Increased efficiency in power distribution engineering: RiLineX – the Power Platform

A summary of the Fraunhofer REFA study

SCHALTSCHRÄNKE · STROMVERTEILUNG · KLIMATISIERUNG · IT-INFRASTRUKTUR · SOFTWARE & SERVICE

RITTAL

FRIEDHELM LOH GROUP

Contents

1 Executive summary

As part of continuous and ongoing development of modern power distribution systems, Rittal has introduced in RiLineX a new and the next generation of 60 mm busbar systems to achieve system-wide benefits in engineering and, in particular, optimisation of assembly processes in enclosure manufacturing. The previously used open 60 mm systems with busbar supports whilst well established have somewhat less scope for flexible, space-saving equipment installation and configuration as well as cost and time saving.

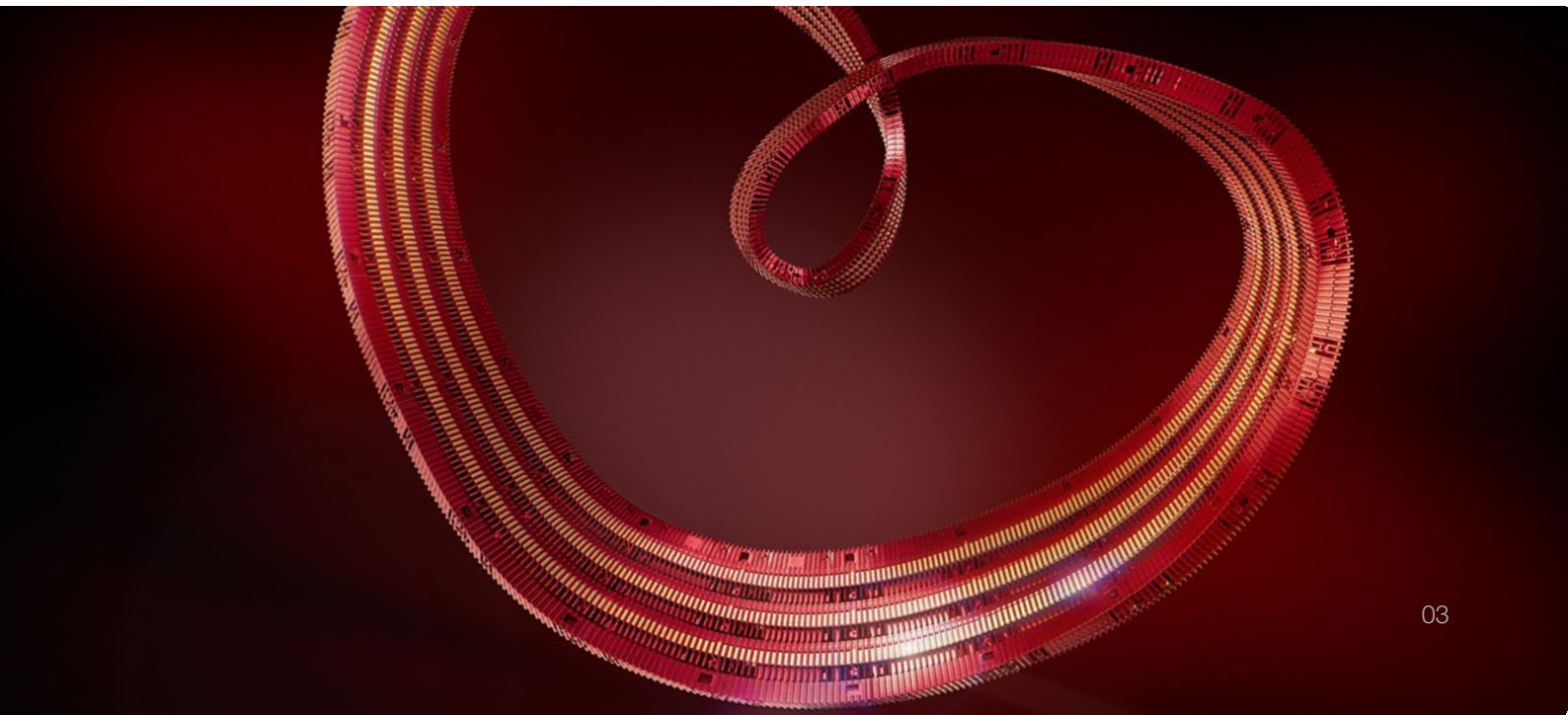
The aim of the REFA study, conducted by the Fraunhofer Institute for Material Flow and Logistics (IML), was to objectively compare the assembly times of the two systems. And specifically, it sought to determine those process steps where RiLineX offered significant advantages and how these could positively affect overall assembly time. A 60 mm busbar system, 3-pole, with a load capacity of 800 A, and fitted with standard flat copper bars, served as the control baseline.

