreened construction is required. Where a specific festoon system, travel speed, loop spacing or operating temperature applies, send those details with the enquiry so the construction can be optimised.

### Ordering example

**FCCF-040350** — FC-FLAT CF flat festoon cable, 4 × 35 mm², screened, EPR/CR, 300/500 V, black sheath, 531 m on one drum.

### Supply conditions

| | |
|---|---|
| Minimum order quantity | **300 m per specification** |
| Standard drum length | **Continuous, cut to order** |
| Packing | **Non-returnable wooden drums** |
| Length tolerance | **+2 % / −0 %** |

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