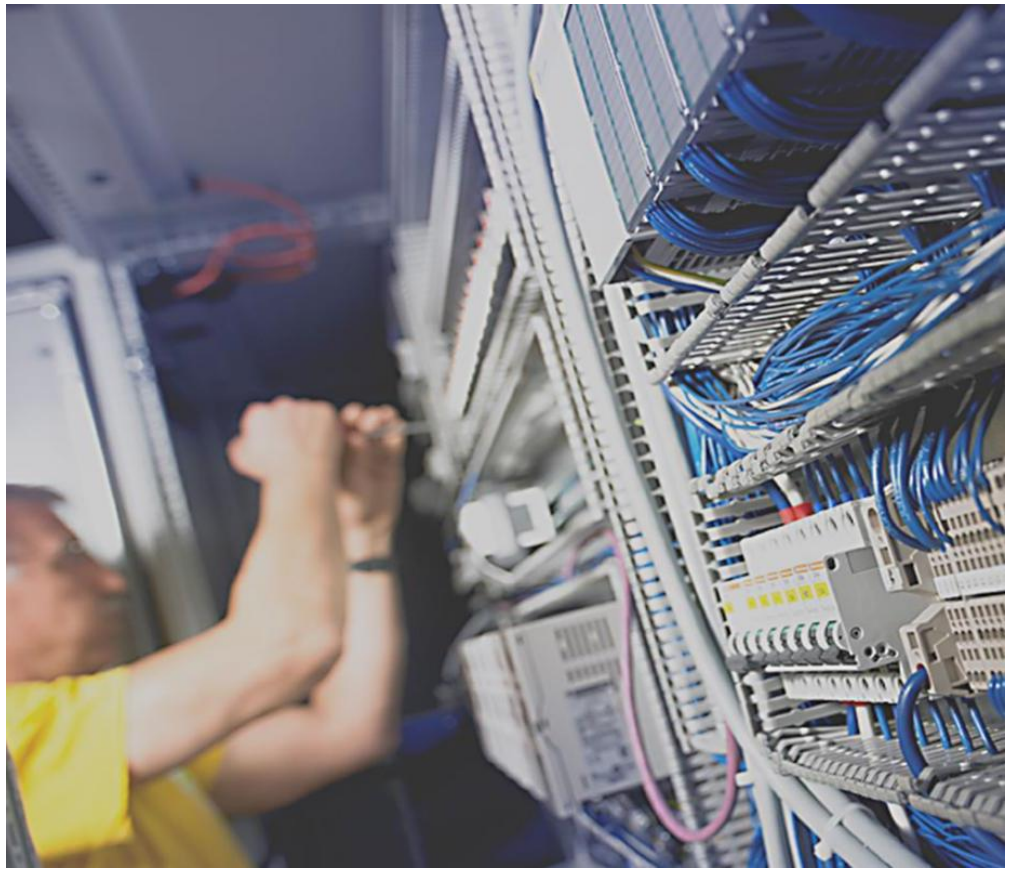
PANEL WIRING WITH DATA2WIRE

Economic solution for your digitalized & lean production

Today’s Challenges

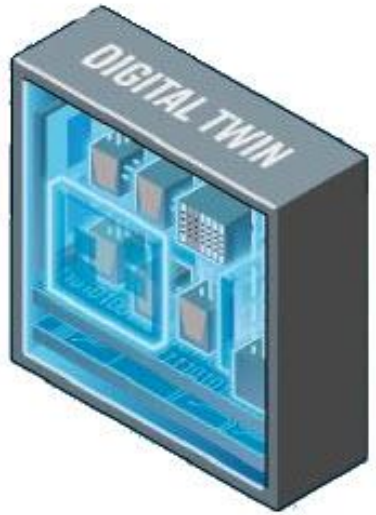
Electric panel building becomes more challenging

- Labor shortage
- Lack of skilled workers
- Supply chain issues & material costs
- Shortest delivery time expectations
- Small production sizes
- Last minute design changes
- Cost pressure



