FEICHUN CABLE

Anhui Feichun Special Cable Co., Ltd.
安徽飞纯特种电缆有限公司

TECHNICAL SPECIFICATION DOCUMENT

PANZERFLEX-ELX

Medium Voltage Reeling Cable with Integrated Optical Fiber Transmission
Rated Voltage: 12/20kV
Specification Compliant to: VDE 0250-813 | IEC 60228 | DIN VDE 0298

Technical Engineering Department: **Tech@feichuncables.com**
Document Reference: FC-PANZERFLEX-ELX-12-20kV-Rev.2024

1. SCOPE OF SUPPLY

1.1 Product Classification

This technical specification defines the design, construction, and performance characteristics of PANZERFLEX-ELX medium voltage flexible reeling cables incorporating integrated optical fiber transmission systems. The cable is engineered for demanding industrial applications requiring simultaneous power and data transmission under extreme mechanical stress conditions.

1.2 Intended Applications

The PANZERFLEX-ELX cable system is specifically designed for the following industrial applications:

- **Port and Maritime Equipment:** Ship-to-shore container handling cranes, quayside gantry cranes
- **Material Handling Systems:** Stacker/reclaimer equipment, conveyor transfer systems
- **Mining and Excavation:** Mobile excavators, draglines, mining shovels
- **Machine Tools:** Large-scale CNC equipment with moving gantries
- **Overhead Traveling Systems:** Festoon cable distribution networks

1.3 Operating Environment Classification

The cable is engineered to operate in environments characterized by high mechanical stress, frequent bending/torsional operations, rapid acceleration/deceleration cycles, and sustained high-speed movement up to specified operational limits.

For application-specific engineering consultations and technical feasibility assessments, contact the Technical Engineering Department: **Tech@feichuncables.com**

2. REGULATORY COMPLIANCE AND STANDARDS

2.1 Primary Standards Compliance

2.2 Environmental and Safety Standards

2.3 Quality Assurance Certification

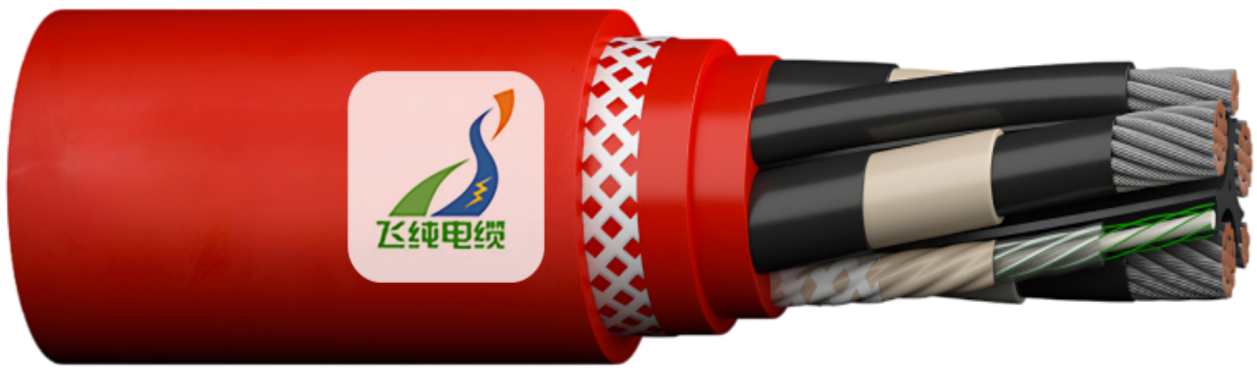
Cable Design Standard:	**VDE 0250 Part 813**
Conductor Classification:	**IEC 60228 Class 5**
Current Rating Methodology:	**DIN VDE 0298 Part 4**
Bending Radius Calculations:	**DIN VDE 0298 Part 3**
Test Voltage Procedures:	**VDE 0250-813**

Oil Resistance Testing:	**VDE/IEC Standard Methods**
UV Radiation Resistance:	**IEC 60811 Series**
Chemical Resistance:	**IEC 60811-404**
Flame Propagation:	**IEC 60332-1-2**
EMC Performance:	**EN 50081/50082**

