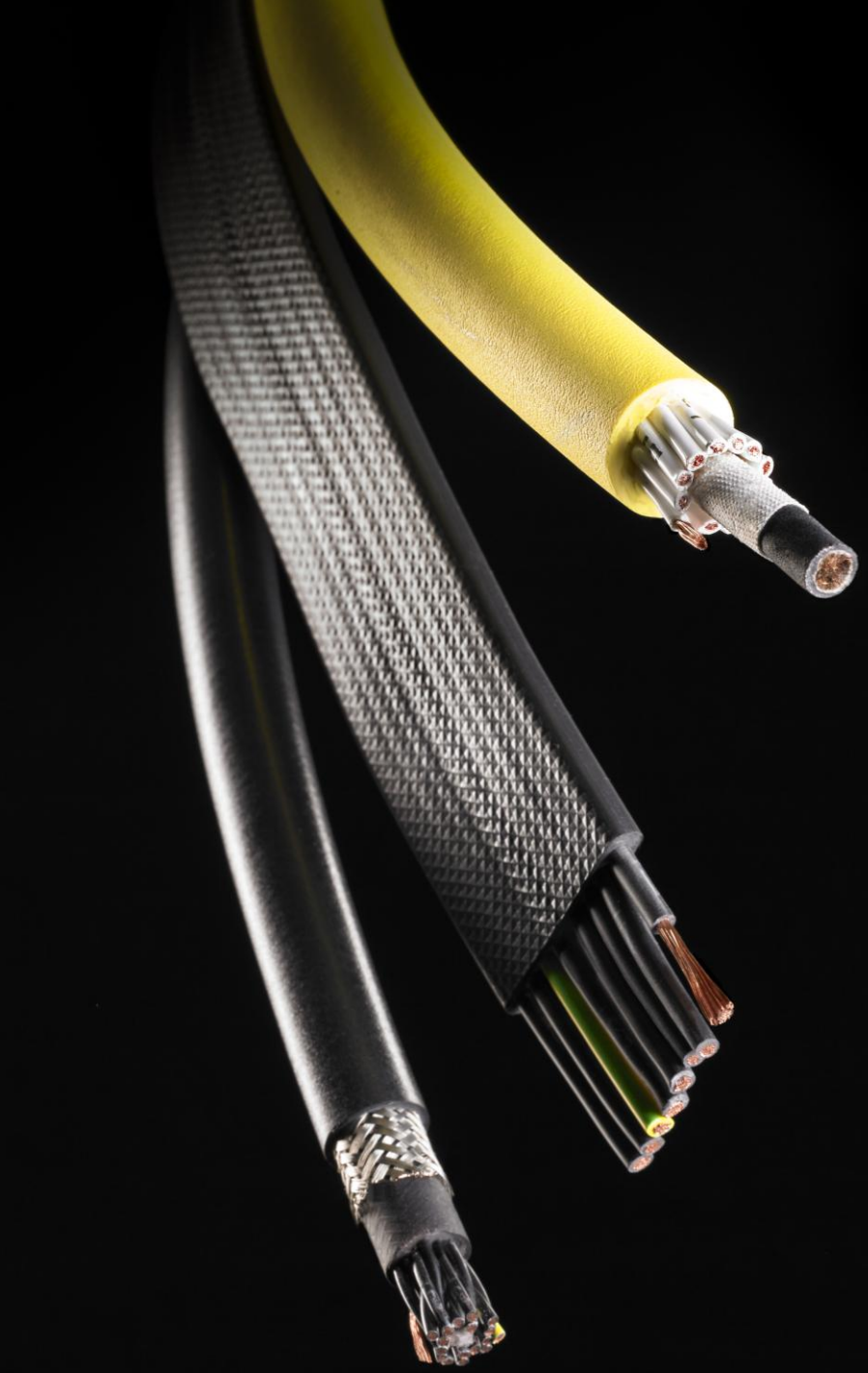


VIETNAM NATIONAL UNIVERSITY HO CHI MINH CITY
HO CHI MINH CITY UNIVERSITY OF TECHNOLOGY

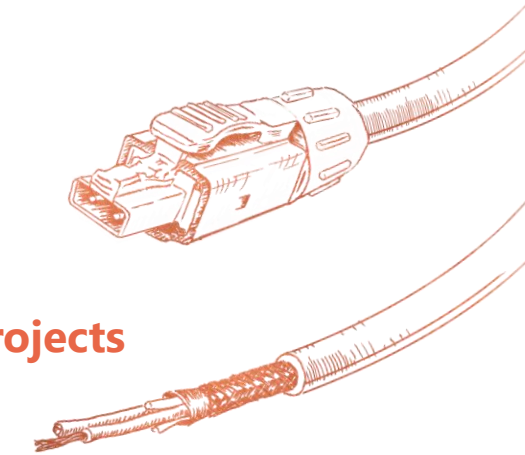
HELUKABEL®

Seminar

CABLES & AUTOMATION

The backbone of modern industry

What we will learn



1. Industrial Automation

Why industrial automation?

