FEICHUN SPECIAL CABLES · 飞纯特种电缆

TDS · ES-DB | 6/10 kV | 24 FO · 62.5/125 µm | IEC 60502-2

MV Reeling Cable ES-DB 3×50+2×25/2+24FO — 6/10 kV

Technical Data Sheet (TDS) for a screened, flexible medium-voltage reeling cable with integrated multimode optical fibre, for crane and reeling-drum systems

Doc. No.: **FC-TDS-ESDB-2026-ARX345** Rev.: **00** Date: **20.11.2026**

Customer: **ARX Engineering PTE LTD (Singapore)** Quantity: **1 drum / 345 m**

01 Scope and Application

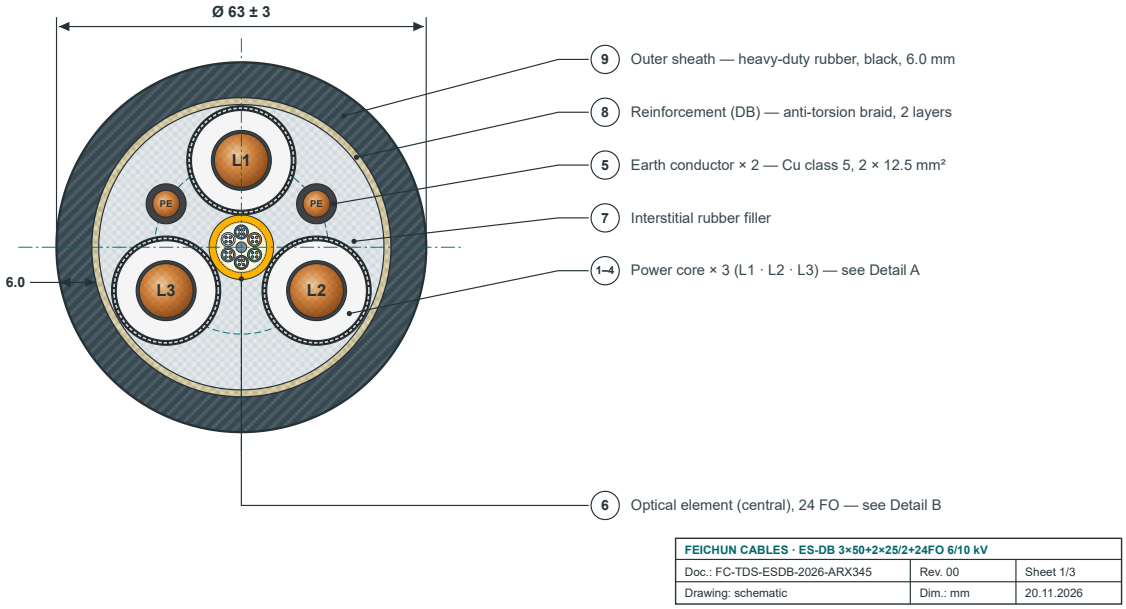
The **FeiChun MV Reeling Cable ES-DB 3×50+2×25/2+24FO 6/10 kV** supplies power and data to equipment that moves on a cable reeling drum: ship-to-shore, RTG and STS container cranes, stackers, reclaimers, ship-loaders and other mobile port and industrial machinery. It is rated for three-phase 50/60 Hz systems with a rated voltage of **6/10 kV**.

- Three individually screened power cores (**ES**), two earth conductors and a central **24-fibre multimode (62.5/125 µm)** optical element for control and communication.
- EPR rubber insulation with semi-conductive conductor and core screens; double-layer anti-torsion braid reinforcement (**DB**) under a heavy-duty rubber sheath.
- For repeated winding and unwinding on reeling drums; tensile load is carried by the copper and the braid, not by the optical fibres.
- Suitable for tropical coastal and port climates: high humidity, UV, salt-laden air, oil and ozone.

