

WALSTOON®

# WS-FSTN-2PNCT-SB

## Festoon System Flexible Cable

Tinned Copper Shield Braid | AC 600V | JIS C 3327

–40°C to +90°C | Single-Core (2–30) & Paired-Core (2P–8P)

Port Gantry Cranes • Ship Unloaders • Cable Chain Systems

### TECHNICAL PRODUCT MANUAL

Anhui Feichun Special Cable Co., Ltd.

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## 1. Product Overview

The WALSTOON® WS-FSTN-2PNCT-SB is a comprehensive-range festoon system flexible cable designed for port gantry cranes, ship unloaders, cable chain systems, and industrial overhead crane applications. It offers the **widest configuration range** in the WALSTOON festoon cable family — single-core variants from 2 to 30 cores and paired-core variants from 2P to 8P — with tinned copper shield braiding for EMI protection, cross-linked elastomer insulation, and chloroprene rubber (CR) outer sheath for oil, ozone, UV, abrasion, and flame resistance.

While its sibling product (WS-FSTN-2PNCT-PSB) features Kevlar® para-aramid fibre reinforcement for extreme tensile applications, the SB variant focuses on delivering every core configuration a crane electrical system requires — power, control, and signal — within a single product specification. This simplifies procurement, reduces inventory, and guarantees compatibility across all cable runs on the same festoon system.

**SAFETY-CRITICAL COMPONENT:** Festoon cables on port cranes are safety-critical. Cable failure can result in loss of crane control, uncontrolled load release, and risk to human life. Install, support, and maintain per crane manufacturer specifications.

## 2. Technical Specifications

| Parameter           | Specification                                        |
|---------------------|------------------------------------------------------|
| Product Designation | WS-FSTN-2PNCT-SB (Festoon, 2PNCT type, Shield Braid) |
| Standard            | JIS C 3327. Construction per JIS C 3005.             |
| Rated Voltage       | AC 600V                                              |
| Test Voltage        | AC 3,000V / 1 minute                                 |
| Rated Temperature   | 90°C (max continuous conductor)                      |
| Ambient Temp. Range | –40°C to +90°C                                       |
| Min. Bending Radius | 6 × OD                                               |

| Parameter        | Specification                                                   |
|------------------|-----------------------------------------------------------------|
| Shield           | Tinned copper braid (0.3 mm or 0.45 mm)                         |
| Flame Retardancy | JIS C 3005                                                      |
| Oil Resistance   | JIS C 3005                                                      |
| Abrasion         | JIS C 3327 Table 6.12                                           |
| Weather          | Ozone, UV, moisture resistant                                   |
| Configurations   | Single-core: 2–30 (0.75–3.5 mm²). Paired: 2P–8P (1.25–3.5 mm²). |

### 3. Tinned Copper Shield Braid — EMI Protection

The tinned copper braided shield provides EMI protection in the electrically hostile crane environment — VFDs, high-current motors, slip-ring assemblies, and radio equipment all generate significant electromagnetic noise. The tin coating prevents copper oxidation in coastal salt-spray atmospheres and improves solderability at terminations. Shield thickness is **0.3 mm** for smaller cables and **0.45 mm** for larger diameters, maintaining consistent >90% braid coverage across all configurations.

**Shield Grounding:** Ground at one end for analogue signals (prevents ground loops); ground at both ends for digital communication and VFD feedback cables (360° high-frequency shielding). Use low-impedance clamp connections, not pigtails.

### 4. Cable Construction

| Layer         | Material                          | Function                                              |
|---------------|-----------------------------------|-------------------------------------------------------|
| Conductor     | Annealed copper, Class 5 flexible | Power/signal transmission; max flex life              |
| Insulation    | Cross-linked elastomer, 90°C      | Primary insulation; oil resistant per JIS C 3005      |
| Core Assembly | Single or paired cores + fillers  | Single for power/control; paired for balanced signals |
| Shield Braid  | Tinned copper, 0.3/0.45 mm        | EMI shielding for crane control signals               |
| Outer Sheath  | Chloroprene rubber (CR)           | Oil/ozone/UV/abrasion/flame protection                |

### 5. Configuration Options

**44 individual specifications** across single-core and paired-core variants. **Single-core:** 2, 3, 4, 5, 6, 10, 12, 16, 20, 24, 30 cores in 0.75/1.25/2/3.5 mm². **Paired-core:** 2P–8P in 1.25/2/3.5 mm². Covers all crane circuits: power, control, analogue signals, and digital communication within one product family.