2. Cable Structure

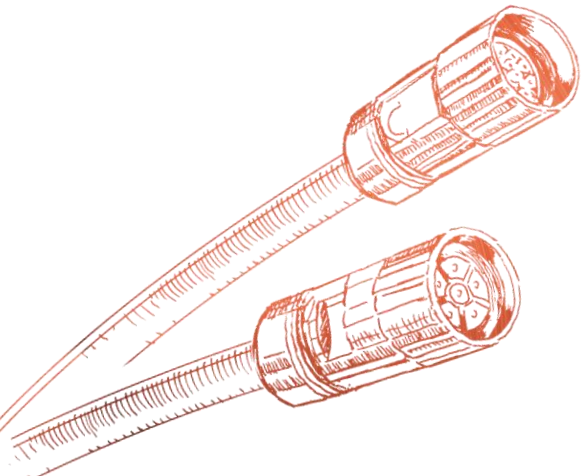
What is the basic structure of a cable?

3. Cable selection Guide for projects

How to pick the right cable for your project.

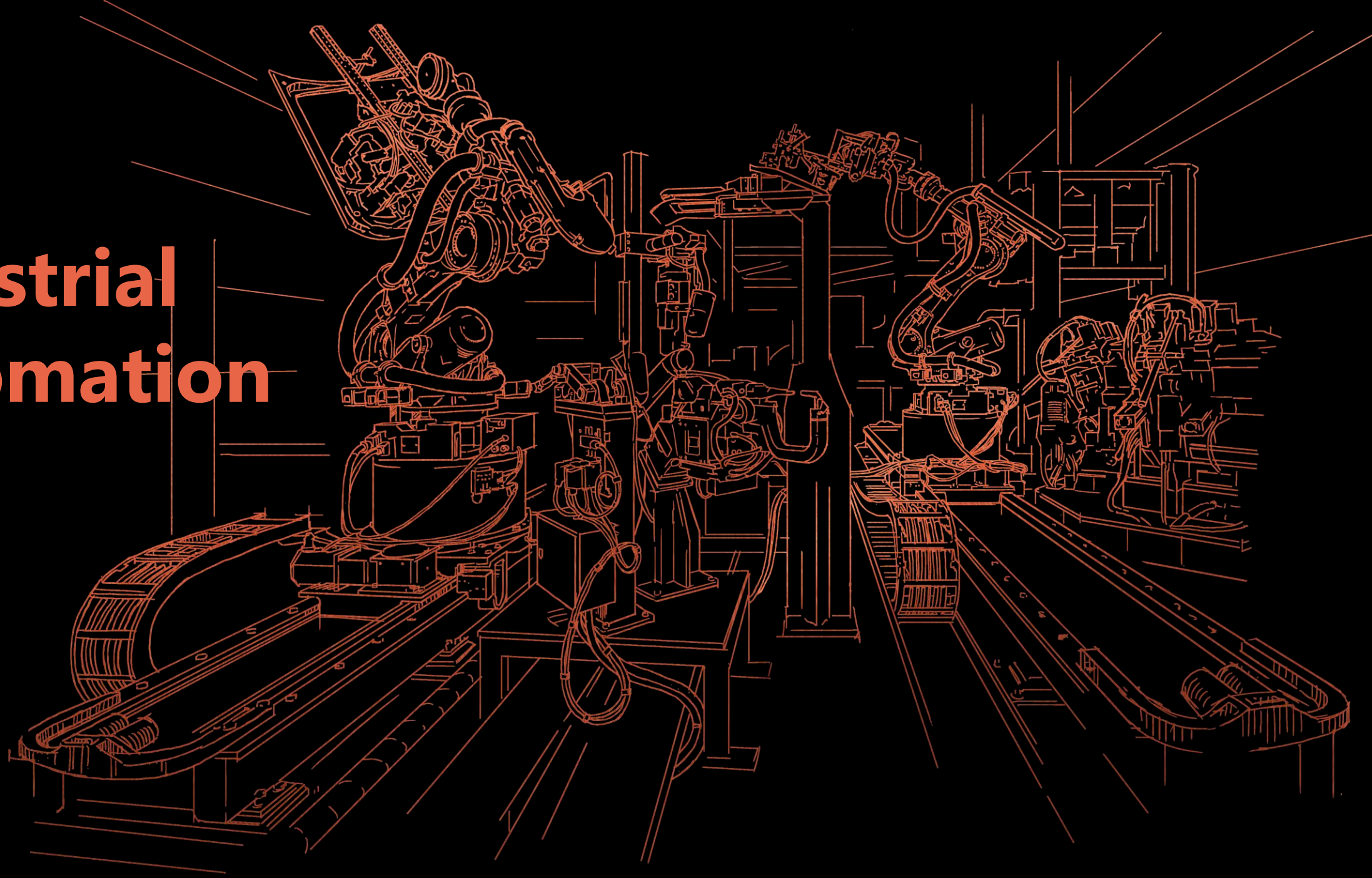
4. Drag Chains

An overview about drag chains.