RATED VOLTAGE U_0/U	CONFIGURATION
6/10 kV	**3×50+2×25/2+24FO**
OVERALL DIAMETER	WEIGHT
≈ 63 mm	**≈ 5 400 kg/km**

02 Cable Construction — Cross-Section

Fig. 1 · Cross-section · ES-DB 3×50+2×25/2+24FO 6/10 kV (proportional drawing, 1 mm = 5 units)



Item	Element	Material / design
1	Power conductor, 3 pcs	Tinned fine-wire copper, class 5 (IEC 60228), 50 mm², Ø ≈ 9.2 mm
2	Conductor screen	Semi-conductive rubber, extruded, 0.5 mm
3	Insulation	EPR (ethylene-propylene rubber), nominal 3.4 mm, 90 °C rating
4	Core screen (ES)	Semi-conductive rubber layer plus tinned copper braid on each core, 0.8 mm total
5	Earth conductors, 2 pcs	Tinned fine-wire copper, class 5; 25 mm² total (2 × 12.5 mm²), semi-conductive rubber cover, Ø ≈ 6.8 mm
6	Optical element (central)	24 multimode fibres 62.5/125 µm in 6 loose tubes × 4 fibres, central FRP strength member, aramid yarn, TPU jacket, Ø ≈ 11 mm
7	Filler / assembly	Rubber filler in the interstices; cores, earth conductors and optical element stranded in a long lay (≈ 8 × assembly Ø) for reeling duty
8	Reinforcement (DB)	Double-layer counter-wound anti-torsion braid (polyester / aramid), 1.2 mm
9	Outer sheath	Heavy-duty CSP / PCP-type rubber, flame-retardant, oil / UV / ozone resistant; black; nominal 6.0 mm

Note on designation. "3×50+2×25/2" is read as 3 power cores of 50 mm² plus 2 earth conductors with a total cross-section of 25 mm² (12.5 mm² each). If the original drawing defines it differently (for example 2 × 25 mm² each), please advise before order confirmation.

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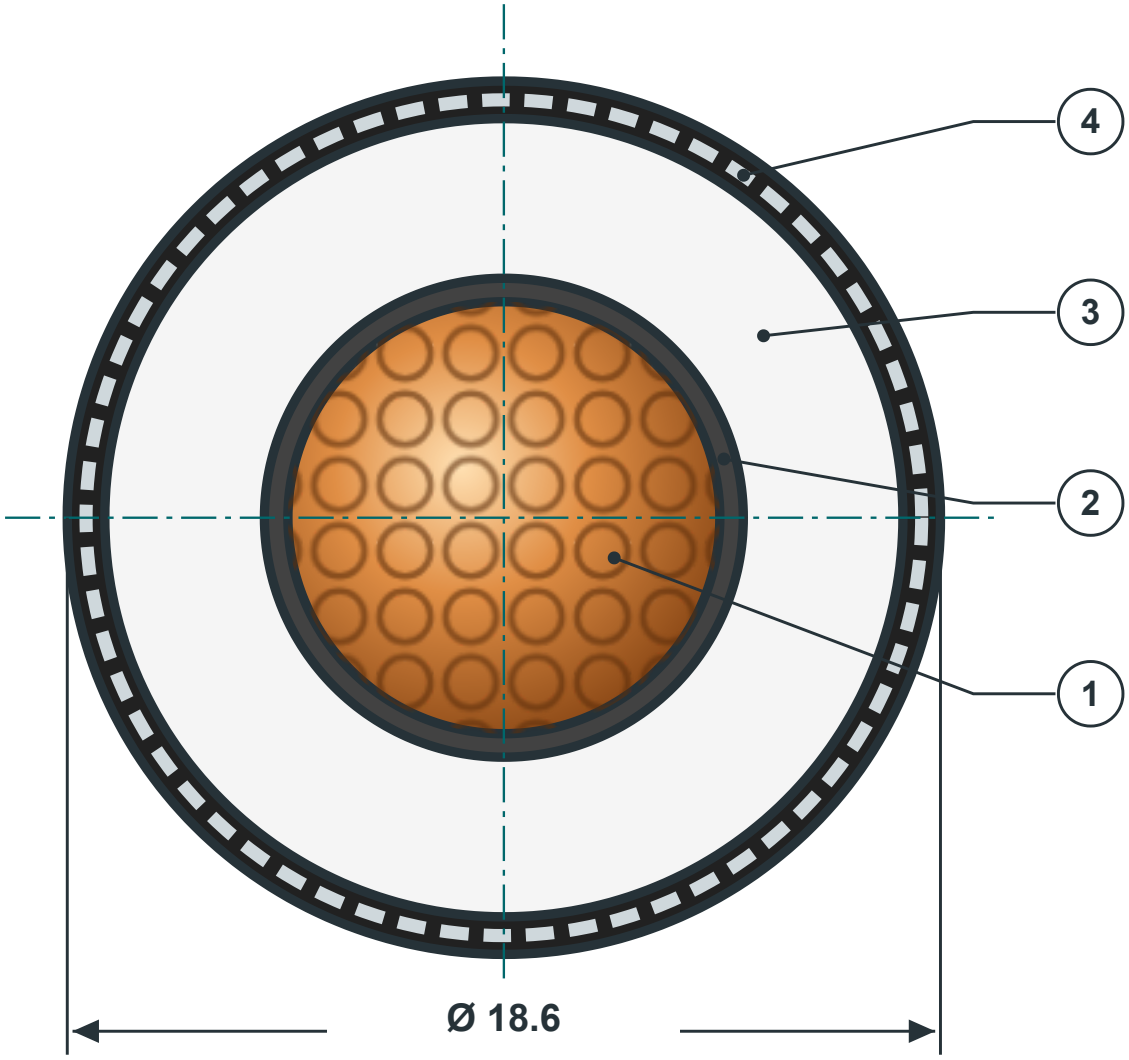
03 Detail Drawings