The REFA study comprehensively outlined that the RiLineX platform offers significant efficiency advantages over other more established 60 mm busbar systems in almost all the researched assembly processes. Time savings of up to 80% were achieved, in particular during the initial assembly of the busbar system, with both manual and CNC-supported machining of the mounting plate. RiLineX also impresses with regard to assembling devices and adaptors thanks to its tool-free plug-in technology, modular design and the screw-less adjustability of the support rails. Individual items and parts, such as the component adaptor, enable an additional time saving of more than 80%.

A further advantage becomes evident when baying additional enclosures. Thanks to the well-designed connection technology and precise-fitting components, this process is around six times faster with RiLineX than with open 60 mm busbar systems. These results prove that RiLineX not only represents a clear technical development, but also offers an economically attractive solution for modern power distribution engineering.

In addition to the documented time savings, RiLineX also offers impressive ease of installation and clear system structure and functionality. The pre-defined technical system features, such as the specified short-circuit resistance, are an essential and fundamental part of the design and make project-specific engineering easier and ensure safe and reliable implementation in every-day use.

Overall, the study provides a sound basis for companies that want to optimise, improve and streamline their production processes while increasing the quality and safety of their power distribution systems. RiLineX, therefore, stands out as a future-proofing combination of efficiency, safety and technical innovation in power distribution engineering.



2 | Methodology used in the study to compare timings

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

Among other things, the following were tested and examined:

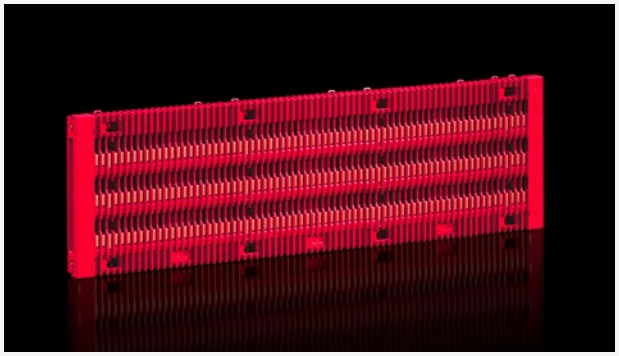
- The initial assembly of a busbar system (manually and with CNC drilling)
- The baying of an additional enclosure (section)
- The assembly of components, equipment and corresponding adaptors, including circuit-breakers, NH fuse switch disconnectors, connection adaptors and component adaptors

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

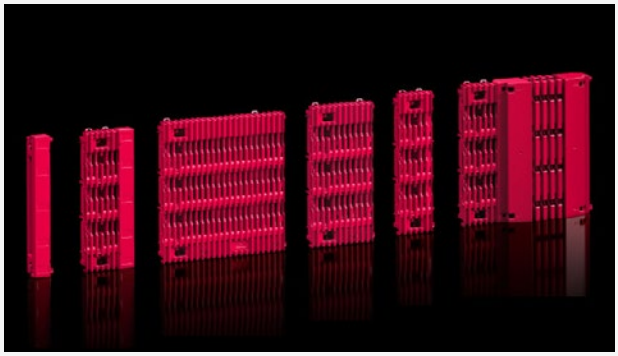
The assembly was performed in two identical enclosures (WHD 1000 × 2000 × 500 mm), each with horizontal installation of the 60 mm busbar systems (3-pole, 800 A) in the upper section of the mounting plate.

