

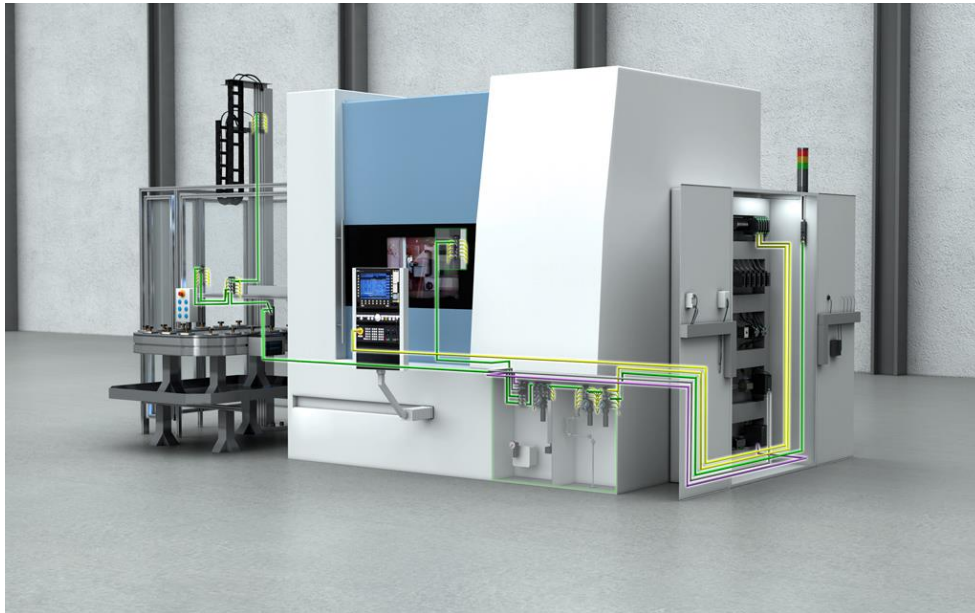


*stay connected*

# Murrelektronik

## Machine Wiring Concepts

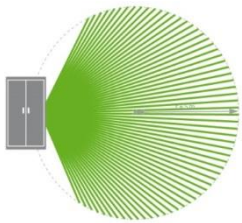
# MACHINE WIRING CONCEPTS



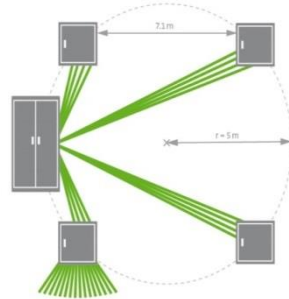


# MACHINE WIRING CONCEPTS

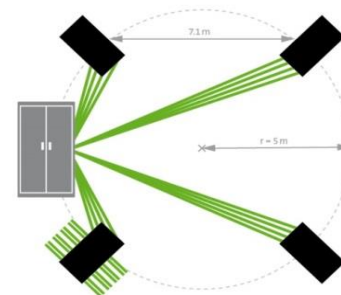
## POINT-TO-POINT



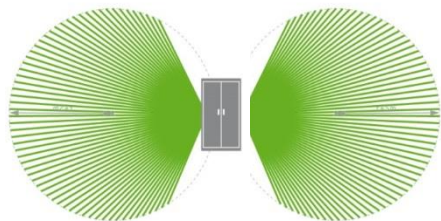
## TERMINAL BOX



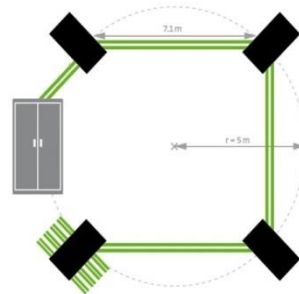
## PASSIVE



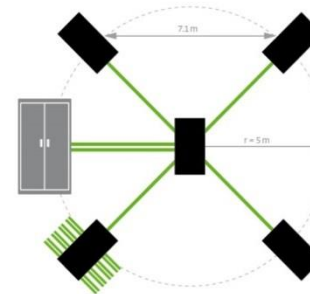
## CENTRALIZED

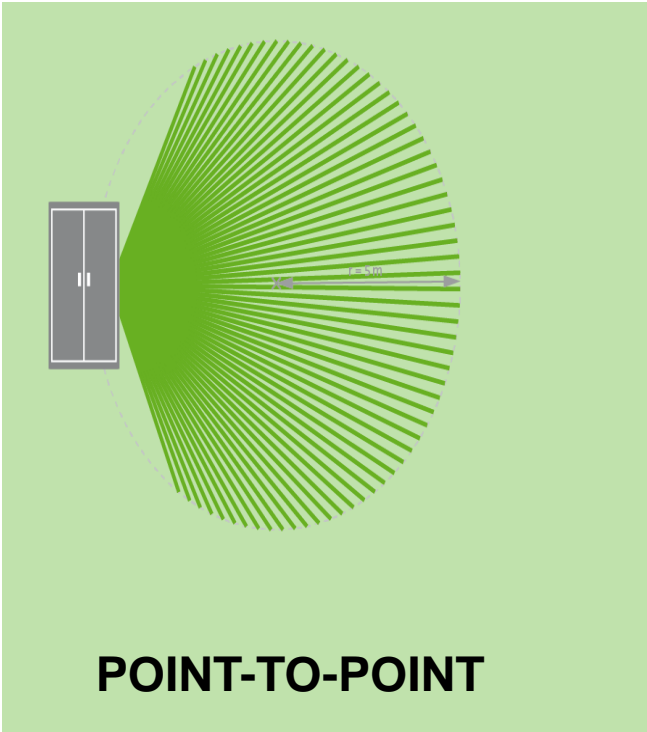
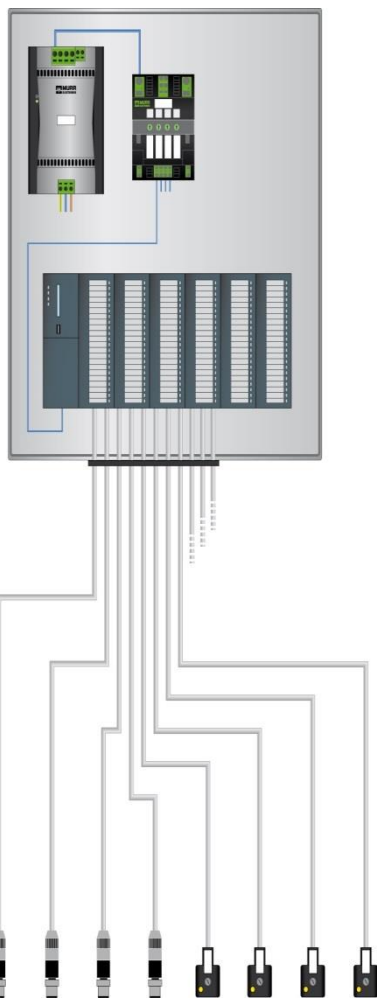


## COMPACT



## MODULAR



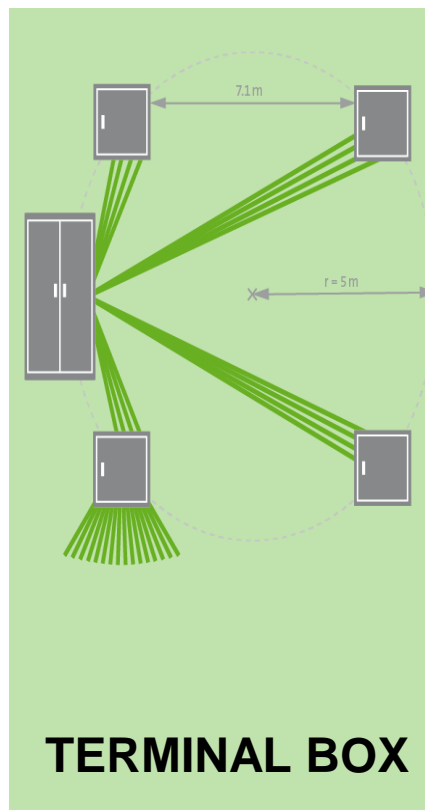
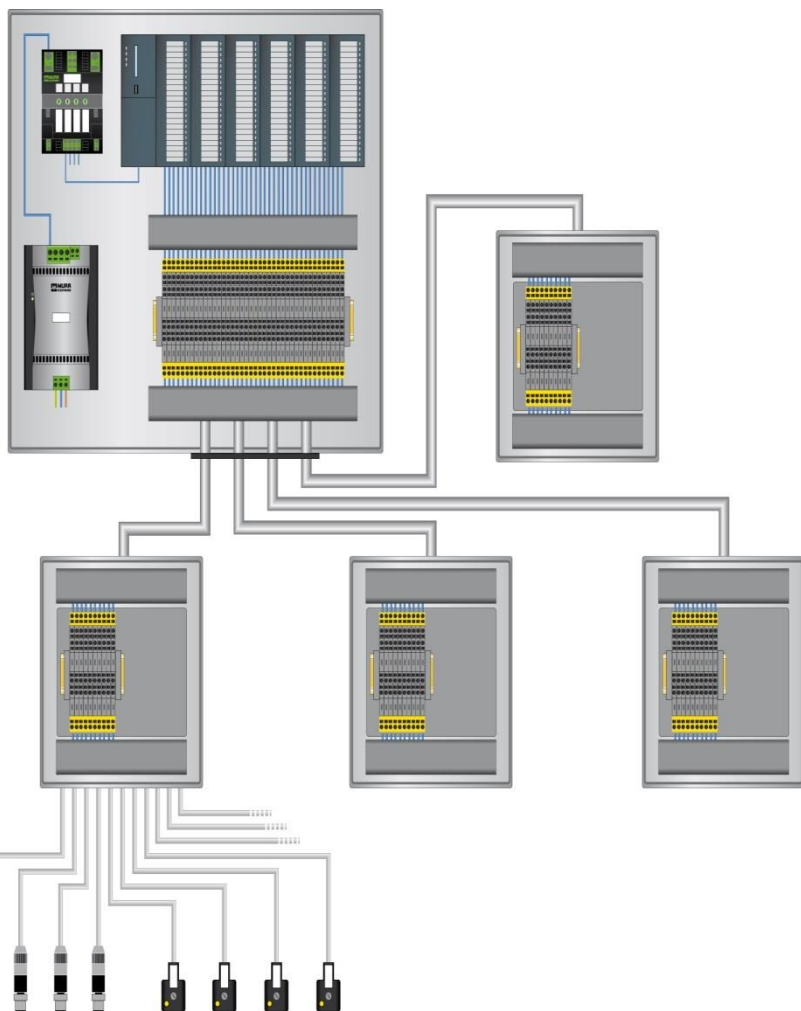


### PROS

- Very flexible
- Market Acceptance

### CONS

- High installation costs
- High risk of wiring errors
- Large space required
- Difficult transport separation
- Maintenance Costs

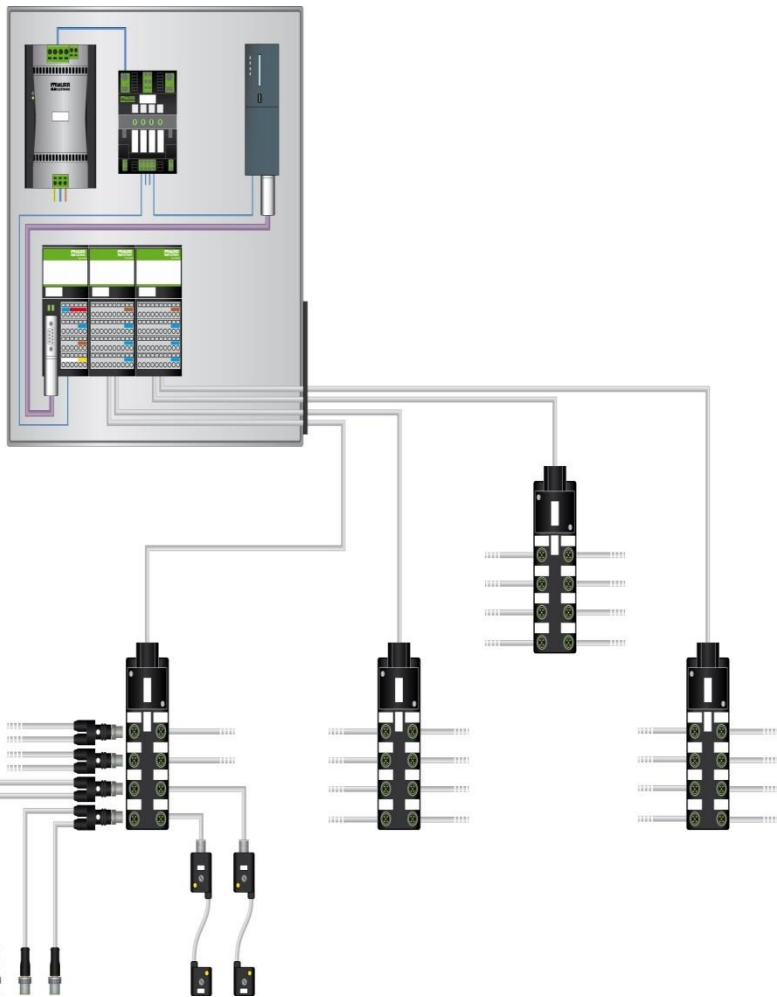


## PROS

- Very flexible
- Market Acceptance

## CONS

- High installation costs
- High risk of wiring errors
- Large space required
- Difficult transport separation
- Limited visible diagnostics



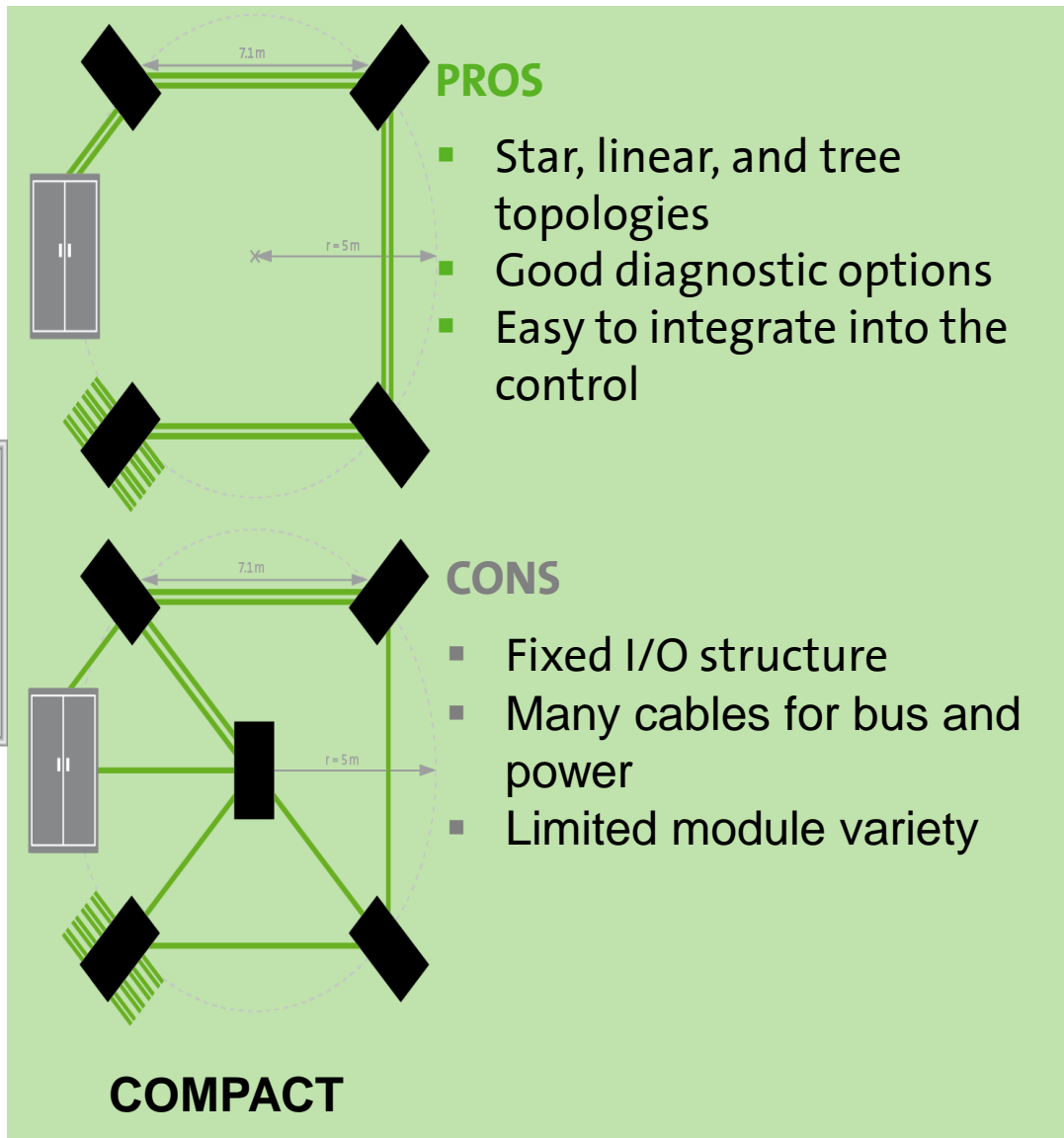
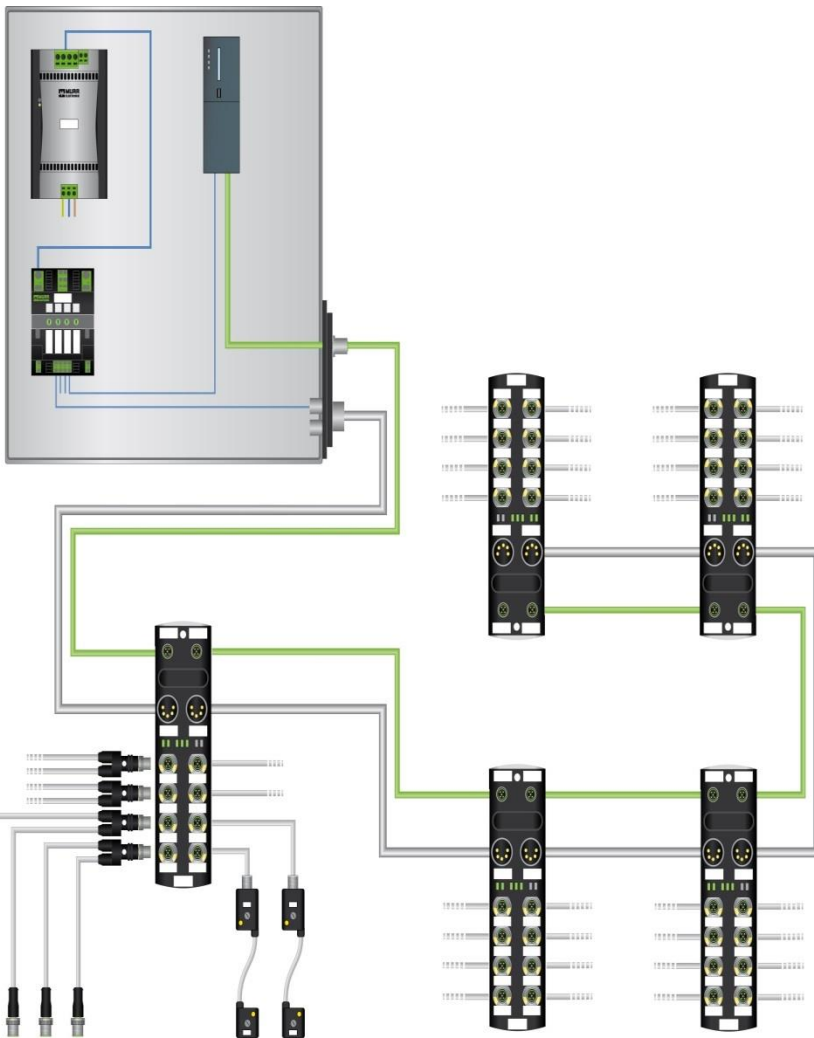
**PROS**