Part 1

Industrial Automation



What is Industrial Automation?

“Industrial automation refers to the use of control systems such as computers, robots, and information technologies to manage and control industrial processes and machinery, with the goal of improving efficiency, accuracy, and safety while reducing human intervention and operational costs.”

Why Industrial Automation?

1990	2025
49 Cars / worker/ year	**417** Cars / worker/ year
8% % Defect	**2.4%** % Defect

Source: car recalls / research gate

IA can make products cheaper and better

We always have choices, but which one is yours?

replacing the cables from **servo company**

replacing the cables from **local cables**

replacing the cables from **compatible sources**

Key Takeaways

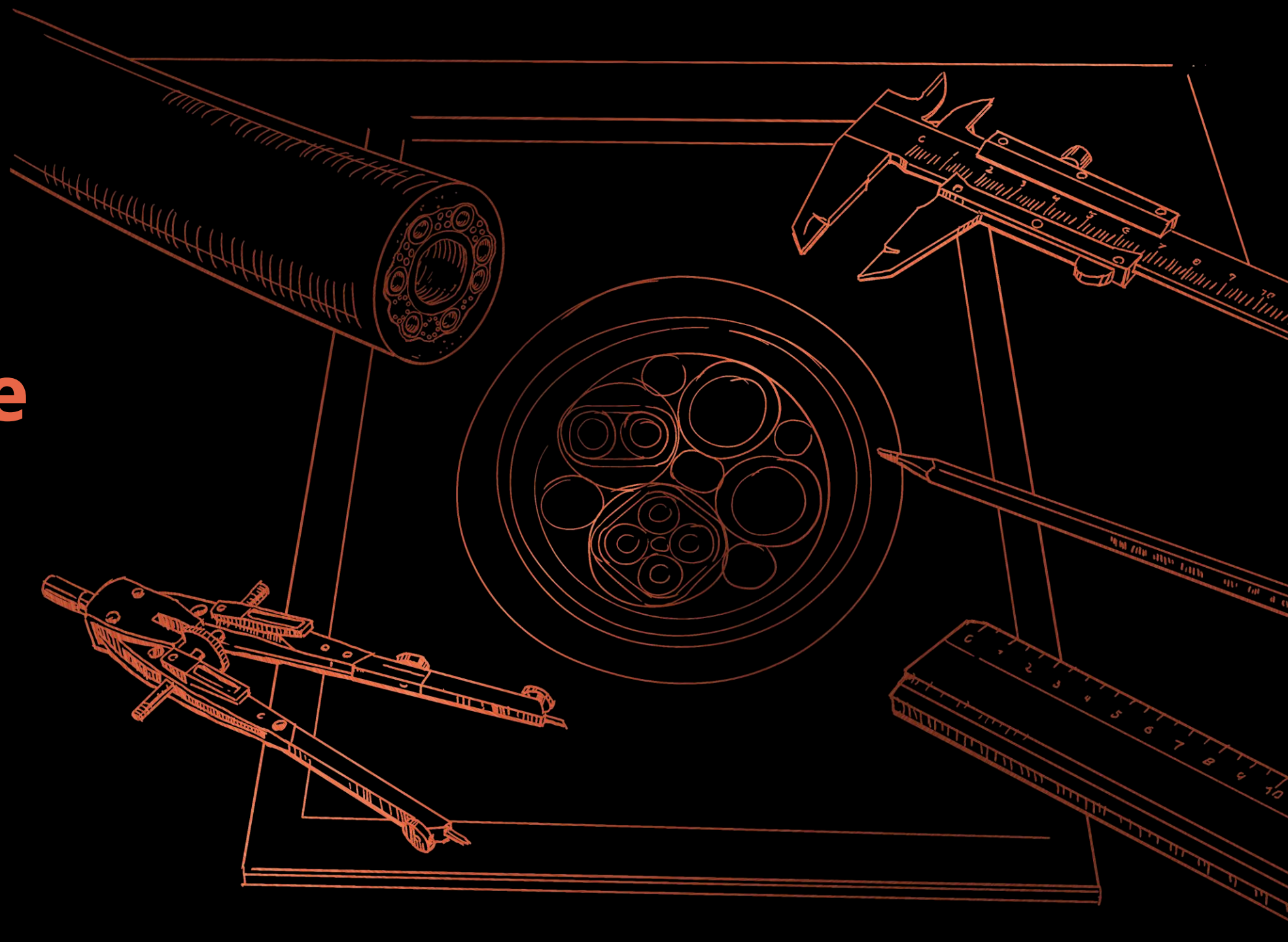
1. Industrial Automation enables process efficiency, accuracy and safety.

2. Enhancement of process efficiency, accuracy, and safety makes the business more cost-effective and profitable.

3. Understanding the details of equipment will maintain and balance the efficiency of Industrial Automation.

Part 2

Cable Structure



Cable Structure

How many components are there?

