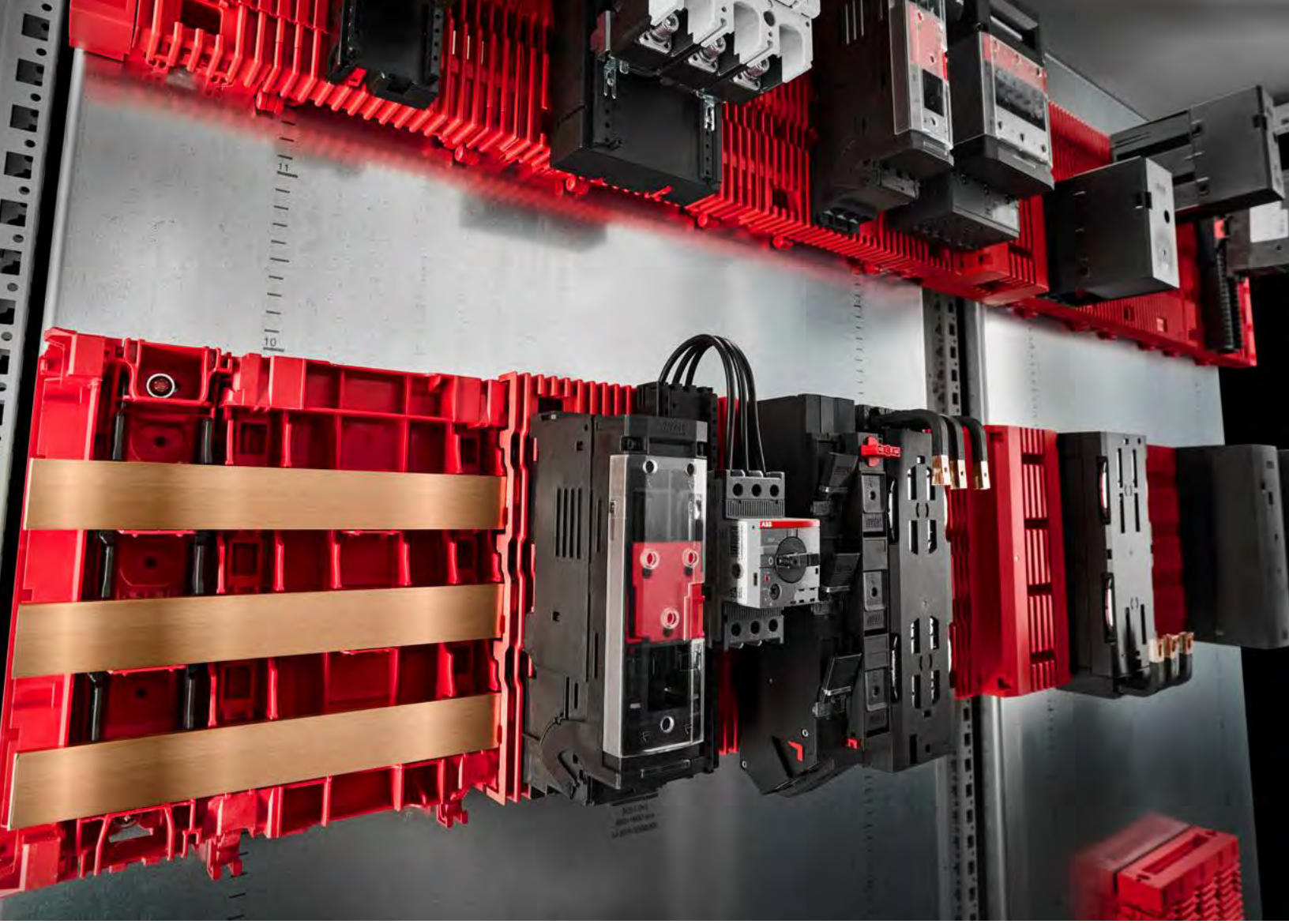

Cut Panel Assembly Time by 80% - RiLineX Power Platform

Validated by Fraunhofer Institute

ENCLOSURES | POWER DISTRIBUTION | CLIMATE CONTROL | IT INFRASTRUCTURE | SOFTWARE & SERVICES

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Contents

1 Executive Summary

Compared to RiLine60, RiLineX offers:

1. 80% faster initial busbar installation (manual and CNC)
2. 82% time savings on device and adapter installation
3. 6x faster enclosure baying speed

The Products:

Rittal has introduced RiLineX, the next generation of 60 mm busbar systems to optimize assembly processes in enclosure manufacturing. The previously used open 60 mm busbar systems, though well established, offer less scope for flexible, space-saving equipment installation and configuration as well as cost and time saving.