- Low material costs
- Using homerun cables makes laying cables easy
- Wide range of products
- Basic diagnostics
- Pre-Engineered Solutions

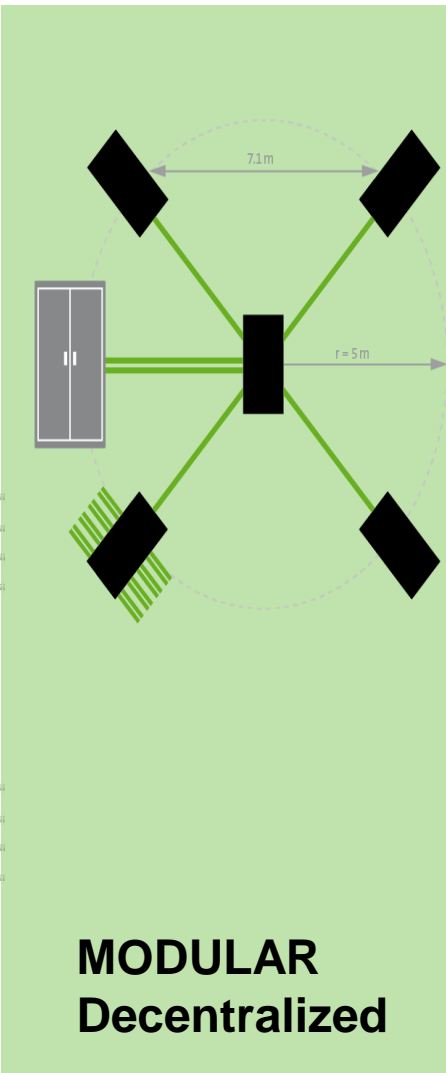
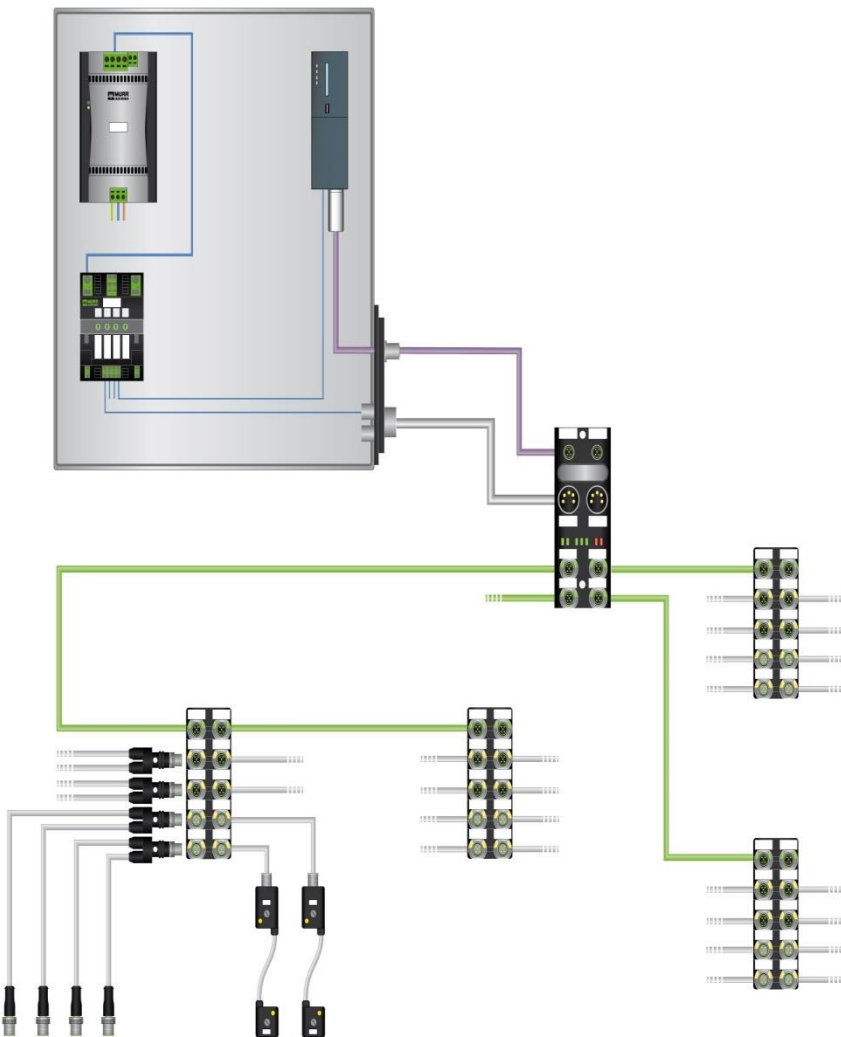
**CONS**

- Cabinet Wiring remains
- Still prone to errors

**PASSIVE**







**PROS**

- Reduced installation costs
- OCT - One cable technology
- Change the bus without having to change the system
- Low inventory costs
- Multifunctional I/Os
- Module variety
- Diagnostics


**CONS**

- High material costs for small systems
- Higher integration level

**MODULAR  
Decentralized**



## 64 I/Os for optimum comparability

 **WP: Wiring Point**  
Number of single wires to be connected by hand.



1 WP  $\triangleq$  120 seconds

 **CP: Connection Point**

Number of connections with connectors: screwed in or plugged in.



1 CP  $\triangleq$  10 seconds

## Example

**I/O**            **110 DI / 45 DO**

**Time**        WP380 / CP90

(2 min each point)

**Material**    \$3500

**Difficulty Level**    

## Service Level

The service level describes the level of functionality and technology of an installation concept.

High level = easier planning, quicker setup, more detailed diagnostics, easier maintenance

# DETERMINE THE RIGHT SOLUTION



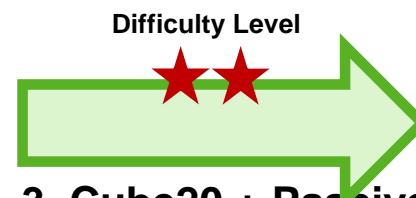
## 1. Discrete wiring

- ➔ many individual parts
- ➔ time extensive
- ➔ expensive in installation and maintenance



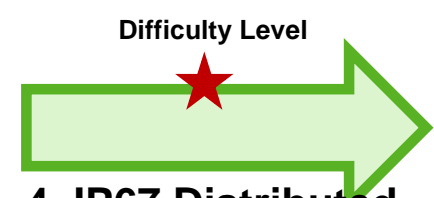
## 2. Passive distribution boxes

- ➔ introduction in M12 / M8 technology
- ➔ fast assembly
- ➔ overall costs reduced
- ➔ diagnostics



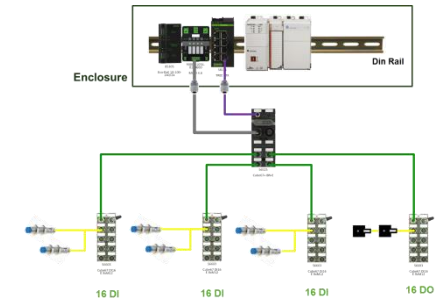
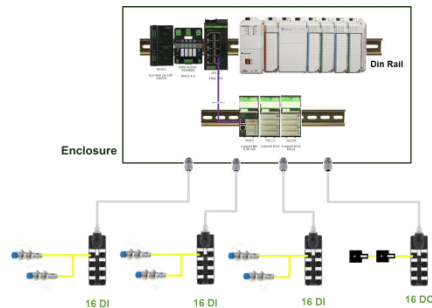
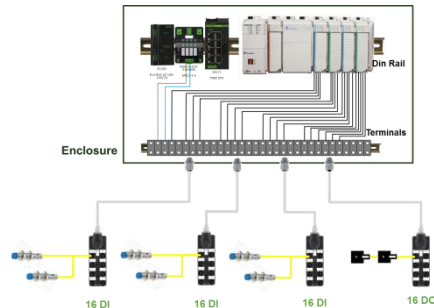
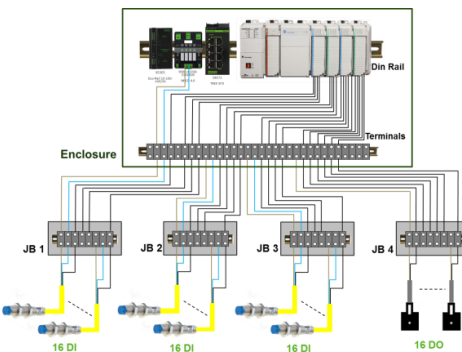
## 3. Cube20 + Passive distribution

- ➔ assembly friendly
- ➔ simplify the system
- ➔ overall costs dramatically reduced
- ➔ diagnostics



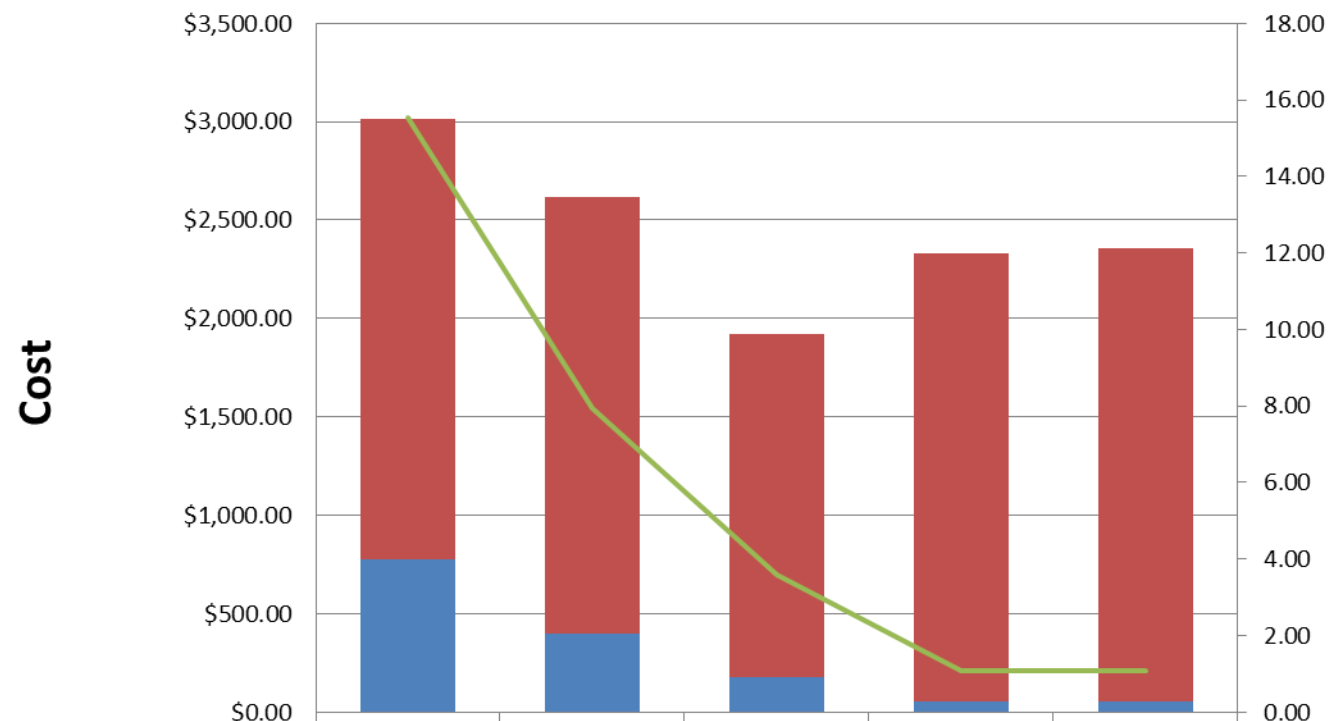
## 4. IP67 Distributed I/O

- ➔ assembly friendly
- ➔ most productive solution
- ➔ Minimize labor cost
- ➔ diagnostics



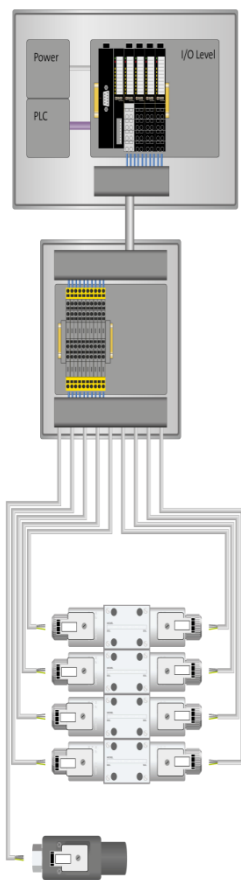
# COMPARE THE MACHINE WIRING METHODS

## Wiring Concept Cost Comparison - Hardwiring to Fieldbus

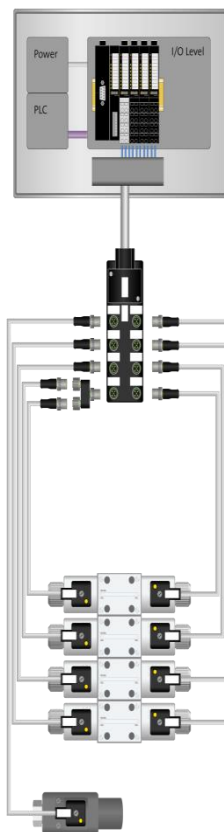


Hardware Cost	\$2,236.00	\$2,217.17	\$1,743.67	\$2,279.65	\$2,306.27
Total Labor Cost / Machine	\$776.67	\$396.67	\$180.00	\$53.33	\$53.33
Electrical Wiring Time / Machine (hour)	15.53	7.93	3.60	1.07	1.07