What are the names of each component?

What is the function of each component?

Cable Structure

1	**Conductor**	Lõi	Cu			...
2	**Insulation**	Vỏ cách điện	PVC	PE	XLPE	...
3	**Sheath**	Vỏ bảo vệ	PVC	PE	XLPE	...

Cable structure abbreviation: Cu / PVC / PVC

Cable Structure

1	**Conductor**	Lõi	Cu
2	**Insulation**	Vỏ cách điện	PVC
3	**Shield**	Lớp chống nhiễu	TCB Tinned copper braid
4	**Sheath**	Vỏ bảo vệ	PVC

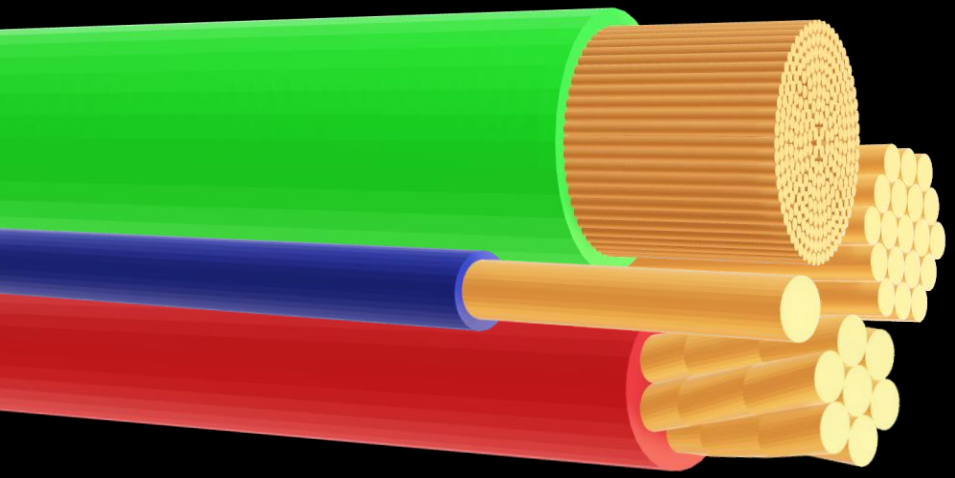
Cable structure abbreviation: Cu / PVC / TCB / PVC

Cable Structure

1	**Conductor**	Lõi	Cu	
2	**Insulation**	Vỏ cách điện	PVC	
3	**Shield**	Lớp chống nhiễu	TCB Tinned copper braid	Foil Aluminum
4	**Armours**	Lớp giáp	PVC	SWA Steel Wire Armours
5	**Inner sheath**	Vỏ bảo vệ bên trong	PVC	
6	**Outer sheath**	Vỏ bảo vệ bên ngoài	PVC	

Cable structure abbreviation: Cu / PVC / OS / PVC / SWA / PVC

Cable Conductors

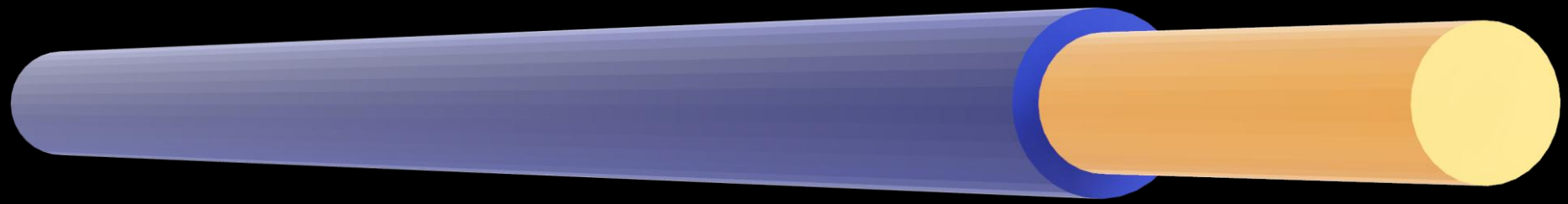


Conductors are divided into different ***classes***.

The ***higher*** the class, the ***more flexible*** the conductor.

DIN VDE 0295 / IEC 60228

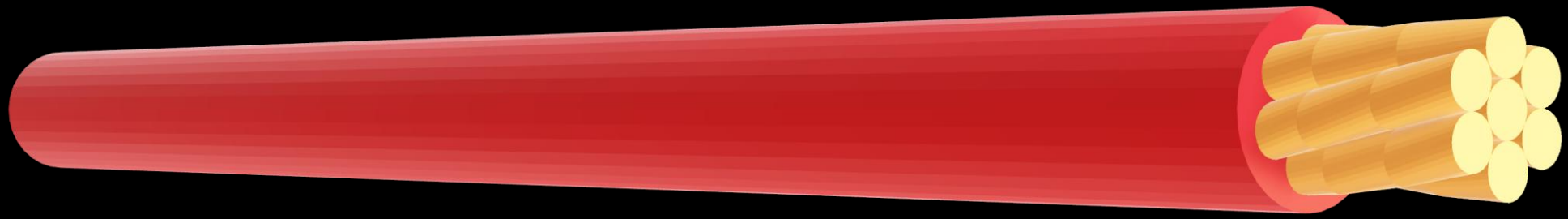
Cable Conductors



Class 1 for solid conductor

Usage: suitable for fixed installations like power distribution and building wiring, they are durable but not flexible.