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 optimising 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

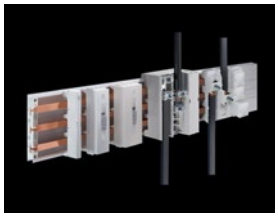
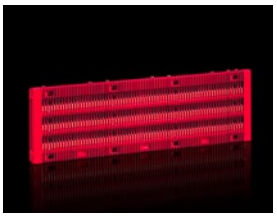
Installation of RiLine60 enclosures

In addition, the baying of a further enclosure was carried out to assess the versatility and modular-based nature of the connecting system and technology.

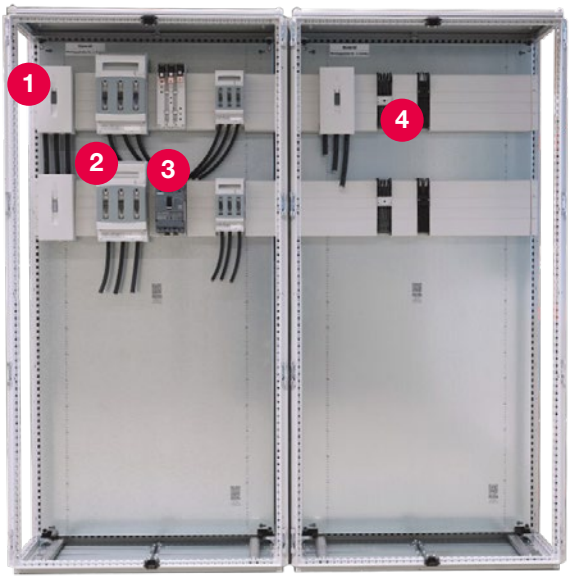
3 | Results overview

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



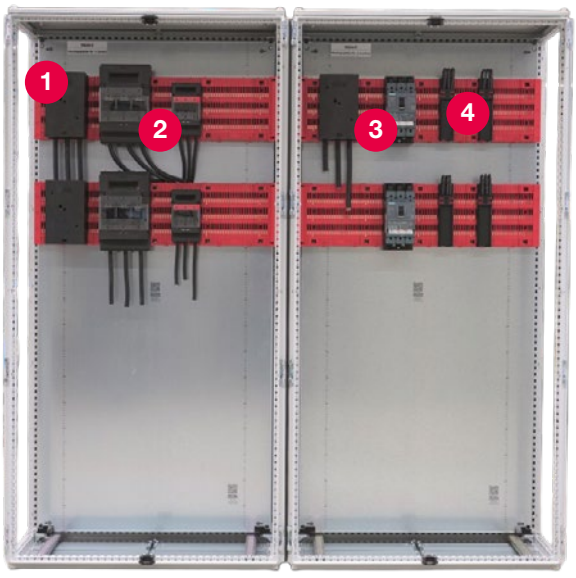
1 Connection adaptor

2 Fuse-switch disconnector

3 CB component adaptor

4 Component adaptor

Equipment on RiLineX