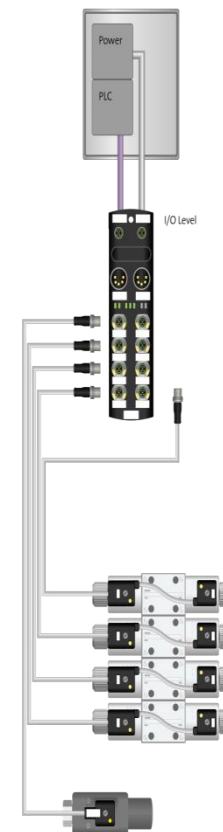
# Observe the Machine Wiring Concept Changes



Single Wire Connection



Passive distribution box



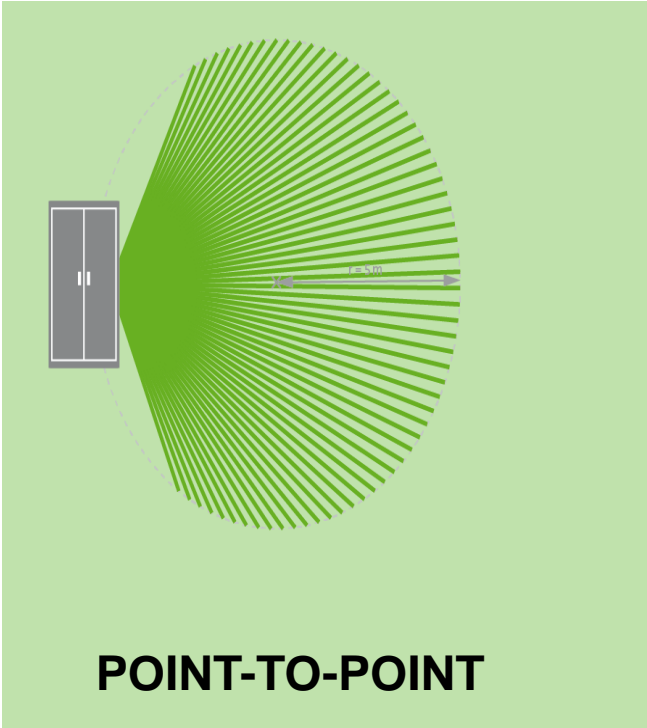
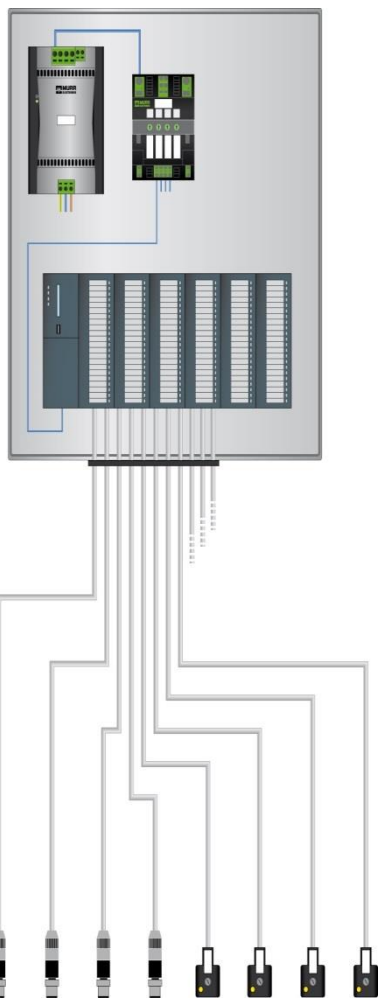
Fieldbus module



*stay connected*

# Murrelektronik

Machine Wiring Concepts

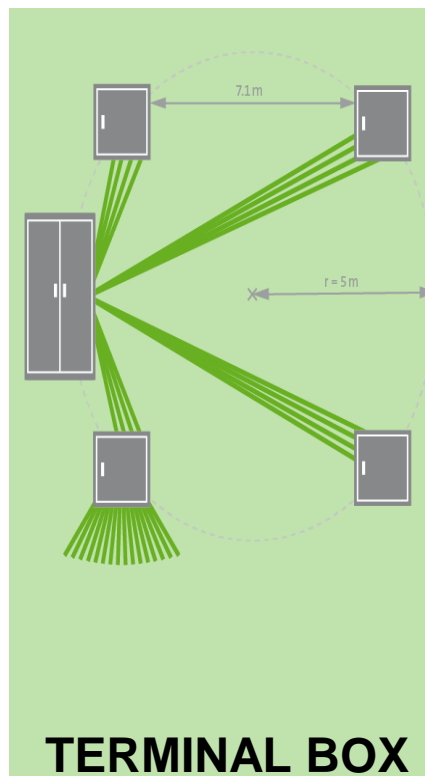
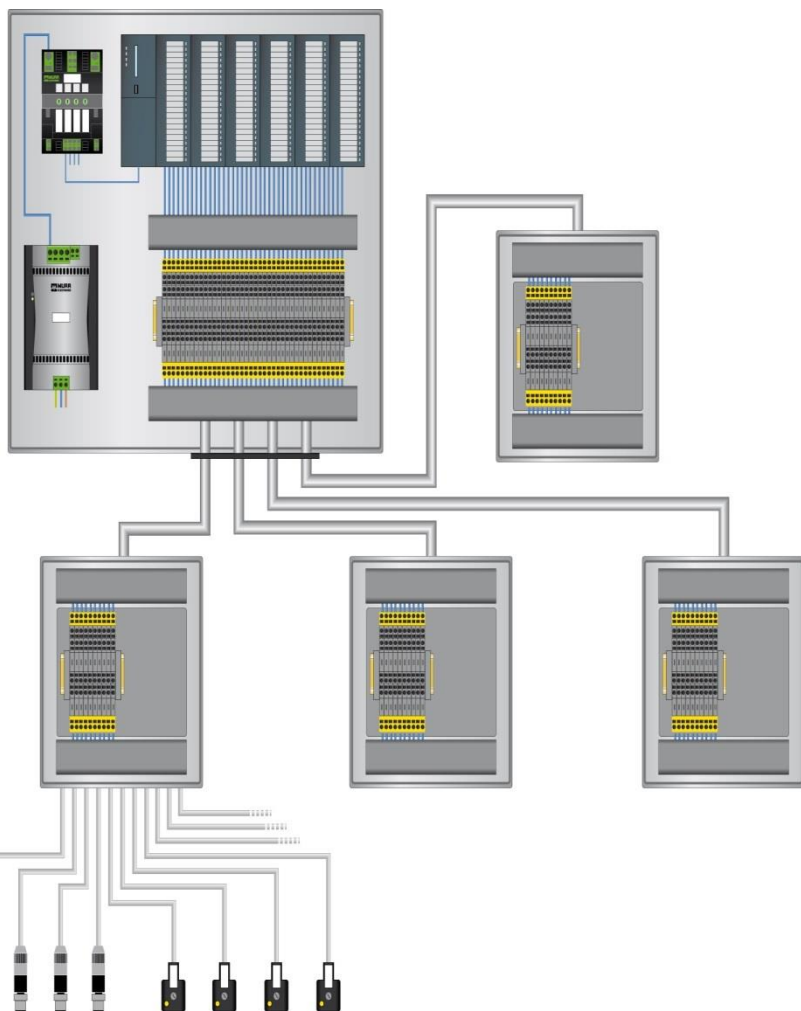


## PROS

- Very flexible
- High added value

## CONS

- High installation costs
- High risk of wiring errors
- Large space required
- Difficult transport separation



## PROS

- Very flexible
- High added value

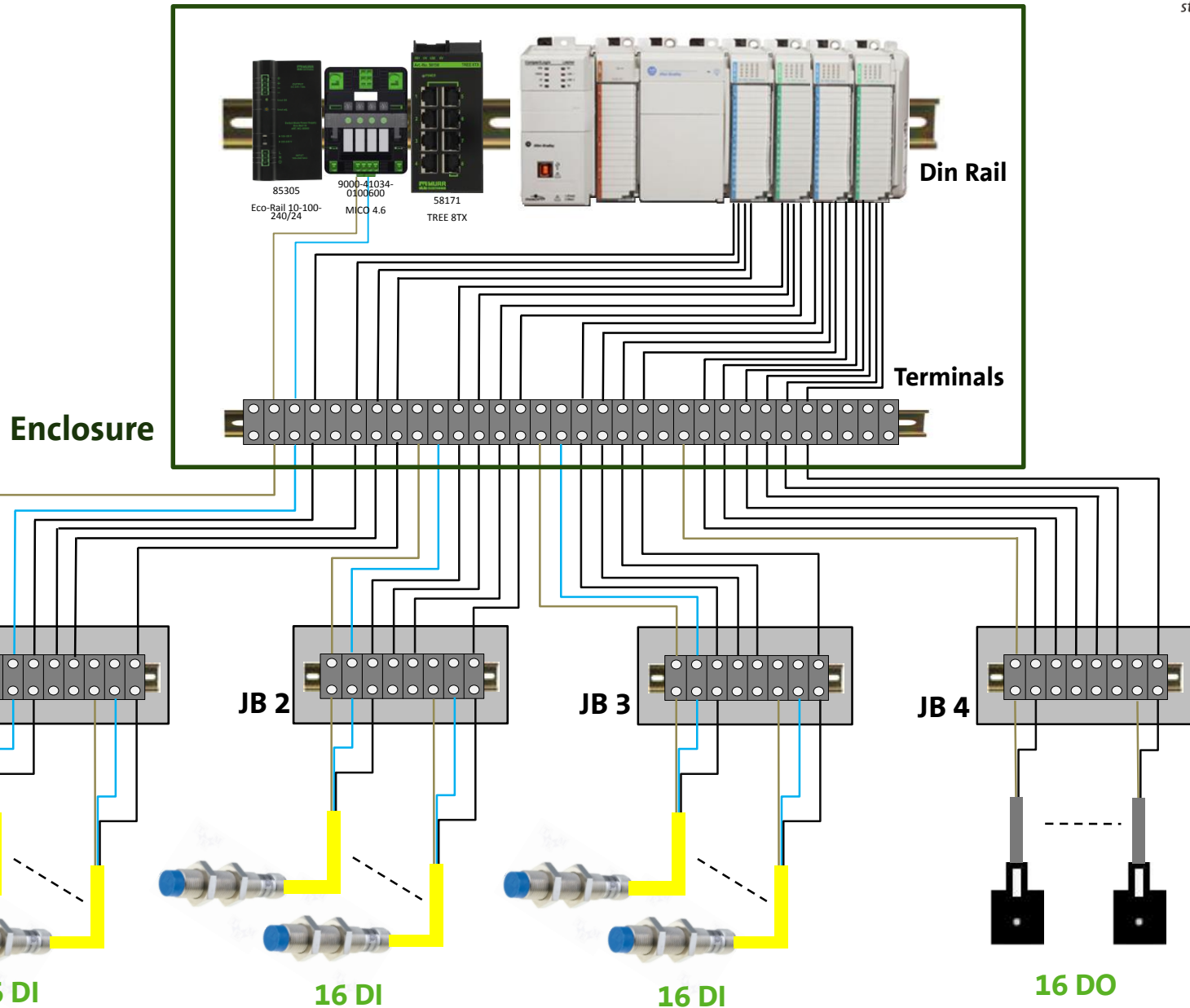
## CONS

- High installation costs
- High risk of wiring errors
- Large space required
- Difficult transport separation