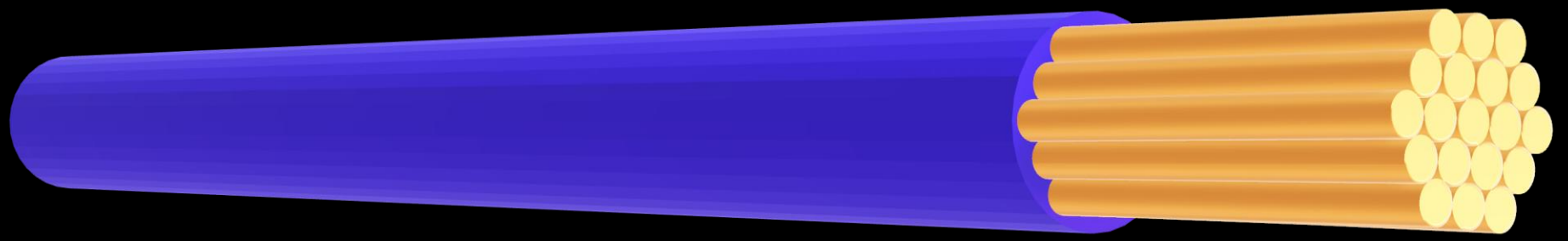
Cable Conductors



Class 2 for stranded conductor

Usage: commonly used in industrial wiring, electrical panels, and motor control centers where some bending is required

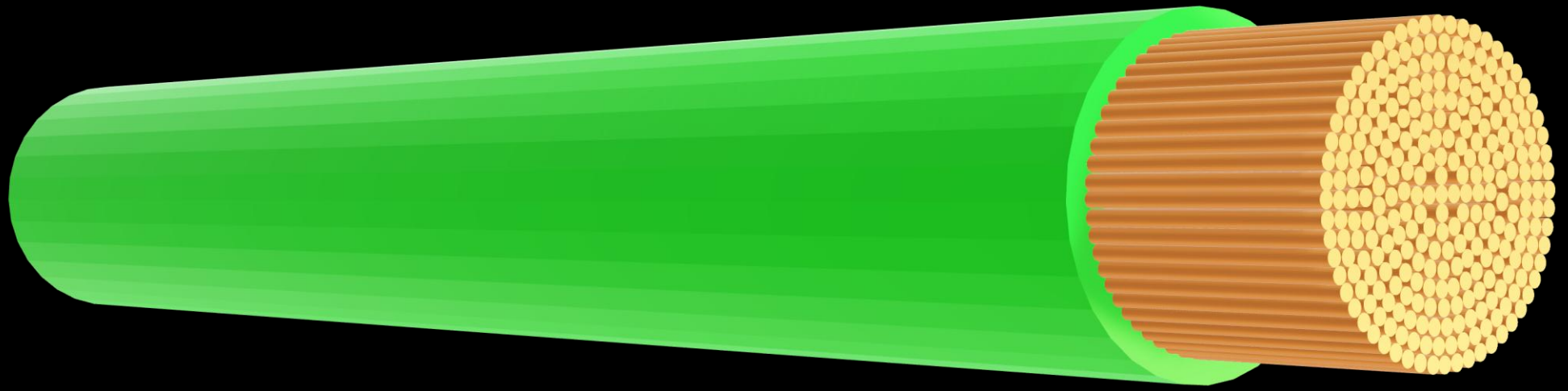
Cable Conductors



Class 5 for flexible conductors

Usage: fixed installation, flexible use for medium mechanical stress with free movement without tensile stress or forced movements.

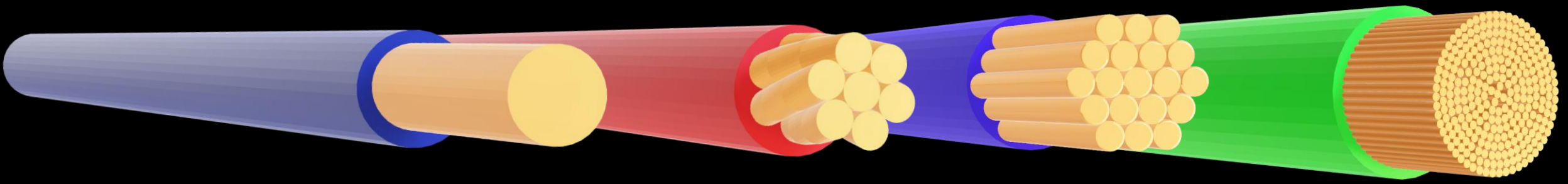
Cable Conductors



Class 6 for high flexible conductors

Usage: high flexible applications in drag chains or robots.