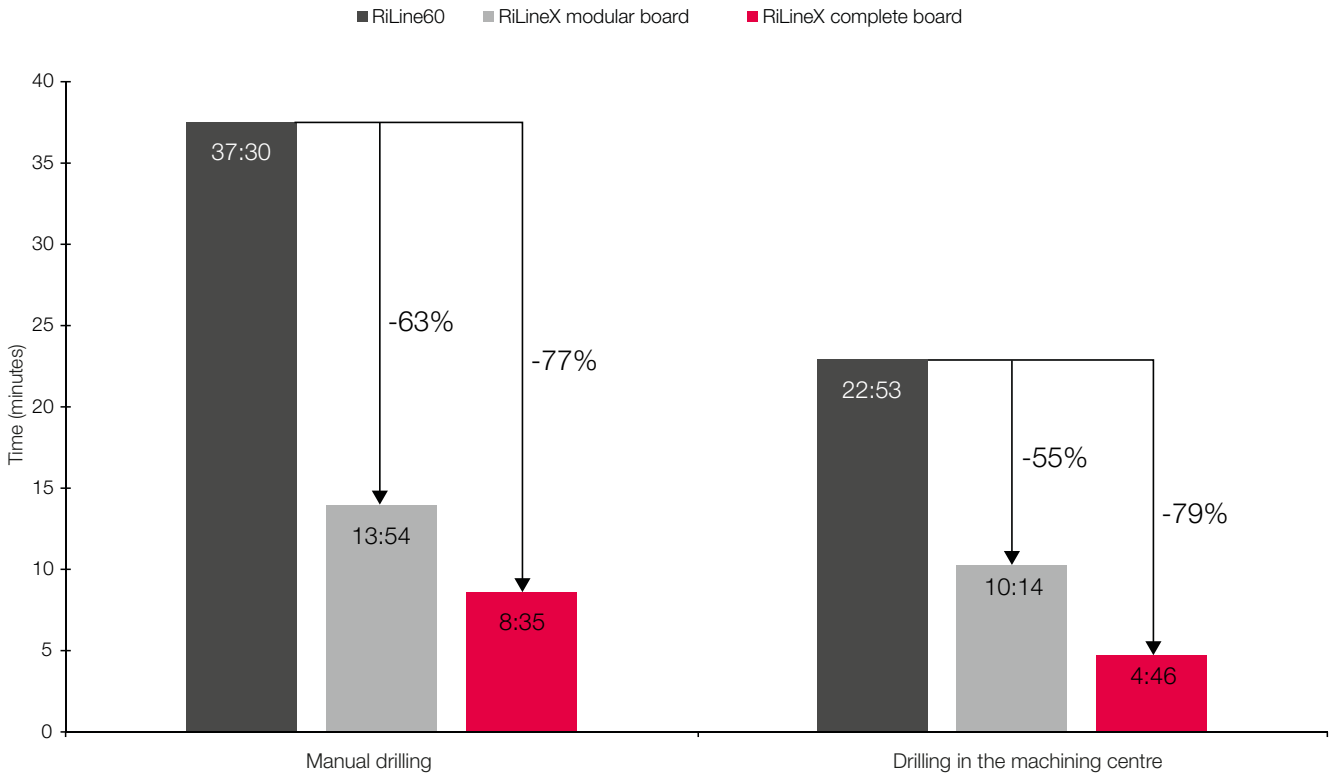


The graphic clearly highlights that RiLineX, in particular the option with a fully pre-assembled complete board, reduces the **assembly time compared to RiLine60 by up to 80%**.

This is thanks primarily to the **modular construction that enables tool-free assembly using "Click & Work"** or even also the installation of pre-assembled complete boards – taken out and used straight from the packaging.

This leads to a radical **reduction in installation and time** and **lowers the labour costs** for each project. **This significantly greater efficiency leads to marked and impressively increased productivity.**