The Goal:

The aim of the study conducted by the Fraunhofer Institute for Material Flow and Logistics (IML) was to objectively compare the implementation efficiency of the RiLine60 system to the new RiLineX system.

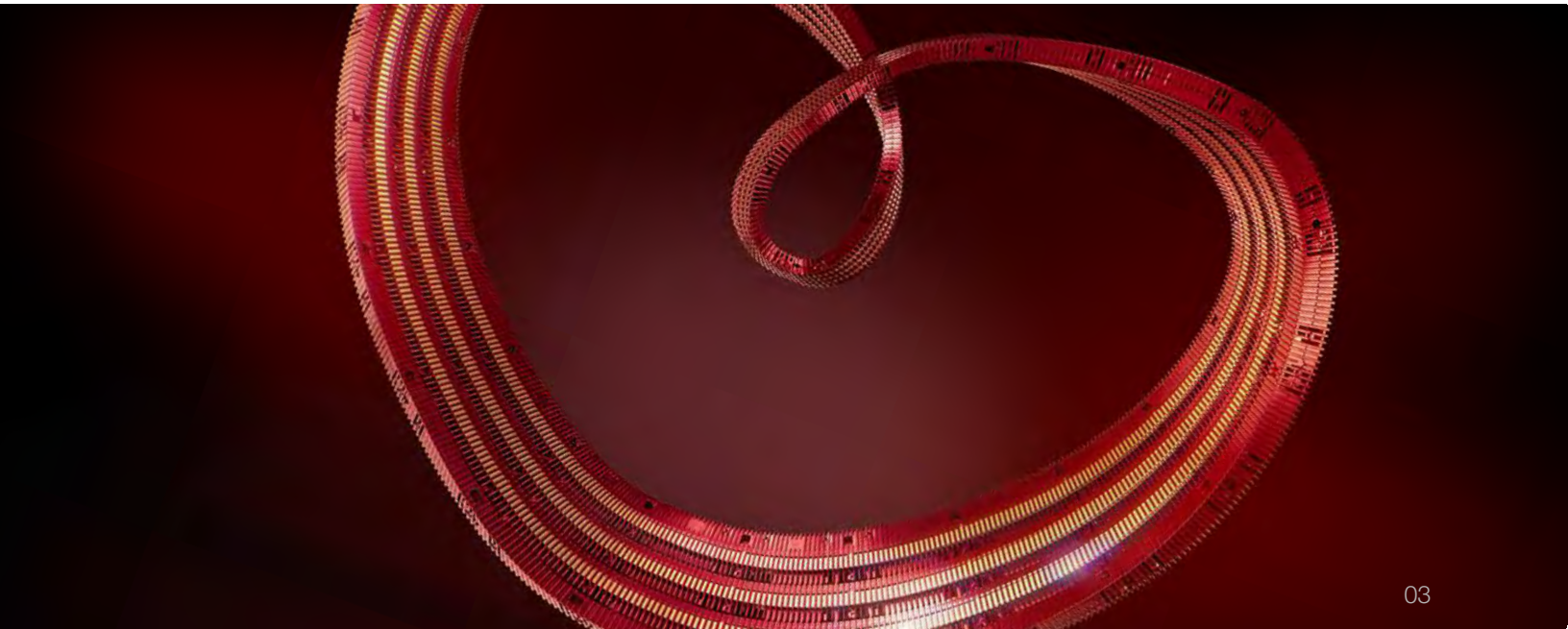
The Results:

Compared to RiLine60, RiLineX achieved:

1. Time savings of up to 80% during the initial assembly of the busbar system, with both manual and CNC-supported machining of the backplate.

2. Time savings of up to 82% when installing individual parts like component adapters thanks to tool-free plug-in technology, modular design, and screw-less, adjustable support rails.

3. About six times faster enclosure baying thanks to its connection technology and precise component fitting.



2| Methodology

The study to measure timings took place over two working days in February 2025 in a real production environment at a specialized panel builder. The data was collected and recorded in accordance with the REFA standard procedure[1].