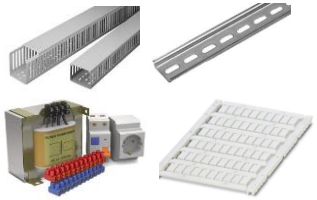
Our Vision for your Production

Digital Twin as base for an automated and parallelized production process



Pre-processed panels

Prepared panel components



Assembled and labeled terminal rails

Prepared wiring optimized wire sets

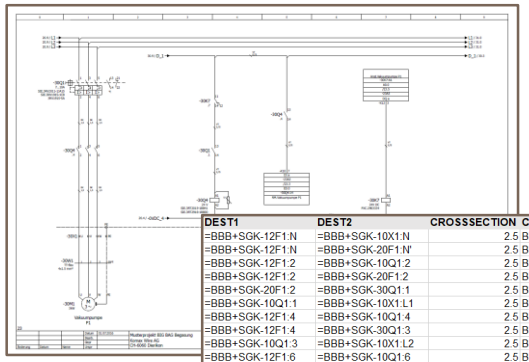
The three Pillars of Automation

It’s more than just the wiring process…

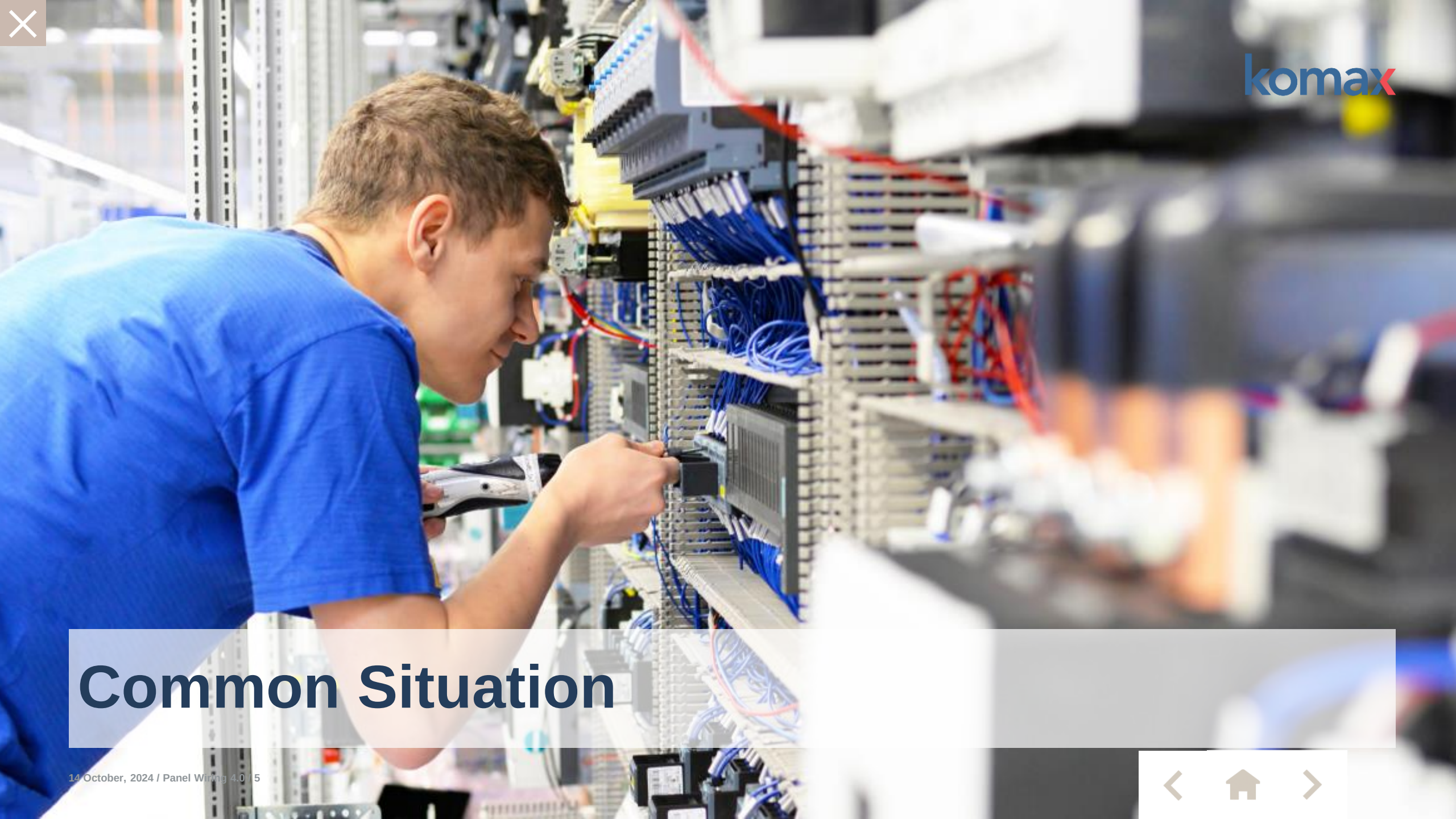
Process

Information

Material



DEST1	DEST2	CROSSSECTION	COLOUR	LENGTH
=BBB+SGK-12F1:N	=BBB+SGK-10X1:N	2.5	Blue	
=BBB+SGK-12F1:N	=BBB+SGK-20F1:N'	2.5	Blue	
=BBB+SGK-12F1:2	=BBB+SGK-10Q1:2	2.5	Black	
=BBB+SGK-12F1:2	=BBB+SGK-20F1:2	2.5	Black	
=BBB+SGK-20F1:2	=BBB+SGK-30Q1:1	2.5	Black	
=BBB+SGK-10Q1:1	=BBB+SGK-10X1:L1	2.5	Black	
=BBB+SGK-12F1:4	=BBB+SGK-10Q1:4	2.5	Black	
=BBB+SGK-12F1:4	=BBB+SGK-30Q1:3	2.5	Black	
=BBB+SGK-10Q1:3	=BBB+SGK-10X1:L2	2.5	Black	
=BBB+SGK-12F1:6	=BBB+SGK-10Q1:6	2.5	Black	
=BBB+SGK-12F1:6	=BBB+SGK-30Q1:5	2.5	Black	
=BBB+SGK-10Q1:5	=BBB+SGK-10X1:L3	2.5	Black	
=BBB+SGK-12F1:1	=BBB+SGK-12X1:L1	1.5	Black	
=BBB+SGK-12F1:3	=BBB+SGK-12X1:L2	1.5	Black	
=BBB+SGK-12F1:5	=BBB+SGK-12X1:L3	1.5	Black	
=BBB+SGK-12F1:N'	=BBB+SGK-12X1:N	1.5	Blue	
=BBB+SGK-30Q1:14	=BBB+SGK-30Q4:A1	0.75	Violet	
=BBB+SGK-30Q1:2	=BBB+SGK-30Q4:1	1.5	Black	
=BBB+SGK-30Q1:4	=BBB+SGK-30Q4:3	1.5	Black	
=BBB+SGK-30Q1:6	=BBB+SGK-30Q4:5	1.5	Black	
=BBB+SGK-30Q4:2	=BBB+SGK-30X1:U	1.5	Black	
=BBB+SGK-30Q4:4	=BBB+SGK-30X1:V	1.5	Black	
=BBB+SGK-30Q4:6	=BBB+SGK-30X1:W	1.5	Black	



Common Situation

Study of University Stuttgart

Investigation over 500 panel builders

4.5 min Per wire for reading a connection in the schematic diagram and by manual wire processing

49% Of the production time of a panel is needed for wiring!

10% all E-CAD users create electronic connection lists.

9% Of panel are serial production.