Assembly times of the busbar systems

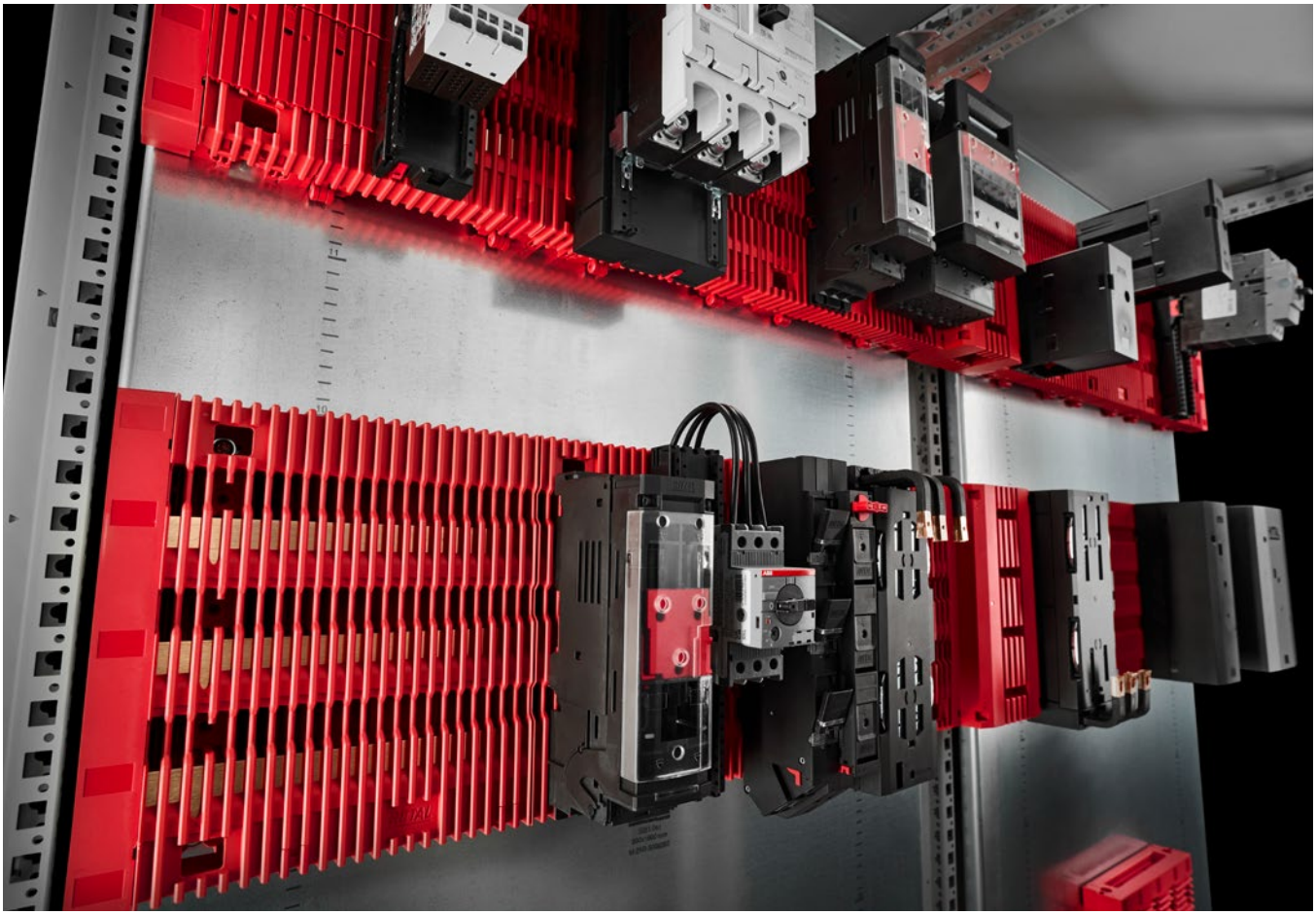


3.2 Assembly of equipment, connectors and adaptors

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

Process	RiLine60	RiLineX	Time saving with RiLineX
Connection adaptor with through-wiring	10:26 min.	7:32 min.	28%
Connection adaptor 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 adaptor type "Easy Fix"	6:48 min.	4:26 min.	35%
Component adaptor	2:06 min.	0:23 min.	82%