The following were tested and examined:

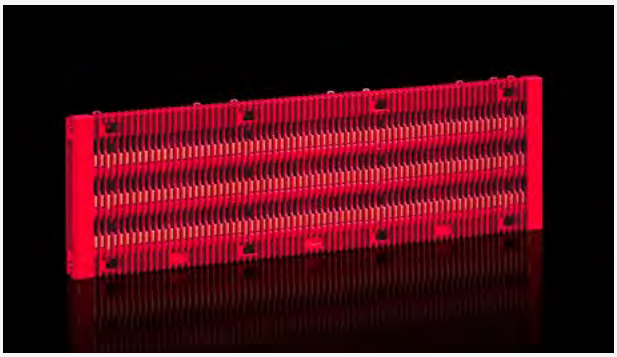
- The initial assembly of a busbar system (manually and with CNC drilling)
- The baying of additional enclosures (section)
- The assembly of components, equipment, and corresponding adapters, including circuit-breakers, NH fuse switch disconnectors, connection adapters, and component adapters

The results were recorded and documented systematically and compared in chart and table form to make it easier to determine any time savings.

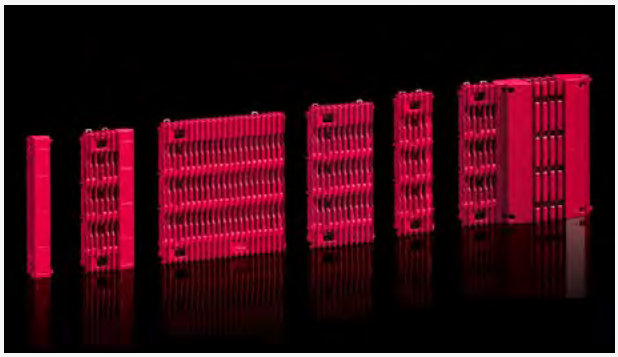
The assembly was performed in two identical enclosures (WHD 1000 × 2000 × 500 mm), each with horizontal installation of the 60 mm busbar systems (3-pole, 800 A) in the upper section of the backplate.

Two identical systems were set up for the traditional busbar system (RiLine60), while both the modular version with individual components and the pre-assembled complete solution, which is ready for immediate use, were tested for RiLineX.

RiLineX Complete Board



RiLineX Modular Board



1. REFA is the abbreviation for the 'Reichsausschuss für Arbeitszeitermittlung' (Committee for Working Time Determination) founded in 1924. Since 1977, it has been known as 'REFA – Verband für Arbeitsstudien und Betriebsorganisation e. V.' (REFA – Association for Work Studies and Business Organisation). Its main task is to develop and promote practical methods for optimizing work processes and increasing economic efficiency. The standard research procedure is used for the objective analysis and assessment of workflows and time data in industrial processes.

Installation of RiLineX Enclosures

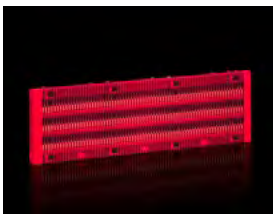
Installation of RiLine60 Enclosures

The baying of additional enclosures was carried out to assess the versatility and modularity of the connecting system.

3 | Results Overview

3.1 Assembly of the Busbar System

The table shows the average assembly times for RiLine60 and RiLineX for manual and CNC drilling.

Process type	RiLine60	RiLineX modular board	RiLineX complete board	Time saving with RiLineX
				
Manual drilling	37:30 min.	13:54 min.	8:35 min.	Up to 75-80%
CNC drilling	22:53 min.	10:14 min.	4:46 min.	Up to 80%