Detail A — Power core (× 3)

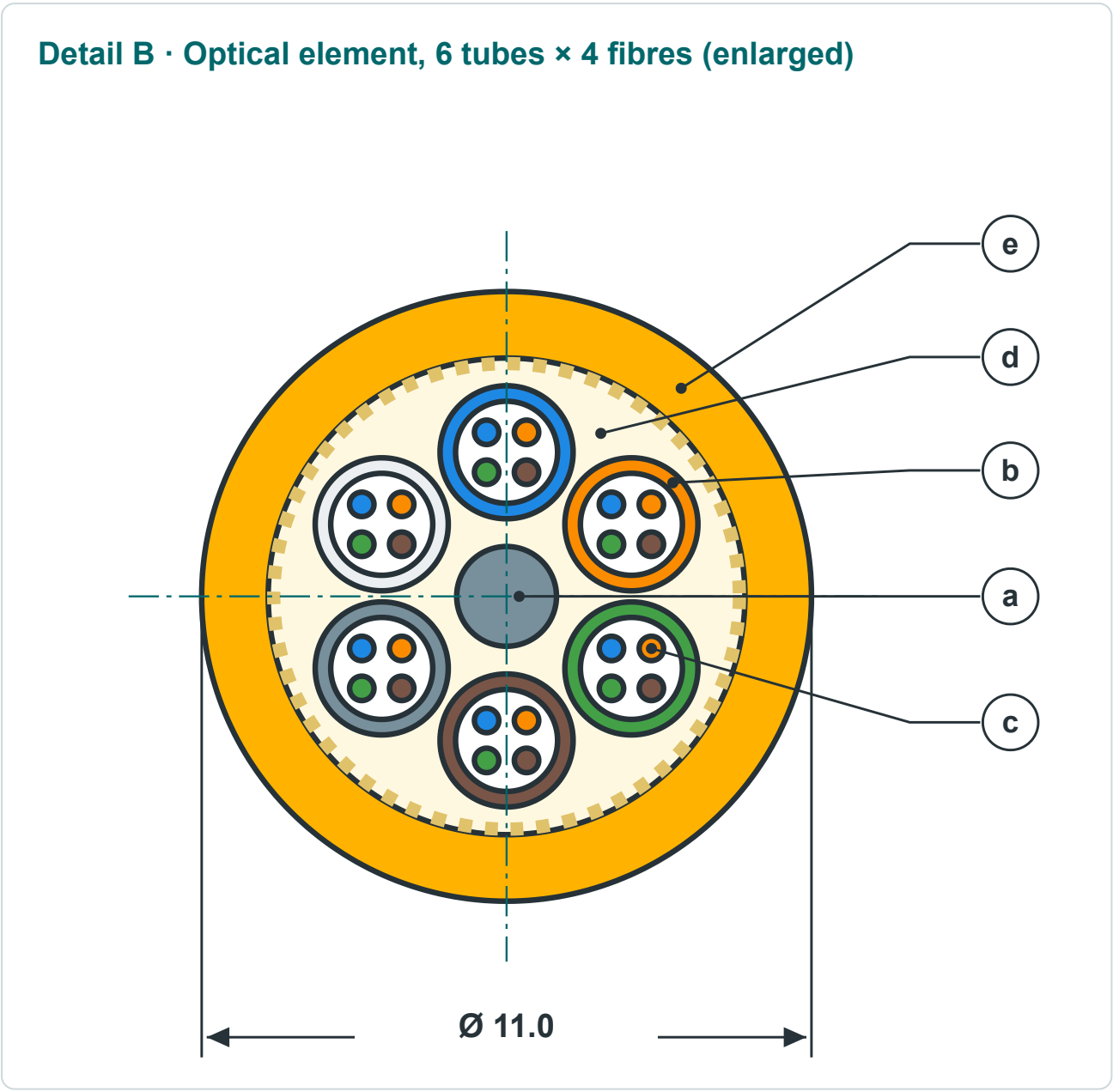
Detail A · Power core L1 / L2 / L3 (enlarged)