Cable Conductors



Selecting the appropriate cable class is crucial for ensuring

safety, efficiency, and reliability in your application.

Cable Insulation

Material Types

Operating Temp. and individual capability

PVC
(Polyvinyl Chloride)
70^{0}C — Flexible Application

PE
(Polyethylene)
75^{0}C — Weather Resistance

XLPE
(Cross-Linked Polyethylene)
90^{0}C — Current Capacity

TPE
(Thermoplastic Elastomer)
80-140^{0}C — Torsion/ Movement

PUR
(Polyurethane)
80-90^{0}C — All Physical properties, excepting immersing

PTFE
(Polytetrafluoroethylene)
100-300^{0}C — Heat Resistance/ Aerospace and Military Application

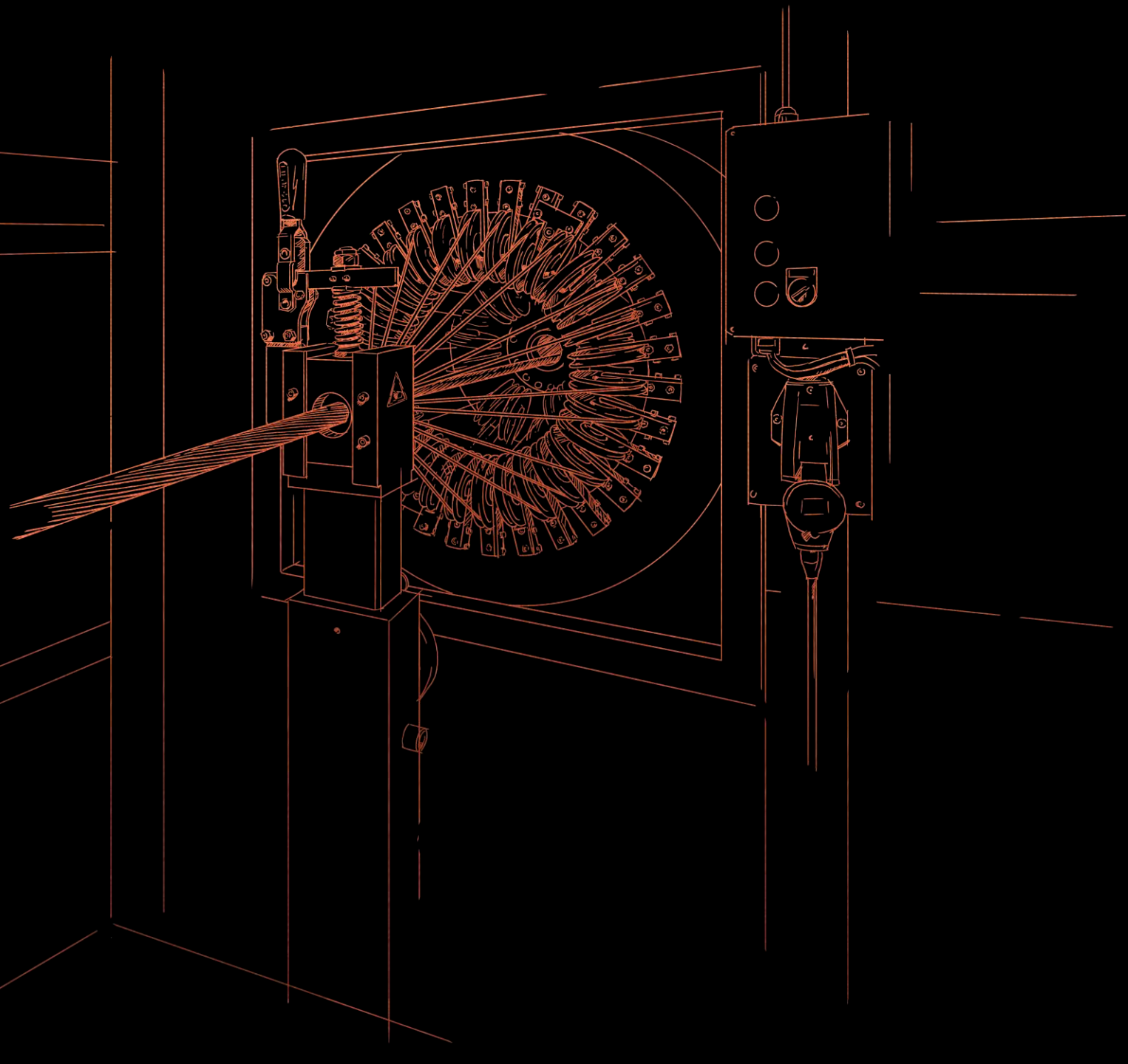
SI
(Silicon)
180-220^{0}C — Ultra Heat Resistance/ Metallurgical Application

EPR
(Ethylene Propylene Rubber)
80-90^{0}C — Immersion/ Movement/ Recycle

LSOH,LSZH
(Low Smoke Zero Halogen)
80^{0}C — Low smoke /Halogen free/ Highly flame-retardant

Part 3

Cable Selection Guide for Projects



Step 1: Cable Application

1. General
- Power
- Control
- Data

2. Special
- Heat
- Moving
- Servo Motor

Step 2: Cable Structure

1. Sheath material
- PVC
- PUR
- TPE

2. Screening
- TCB
- AL-PET
- AL-PET+TCB

3. Armoured
- SWA
- GSWA

Step 3: Additional information

1. Environment
- Indoor/Outdoor
- Oil-Chemical/ UV/ Anti-rodent
- Flame retardant
- Flexible, direct burial.
- Abrasion resistant, robust.