Equipment on RiLine60

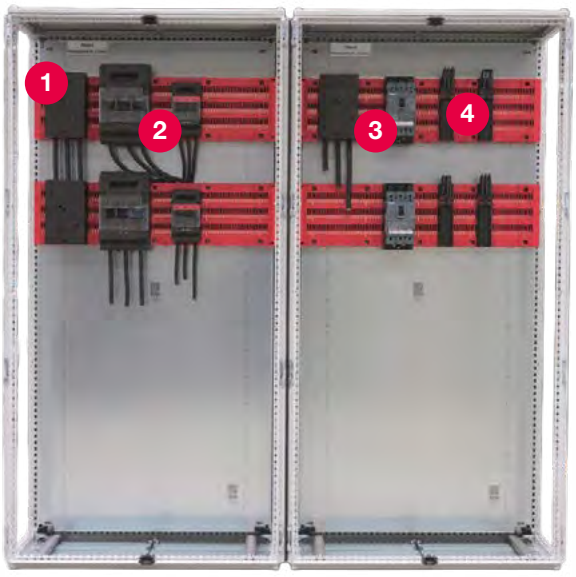
1 Connection adaptor

2 Fuse-switch disconnector

3 CB component adaptor

4 Component adaptor

Equipment on RiLineX

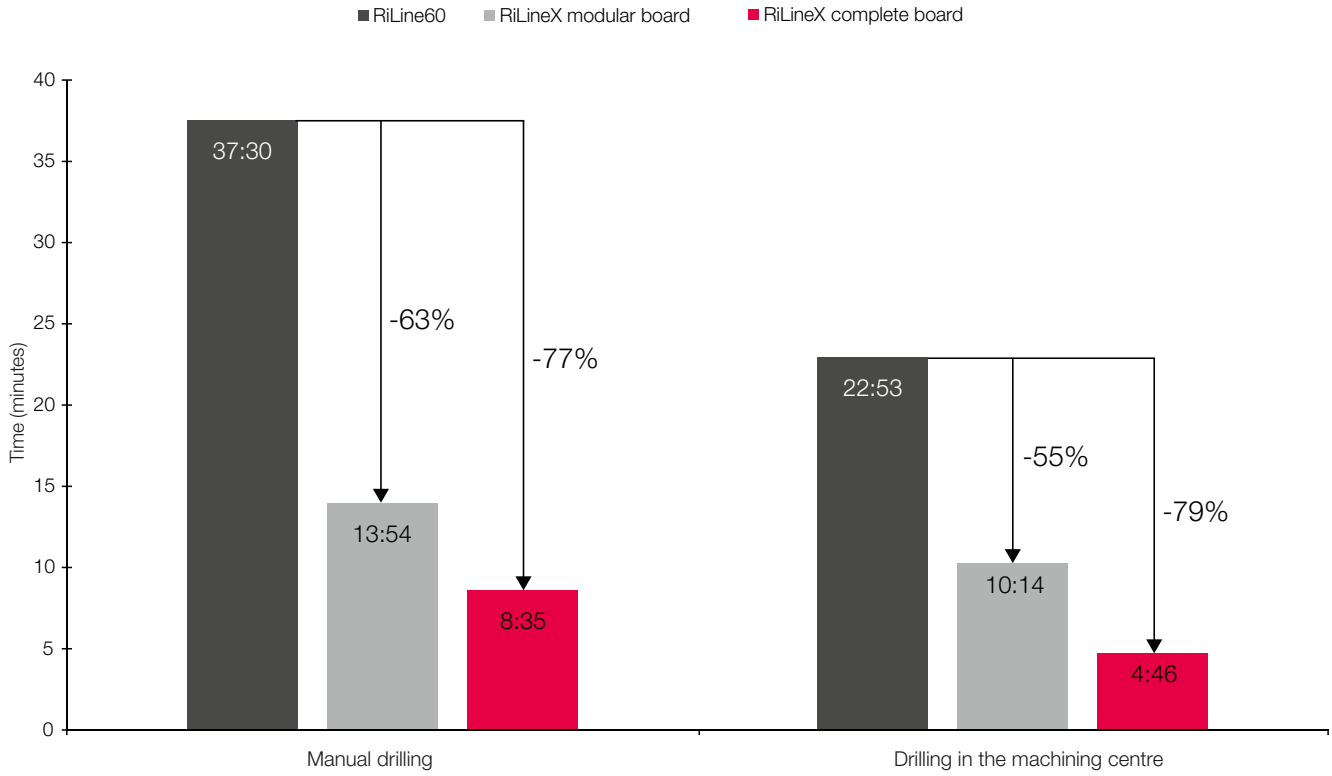


The graphic clearly highlights that RiLineX, in particular the option with a fully pre-assembled complete board, reduces the **assembly time compared to RiLine60 by up to 80%**.

This is primarily due to the **modular construction that enables tool-free, "click-in" assembly,** as well as its pre-assembled design that can be used straight from the packaging.

This leads to a **reduction in installation time and labor costs for each project,** which further lead to an impressive increase in productivity.