Manufacturing Quality:	**ISO 9001:2015**
Environmental Management:	**ISO 14001:2015**
Product Conformity:	**CE Marking**
Third-Party Verification:	**Available upon request**
Factory Acceptance Testing:	**Per IEC 60502 Series**

2.4 Optical Fiber Standards

Fiber Specifications:	**ITU-T G.651/G.652**
Optical Performance:	**IEC 60793 Series**
Mechanical Testing:	**IEC 60794 Series**
Environmental Testing:	**Telcordia GR-20**
Installation Guidelines:	**IEC 60794-1-2**



3. ELECTRICAL PERFORMANCE SPECIFICATIONS

3.1 Voltage Rating Classifications

Nominal System Voltage U_0/U:	**3.6/6 ÷ 12/20 kV**
Maximum System Voltage Um:	**7.2 ÷ 24 kV AC RMS**
Withstand Test Voltage (5 min):	**11 ÷ 29 kV AC RMS**
Impulse Withstand Voltage:	**Per VDE 0250-813**
Partial Discharge Level:	**≤ 10 pC at 1.5 × U_0**

3.2 Current Rating Methodology

Calculation Standard:	**DIN VDE 0298-4**
Reference Conditions:	**30°C Ambient, Free Air**
Installation Method A:	**Straight Laying**
Installation Method B:	**Spiral/Single Layer Reel**
Installation Method C/D:	**Multi-Layer Reel Systems**

3.3 Thermal Performance Parameters

Continuous Operation (Flexible):	**-30°C to +60°C**
Continuous Operation (Fixed):	**-40°C to +80°C**
Maximum Conductor Temperature:	**90°C Continuous**
Emergency Overload:	**105°C (100 hours/year)**
Short-Circuit Rating:	**250°C (1 second max)**

3.4 Electromagnetic Compatibility

Design Philosophy:	**Symmetrical Configuration**
Production Tolerances:	**≤ ±2% Geometric**

Interference Suppression:	**Very Low Level**
Screen Effectiveness:	**≥ 40 dB at 10 MHz**
Cross-Talk Suppression:	**≥ 60 dB (fiber optic)**

4. MECHANICAL PERFORMANCE SPECIFICATIONS

4.1 Tensile Strength Requirements

Maximum Installation Load:	**20 N/mm² (conductor area)**
Operational Tensile Load:	**15 N/mm² (continuous)**
Safety Factor:	**2.5:1 (design margin)**
Load Distribution:	**Uniform across all conductors**
Test Verification:	**Per IEC 60794-1-2**

4.2 Bending Performance Criteria

Static Bending Radius:	**8 × Overall Diameter**
Dynamic Bending Radius:	**12 × Overall Diameter**
Calculation Reference:	**DIN VDE 0298-3**
Bend Cycle Life:	**≥ 10^6 cycles (test)**
Torsional Flexibility:	**±360° per meter**

4.3 Operational Speed Limitations

Cable Reel Systems:	**180 m/min (standard)**
Festoon Applications:	**120 m/min (maximum)**
High-Speed Operation:	**> 180 m/min (consult factory)**
Acceleration Limits:	**5 m/s² (continuous)**
Deceleration Limits:	**8 m/s² (emergency stop)**

Contact Technical Engineering Department **Tech@feichuncables.com** for high-speed applications exceeding standard specifications.

4.4 Environmental Resistance Properties

Hydrocarbon Oil Resistance:	**DIN EN 60811-404**
UV Radiation Exposure:	**Unlimited outdoor service**
Ozone Resistance:	**150 pphm, 40°C, 7 days**
Water Ingress Protection:	**IP67 (cable body)**
Chemical Compatibility:	**Industrial solvents/cleaners**

Advanced Construction Details

Conductor

Tinned copper conductor, flexible Class 5 according to IEC 60228. Specially designed for mobile applications with enhanced flexibility and durability.