500 Wires per panel Ø

Time Eater Panel Wiring

Manual wire production takes up a lot of precious time

Panel Wiring Process [266s]

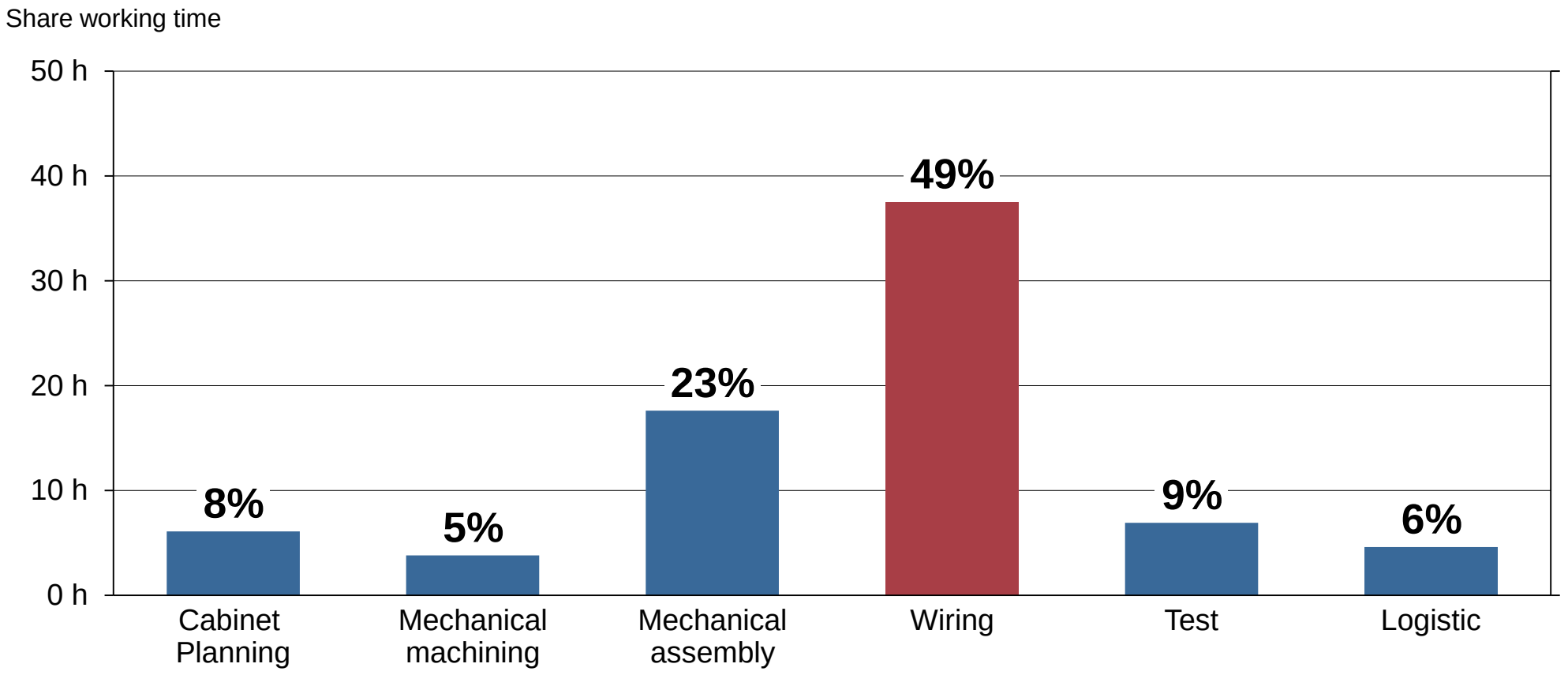
Reading Schematic Diagramm [67s] → Manual Wire Processing [157s] → Laying Wire [42s]

Per wire / average 300 pages electric schematic / average 500 wires per panel

Source: University of Stuttgart

Share of Panel Production Time

Manual wiring process takes half of the production time



Source: University of Stuttgart

3 main activities in the wiring process

Common Situation: a 100% manually wiring process

Reading Schematic Diagramm	Manual Wire Processing	Laying Wire
67 s	157 s	42 s

per wire / Ø 300 pages electric schematic / Ø 500 wires per cabinet

No automation without data

The manufacturing data must be prepared on easy simple way

Reading Schematic Diagram

67 s

Manual Wire Processing

157 s

Laying Wire

42 s

per wire / Ø 300 pages electric schematic / Ø 500 wires per cabinet

Wire data preparation with ECAD…

… is amazingly simple and practical

Data Preparation	Manual Wire Processing	Laying Wire
15 - 45 s	**157 s**	**42 s**

per wire / Ø 300 pages electric schematic / Ø 500 wires per cabinet

Prefabricated wires highly automated …

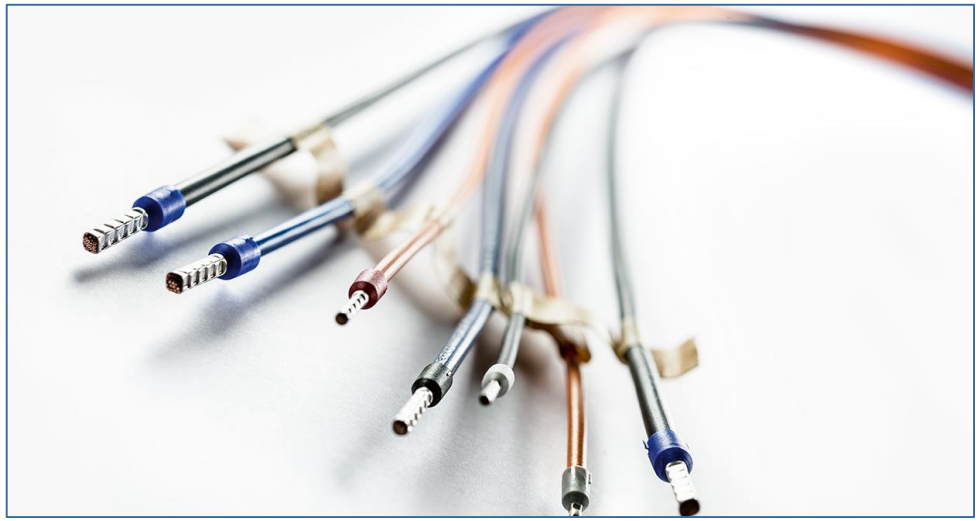
… in a wiring optimized sequence

Data Preparation	Manual Wire Processing	Laying Wire
15 - 45 s	157 s	42 s

per wire / Ø 300 pages electric schematic / Ø 500 wires per cabinet

An economical automated wire processing ...