## TERMINAL BOX



# DISCRETE WIRING



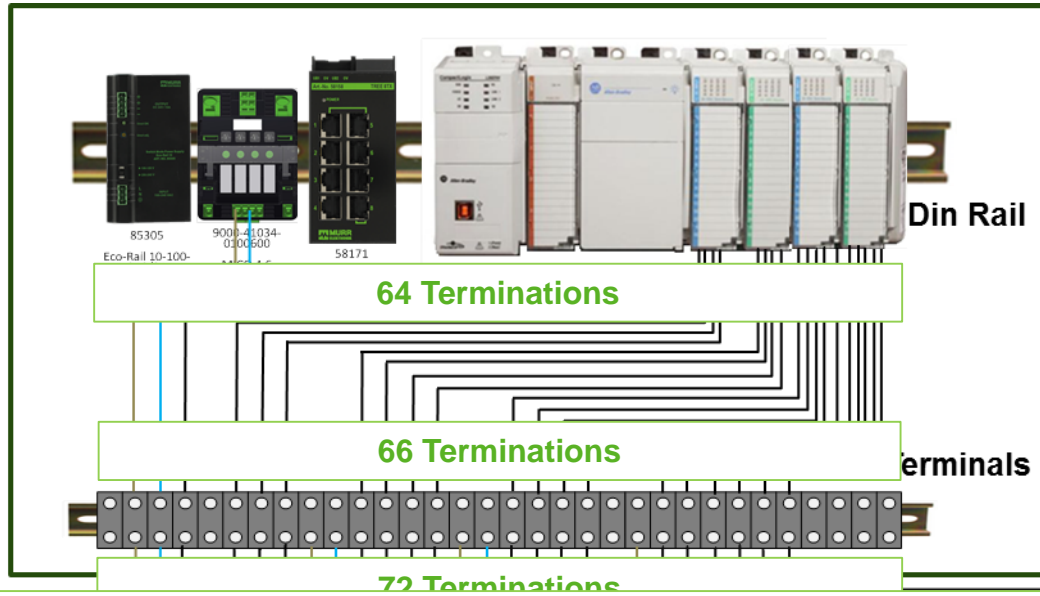
# DISCRETE WIRING – TERMINATIONS

Difficulty Level

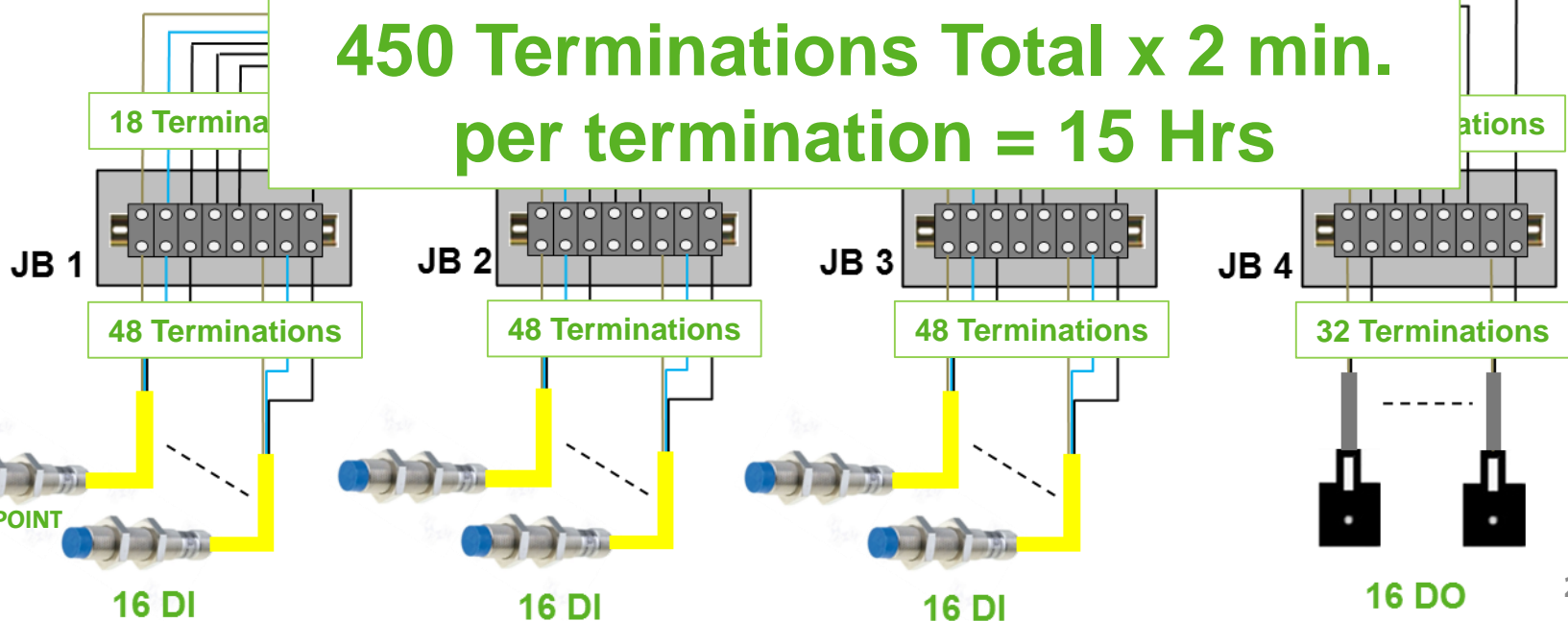


48 DI/16 DO  
450 Terminations  
64 M12 Connections  
15.53 hours

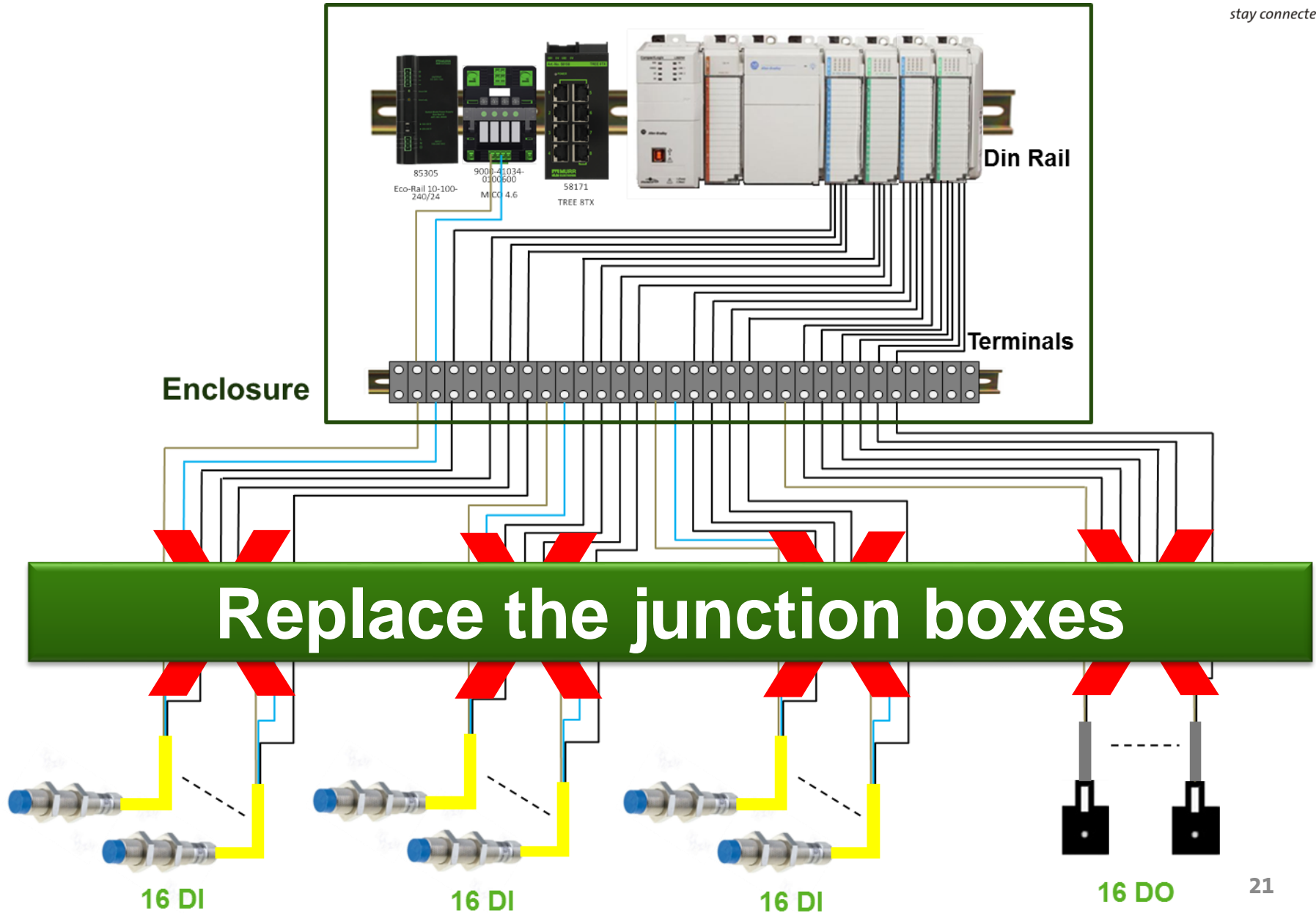
\$3012.67



**450 Terminations Total x 2 min.  
per termination = 15 Hrs**



# PASSIVE DISTRIBUTION – PURPOSE



16 DI

16 DI

16 DI

16 DO

# PASSIVE DISTRIBUTION

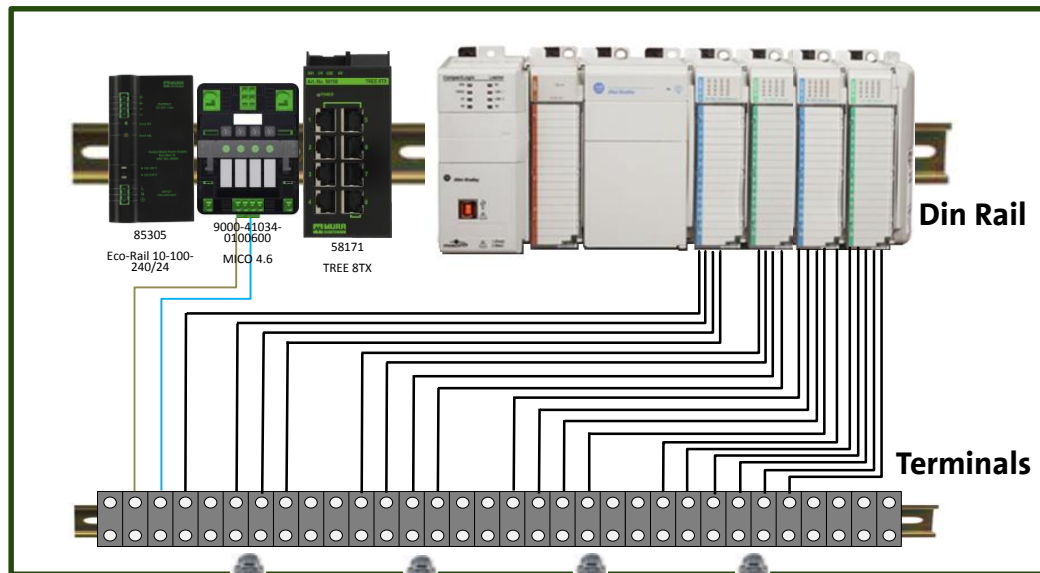
Difficulty Level



48 DI/16 DO  
206 Terminations  
128 M12 Connections  
7.93 hours

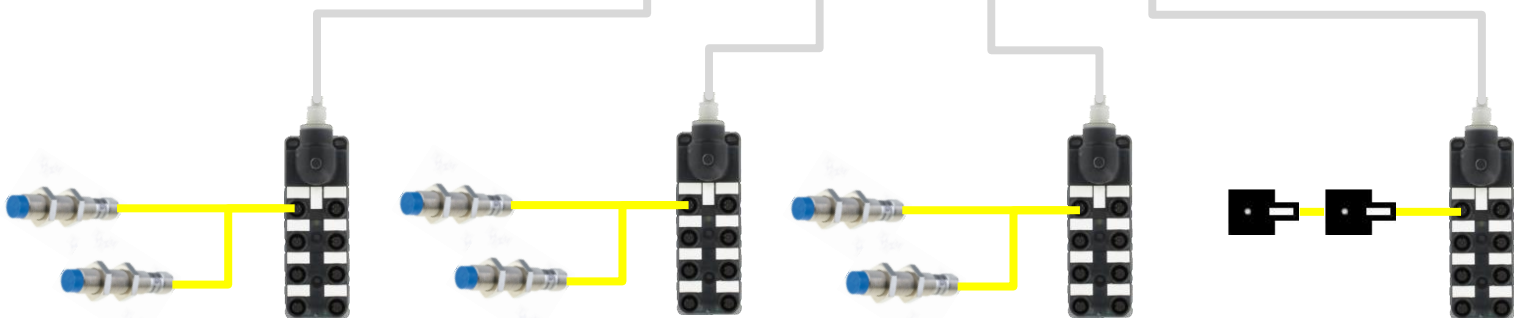
\$2613.66

Enclosure



Din Rail

Terminals

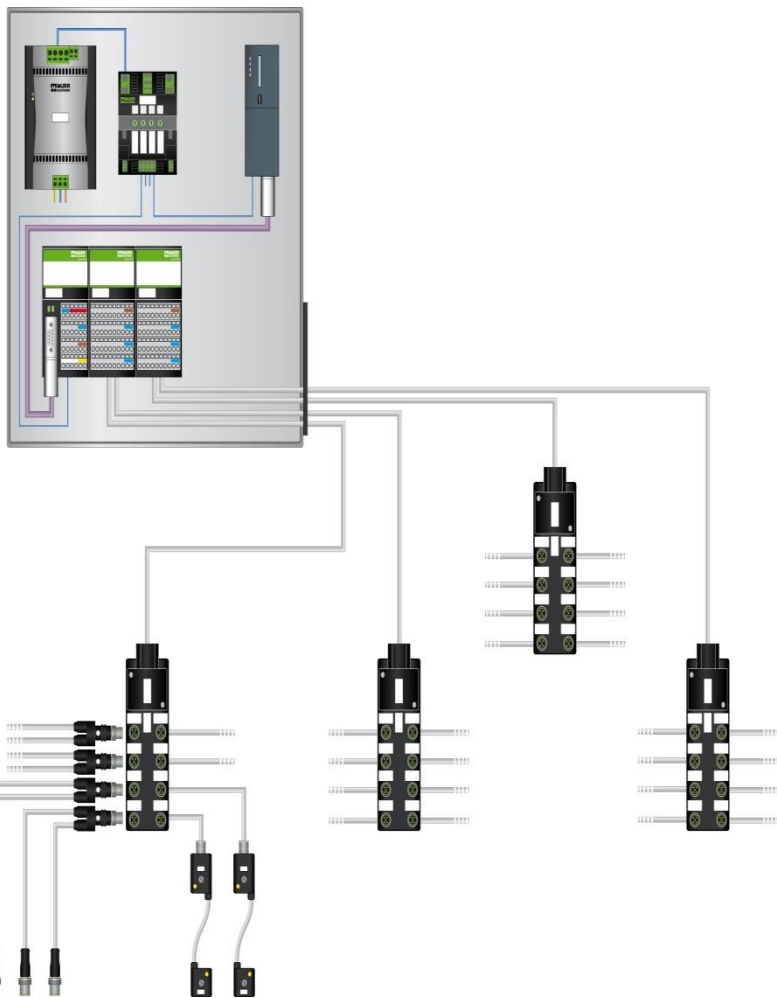


16 DI

16 DI

16 DI

16 DO



**PROS**

- Low material costs
- Using homerun cables makes laying cables easy
- Wide range of products
- Basic diagnostics
- Compatibility

**CONS**

- Medium amount of wiring
- Still prone to cabinet errors

**PASSIVE**

# CENTRALIZED IP20 FIELD BUS + PASSIVE DISTRIBUTION

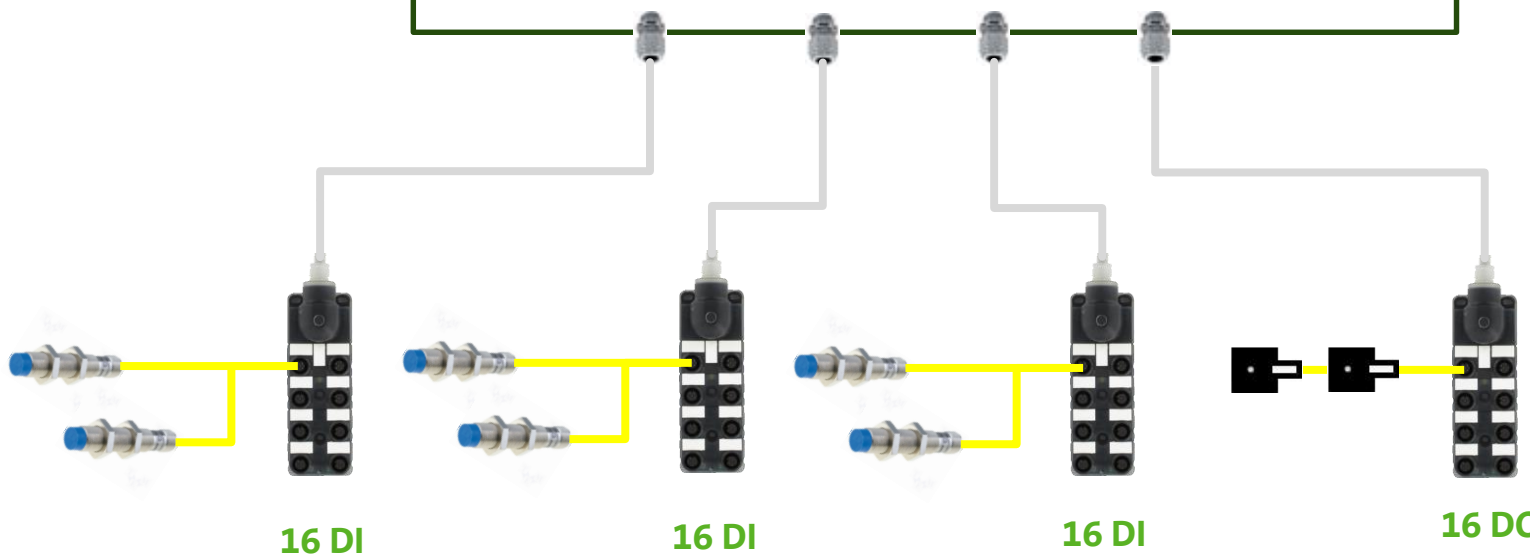
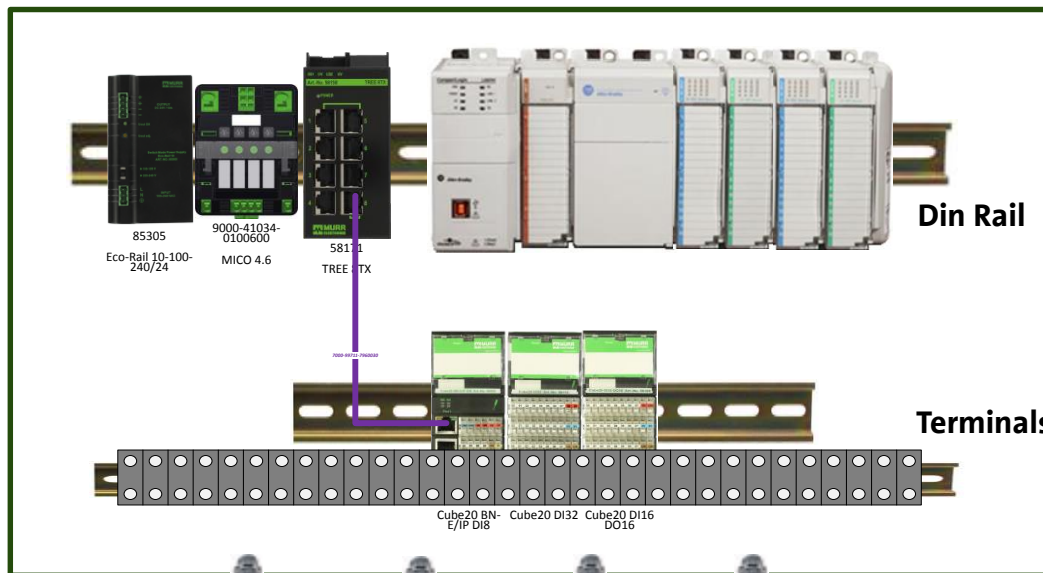
Difficulty Level