**Typical STS crane:** 4C×3.5 mm² (trolley power), 12C×1.25 mm² (discrete control), 4P×1.25 mm² (analogue sensors), 2P×2 mm² (fieldbus). Contact Feichun for cable schedule assistance.

## 6. Dimensional Data — Single-Core (2–12 Cores)

| Cores | mm²  | Cond.Ø | Insul. | Shield | Sheath | OD   | kg/km | R (Ω/km) | IR (MΩ·km) |
|-------|------|--------|--------|--------|--------|------|-------|----------|------------|
| 2     | 0.75 | 1.1    | 0.8    | 0.3    | 1.8    | 11.0 | 130   | 26.6     | 500        |
| 2     | 1.25 | 1.5    | 0.8    | 0.3    | 1.8    | 12.0 | 155   | 16.00    | 500        |
| 2     | 2    | 1.8    | 0.8    | 0.3    | 1.9    | 13.0 | 185   | 10.20    | 500        |
| 2     | 3.5  | 2.5    | 0.8    | 0.3    | 2.0    | 14.5 | 245   | 5.54     | 400        |
| 3     | 0.75 | 1.1    | 0.8    | 0.3    | 1.8    | 11.5 | 150   | 26.6     | 500        |
| 3     | 1.25 | 1.5    | 0.8    | 0.3    | 1.9    | 12.5 | 185   | 16.00    | 500        |
| 3     | 2    | 1.8    | 0.8    | 0.3    | 1.9    | 13.5 | 215   | 10.20    | 500        |
| 3     | 3.5  | 2.5    | 0.8    | 0.3    | 2.0    | 15.0 | 295   | 5.54     | 400        |
| 4     | 0.75 | 1.1    | 0.8    | 0.3    | 1.9    | 12.5 | 175   | 26.6     | 500        |
| 4     | 1.25 | 1.5    | 0.8    | 0.3    | 1.9    | 13.5 | 215   | 16.00    | 500        |
| 4     | 2    | 1.8    | 0.8    | 0.3    | 2.0    | 14.5 | 260   | 10.20    | 500        |
| 4     | 3.5  | 2.5    | 0.8    | 0.3    | 2.1    | 16.5 | 360   | 5.54     | 400        |
| 5     | 0.75 | 1.1    | 0.8    | 0.3    | 1.9    | 13.5 | 200   | 26.6     | 500        |
| 5     | 1.25 | 1.5    | 0.8    | 0.3    | 2.0    | 14.5 | 355   | 16.00    | 500        |
| 5     | 2    | 1.8    | 0.8    | 0.3    | 2.0    | 15.5 | 300   | 10.20    | 500        |
| 5     | 3.5  | 2.5    | 0.8    | 0.3    | 2.2    | 17.5 | 435   | 5.54     | 400        |
| 6     | 0.75 | 1.1    | 0.8    | 0.3    | 2.0    | 14.5 | 235   | 26.6     | 500        |
| 6     | 1.25 | 1.5    | 0.8    | 0.3    | 2.1    | 15.5 | 295   | 16.00    | 500        |
| 6     | 2    | 1.8    | 0.8    | 0.3    | 2.1    | 16.5 | 355   | 10.20    | 500        |
| 6     | 3.5  | 2.5    | 0.8    | 0.3    | 2.3    | 19.0 | 510   | 5.54     | 400        |
| 10    | 0.75 | 1.1    | 0.8    | 0.3    | 2.2    | 17.5 | 255   | 26.6     | 500        |
| 10    | 1.25 | 1.5    | 0.8    | 0.3    | 2.3    | 19.0 | 450   | 16.00    | 500        |
| 10    | 2    | 1.8    | 0.8    | 0.3    | 2.3    | 21.0 | 550   | 10.20    | 500        |
| 10    | 3.5  | 2.5    | 0.8    | 0.45   | 2.5    | 24.0 | 835   | 5.54     | 400        |
| 12    | 0.75 | 1.1    | 0.8    | 0.3    | 2.2    | 18.0 | 385   | 26.6     | 500        |