Assembly Times of the Busbar Systems

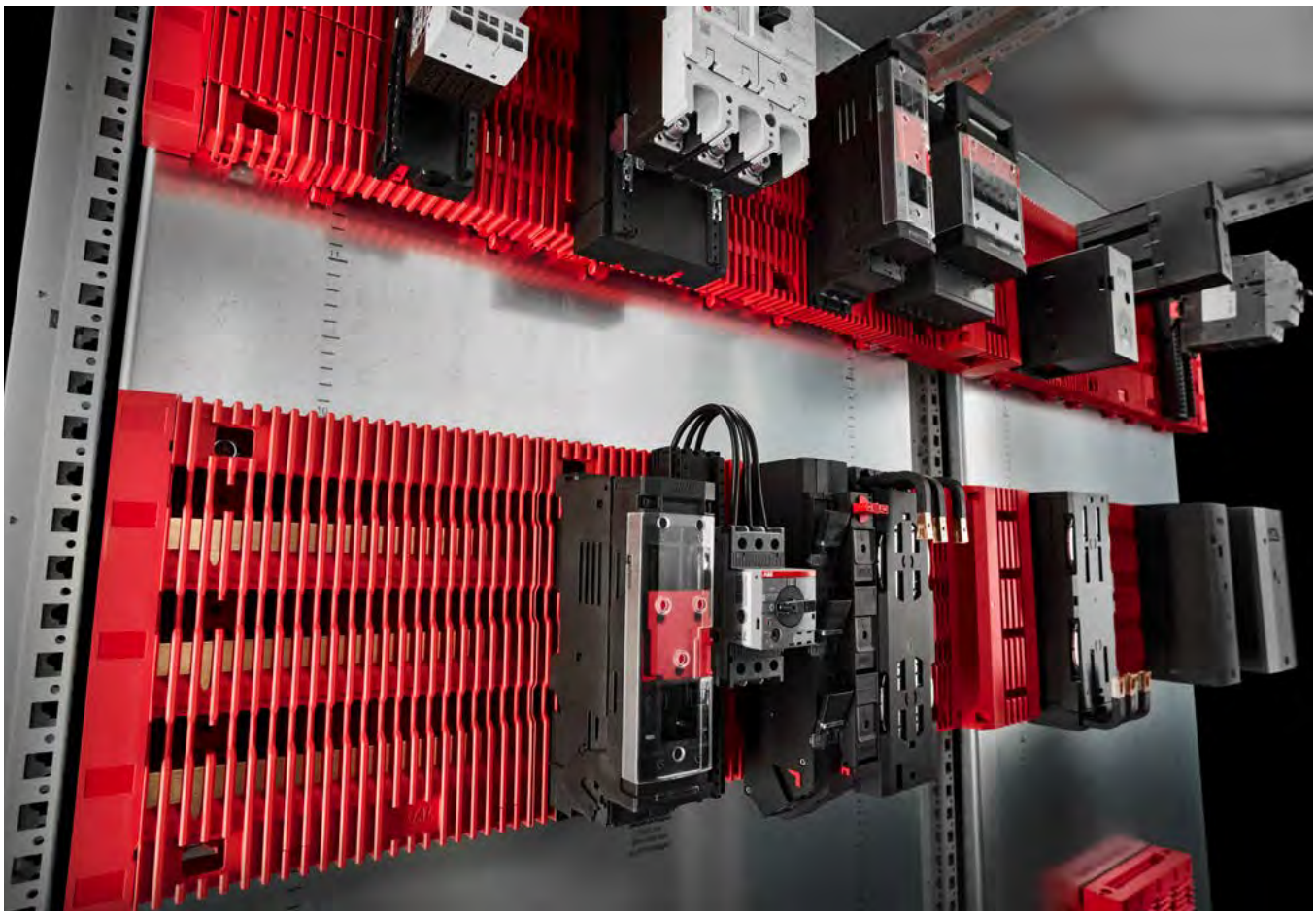


3.2 Assembly of Equipment, Connectors, and Adapters

The assembly times of a variety of equipment, connectors, and adapters on a RiLine60 busbar system and the RiLineX platform are compared here.

Process	RiLine60	RiLineX	Time saving with RiLineX
Connection adapter with through-wiring	10:26 min.	7:32 min.	28%
Connection adapter without through-wiring	5:05 min.	5:12 min.	0%
Fuse switch disconnector without micro-switch	3:59 min.	3:02 min.	24%
Assembly of a circuit-breaker on the CB component adapter type "Easy Fix"	6:48 min.	4:26 min.	35%
Component adapter	2:06 min.	0:23 min.	82%