Item	Layer	Thickness	Ø over layer
1	Conductor (Cu class 5, tinned)	—	**9.2 mm**
2	Conductor screen	**0.5 mm**	**10.2 mm**
3	EPR insulation	**3.4 mm (min. 2.96)**	**17.0 mm**
4	Core screen (rubber + tinned Cu braid)	**0.8 mm**	**18.6 mm**

The semi-conductive layers are bonded to the insulation. The tinned copper braid of each core is connected to earth and carries the screen fault current.

Detail B — Optical element (24 FO)



Pos.	Element	Design
a	Central strength member	FRP rod, Ø ≈ 2.0 mm
b	Loose tube, 6 pcs	Colour-coded PBT tube, OD ≈ 2.4 mm, gel-filled, stranded around the FRP rod
c	Optical fibre, 4 per tube	Multimode graded-index 62.5/125 µm, 250 µm coated, colour-coded; 24 fibres in total
d	Aramid yarn / water-blocking layer	Aramid yarn plus swellable tape, ≈ 0.4 mm
e	Element jacket	Halogen-free TPU, ≈ 1.3 mm, Ø ≈ 11.0 mm

Fibre colour code

Tube	T1	T2	T3	T4	T5	T6
Tube colour	Blue	Orange	Green	Brown	Slate	White
Fibre Nos.	1–4	5–8	9–12	13–16	17–20	21–24

Within every tube the four fibres are coloured in this order: blue, orange, green, brown.