... deliver wiring optimized wire sets for wiring

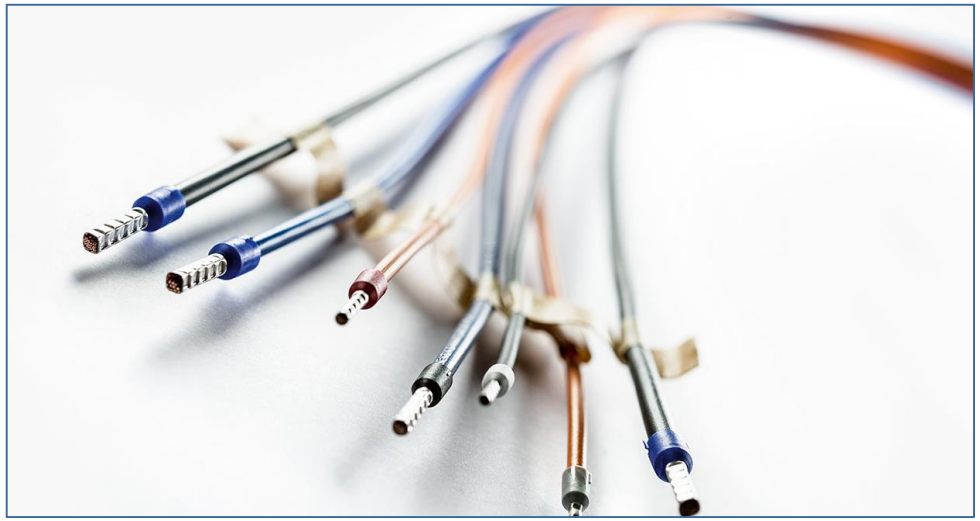


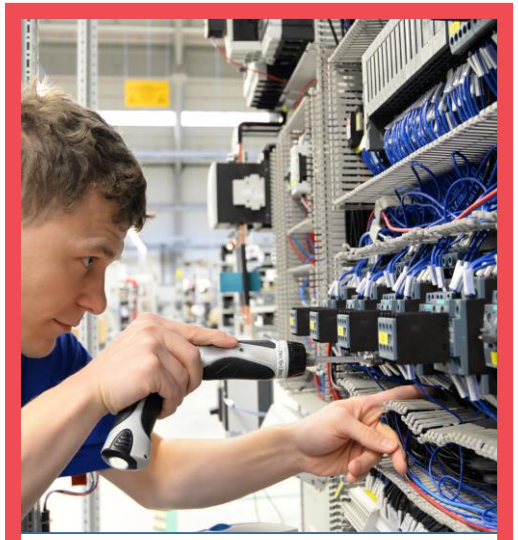
Data Preparation	Automated Wire Processing	Laying Wire
15 - 45 s	**5 - 5 s**	**42 s**

per wire / Ø 300 pages electric schematic / Ø 500 wires per cabinet

Higher productivity with prefabricated wires

With no reading of schemes and less tool changing during the wiring



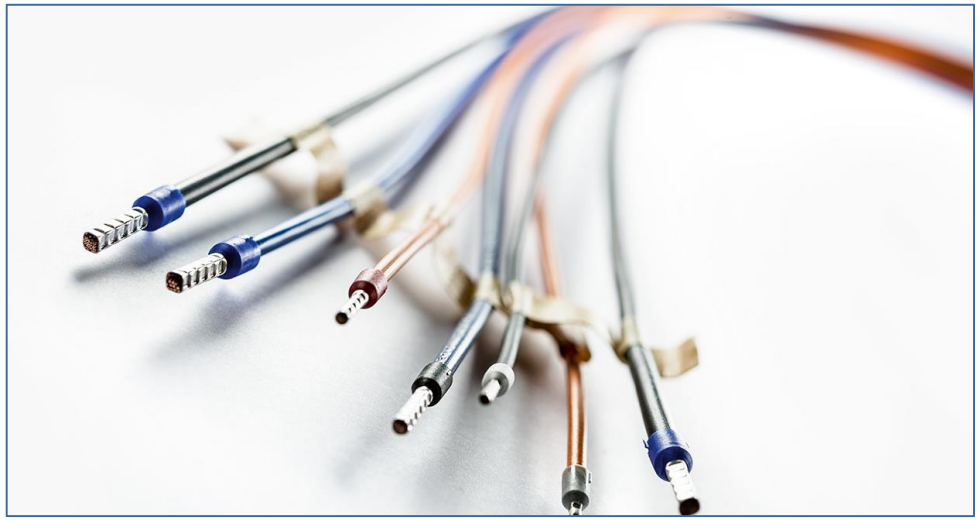


Data Preparation	Automated Wire Processing	Laying Wire
15 - 45 s	**5 - 5 s**	**42 s**