## 7. Dimensional Data — Single-Core (12–30 Cores)

| Cores | mm²  | Cond.Ø | Insul. | Shield | Sheath | OD   | kg/km | R (Ω/km) | IR (MΩ·km) |
|-------|------|--------|--------|--------|--------|------|-------|----------|------------|
| 12    | 1.25 | 1.5    | 0.8    | 0.3    | 2.3    | 19.5 | 495   | 16.00    | 500        |
| 12    | 2    | 1.8    | 0.8    | 0.3    | 2.4    | 21.0 | 620   | 10.20    | 500        |
| 12    | 3.5  | 2.5    | 0.8    | 0.45   | 2.6    | 25.0 | 945   | 5.54     | 400        |
| 16    | 0.75 | 1.1    | 0.8    | 0.3    | 2.3    | 19.5 | 475   | 26.6     | 500        |
| 16    | 1.25 | 1.5    | 0.8    | 0.45   | 2.4    | 22.0 | 640   | 16.00    | 500        |
| 16    | 2    | 1.8    | 0.8    | 0.45   | 2.5    | 24.0 | 800   | 10.20    | 500        |
| 16    | 3.5  | 2.5    | 0.8    | 0.45   | 2.7    | 27.0 | 1,190 | 5.54     | 400        |
| 20    | 0.75 | 1.1    | 0.8    | 0.45   | 2.4    | 22.0 | 595   | 26.6     | 500        |
| 20    | 1.25 | 1.5    | 0.8    | 0.45   | 2.5    | 24.0 | 770   | 16.00    | 500        |
| 20    | 2    | 1.8    | 0.8    | 0.45   | 2.7    | 26.0 | 975   | 10.20    | 500        |
| 20    | 3.5  | 2.5    | 0.8    | 0.45   | 2.9    | 30.0 | 1,450 | 5.54     | 400        |
| 24    | 0.75 | 1.1    | 0.8    | 0.45   | 2.5    | 24.0 | 695   | 26.6     | 500        |
| 24    | 1.25 | 1.5    | 0.8    | 0.45   | 2.7    | 27.0 | 920   | 16.00    | 500        |
| 24    | 2    | 1.8    | 0.8    | 0.45   | 2.8    | 28.0 | 1,150 | 10.20    | 500        |
| 24    | 3.5  | 2.5    | 0.8    | 0.45   | 3.1    | 33.0 | 1,740 | 5.54     | 400        |
| 30    | 0.75 | 1.1    | 0.8    | 0.45   | 2.6    | 25.0 | 815   | 26.6     | 500        |
| 30    | 1.25 | 1.5    | 0.8    | 0.45   | 2.8    | 28.0 | 1,080 | 16.00    | 500        |
| 30    | 2    | 1.8    | 0.8    | 0.45   | 2.9    | 30.0 | 1,360 | 10.20    | 500        |
| 30    | 3.5  | 2.5    | 0.8    | 0.45   | 3.2    | 35.0 | 2,070 | 5.54     | 400        |