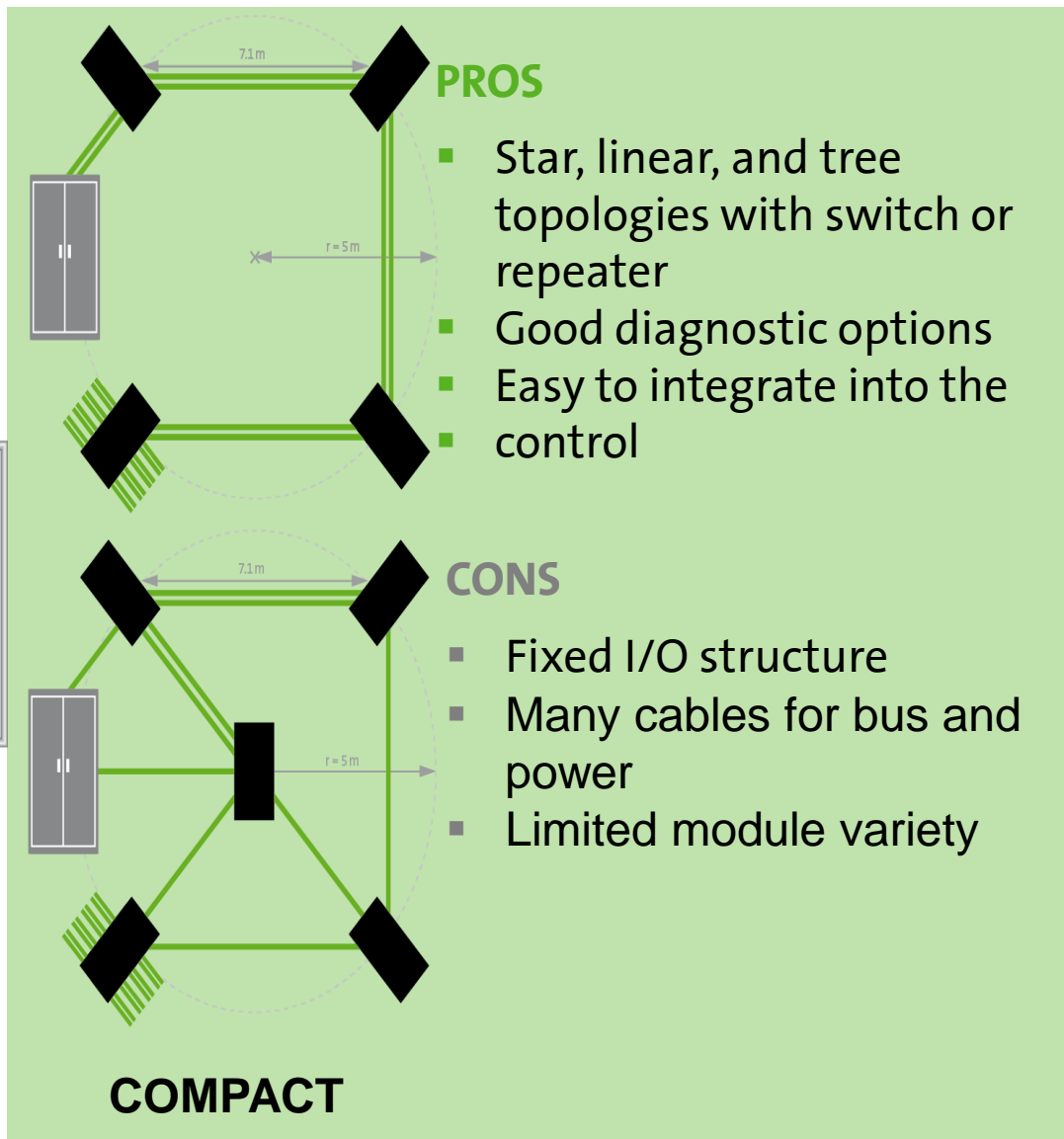
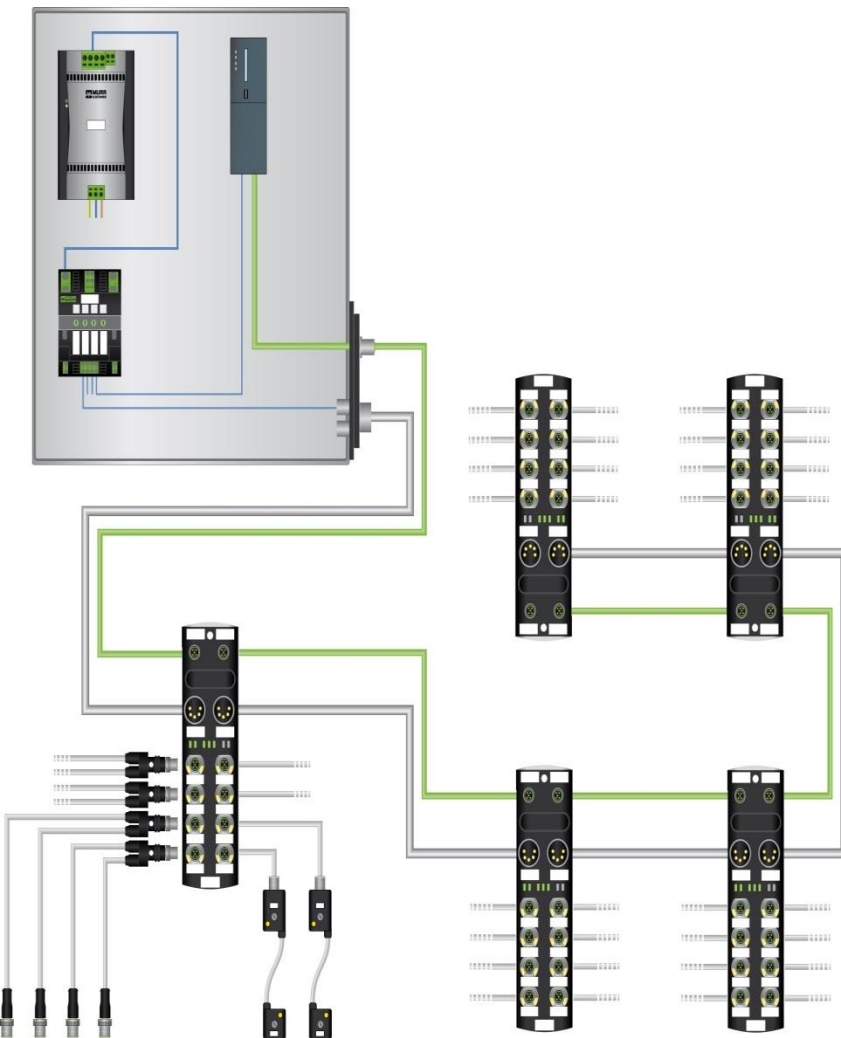


48 DI/16 DO  
76 Terminations  
128 M12 Connections  
3.6 hours

\$1923.66

Enclosure





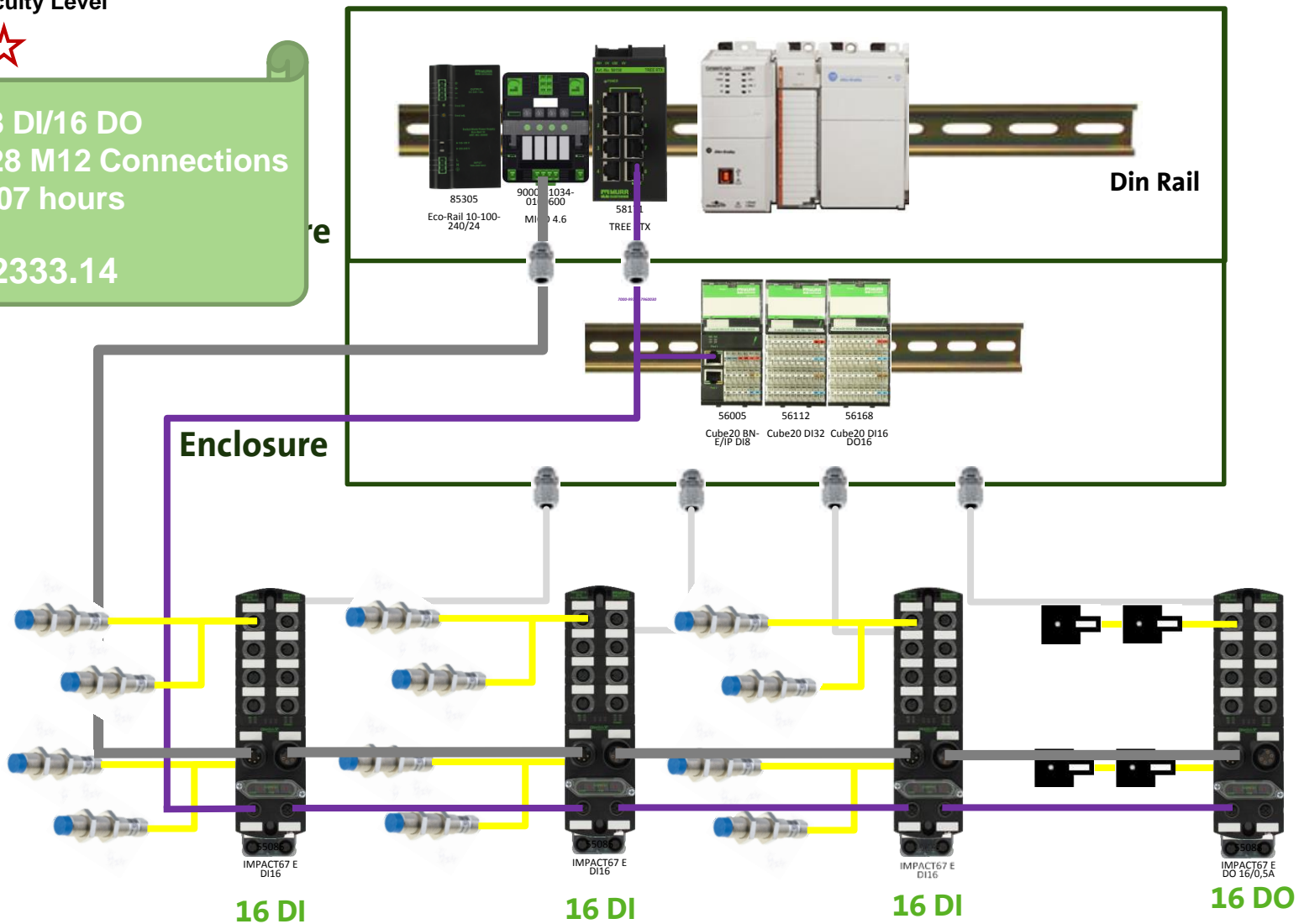
# IP67 DISTRIBUTED FIELD BUS – COMPACT I/O

Difficulty Level

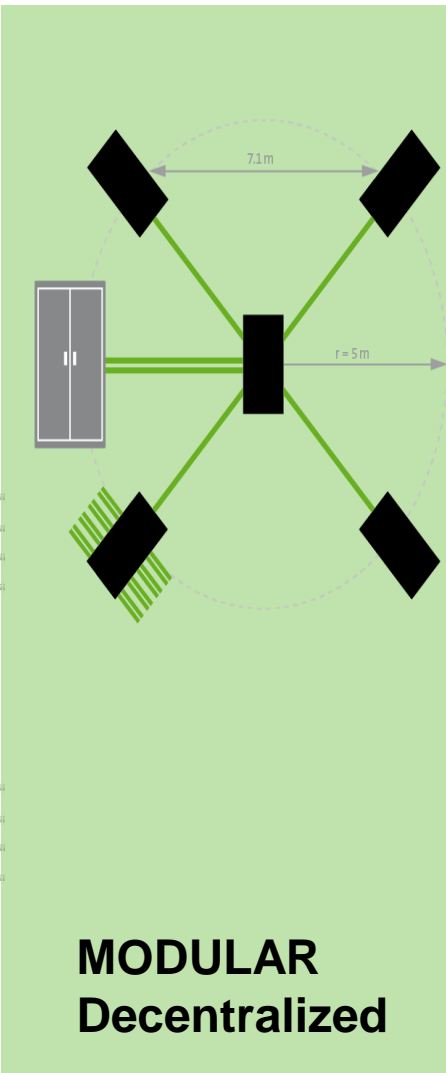
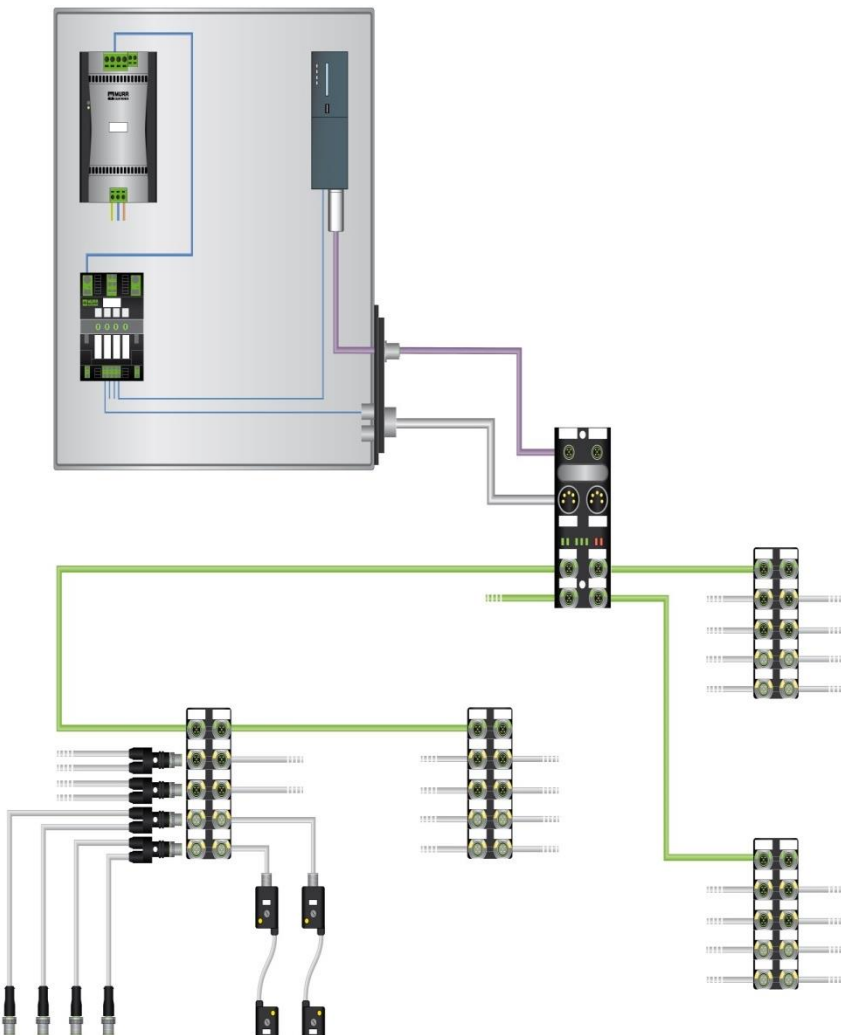


48 DI/16 DO  
128 M12 Connections  
1.07 hours

\$2333.14







**PROS**

- Reduced installation costs
- OCT - One Cable Technology
- Change the bus without having to change the system
- Low inventory costs
- Multifunctional I/Os
- Module variety
- Diagnostics