per wire / Ø 300 pages electric schematic / Ø 500 wires per cabinet

Optimal wire sequence automated fabricated

It begins at the data preparation and ends at the wiring



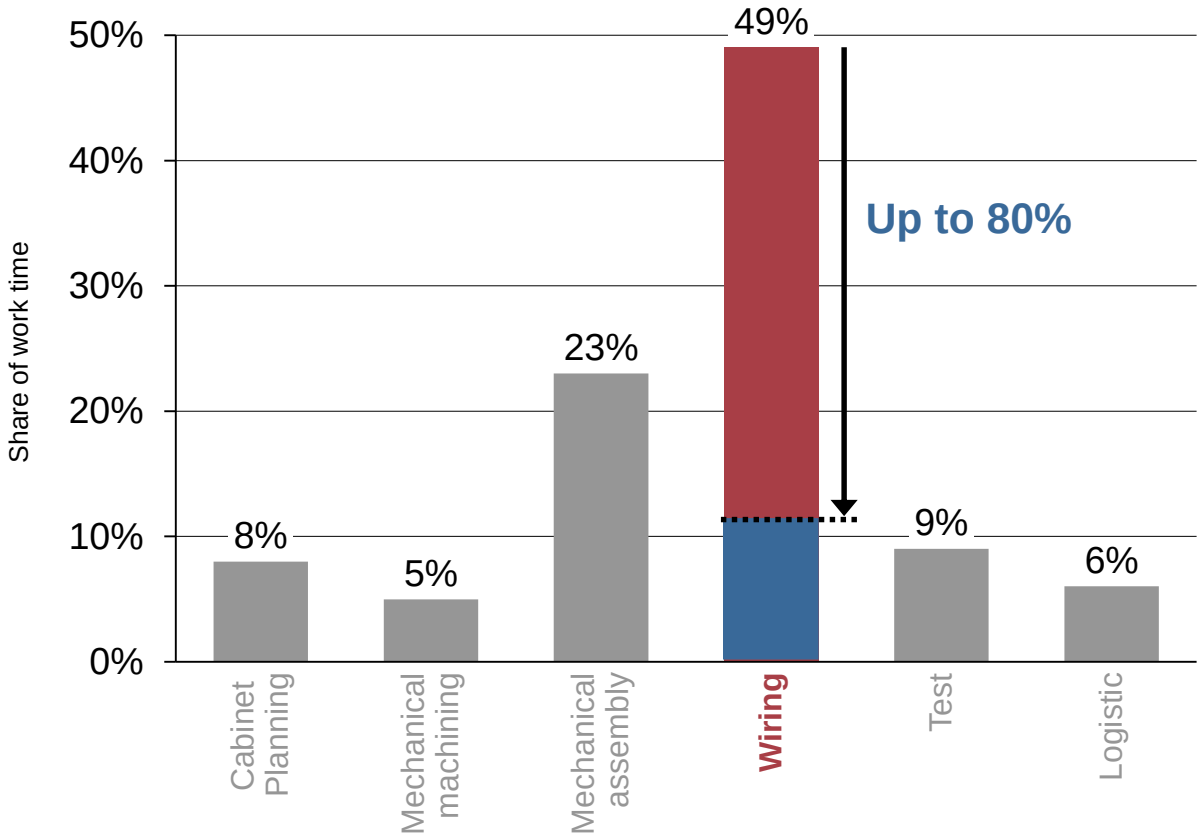
Data Preparation	Automated Wire Processing	Laying Wire
15 - 45 s	**5 - 5 s**	**Less than 42 s**

per wire / Ø 300 pages electric schematic / Ø 500 wires per cabinet

Results

Economical Automation Process

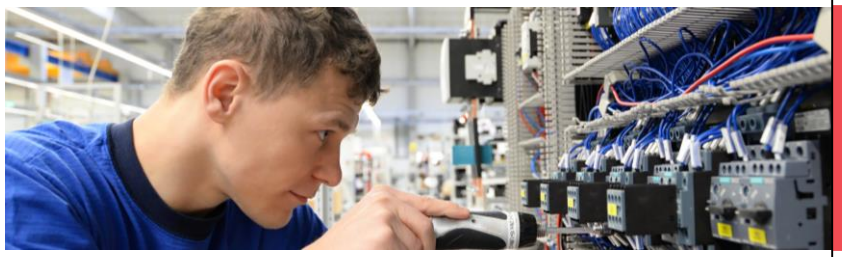
Time savings of up to 80% become reality

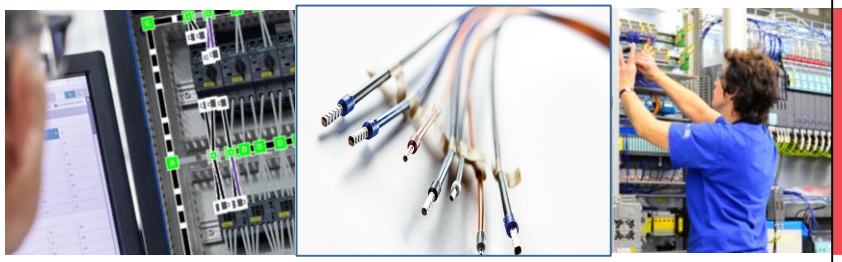


- ✓ Reduce the wiring process by up to 80% with automated pre-fabricated wires.
- ✓ Efficient automated wiring process even for batch size 1.
- ✓ Skilled workers focus on design rather than manual production
- ✓ An approach in the direction of panel wiring 4.0.

Your time savings with automation

... also possible for batch size 1





67s
157s
42s
266s
45s
15s
35s
95s
-64%
Data preparation
Automated Wire Processing
Wire laying

Lean wiring with automated prefabrication

- ✓ No reading of electrical schematic diagrams
- ✓ The connection information are printed on the wires
- ✓ Less tool changing due the wiring optimized sequence of wire
- ✓ A screen shows the lay way and guides the less qualified personnel during the wiring process

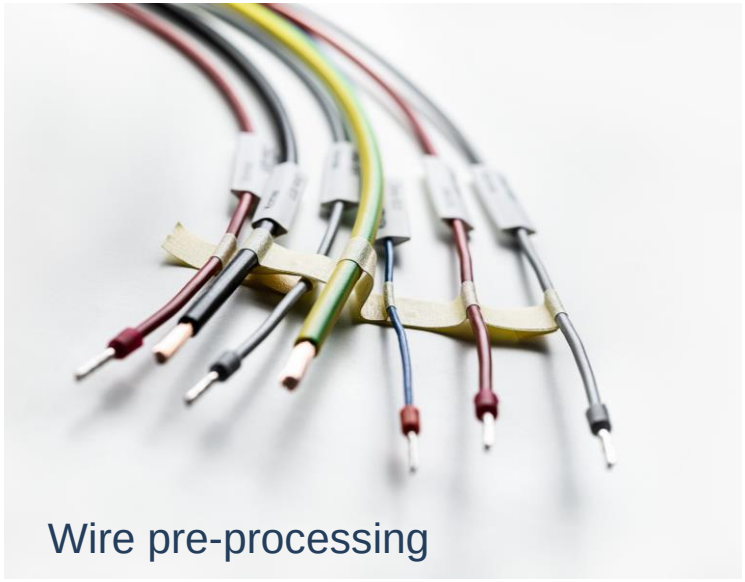
The data preparation is the first step!