04 Layer-Stripped View (Termination Preparation)

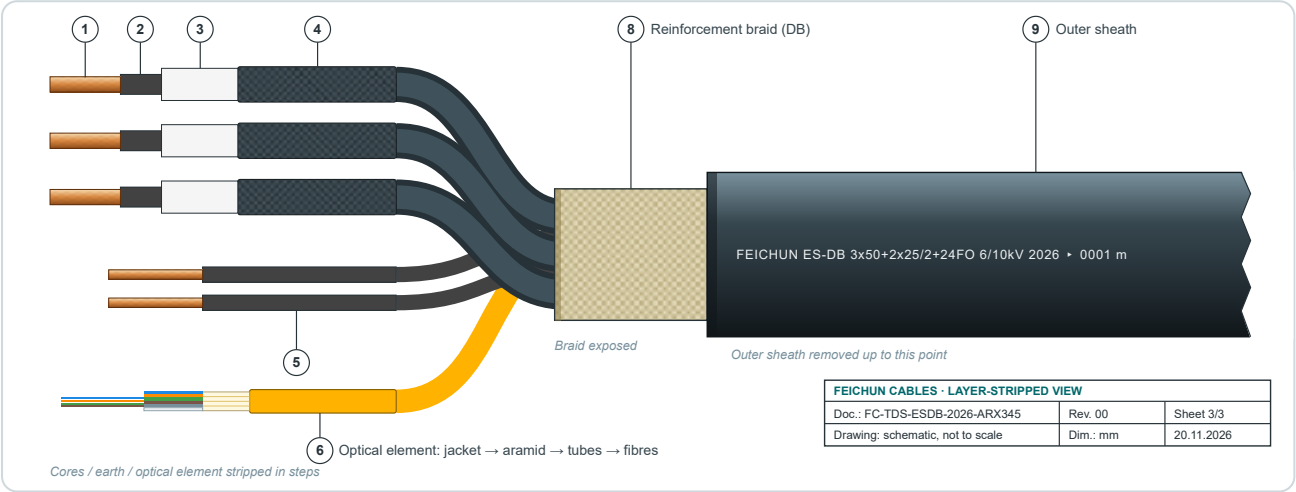


Fig. 3 · Longitudinal view with each layer removed in steps. Item numbers as in Fig. 1. The interstitial filler (item 7) sits between the stranded elements and is not shown here.

- Typical strip lengths for termination: outer sheath and braid as required by the end-connector supplier; core screen, insulation and conductor screen per the termination kit manual.
- Cut the aramid yarn of the optical element last. Do not bend the loose tubes tighter than 20 × tube OD.

05 Construction and Dimensional Data

Layer	Thickness	Ø over layer
Power conductor 50 mm²	—	**9.2 mm**
Conductor screen	**0.5 mm**	**10.2 mm**
EPR insulation	**3.4 mm**	**17.0 mm**
Core screen (rubber + braid)	**0.8 mm**	**18.6 mm**
Earth conductor 12.5 mm² with cover	—	**≈ 6.8 mm**
Optical element	—	**≈ 11.0 mm**
Pitch circle of power cores	—	**≈ 29.6 mm**
Assembly (envelope of cores)	—	**≈ 48.2 mm**
Reinforcement braid (2 layers)	**≈ 1.2 mm**	**≈ 51.0 mm**
Outer sheath	**6.0 mm**	**≈ 63.0 mm**

Parameter	Value (approx.)
Power cores	**3 × 50 mm²**
Earth conductors	**2 × 25/2 (12.5 mm² each)**
Optical fibre	**24 FO, multimode 62.5/125 µm (OM1)**
Conductor class	**Class 5, tinned copper**
Overall diameter	**63 ± 3 mm**
Cable weight	**≈ 5 400 kg/km**
Copper content (power + earth)	**≈ 1 600 kg/km**
Sheath colour	**Black**
Net cable weight, 345 m	**≈ 1 860 kg**

Dimensions and weights are design values; final values are confirmed in the approved production drawing and the factory test report.

06 Electrical and Optical Characteristics

Electrical parameter	Value
Rated voltage U_0/U (Um)	**6/10 kV (12 kV)**
Frequency	**50 / 60 Hz**
AC test voltage, 5 min (3.5 U_0)	**21 kV**
Conductor resistance 50 mm^2 at 20 °C, max.	**0.386 Ω/km**
Earth conductor 12.5 mm^2 at 20 °C, max.	**≈ 1.54 Ω/km**
Insulation resistance at 20 °C, min.	**100 MΩ·km**
Partial discharge at 2 U_0, max.	**10 pC**
Max. conductor temperature (continuous / short-circuit)	**+90 °C / +250 °C**
Current rating, fully unwound, air 30 °C	**≈ 200 A**