**CONS**

- High material costs for small systems
- Topology
- Distances

**MODULAR  
Decentralized**



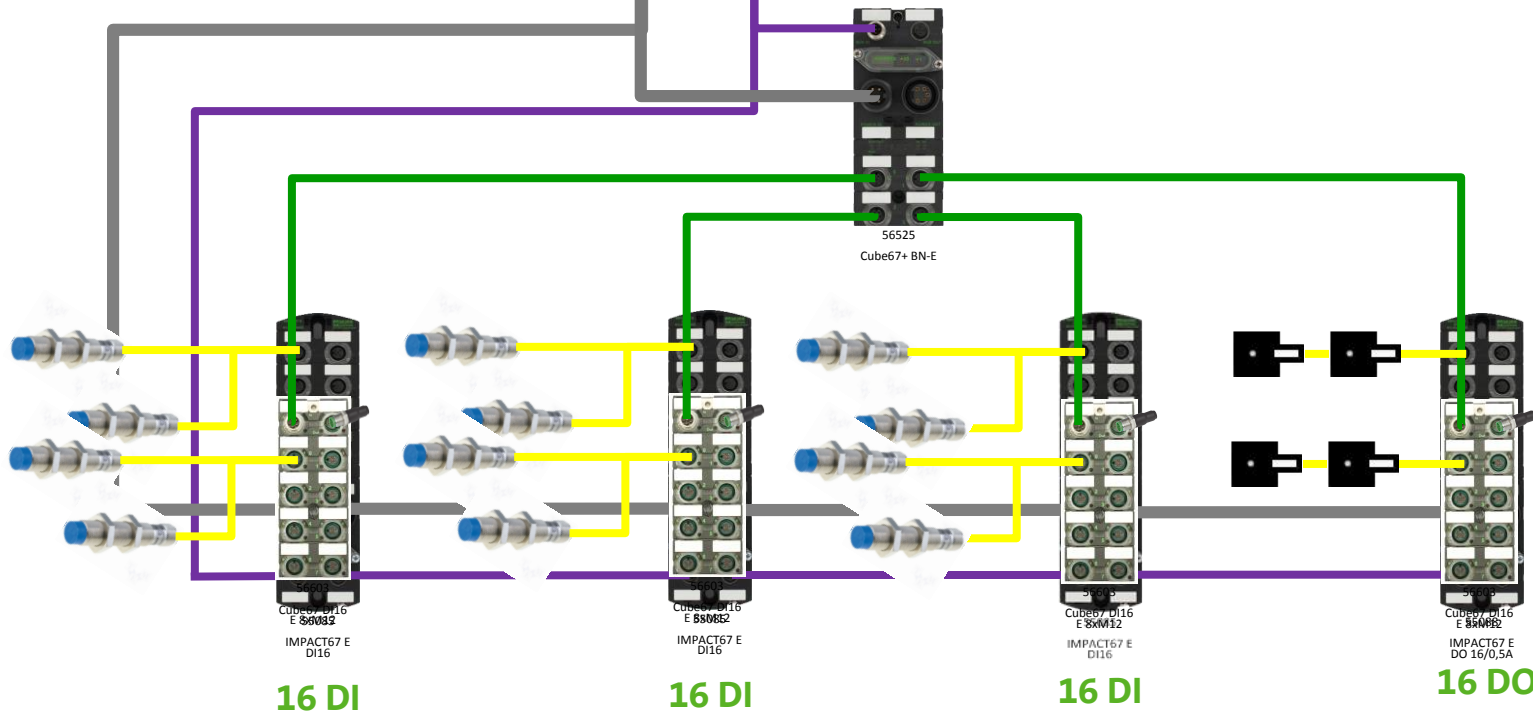
# IP67 DISTRIBUTED FIELD BUS – CUBE67+

Difficulty Level

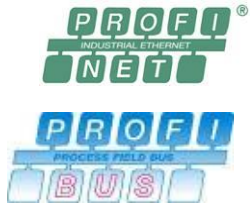


48 DI/16 DO  
128 M12 Connections  
1.07 hours

\$2359.76



# CUBE67+ I/O SYSTEM



**EtherNet/IP™**  
*conformance tested*

**EtherCAT®**

**Cube67+  
Busnode**

*Daisy chain  
communication*

*Daisy chain  
power*

**Cube20 I/O  
modules for  
analog and  
digital signals**

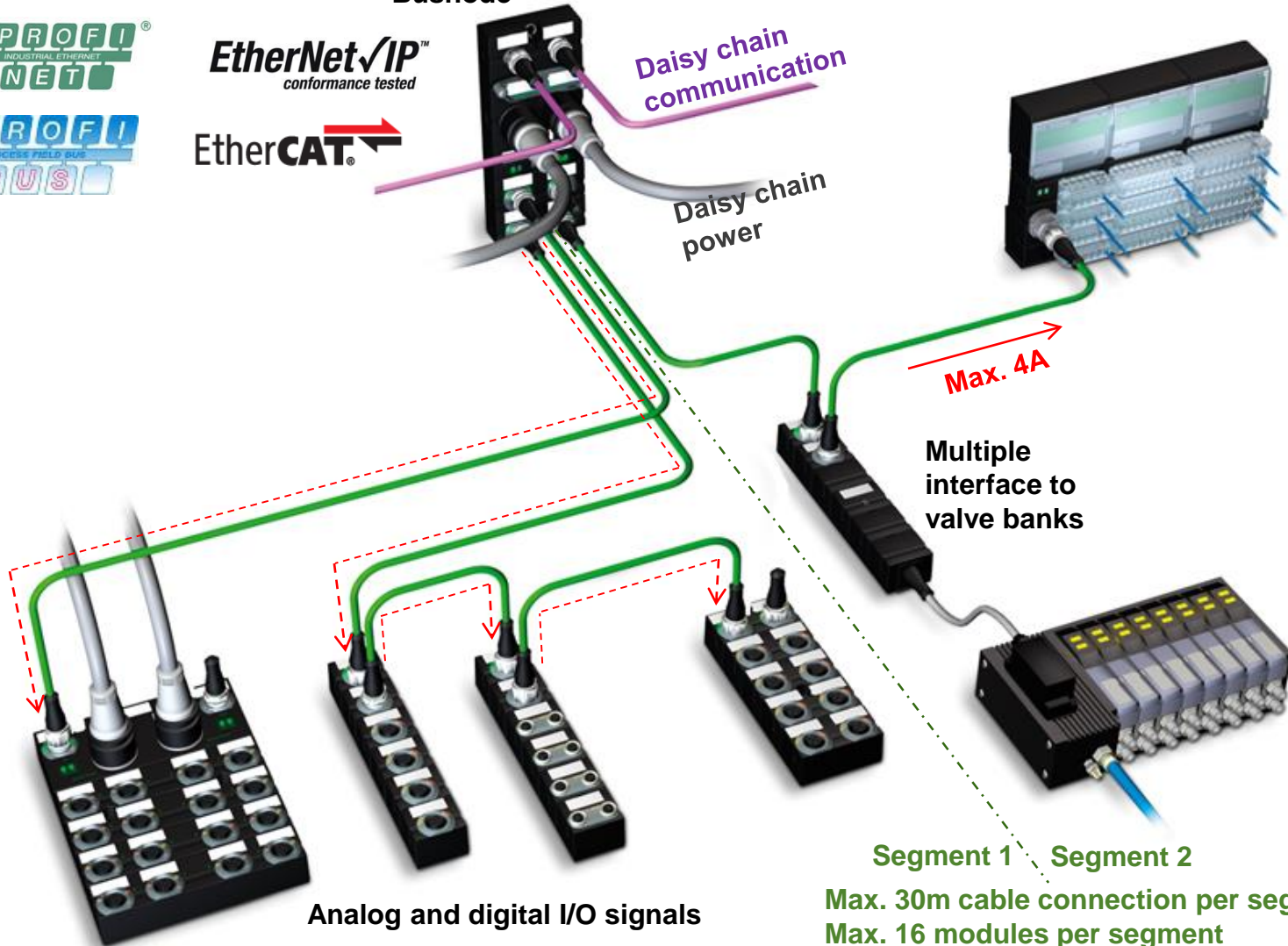
**Max. 4A**

**Multiple  
interface to  
valve banks**

**Analog and digital I/O signals**

**Segment 1   Segment 2**

**Max. 30m cable connection per segment  
Max. 16 modules per segment**



# DETERMINE THE RIGHT SOLUTION



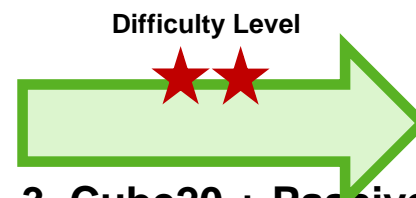
## 1. Discrete wiring

- ➔ many individual parts
- ➔ time extensive
- ➔ expensive in installation and maintenance



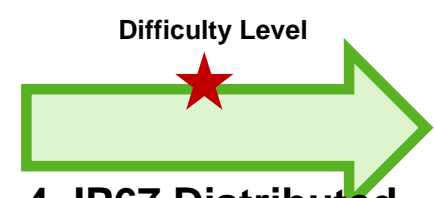
## 2. Passive distribution boxes

- ➔ introduction in M12 / M8 technology
- ➔ fast assembly
- ➔ overall costs reduced
- ➔ diagnostics



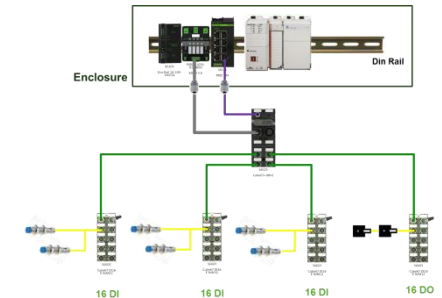
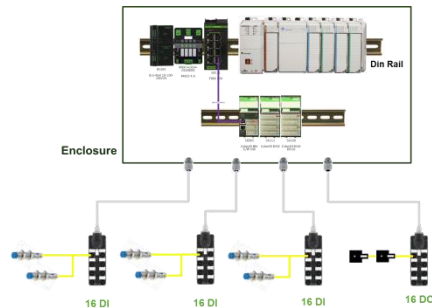
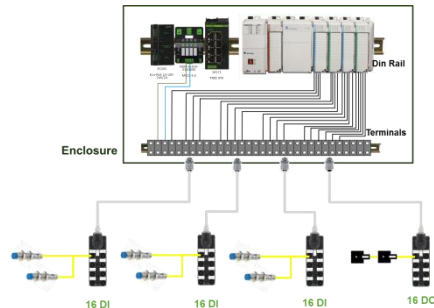
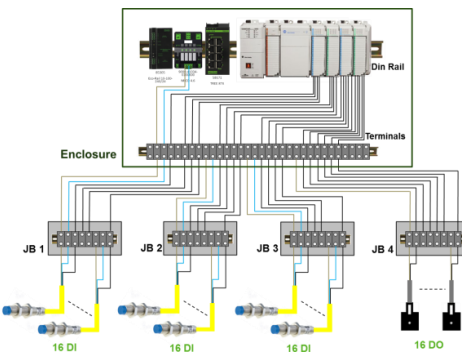
## 3. Cube20 + Passive distribution

- ➔ assembly friendly
- ➔ simplify the system
- ➔ overall costs dramatically reduced
- ➔ diagnostics



## 4. IP67 Distributed I/O

- ➔ assembly friendly
- ➔ most productive solution
- ➔ Minimize labor cost
- ➔ diagnostics

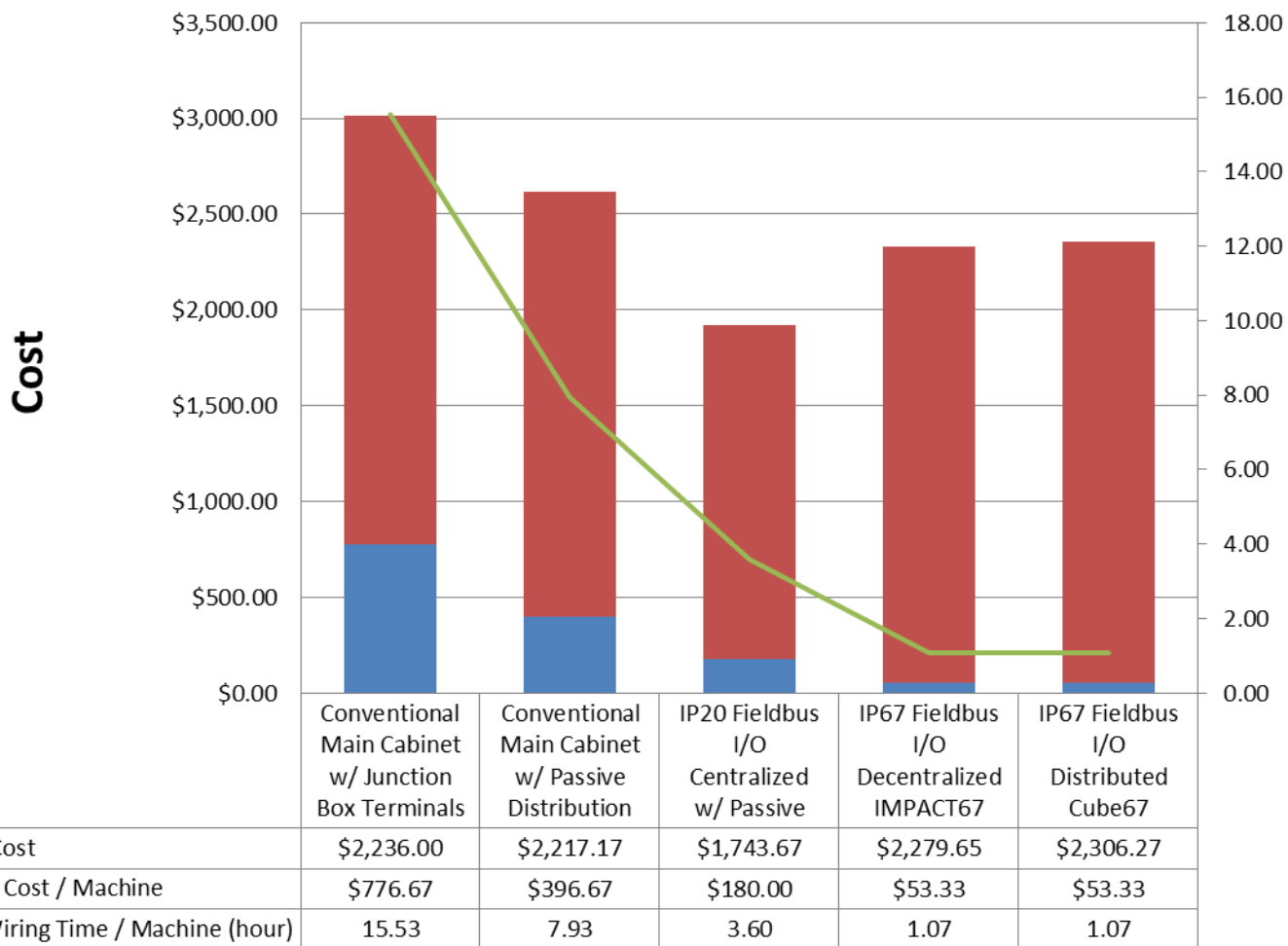


# DETERMINE THE RIGHT SOLUTION



# COST COMPARISON CHART

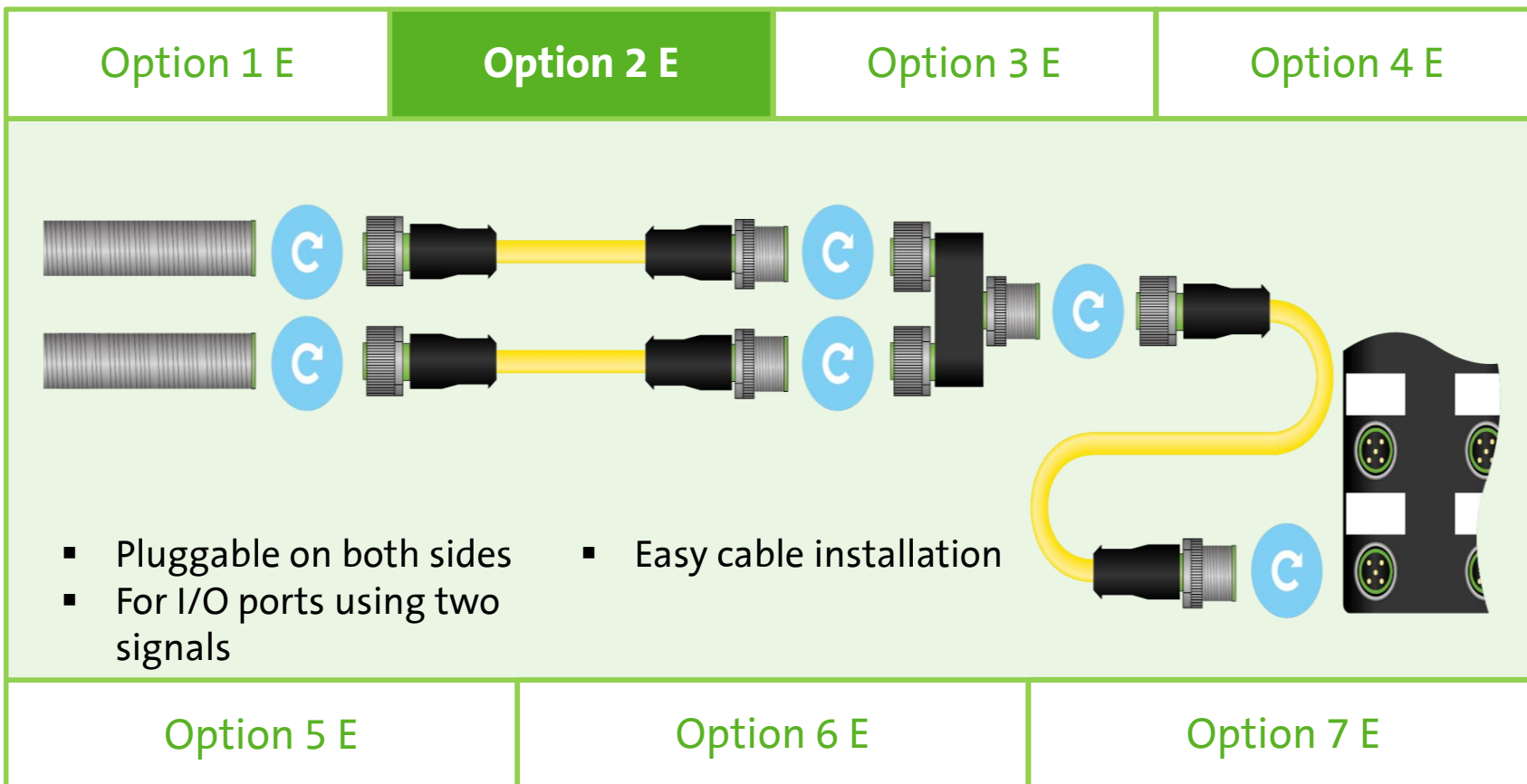
## Wiring Concept Cost Comparison - Hardwiring to Fieldbus