Economical Automated Wiring Process

Efficient wiring process in three steps

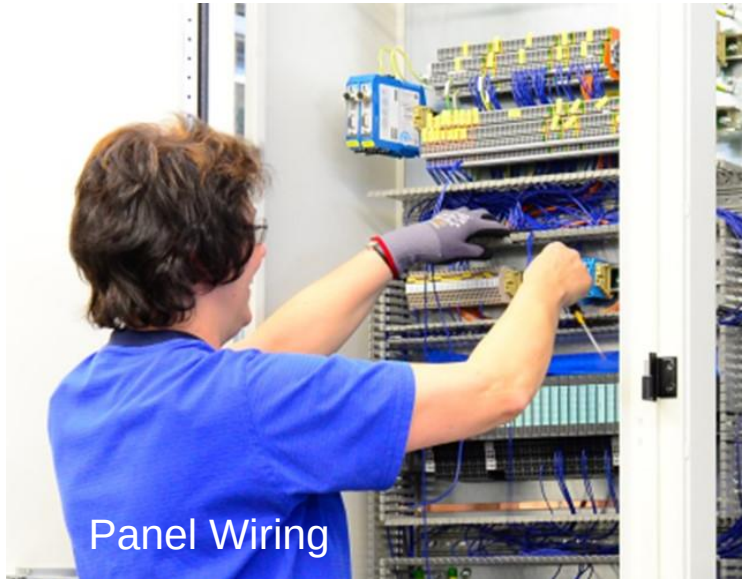
Data Preparation

- ✓ The electric professionals contribute their full knowledge to the data preparation.
- ✓ Production data is defined including an optimized sequence for wiring.



Wire pre-processing

- ✓ Highly automated process manufactures the wires in shortest production time.
- ✓ The optimized wire sequence requires a flexible wire processing.

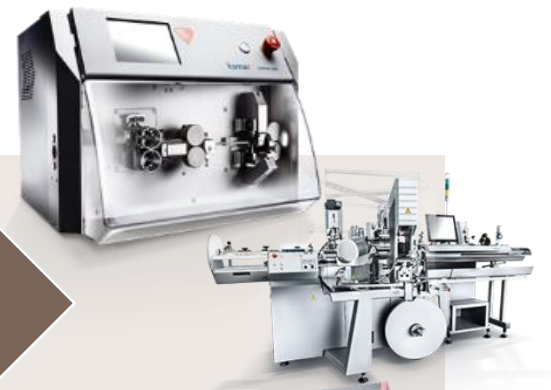


Panel Wiring

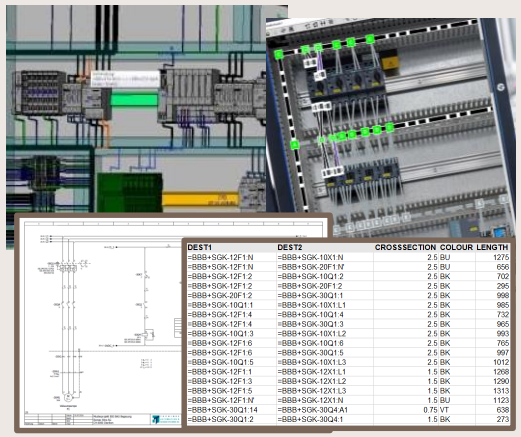
- ✓ Less qualified assemblers are guided by printed information on the wire instead of reading schemas.
- ✓ The optimized wire sequence results in an efficient wiring.

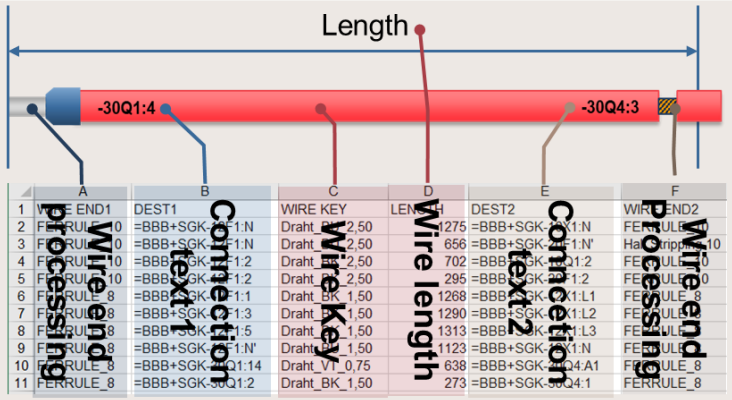
Digitalization and Automation as a Lever