2. Operation
- Temperature range
- Voltage class
- Cross section mm2
- No. of core.

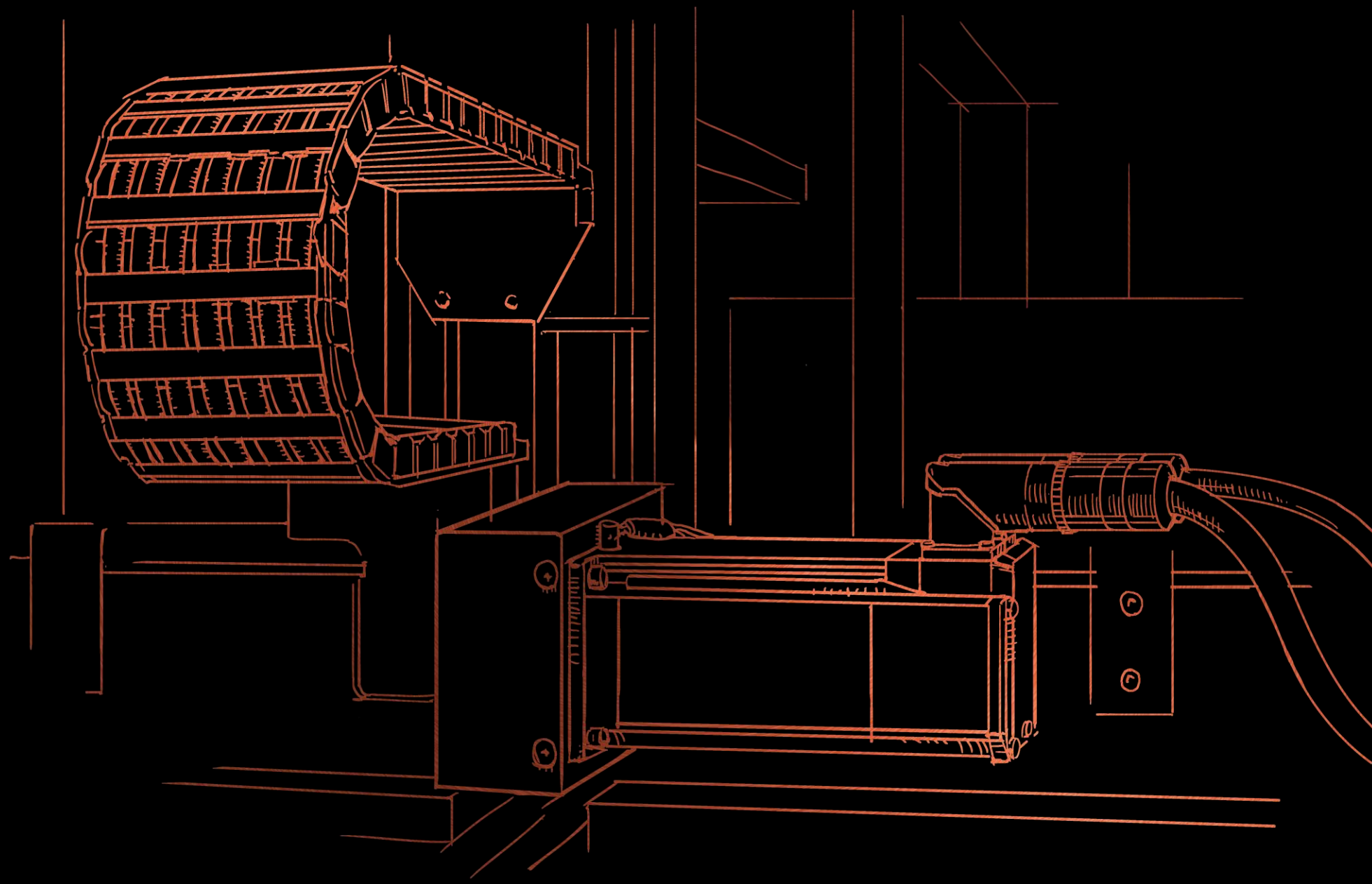
Applications

Quality Standards

Environment, usage characteristics

Part 4

Drag Chains

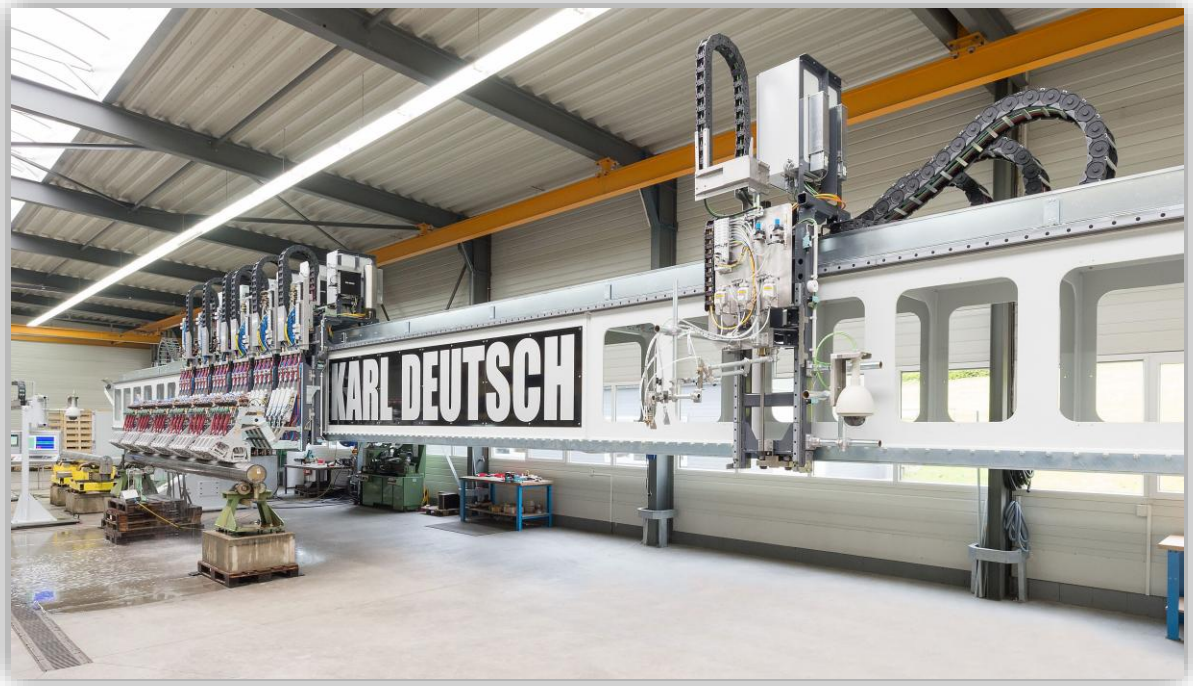


What is a drag chain?

Moving application.