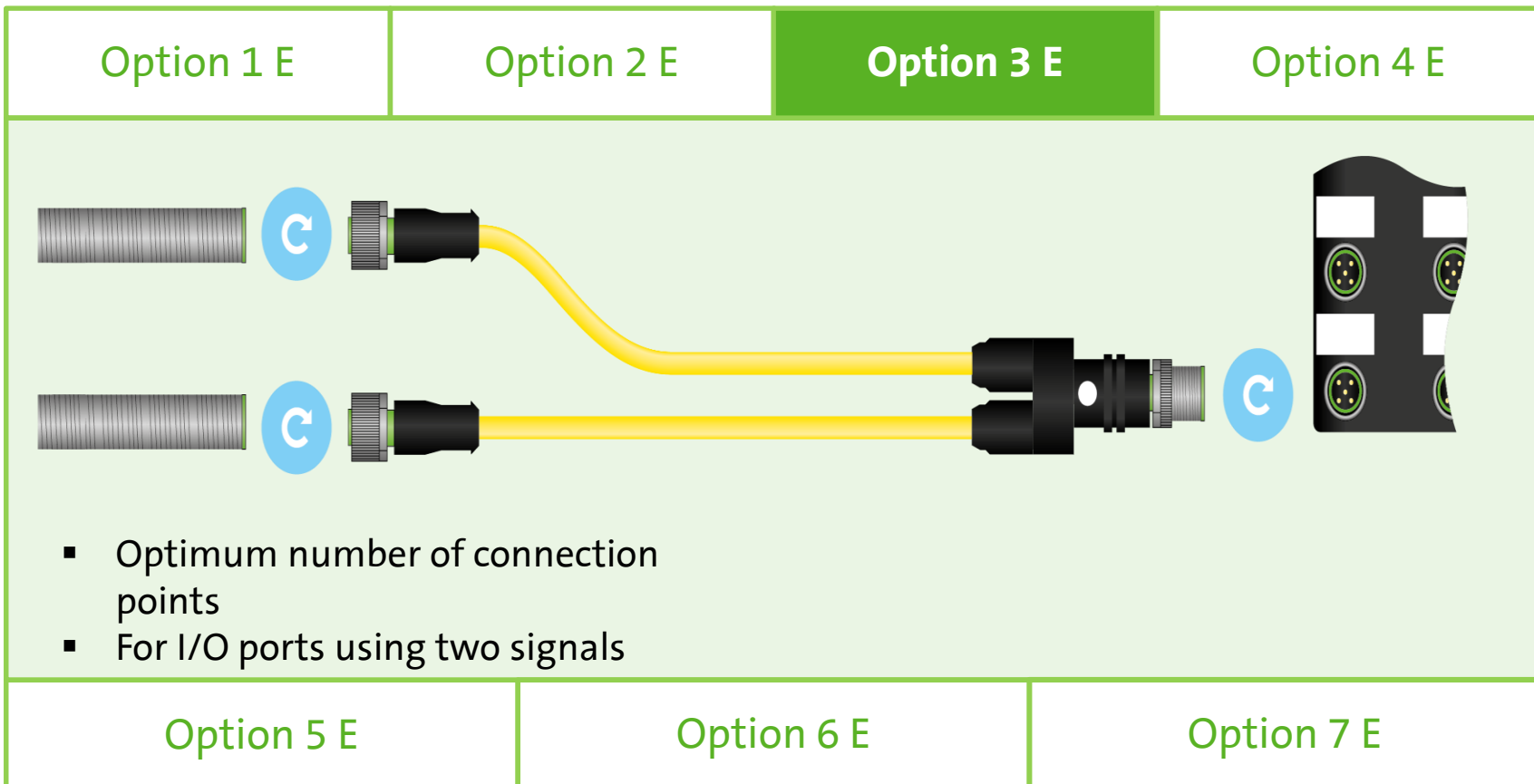



# PASSIVE WIRING EXAMPLES TO DEVICES

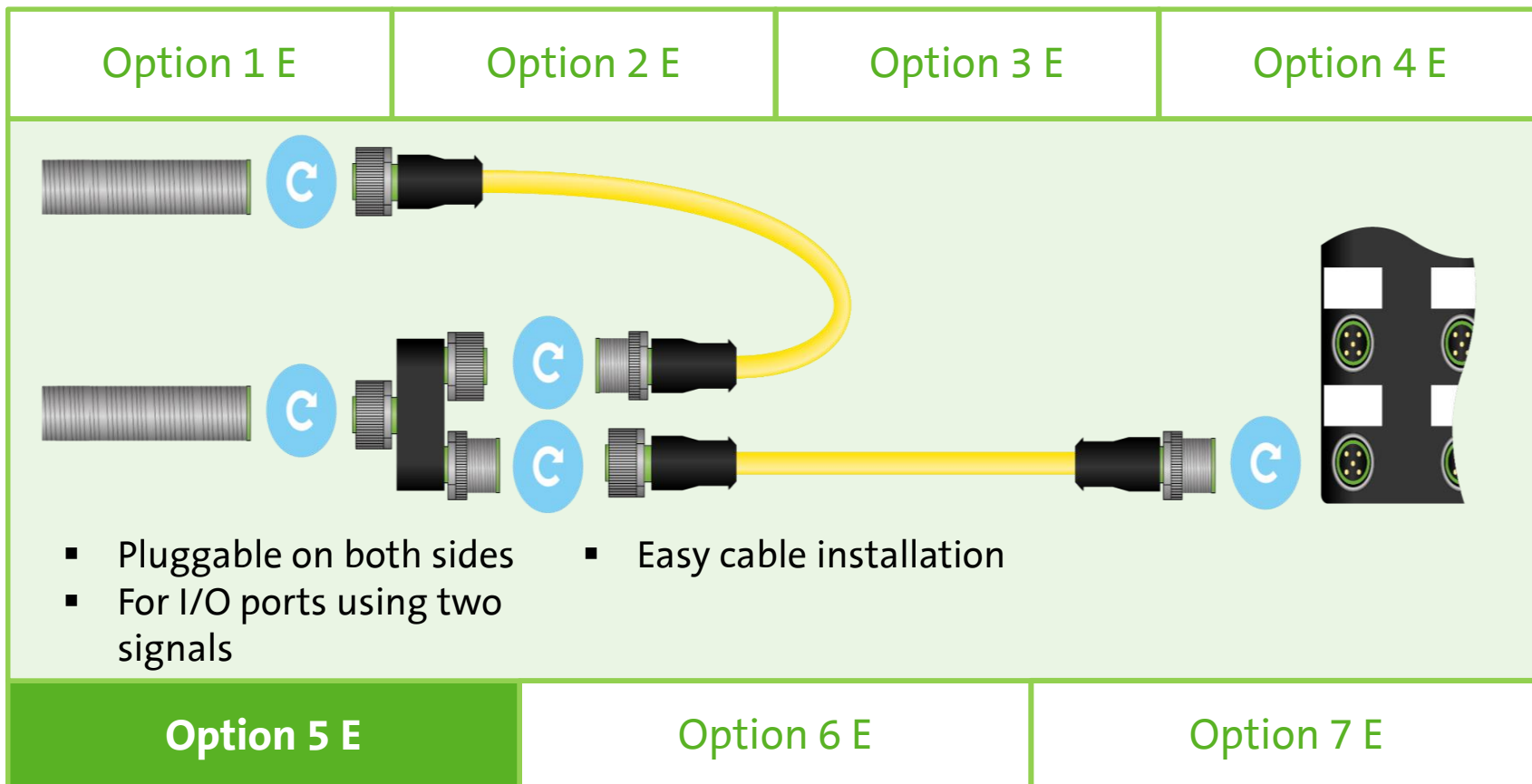
Option 1 E	Option 2 E	Option 3 E	Option 4 E
 <ul style="list-style-type: none"> <li>▪ Pluggable on both sides</li> <li>▪ I/O ports using one signal</li> </ul>			
Option 5 E	Option 6 E	Option 7 E	