Optical parameter	Value
Fibre type	**Multimode graded index 62.5/125 µm**
Fibre count	**24 (6 tubes × 4)**
Attenuation at 850 nm, max.	**3.5 dB/km**
Attenuation at 1300 nm, max.	**1.5 dB/km**
Bandwidth at 850 / 1300 nm, min.	**200 / 500 MHz·km**
Numerical aperture	**0.275 ± 0.015**
Fibre standard	**IEC 60793-2-10 A1b / ITU-T G.651.1**
Fibre strain under max. tension	**≤ 0.3 %**

Current derating on the drum

Layers on drum	1	2	3	4
Factor	**0.80**	**0.61**	**0.49**	**0.42**

Air temperature, °C	20	30	40	50
Factor	**1.07**	**1.00**	**0.91**	**0.82**

07 Mechanical and Operating Characteristics

Parameter	Value
Operating temperature (reeling / moving)	**−25 °C … +80 °C**
Min. bending radius on drum (dynamic)	**12 × D ≈ 760 mm**
Min. bending radius, fixed installation	**8 × D ≈ 505 mm**
Max. tensile load, reeling	**15 N/mm² × 175 mm² Cu ≈ 2.6 kN**
Reeling speed, max.	**≈ 120 m/min**
Resistance to oil, UV, ozone, humidity	**Yes — outdoor / marine use**
Flame retardancy	**IEC 60332-1-2**
Service life under correct use	**Application dependent; ≥ 4 years typical**

Installation guidance. Do not twist the cable or allow loops to form during reeling. Match the drum core diameter, guide-roller radii and tension-control settings to the minimum bending radius above. Terminate fibres with suitable fan-out kits and keep fibre ends dry. Connect core screens and earth conductors to the machine earth and earth-continuity monitoring.

08 Standards and Testing

Reference standards

- IEC 60502-2 — Power cables 6 kV to 30 kV
- IEC 60228 — Conductors of insulated cables
- IEC 60811 — Test methods for insulating and sheathing materials
- IEC 60793-2-10 — Multimode fibre specification
- IEC 60794-1-2 — Optical cable test methods
- IEC 60332-1-2 — Flame propagation
- Reference design: DIN VDE 0250-813 (reeling cables)

Routine tests (each length)

- Construction and dimension check
- Conductor resistance
- AC voltage test, 21 kV, 5 min
- Insulation resistance
- Partial discharge measurement

- Optical attenuation (OTDR) — all 24 fibres, 850 / 1300 nm
- Continuity of earth conductors and screens

The factory test report and OTDR traces are supplied with the shipment. Third-party witness testing is available at the Buyer's cost on request.

09 Marking, Packing and Delivery (345 m)

Parameter	Value
Length / drums	**1 × 345 m on 1 steel-reinforced wooden drum, continuous length (+0 / +1 %)**
Drum size (indicative)	**Ø 2 000 × 1 200 mm**
Gross weight (indicative)	**≈ 2.7 t**
Marking on sheath (every 1 m)	**FEICHUN ES-DB 3x50+2x25/2+24FO 6/10kV 2026 + metre mark**
Drum label	**Manufacturer, type, length, gross / net weight, batch no., rolling direction**
End protection	**Heat-shrink end caps; fibre ends sealed**

10 Warranty and Product Identity

Item	Statement
Brand / origin	FeiChun · Made in China
Product status	Newly manufactured FeiChun-brand cable built to the specified configuration. It is an equivalent / alternative product, not the original brand of the existing cable; no OEM claim is made.
Warranty	12 months from delivery, for defects not caused by misuse or improper installation
Lead time	3–4 weeks after order confirmation (made to order)
Technical support	Online support for termination and commissioning on request

Prepared by: Design engineer	Checked by: Technical / QA Dept.	Approved by: Technical Director

ANHUI FEICHUN SPECIAL CABLE CO., LTD.

安徽飞纯特种电缆有限公司

Hefei, Anhui Province, P.R. China

National Economic & Technological Development Zone

www.feichuncables.com

CONTACTS

Technical: Tech@feichuncables.com

Sales: zihao.yang@feichuncables.com

Zihao Yang, Sales Manager

WhatsApp: +86 138 5512 3218

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