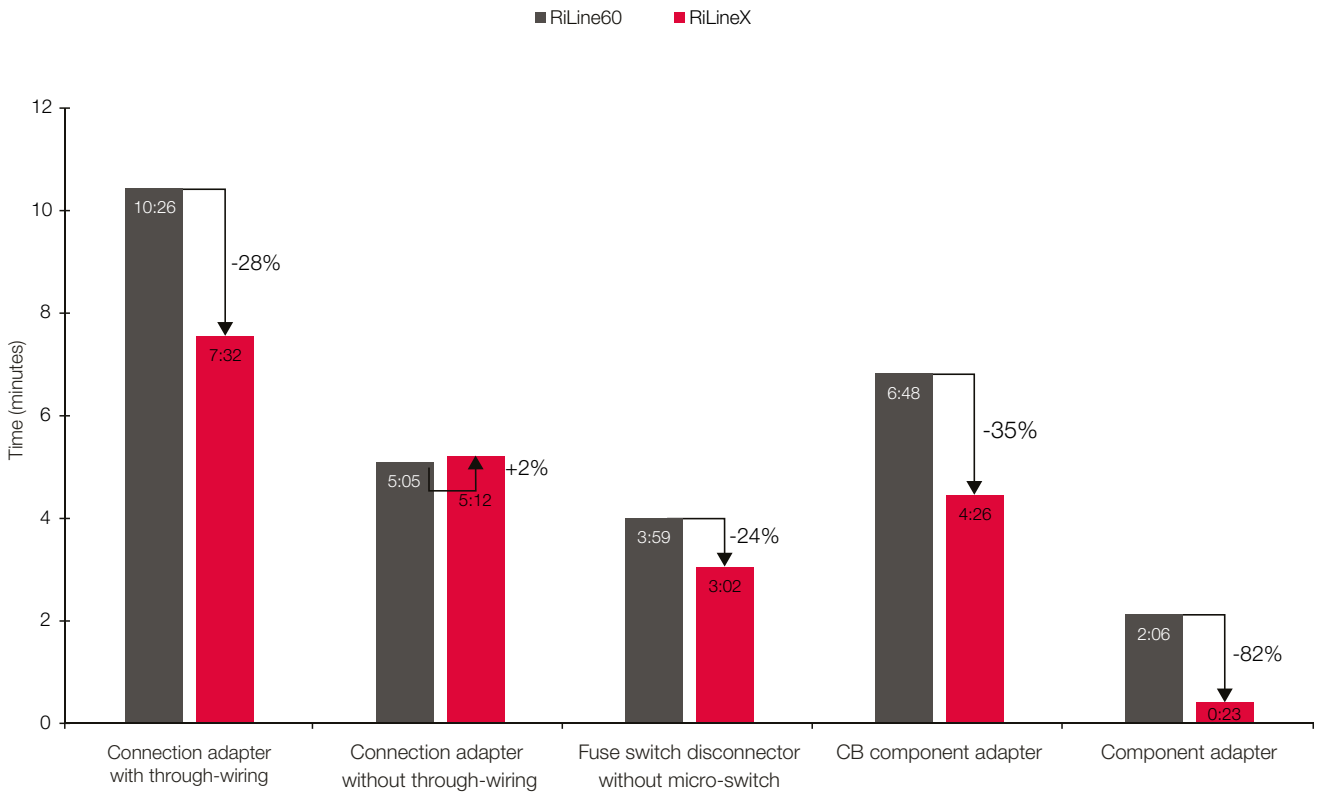
Components and Equipment on RiLineX



The graph below shows that RiLineX enables faster assembly for almost all types of equipment and connectors, with the **component adapter** standing out in particular **with a time saving of over 80%.**

The optimized adapter design, **tool-free plug-in technology,** and simple adjustment options of the support rails (screw-less) make the RiLineX component adapters significantly more efficient.

Assembly Times of Devices and Adapters



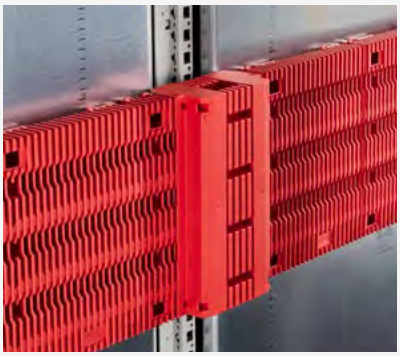
3.3 Baying Additonal Enclosures

The table and chart below compare the assembly time for baying an additional enclosure to both systems.