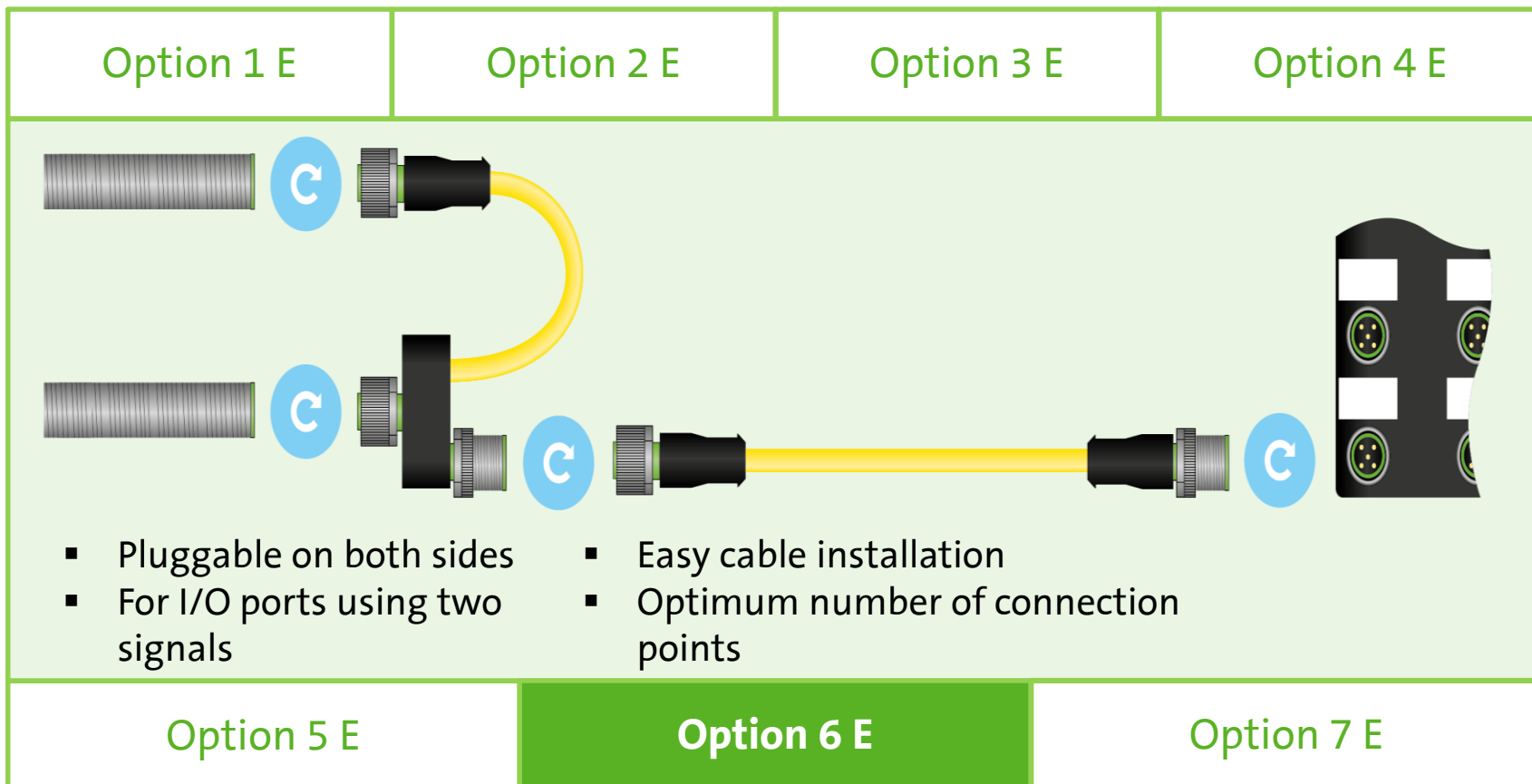


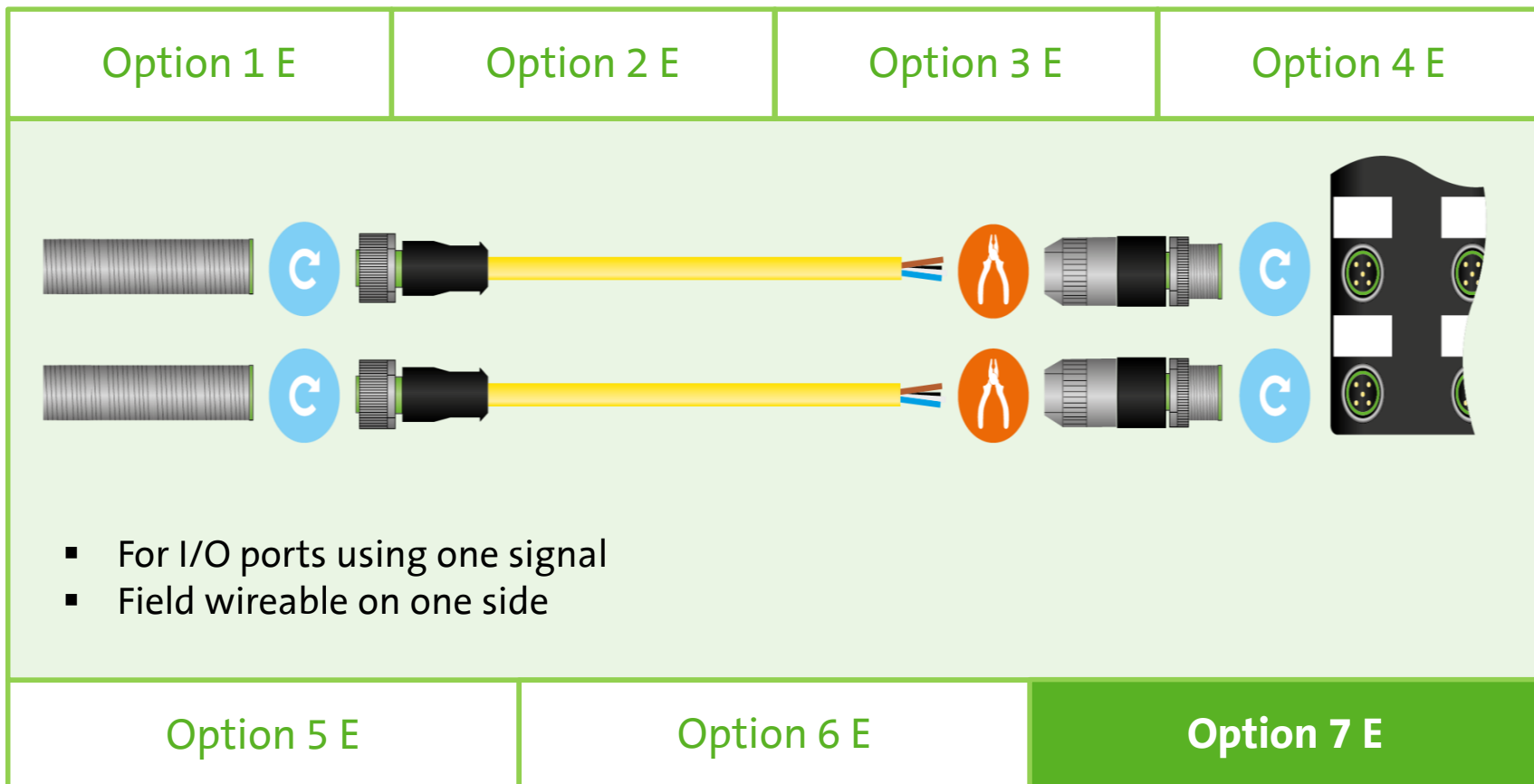


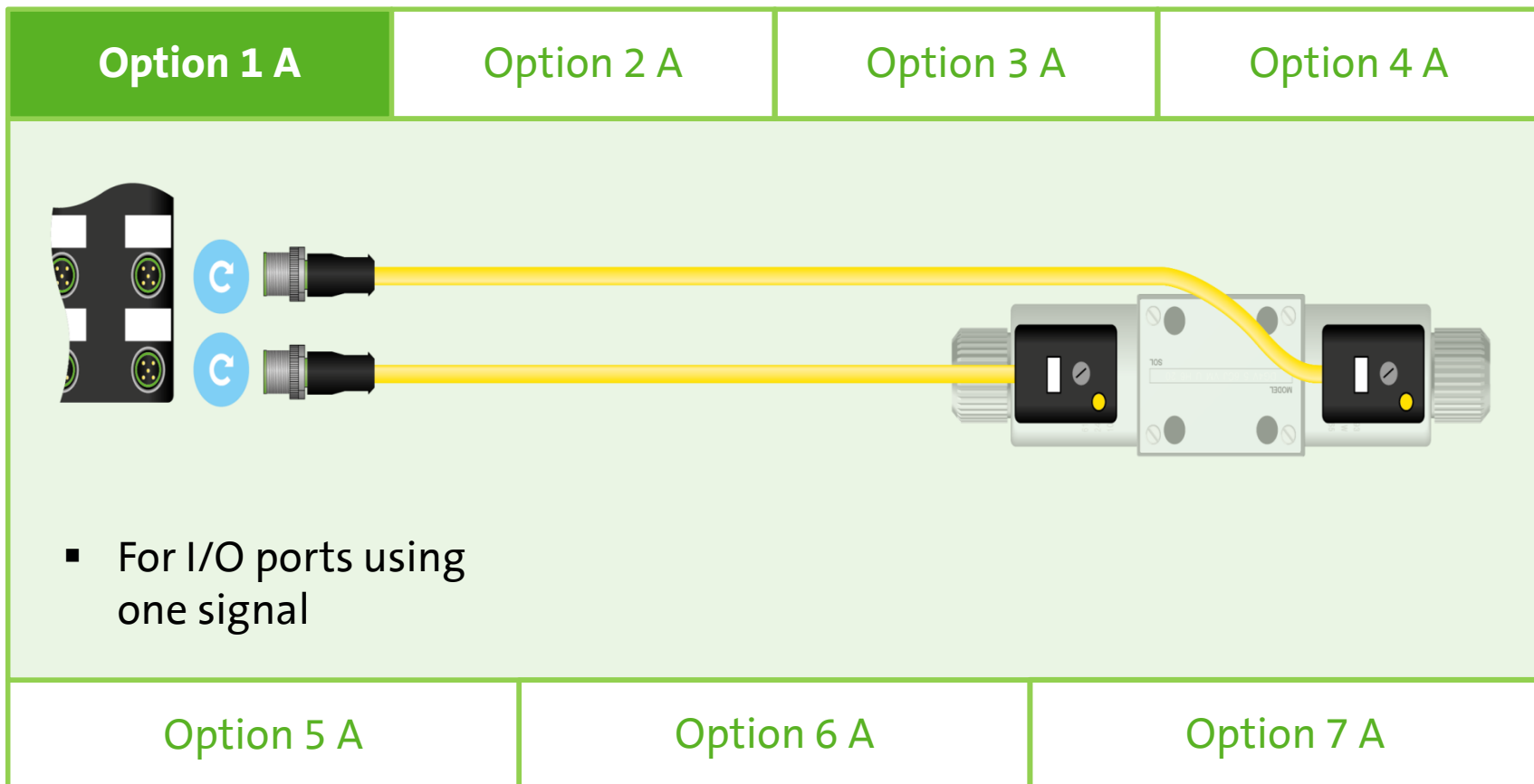


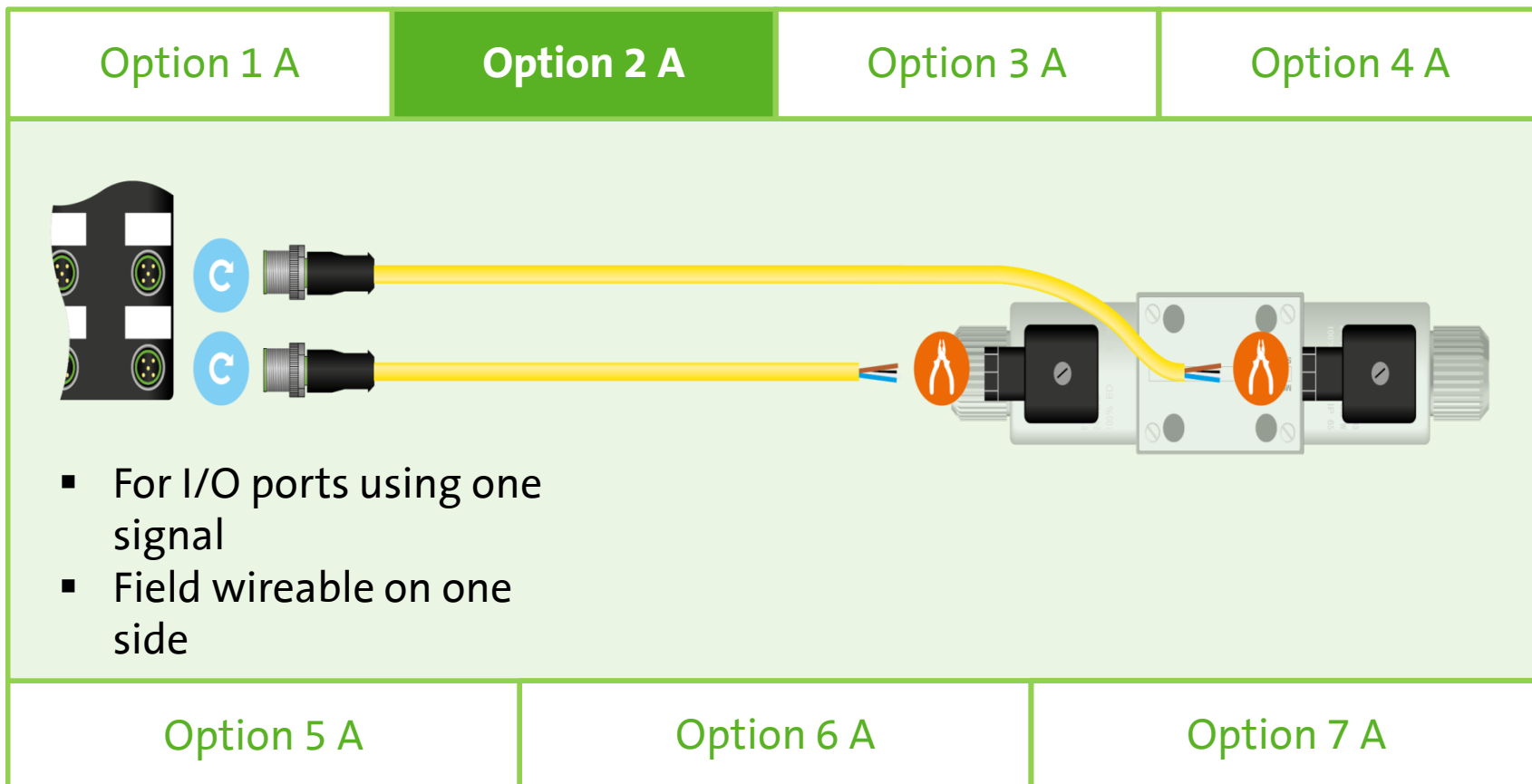
Option 1 E	Option 2 E	Option 3 E	Option 4 E
 <p>The diagram shows a cable assembly for Option 4 E. It consists of two parallel yellow cables. Each cable has a braided shielded end on the left, a black plastic connector housing with a metal ring, and a metal plug on the right. The right end of the assembly is connected to a black panel with four circular ports. Blue circular icons with a white 'C' are placed around the connectors and the panel to indicate that the assembly is pluggable on both sides.</p> <ul style="list-style-type: none"> <li>▪ Pluggable on both sides</li> <li>▪ For I/O ports using two signals</li> </ul>			
Option 5 E	Option 6 E	Option 7 E	



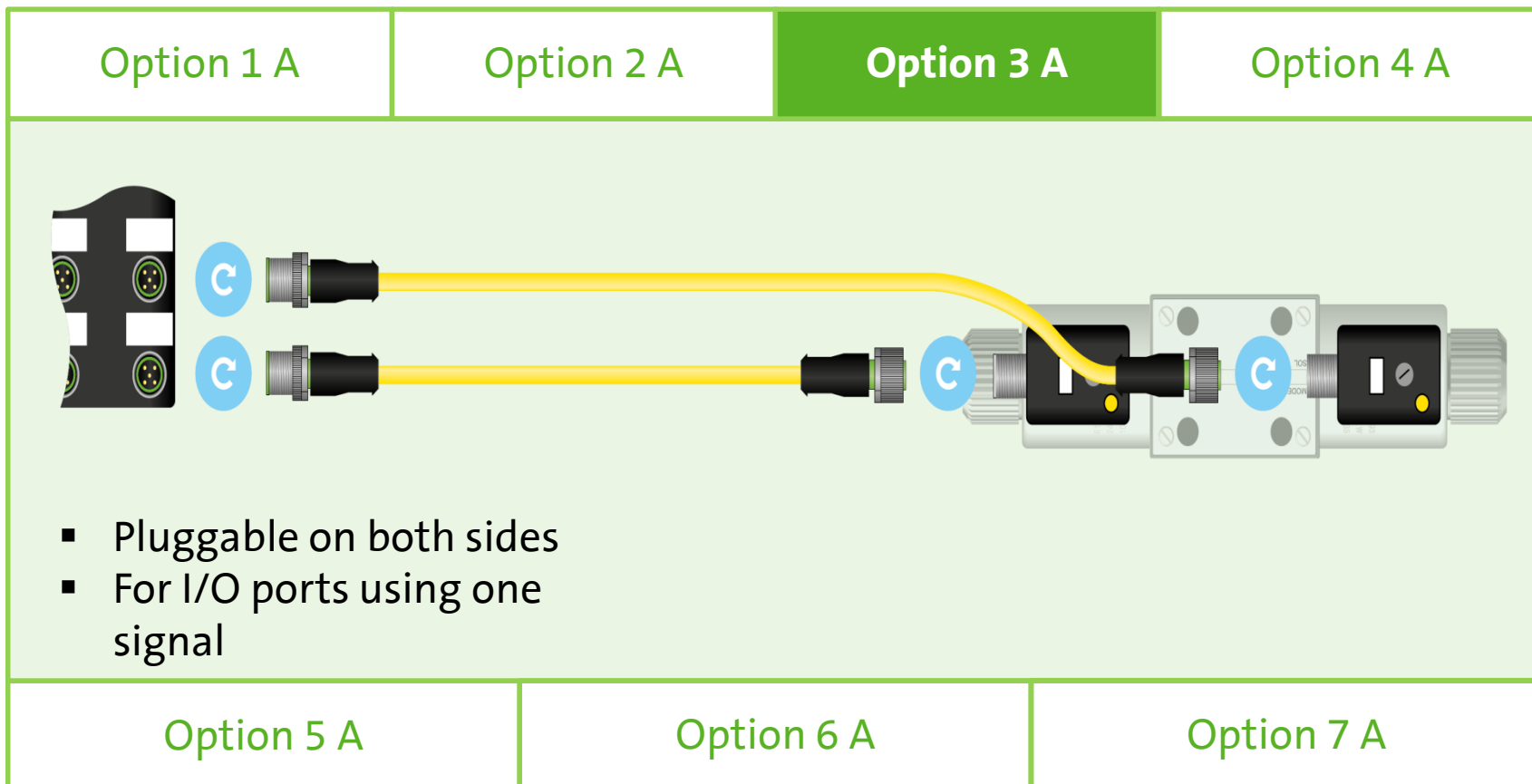


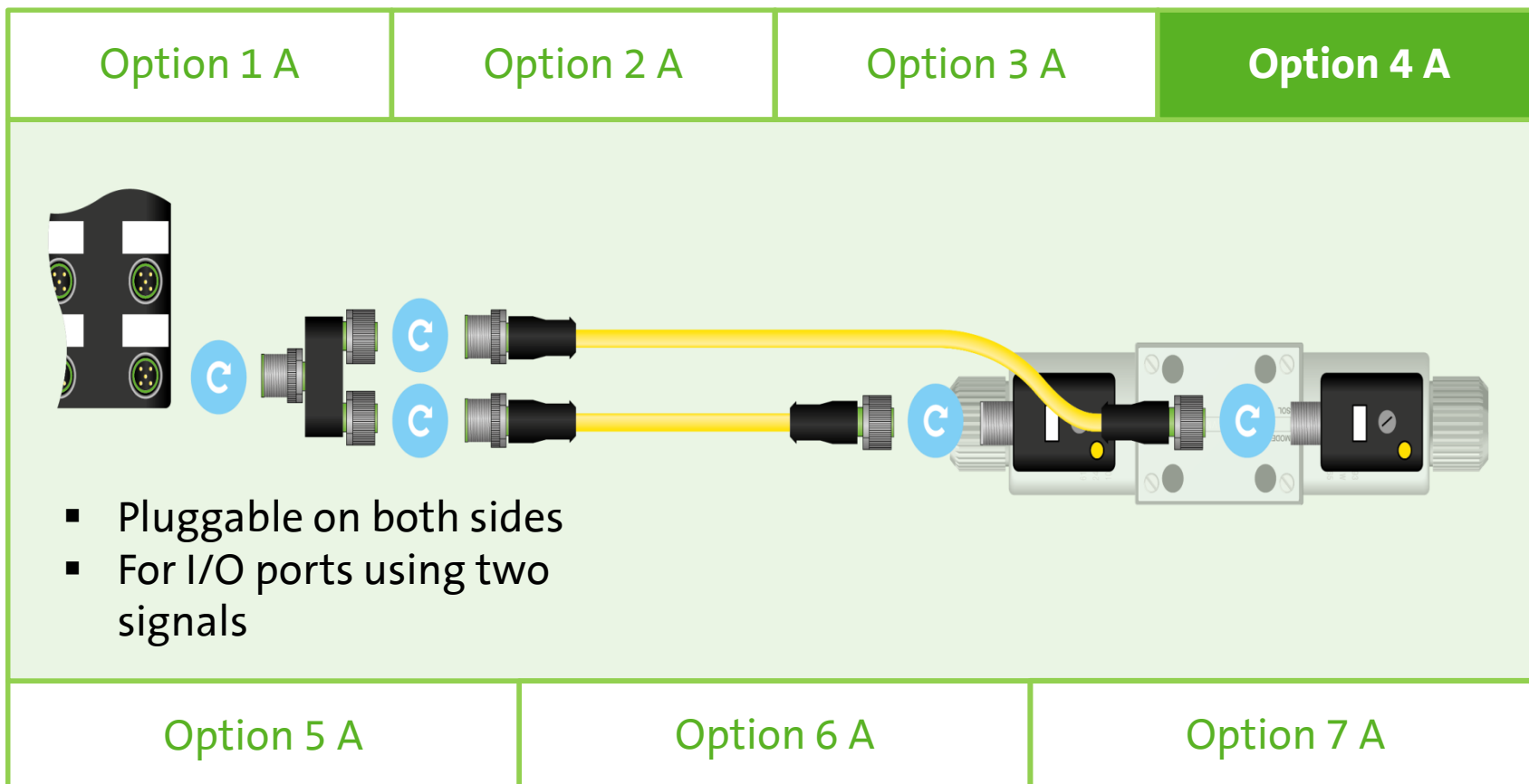





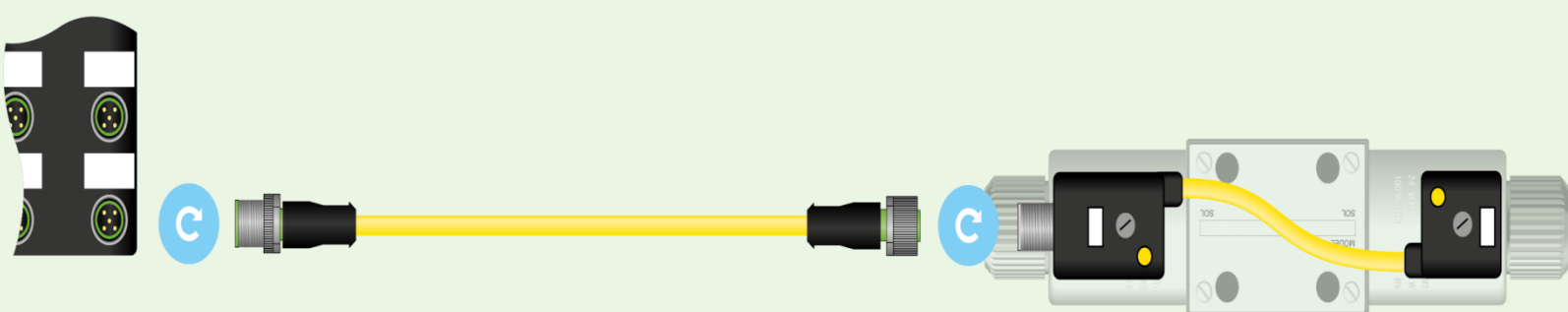








Option 1 A	Option 2 A	Option 3 A	Option 4 A
 <p>The diagram shows a yellow cable with a multi-pin connector on the left and a device with two ports on the right. A blue circle with a white 'C' is positioned between the connector and the cable. The device has two ports, each with a yellow indicator light. The cable is connected to the top port of the device.</p> <ul style="list-style-type: none"><li>▪ For I/O ports using two signals</li><li>▪ Easy cable installation</li></ul>			
<b>Option 5 A</b>		Option 6 A	Option 7 A

Option 1 A	Option 2 A	Option 3 A	Option 4 A
 <ul style="list-style-type: none"> <li>▪ Pluggable on both sides</li> <li>▪ For I/O ports using two signals</li> <li>▪ Easy cable installation</li> <li>▪ Optimum number of connection points</li> </ul>			
Option 5 A	<b>Option 6 A</b>		Option 7 A