**Note:** Shield braid transitions from 0.3 mm to 0.45 mm on larger cables to maintain >90% coverage density.

## 8. Dimensional Data — Paired-Core (2P–8P)

| Pairs | mm²  | Cond.Ø | Insul. | Shield | Sheath | OD   | kg/km | R (Ω/km) | IR (MΩ·km) |
|-------|------|--------|--------|--------|--------|------|-------|----------|------------|
| 2P    | 1.25 | 1.5    | 0.8    | 0.3    | 2.3    | 19.5 | 370   | 16.00    | 500        |
| 2P    | 2    | 1.8    | 0.8    | 0.3    | 2.4    | 21.0 | 440   | 10.20    | 500        |
| 2P    | 3.5  | 2.5    | 0.8    | 0.45   | 2.6    | 25.0 | 625   | 5.54     | 400        |
| 3P    | 1.25 | 1.5    | 0.8    | 0.3    | 2.4    | 21.0 | 435   | 16.00    | 500        |
| 3P    | 2    | 1.8    | 0.8    | 0.45   | 2.5    | 23.0 | 550   | 10.20    | 500        |
| 3P    | 3.5  | 2.5    | 0.8    | 0.45   | 2.7    | 26.0 | 760   | 5.54     | 400        |
| 4P    | 1.25 | 1.5    | 0.8    | 0.45   | 2.5    | 23.0 | 545   | 16.00    | 500        |
| 4P    | 2    | 1.8    | 0.8    | 0.45   | 2.6    | 25.0 | 660   | 10.20    | 500        |
| 4P    | 3.5  | 2.5    | 0.8    | 0.45   | 2.8    | 29.0 | 920   | 5.54     | 400        |
| 5P    | 1.25 | 1.5    | 0.8    | 0.45   | 2.6    | 25.0 | 650   | 16.00    | 500        |
| 5P    | 2    | 1.8    | 0.8    | 0.45   | 2.7    | 27.0 | 790   | 10.20    | 500        |
| 5P    | 3.5  | 2.5    | 0.8    | 0.45   | 3.0    | 32.0 | 1,120 | 5.54     | 400        |
| 6P    | 1.25 | 1.5    | 0.8    | 0.45   | 2.7    | 27.0 | 760   | 16.00    | 500        |
| 6P    | 2    | 1.8    | 0.8    | 0.45   | 2.9    | 30.0 | 940   | 10.20    | 500        |
| 6P    | 3.5  | 2.5    | 0.8    | 0.45   | 3.1    | 34.0 | 1,320 | 5.54     | 400        |
| 7P    | 1.25 | 1.5    | 0.8    | 0.45   | 2.9    | 30.0 | 890   | 16.00    | 500        |
| 7P    | 2    | 1.8    | 0.8    | 0.45   | 3.0    | 32.0 | 1,080 | 10.20    | 500        |
| 7P    | 3.5  | 2.5    | 0.8    | 0.45   | 3.3    | 37.0 | 1,540 | 5.54     | 400        |
| 8P    | 1.25 | 1.5    | 0.8    | 0.45   | 3.0    | 32.0 | 1,010 | 16.00    | 500        |
| 8P    | 2    | 1.8    | 0.8    | 0.45   | 3.2    | 35.0 | 1,250 | 10.20    | 500        |
| 8P    | 3.5  | 2.5    | 0.8    | 0.45   | 3.5    | 41.0 | 1,800 | 5.54     | 400        |

Note: P = pair (2 conductors per pair). R and IR values are per individual conductor.

## 9. Application Guide

**STS Container Cranes:** Multiple parallel festoon cables: power, control, signal, fieldbus. SB family covers all circuit types in one specification.

**Grab-Type Ship Unloaders:** Bulk cargo handling — coal, ore, grain. High core counts (16–30) for complex grab/hoist/trolley control wiring. Abrasion-resistant sheath.

**Rail-Mounted Gantry Cranes:** Container yard operations. JIS C 3005 flame retardancy critical near container stacks.

**Cable Chain Systems:** 6×OD bending radius compatible with standard energy chains. Full config range in single product family.

**Industrial Overhead Cranes:** Steel mills, automotive plants, power stations, warehouses. –40°C to +90°C covers cold storage to hot industrial environments.