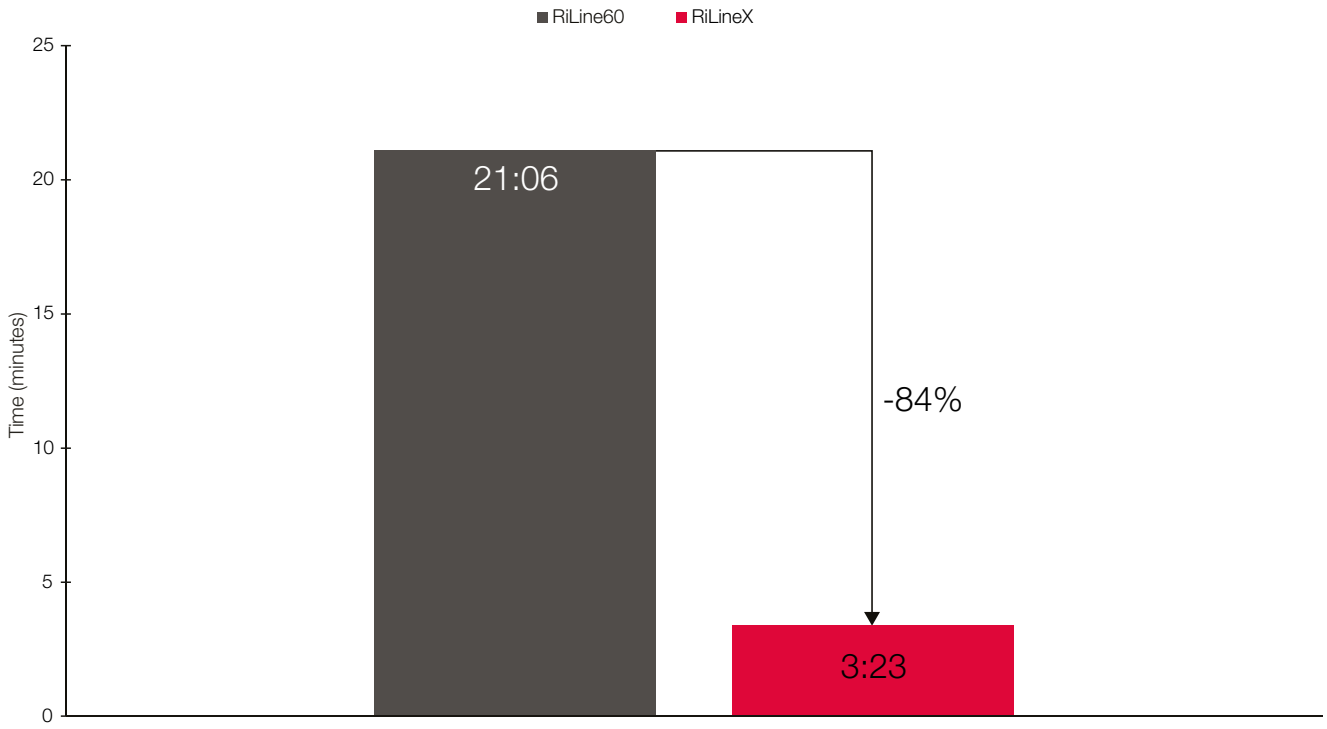
An additional enclosure can be bayed **around 6 times faster with RiLineX than with RiLine60.** The precise-fitting components and simplified connection technology, which is designed to fit the geometry of Rittal VX25 enclosures, greatly contribute to the assembly time reduction.

Process	RiLine60	RiLineX	Time saving with RiLineX
Baying	21:06 min.	3:23 min.	80%

Baying for RiLineX



Assembly Time for Baying an Additional Enclosure



List of items in the test set-up

VX25 enclosure And Accessories
(WHD 1000x2000x500 mm, with base/plinth and doors, without side panels)

8005.000
2 packs of VX25 basic enclosure, 1000 x 2000 x 500 mm
8660.005
2 packs of VX25 base/plinth corner pieces 100 mm
8660.032
2 packs of VX25 side base/plinth trim panels 100 mm