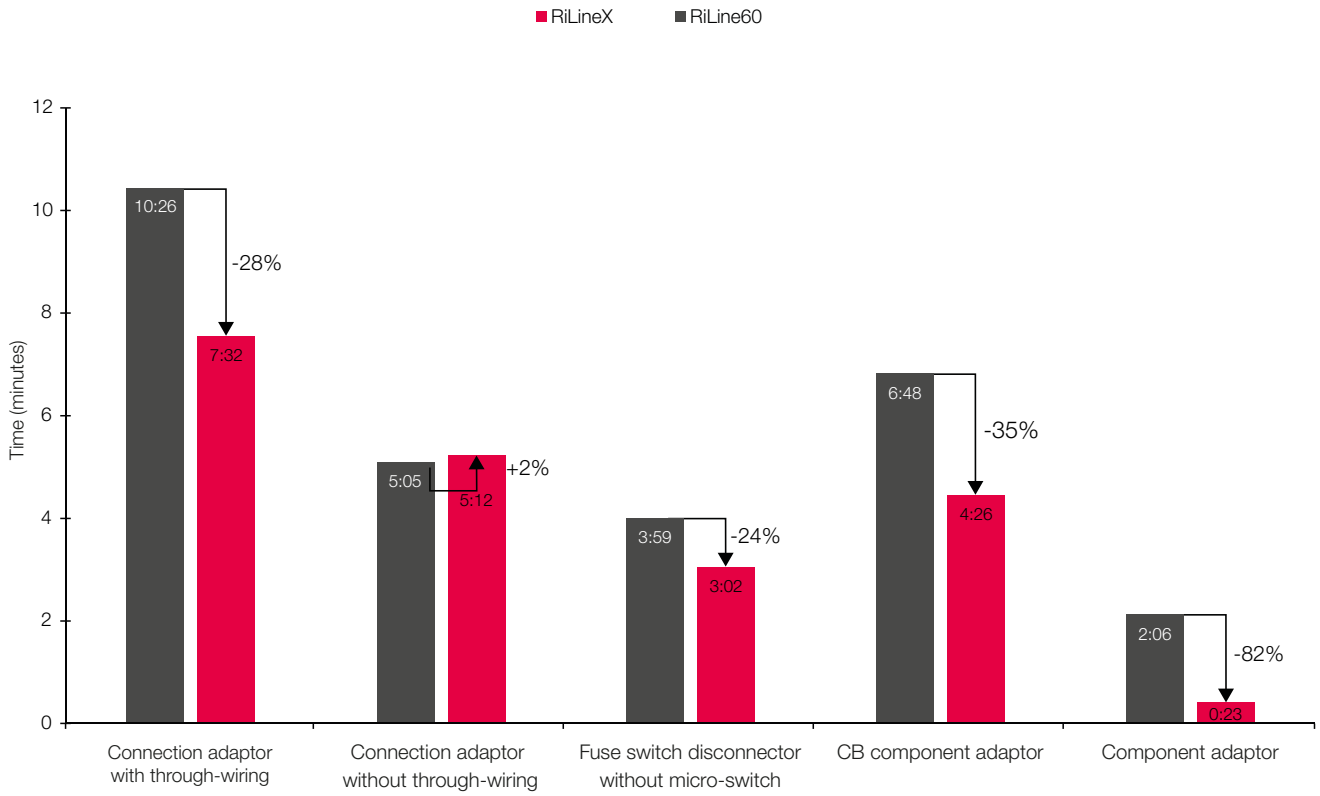
Components and equipment on RiLine



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

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

Assembly times of devices and adaptors



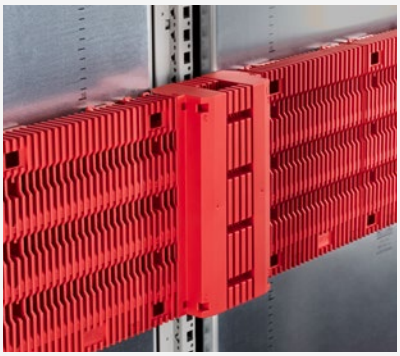
3.3 Baying an additonal enclosure

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