## 10. Environmental Performance

| Threat                          | Protection                        | Standard          |
|---------------------------------|-----------------------------------|-------------------|
| Mineral oils / hydraulic fluids | CR rubber resists swelling        | JIS C 3005        |
| Ozone                           | Stabilizers prevent cracking      | Weather rated     |
| UV radiation                    | UV absorbers prevent brittleness  | Outdoor certified |
| Saltwater spray                 | CR sheath + tinned Cu braid       | Coastal rated     |
| Abrasive dust                   | Abrasion-resistant CR compound    | JIS C 3327 T6.12  |
| Flame / fire                    | Self-extinguishing CR rubber      | JIS C 3005        |
| Cold (−40°C)                    | CR maintains flexibility          | Full rated        |
| Heat (+90°C)                    | Cross-linked elastomer insulation | Full rated        |

## 11. Festoon System Design

**Cable Selection:** Single-core for power/discrete control; paired-core for analogue/digital signals. **Sag:**  $S = (w \times L^2) / (8 \times T)$ ; use cable weight from spec tables. **Multi-cable:** Maintain 50–100 mm separation between power and signal groups. **Bending radius:** 6×OD at all points — hangers, chain bends, junction entries. Largest cable (30C×3.5mm², OD=35mm) requires 210 mm min. radius.

## 12. SB vs. PSB Comparison

| Feature          | WS-FSTN-2PNCT-SB (This Cable)  | WS-FSTN-2PNCT-PSB (Kevlar®)   |
|------------------|--------------------------------|-------------------------------|
| Reinforcement    | Tinned copper shield braid     | Kevlar® aramid fibre braid    |
| Config Range     | Widest: 2–30C + 2P–8P          | Paired only: 2P–12P           |
| Conductor Sizes  | 0.75–3.5 mm²                   | 1.25–3.5 mm²                  |
| Tensile Strength | Standard                       | Extreme (5× steel/weight)     |
| Shock Absorption | Standard                       | Excellent (~60 J/g)           |
| Weight           | Standard                       | 20–35% lighter                |
| Best For         | Control, signal, general power | Long-span, high-speed festoon |
| Cost             | Lower                          | Higher (Kevlar® premium)      |

**Recommended:** Use both families together — PSB for primary power festoon (highest tensile loads), SB for control and signal cables alongside. This optimises performance and cost.

## 13. Feichun Equivalent

**Lead Time:** 3–5 weeks (Japanese OEM: 10–16 weeks). **Pricing:** 12C×2mm² — Japanese OEM ~¥3,200/m; Feichun ~¥1,650/m. Per 200 m: savings ~¥310,000.

**Case Study — Middle East Bulk Terminal:** 4 ship unloaders, 3,600 m total across 8 specifications. Japanese OEM: \$420,000 / 14 weeks. Feichun: \$215,000 / 4 weeks. All specs passed independent testing: conductor R within ±2%, IR exceeding min by 15–25%, shield coverage >90%, oil immersion passed. Savings: \$205,000, 10 weeks faster delivery.

## 14. Technical FAQ

**Q: SB vs PSB difference?**

SB = standard shield braid, widest config range (2–30C + 2P–8P). PSB = Kevlar® reinforced, paired-core only (2P–12P). Use SB for control/signal, PSB for high-tensile power festoon. Most cranes use both.

**Q: Why does shield thickness change?**

Larger cables need thicker braid (0.45 mm vs 0.3 mm) to maintain >90% coverage density across the greater circumference.

**Q: Can single-core and paired-core run on same festoon?**

Yes — recommended approach. Same sheath material, temperature rating, bending radius, and environmental resistance ensure mechanical compatibility.

**Q: Expected flex life?**

>5 million cycles at 6×OD. In typical crane service (~200 cycles/shift, 300 days/year) = 8–12+ years.

**Q: Suitable for VFD circuits?**

SB paired-core variants suit VFD encoder feedback and control signals. For VFD power output to motor, use dedicated VFD-rated power cable.

**Q: Are 0.75 mm² conductors sufficient?**

Yes for low-current discrete signals (<1 A). Use 1.25–2 mm² for contactors/solenoids, 3.5 mm²+ for power circuits.

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## 15. Contact Information

Technical Specifications  
& Application Engineering

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