1. RiLine60 items (enclosure 1 & enclosure 2)

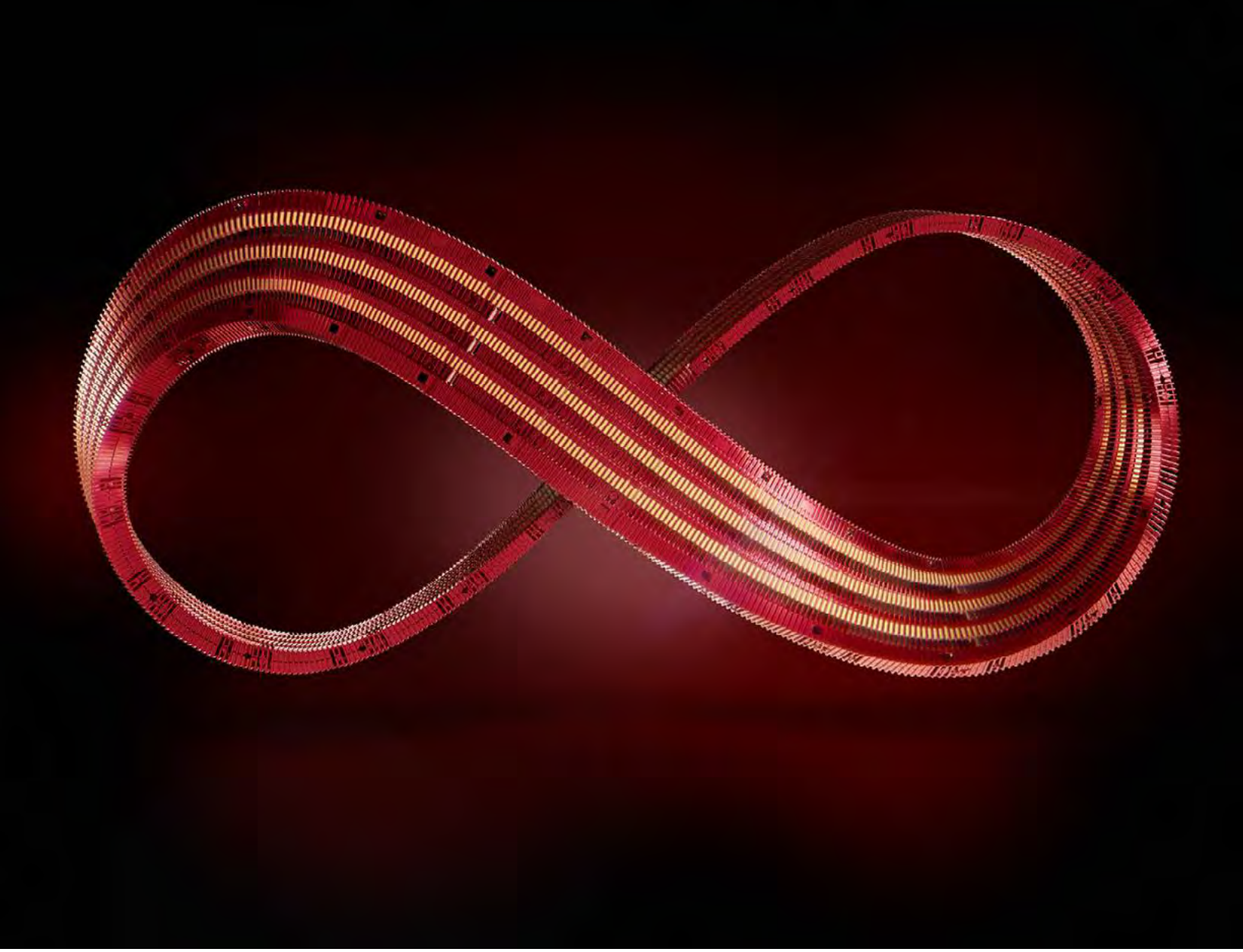
- 1.1 9340.050 8 packs of busbar supports, 3-pole
- 1.2 9340.130 3 packs of base tray 1100 mm
- 1.3 9340.140 2 packs of base tray infills
- 1.4 9340.070 4 packs of end covers
- 1.5 9340.210 2 packs of cover sections (contact hazard protection cover)
- 1.6 9340.220 2 packs of support panels
- 1.7 9340.230 2 packs of cross members
- 1.8 9342.280 4 packs of connection adaptors 800 A top/bottom (9342.300)
- 1.9 9345.610 4 packs of CB component Adaptors 250 A, outlet At the bottom
- 1.10 9343.000 2 packs of NH fuse-switch disconnectors size 00, outlet at the bottom
- 1.11 9343.100 2 packs of NH fuse-switch disconnectors size 1, outlet at the bottom
- 1.12 9340.310 2 packs of OM Adaptors 45 mm/25 A 1 x support rail
- 1.13 9340.410 2 packs of OM Adaptors 55 mm/65 A 1 x support rail
- 1.14 3584.000 1 pack of E-Cu flat copper busbars 30 x 5 mm (pack of 6 @ 2.4 m)
- 1.15 9320.030 3 packs of busbar connectors 30 x 5 enclosure/enclosure (pack of 3)

2. RiLineX items (enclosure 1)

- 2.1 9360.0xx 2 packs of RLX complete board 3p / 400 A, 905 mm
- 2.2 9360.000 2 packs of RLX baying set, long 3p / max. 800 A
- 2.3 9360.240 2 packs of RLX connection Adaptor 3p / 800 A
- 2.4 9362.030 2 packs of RLX NH fuse-switch disconnector size 00
- 2.5 9362.140 2 packs of RLX NH fuse-switch disconnector size 1

3. RiLineX items (enclosure 2)

- 3.1 9360.101 1 pack of RLX end module set 3-pole
- 3.2 9360.120 2 packs of RLX basic module 200 mm
- 3.3 9360.240 1 packs of RLX connection adaptor 3p / 800 A
- 3.4 9360.512 2 packs of RLX CB component adaptor Easy-Fix 250 A
- 3.5 9360.740.2 2 packs of RLX OM Adaptors 45A
- 3.6 9360.760.2 2 packs of RLX OM Adaptors 65A
- 3.7 3584.000 1 pack of E-Cu flat copper busbars, 30x5 mm (from RL60 part list)



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