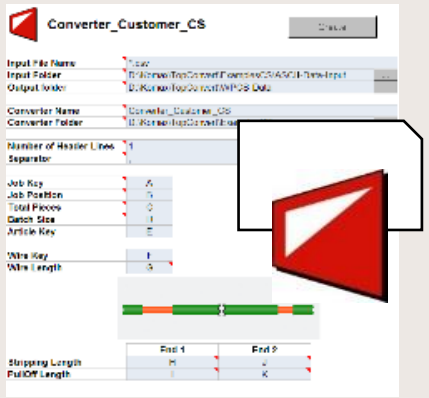
Shorter Production time with Automation



ECAD Data / DLW → Cutting list → Convert data





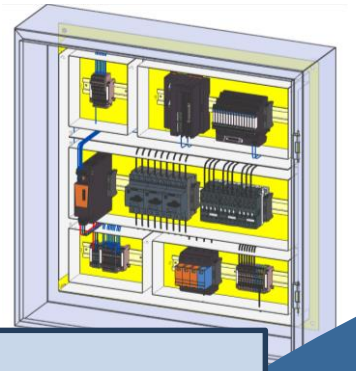


Consistent data flow

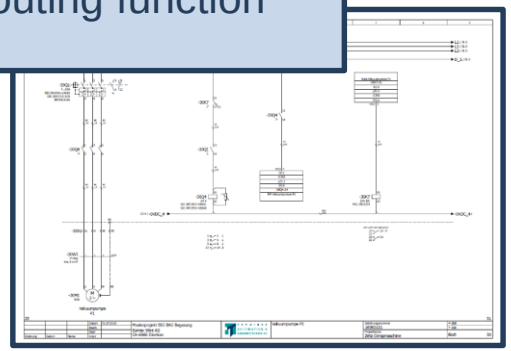
- Convert data export from ECAD or DLW into a cutting list and into machine-readable data
- The cutting list can be sent directly to the machine via WPCS
- No manual programming of items in the machine necessary

Data Preparation enables Automation

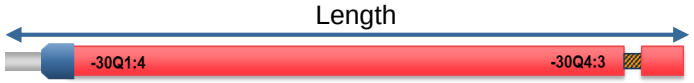
3D E-CAD system as data supplier for the cutting list

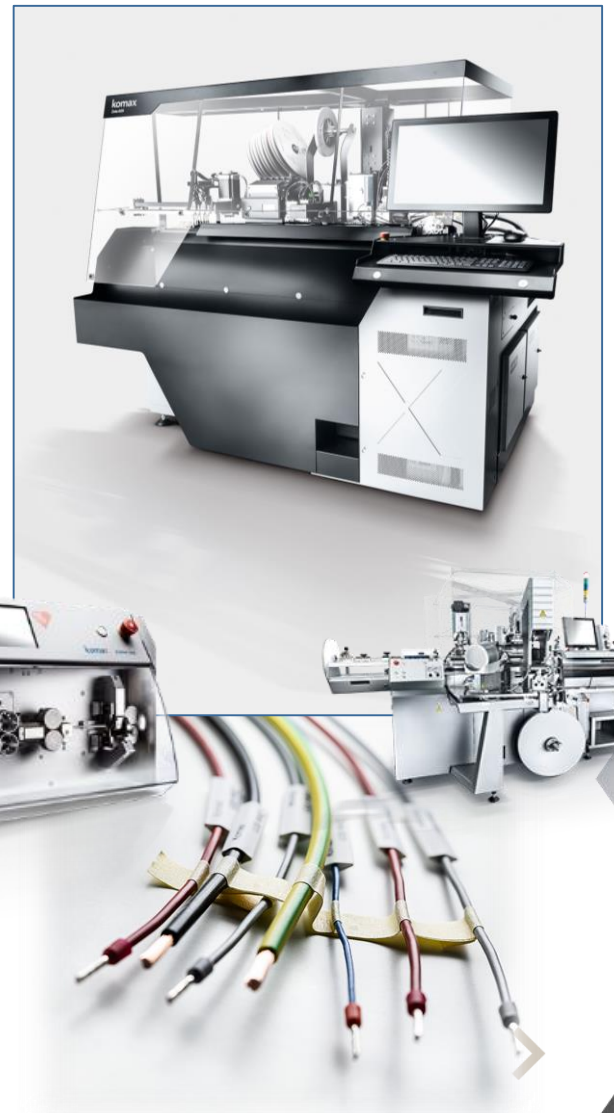


E-CAD system
with
routing function



ArticleKey	ArticleGroup	ArticleName	ArticleHint	LeadSetWireKey1_2	LeadSetWireLength1_2	LeadSetTerminalKey1	LeadSetTerminalKey2	MarkingTextBe
BIGBAG_021		BIGBAG Project		H05_V_K_0.5_VT	1098	I_FER_0.5_8_WH	I_FER_0.5_8_WH	-23A3-X10:9
BIGBAG_021		BIGBAG Project		H07_V_K_1.5_BK	1422	I_FER_1.5_8_BK	I_FER_1.5_8_BK	-32Q4:2
BIGBAG_021		BIGBAG Project		H07_V_K_1.5_BK	1441	I_FER_1.5_8_BK	I_FER_1.5_8_BK	-32Q4:4
BIGBAG_021		BIGBAG Project		H07_V_K_1.5_BK	1467	I_FER_1.5_8_BK	I_FER_1.5_8_BK	-32Q4:6
BIGBAG_022		BIGBAG Project		H05_V_K_0.5_VT	1060	I_FER_0.5_8_WH	I_FER_0.5_8_WH	-33Q4:14
BIGBAG_022		BIGBAG Project		H07_V_K_1.5_BK	1489	I_FER_1.5_8_BK	I_FER_1.5_8_BK	-33Q4:2
BIGBAG_022		BIGBAG Project		H07_V_K_1.5_BK	1511	I_FER_1.5_8_BK	I_FER_1.5_8_BK	-33Q4:4
BIGBAG_022		BIGBAG Project		H07_V_K_1.5_BK	1540	I_FER_1.5_8_BK	I_FER_1.5_8_BK	-33Q4:6
BIGBAG_022		BIGBAG Project		H05_V_K_0.5_DBU	1550	I_FER_0.5_8_WH	I_FER_0.5_8_WH	-33Q4:A2
BIGBAG_019		BIGBAG Project		H05_V_K_0.5_VT	1143	I_FER_0.5_8_WH	I_FER_0.5_8_WH	-31Q4:14
BIGBAG_019		BIGBAG Project		H07_V_K_1.5_BK	1361	I_FER_1.5_8_BK	I_FER_1.5_8_BK	-31Q4:2
BIGBAG_019		BIGBAG Project		H07_V_K_1.5_BK	1368	I_FER_1.5_8_BK	I_FER_1.5_8_BK	-31Q4:4
BIGBAG_019		BIGBAG Project		H07_V_K_1.5_BK	1383	I_FER_1.5_8_BK	I_FER_1.5_8_BK	-31Q4:6
BIGBAG_016		BIGBAG Project		H05_V_K_0.5_VT	1389	I_FER_0.5_8_WH	I_FER_0.5_8_WH	-31Q1:14
BIGBAG_016		BIGBAG Project		H05_V_K_0.5_VT	1864	I_FER_0.5_8_WH	I_FER_0.5_8_WH	-31Q1:13
BIGBAG_016		BIGBAG Project		H07_V_K_1.5_BK	240	I_FER_1.5_8_BK	I_FER_1.5_8_BK	-31Q1:2
BIGBAG_016		BIGBAG Project		H07_V_K_1.5_BK	240	I_FER_1.5_8_BK	I_FER_1.5_8_BK	-31Q1:4