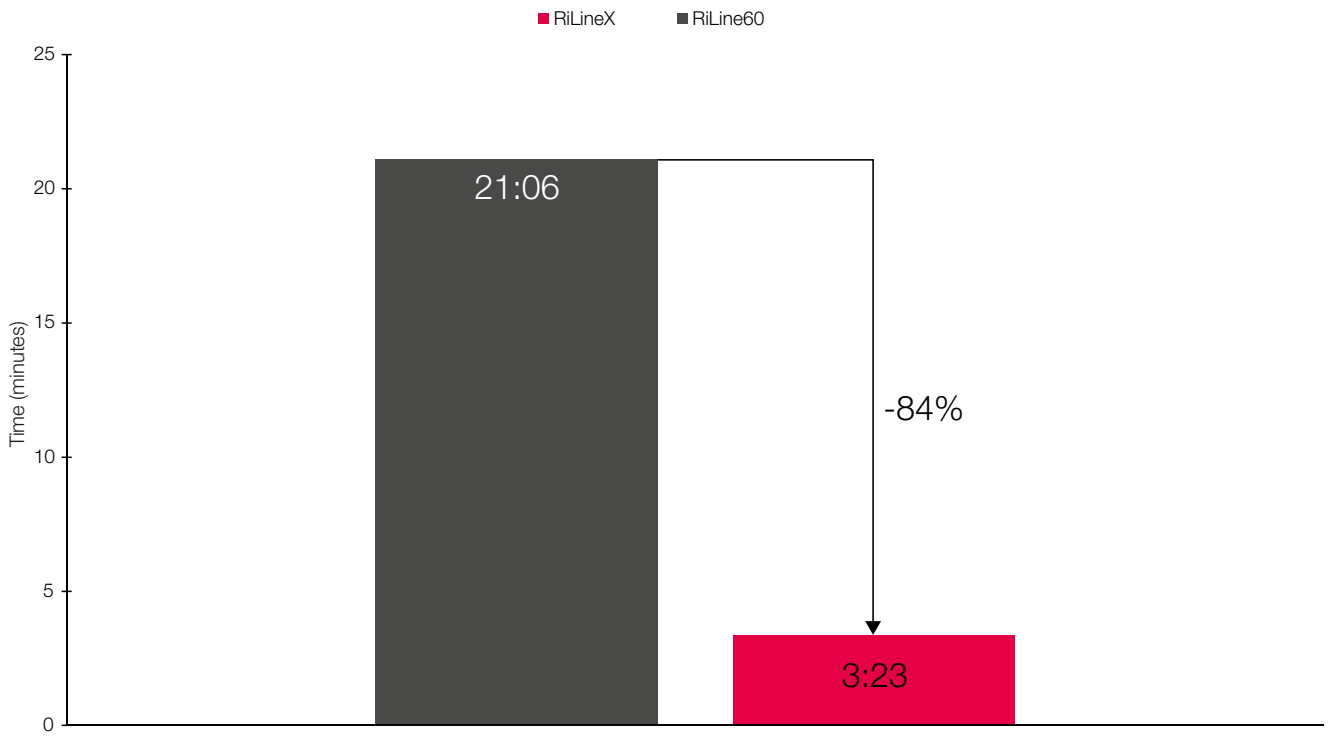
An additional enclosure can be bayed **around 6 times faster with RiLineX than with RiLine60.** The simplified connection technology which is designed to fit the geometry of Rittal VX25 enclosures and the precise-fitting components contribute significantly to the drastic reduction in assembly time.

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)