Insulation

Micro-filtered HEPR rubber compound superior to 3GI3. New specially developed compound with improved electrical and mechanical characteristics for demanding reeling applications.

Field Control System

Conductor Screen: Semiconductive layer applied directly to conductor
Insulation Screen: Semiconductive layer of special compound applied with insulation

Core Identification

Main Cores: Natural color with black semiconductive layer
Split Earth Cores: Identified by position, covered with special black semiconductive compound
Marking: Printed numbers on semiconductor layer

Advanced Laying-up Design

Short lay length (≤ 8 times the laying-up cores diameter) for superior flexibility and mechanical characteristics. Three-core design with protective earth cores split in 2 interstitial areas + 1 module with optical fibers in 1 interstitial area.

Inner Sheath

Polychloroprene rubber-based compound specially developed with improved mechanical characteristics for reeling applications.

Anti-Twisting Protection

Textile braid of synthetic yarns firmly bonded between inner and outer sheath, providing exceptional torsional strength and dimensional stability.

Outer Sheath

Red polychloroprene rubber compound with UV, oil, and chemical resistance superior to 5GM3 compound. Distinctive red color for easy identification in industrial environments.

Cable Marking

PALAZZO - PANZERFLEX-ELX rated voltage nc × cross section, fiber optics n. & type OPTICAL FIBER year of manufacturing

For detailed construction specifications and custom requirements, contact: **Tech@feichuncables.com**

Integrated Optical Fiber Technology

Fiber-Optic Data Transmission

Absolute immunity from electrical interferences - Perfect for industrial environments with high electromagnetic fields.

Main Type: Graded Index 62.5/125

- Standard multimode fiber
- Optimized for industrial data transmission
- Excellent bandwidth characteristics

Alternative Options:

- **Graded Index 50/125** - High bandwidth applications
- **Monomode E9/125** - Long distance transmission

Fiber Configuration:

- **6 fibers** (main type)
- **12 or 18 fibers** available
- Structure: 6 loose tubes (1, 2 or 3 fibers per tube)

*For detailed fiber-optic parameters and specifications, please contact: **Tech@feichuncables.com***

3.6/6 kV Rating - Complete Technical Data

Configuration n×mm² + n×mm²/2 + 1×(6 OF)	D.C. Resistance at 20°C Ω/km	Main Conductor Nominal Ø mm	Protective Earth Nominal Ø mm	Overall Diameter		Net Weight Approx. kg/km	Max. Tensile Force N	Current Carrying Capacity at 30°C				Short Circuit Current 80°-200°C kA·1 sec
				Min. mm	Max. mm			Laid Straight A	Spiral/1 Layer A	2 Layers A	3 Layers A	
3×25+2×25/2+1×(6 OF)	0.795	6.6	4.9	38.8	41.8	2,490	1,500	131	105	80	64	3.2
3×35+2×25/2+1×(6 OF)	0.565	8.0	4.9	41.2	44.2	2,980	2,100	162	130	99	79	4.5
3×50+2×25/2+1×(6 OF)	0.393	9.3	4.9	44.0	47.0	3,510	3,000	202	162	123	99	6.4
3×70+2×35/2+1×(6 OF)	0.277	11.2	6.1	48.1	51.1	4,500	4,200	250	200	153	123	9.0
3×95+2×50/2+1×(6 OF)	0.210	13.0	6.6	52.7	56.7	5,580	5,700	301	241	184	147	12.2
3×120+2×70/2+1×(6 OF)	0.164	15.0	8.0	56.9	60.9	6,950	7,200	352	282	215	172	15.4
3×150+2×70/2+1×(6 OF)	0.132	16.9	8.0	62.7	66.7	8,190	9,000	404	323	246	198	19.2
3×185+2×95/2+1×(6 OF)	0.108	18.3	9.3	66.4	70.4	9,630	11,100	461	369	281	226	23.7
3×240+2×120/2+1×(6 OF)	0.0817	20.5	11.2	76.1	80.1	12,770	14,400	540	432	329	265	30.7