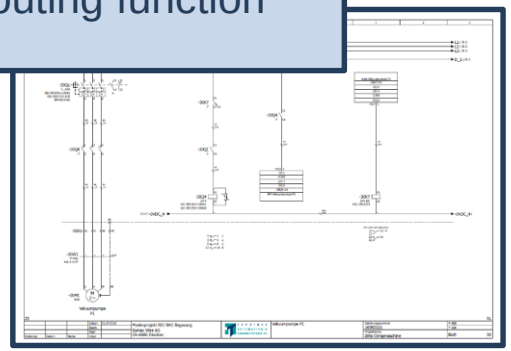


Data Preparation enables Automation

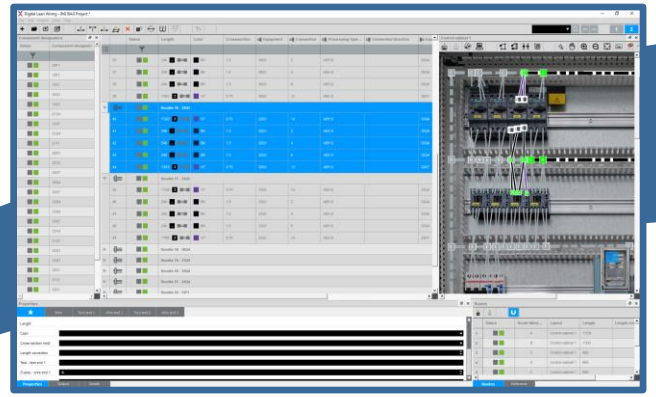
Missing data are added and optimized wire sequence can be inserted

DEST1	DEST2	CROSSSECTION	COLOUR	LENGTH
=BBB+SGK-12F1:N	=BBB+SGK-10X1:N	2.5	BU	1275
=BBB+SGK-12F1:N	=BBB+SGK-20F1:N'	2.5	BU	656
=BBB+SGK-12F1:2	=BBB+SGK-10Q1:2	2.5	BK	702
=BBB+SGK-12F1:2	=BBB+SGK-20F1:2	2.5	BK	295
=BBB+SGK-20F1:2	=BBB+SGK-30Q1:1	2.5	BK	998
=BBB+SGK-10Q1:1	=BBB+SGK-10X1:L1	2.5	BK	985
=BBB+SGK-12F1:4	=BBB+SGK-10Q1:4	2.5	BK	732
=BBB+SGK-12F1:4	=BBB+SGK-30Q1:3	2.5	BK	965
=BBB+SGK-10Q1:3	=BBB+SGK-10X1:L2	2.5	BK	993
=BBB+SGK-12F1:6	=BBB+SGK-10Q1:6	2.5	BK	765
=BBB+SGK-12F1:6	=BBB+SGK-30Q1:5	2.5	BK	997
=BBB+SGK-10Q1:5	=BBB+SGK-10X1:L3	2.5	BK	1012
=BBB+SGK-12F1:1	=BBB+SGK-12X1:L1	1.5	BK	1268
=BBB+SGK-12F1:3	=BBB+SGK-12X1:L2	1.5	BK	1290
=BBB+SGK-12F1:5	=BBB+SGK-12X1:L3	1.5	BK	1313
		1.5	BU	1123
		0.75	VT	638
		1.5	BK	273

E-CAD system
without
routing function



Digital Lean Wiring (DLW)



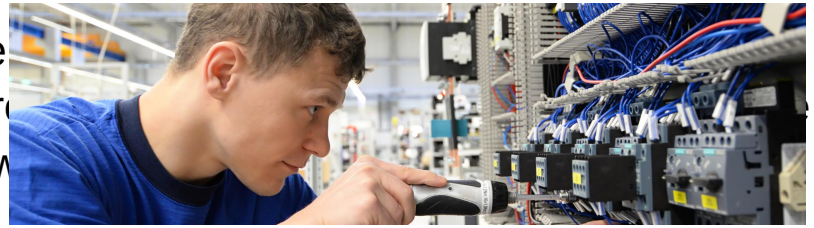
- The electric skilled worker can insert their **knowledge** and their **experience**
- **Without** component data base

Benefit

Automated Panel Production
YOUR BENEFITS

Up to 80% shorter Assembly Time

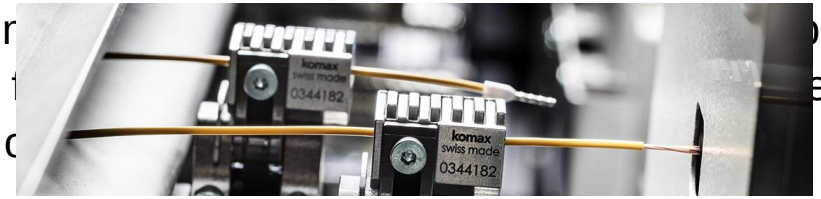
- Reduce
- Lean pr
- Digital w



manual work

Flexibility & short Production Time

- Short tir
- Benefit f
- Higher c



part of the concept
e very first panel

Reduced Inventory

- Impleme
- Minimiz
- First tim

otal inventory
ain issues)

Attractive Jobs

- Qualifie
- Less qu assemb

a preparation
guided by
emes

What do you think, will automatically prefabricated wires optimize the lead time in your panel production?

Thank you very much for your attention!