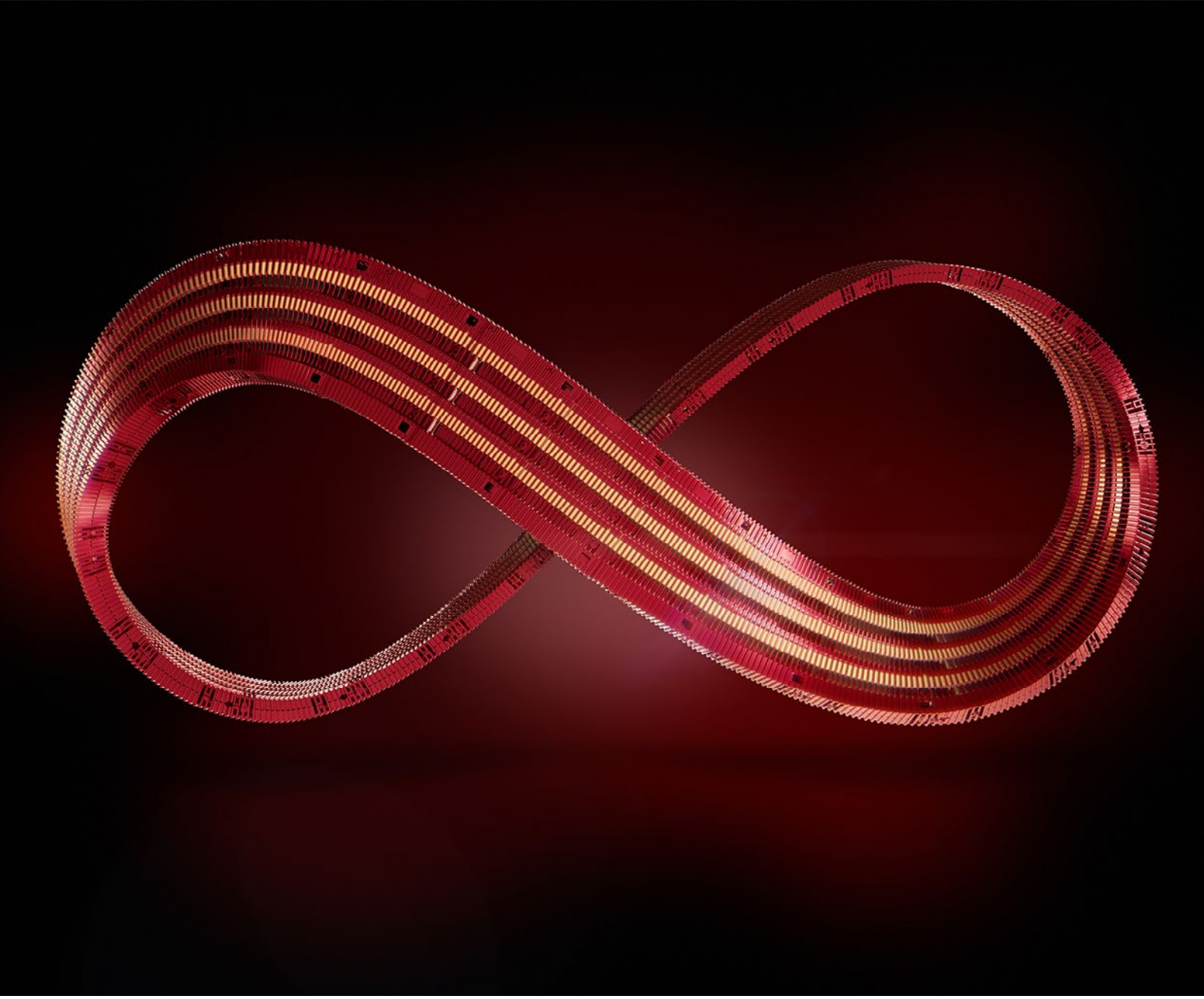
- 1.1 9340.050 8 packs of busbar supports, 3-pole
- 1.2 9340.130 3 packs of base tray 1100 mm
- 1.3 9340.140 2 packs of base tray infills
- 1.4 9340.070 4 packs of end covers
- 1.5 9340.210 2 packs of cover sections (contact hazard protection cover)
- 1.6 9340.220 2 packs of support panels
- 1.7 9340.230 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



Increased efficiency in power distribution engineering: RiLineX – the Power Platform

A summary of the Fraunhofer REFA study

2025

Get ready for the All-Electric Society

Make your systems future-proof – thanks to standardisation across the energy sector

SCHALTSCHRÄNKE · STROMVERTEILUNG · KLIMATISIERUNG · IT-INFRASTRUKTUR · SOFTWARE & SERVICE

RITTAL

FRIEDHELM LOH GROUP