6/10 kV Rating - Complete Technical Data

Configuration n×mm² + n×mm²/2 + 1×(6 OF)	D.C. Resistance at 20°C Ω/km	Main Conductor Nominal Ø mm	Protective Earth Nominal Ø mm	Overall Diameter		Net Weight Approx. kg/km	Max. Tensile Force N	Current Carrying Capacity at 30°C				Short Circuit Current 80°-200°C kA·1 sec
				Min. mm	Max. mm			Laid Straight A	Spiral/1 Layer A	2 Layers A	3 Layers A	
3×25+2×25/2+1×(6 OF)	0.795	6.6	4.9	39.5	42.5	2,540	1,500	131	105	80	64	3.2
3×35+2×25/2+1×(6 OF)	0.565	8.0	4.9	42.0	45.0	3,060	2,100	162	130	99	79	4.5
3×50+2×25/2+1×(6 OF)	0.393	9.3	4.9	44.8	47.8	3,930	3,000	202	162	123	99	6.4
3×70+2×35/2+1×(6 OF)	0.277	11.2	6.1	48.3	52.3	4,570	4,200	250	200	153	123	9.0
3×95+2×50/2+1×(6 OF)	0.210	13.0	6.6	53.5	57.5	5,680	5,700	301	241	184	147	12.2
3×120+2×70/2+1×(6 OF)	0.164	15.0	8.0	57.6	61.6	7,020	7,200	352	282	215	172	15.4
3×150+2×70/2+1×(6 OF)	0.132	16.9	8.0	63.3	67.3	8,280	9,000	404	323	246	198	19.2
3×185+2×95/2+1×(6 OF)	0.108	18.3	9.3	67.0	71.0	9,720	11,100	461	369	281	226	23.7
3×240+2×120/2+1×(6 OF)	0.0817	20.5	11.2	76.8	80.8	12,880	14,400	540	432	329	265	30.7

8.7/15 kV Rating - Complete Technical Data

Configuration n×mm² + n×mm²/2 + 1×(6 OF)	D.C. Resistance at 20°C Ω/km	Main Conductor Nominal Ø mm	Protective Earth Nominal Ø mm	Overall Diameter		Net Weight Approx. kg/km	Max. Tensile Force N	Current Carrying Capacity at 30°C				Short Circuit Current 80°-200°C kA·1 sec
				Min. mm	Max. mm			Laid Straight A	Spiral/1 Layer A	2 Layers A	3 Layers A	
3×25+2×25/2+1×(6 OF)	0.795	6.6	4.9	42.7	45.7	2,830	1,500	139	111	85	68	3.2
3×35+2×25/2+1×(6 OF)	0.565	8.0	4.9	45.5	48.5	3,390	2,100	172	138	105	84	4.5
3×50+2×25/2+1×(6 OF)	0.393	9.3	4.9	48.3	51.3	3,930	3,000	215	172	131	105	6.4
3×70+2×35/2+1×(6 OF)	0.277	11.2	6.1	53.1	57.1	5,130	4,200	265	212	162	130	9.0
3×95+2×50/2+1×(6 OF)	0.210	13.0	6.6	57.0	61.0	6,120	5,700	319	255	195	156	12.2
3×120+2×70/2+1×(6 OF)	0.164	15.0	8.0	62.9	66.9	7,770	7,200	371	297	226	182	15.4
3×150+2×70/2+1×(6 OF)	0.132	16.9	8.0	67.0	71.0	8,820	9,000	428	342	261	210	19.2
3×185+2×95/2+1×(6 OF)	0.108	18.3	9.3	70.0	74.0	10,190	11,100	488	390	298	239	23.7
3×240+2×120/2+1×(6 OF)	0.0817	20.5	11.2	78.2	83.2	13,190	14,400	574	459	350	281	30.7

12/20 kV Rating - Complete Technical Data (Featured Configuration)