Drag and drop with different distance, speed, acceleration, bending radius.

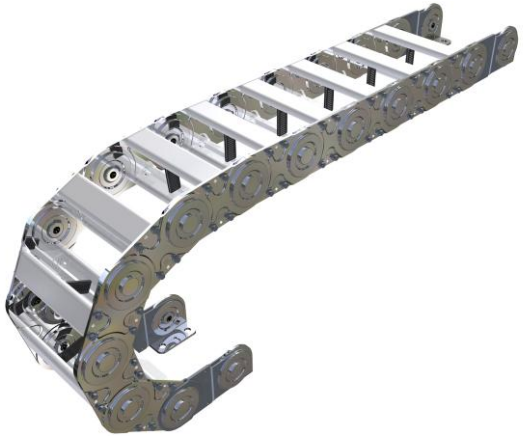
High abrasion.



Drag Chain Types

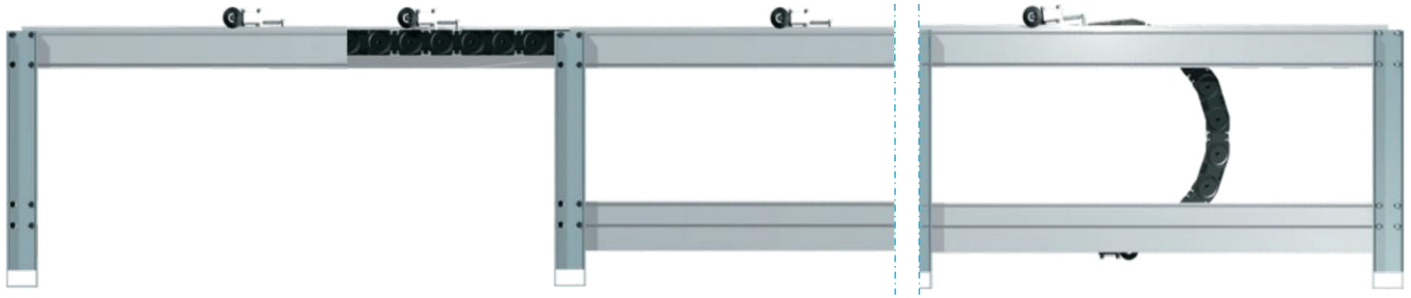
Plastic Drag Chains

Steel Drag Chains



Hybrid Drag Chains

Marathon System



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