Configuration n×mm² + n×mm²/2 + 1×(6 OF)	D.C. Resistance at 20°C Ω/km	Main Conductor Nominal Ø mm	Protective Earth Nominal Ø mm	Overall Diameter		Net Weight Approx. kg/km	Max. Tensile Force N	Current Carrying Capacity at 30°C				Short Circuit Current 80°-200°C kA·1 sec
				Min. mm	Max. mm			Laid Straight A	Spiral/1 Layer A	2 Layers A	3 Layers A	
3×25+2×25/2+1×(6 OF)	0.795	6.6	4.9	48.0	51.0	3,360	1,500	139	111	85	68	3.2
3×35+2×25/2+1×(6 OF)	**0.565**	**8.0**	**4.9**	**51.4**	**55.4**	**4,080**	**2,100**	**172**	**138**	**105**	**84**	**4.5**
3×50+2×25/2+1×(6 OF)	0.393	9.3	4.9	54.2	58.2	4,670	3,000	215	172	131	105	6.4
3×70+2×35/2+1×(6 OF)	0.277	11.2	6.1	58.3	62.3	5,790	4,200	265	212	162	130	9.0
3×95+2×50/2+1×(6 OF)	0.210	13.0	6.6	63.7	67.7	7,040	5,700	319	255	195	156	12.2
3×120+2×70/2+1×(6 OF)	0.164	15.0	8.0	68.0	72.0	8,510	7,200	371	297	226	182	15.4
3×150+2×70/2+1×(6 OF)	0.132	16.9	8.0	73.9	77.9	9,920	9,000	428	342	261	210	19.2
3×185+2×95/2+1×(6 OF)	0.108	18.3	9.3	77.0	81.0	11,310	11,100	488	390	298	239	23.7
3×240+2×120/2+1×(6 OF)	0.0817	20.5	11.1	82.1	87.1	13,840	14,400	574	459	350	281	30.7

Featured Configuration: 3×35+2×25/2+1×(6 OF) highlighted above. For complete technical calculations and installation guidance, contact: **Tech@feichuncables.com**

Installation Guidelines & Technical Notes

Current Rating Classifications

Laid Straight: Maximum current capacity for straight cable runs
Spiral/1 Layer: Current capacity for spiral configuration or single layer on reels
2 Layers: Reduced capacity for two-layer reel installations
3 Layers: Minimum capacity for three-layer reel configurations

EMC Design Features

Symmetrical design with narrow production tolerances ensures very low interference levels, making this cable ideal for sensitive industrial automation and control systems.

Installation Considerations

Minimum Bending Radii: According to DIN VDE 0298 Part 3
Tensile Load: Up to 20 N/mm² during installation and operation
Speed Limitations: Reeling operations up to 180 m/min, Festoon systems up to 120 m/min

Temperature Derating

All current ratings are calculated at 30°C ambient temperature. For applications in different ambient conditions, apply appropriate derating factors according to DIN VDE 0298 Part 4.

For installation support, technical calculations, and application-specific guidance, our engineering team is available at: **Tech@feichuncables.com**

Quality Assurance & Custom Solutions

Additional Voltage Ratings Available

18/30 kV ratings available on request - Contact our technical team for specifications and delivery information.

Custom Configurations

Feichun Cable can provide customized PANZERFLEX-ELX configurations including:

- Alternative fiber counts (12, 18 fiber options)
- Different fiber types (50/125, E9/125 monomode)
- Special conductor arrangements
- Modified sheath colors for specific applications
- Extended temperature ranges for extreme environments

Technical Support Services

Our technical department provides comprehensive support including:

- Application engineering and cable selection
- Installation guidance and training
- Field testing and commissioning support
- Maintenance recommendations and troubleshooting

For all custom requirements and technical support services, reach out to: **Tech@feichuncables.com**

Anhui Feichun Special Cable Co., Ltd.

Advanced Reeling Cable Technology with Integrated Optical Fibers

PANZERFLEX-ELX Series: The Ultimate Solution for High-Performance Mobile Power & Data Transmission

Technical Department: **Tech@feichuncables.com**
Professional Engineering Support • Custom Solutions • Installation Guidance

This technical specification document is subject to continuous improvement. For the latest specifications, installation guidelines, and technical support, please contact our technical department.