

Expert Opinion

– Translation –

Document number: (3417/307/14) – CM dated 17/10/2014

Client: Adolf Würth GmbH & Co. KG
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Order date: 13/10/2014

Order ref: Mr Sailer

Order received: 13/10/2014

Subject: Assessment of Würth VARIFIX® 41 C-mounting rail systems
in conjunction with VARIFIX® Systemfix 41 regarding their
behaviour on exposure to fire according to the standard
temperature-time curve in accordance with DIN EN 1363-1

Basis for assessment: See Section 1

Valid until 17/10/2019

This expert opinion comprises 7 pages including cover sheet and 5 annexes.

This expert opinion is no substitute for the certificate of suitability for use (abP, abZ, ETA) in accordance with the German supervisory authority approval requirements.



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1 General

An expert opinion on the Würth VARIFIX® 41 C-mounting rail systems in conjunction with VARIFIX® Systemfix 41 was commissioned in writing by Würth on 13/10/2014.

The documents serving as basis for the expert opinion are listed below:

- [1] DIN EN 1363-1 : 1999-10, Fire resistance tests - Part 1: General Requirements,
- [2] DIN 4102-4 : 1994-03, Fire Behaviour of Building Materials and Components,
- [3] Specimen guideline on fire protection requirements pertaining to conduits (Specimen Conduit Guideline (German designation: MLAR)), edition of 17/11/2005,
- [4] Test Report No. 3176/176/13-CM, issued by MPA Braunschweig,
- [5] Technical data sheets from the client for Würth C-mounting rail systems VARIFIX® 41

The assessment regarding maximum load and necessary minimum clearance distances depending on the fire resistance time for Würth VARIFIX® 41 C-mounting rail systems was conducted on the basis of the tests carried out with Würth VARIFIX® 41 C-mounting rail systems under exposure to fire according to the standard temperature-time curve in accordance with DIN EN 1363-1.

Existing technical directives and technical specifications currently provide no complete design concept for mounting rail systems covering situations that arise in the event of fire. There is currently no construction supervisory authority approval or verification certificate (e.g. ETA) for Würth VARIFIX® 41 C-mounting rail systems that lays down the regulations to be met in the event of fire.

The following Würth VARIFIX® 41 C-mounting rail systems in conjunction with VARIFIX® Systemfix 41 are covered by this assessment:

- (1) Würth VARIFIX® 41 C-mounting rail systems with Würth VARIFIX® 41/22/1,80 C-mounting rail, for direct fastening (span \leq 450 mm),
- (2) Würth VARIFIX® 41 C-mounting rail systems with Würth VARIFIX® 41/22/2,50 C-mounting rail, for direct fastening (span \leq 450 mm),
- (3) Würth VARIFIX® 41 C-mounting rail systems with Würth VARIFIX® 41/41/2,50 C-mounting rail, for direct fastening (span \leq 450 mm),

The following assessment for Würth VARIFIX® 41 C-mounting rail systems excludes direct use of the system for structures, which, as a total system (e.g. for cable systems designed to maintain circuit integrity and cable trunking/ducts in accordance with DIN 4102-12: 1998-11) are required to meet the requirements of a particular classification (functional integrity or fire resistance classification). For these types of applications, further assessments and tests of the system as a whole are necessary. For electrical trunking/ducts that must meet requirements regarding functional integrity classification, the constraints of the applicable general construction supervisory authority test certificate must also be adhered to.

2 Description of the structural design of Würth VARIFIX® 41 C-mounting rail systems

2.1 General requirements

Würth VARIFIX® 41 C-mounting rail systems are made from galvanized steel or, respectively, stainless steel (material nos. 1.4401, 1.4571).

The stated loads for several single loads are summated values for the maximum total loads per fastening point on the rail. Multiple loads (arranged adjacently) may be arranged as long as the total load does not exceed the stated single load.

Single loads are taken up centrally and multiple loads are distributed and taken up uniformly over the mounting rail system. Where this is not feasible, the loads must be reduced so that the maximum permissible steel stresses in the threaded rods are not exceeded. The maximum permissible steel

stresses for each system are calculated from the normal forces (resulting from the central / symmetrical load distribution) acting on the threaded rods of the suspension system, relative to the calculated cross section of the threaded rods (e.g. M10 $\Rightarrow A_s = 58 \text{ mm}^2$).

Threaded rods of at least the M10 size (strength ≥ 4.8 grade) and nuts of the M10 size (≥ 8 grade) must be used for the suspension system. Where multiple-span systems are installed (continuous beams), the intermediate supports in the form of threaded rod hangers must be of at least the M12 size.

The fastenings in the subfloor must be made in accordance with Section 5.4.

2.2 Design requirements for Würth VARIFIX® 41 C-mounting rail systems fastened directly to the subfloor

When Würth VARIFIX® 41 C-mounting rail systems are fastened directly to the ceiling, the open side of the rail profile faces downwards. The items to be installed on the rails are attached using Würth VARIFIX® Systemfix 41 quick fasteners.

Nodes between the rails and the threaded rods take the form of Würth Varifix® retaining clips, size \geq HK M10, positioned on both sides, in conjunction with the corresponding nuts. The lateral rail projection distance, measured from the central axis of the vertical fastening (threaded rod, threaded bolt), is $a \geq 50 \text{ mm}$.

The fixing of fire-rated pipe clamps or other installations arranged at the underside of the rail system must be friction-locked.

If fire-rated pipe clamps and other installations permit lower loads, these shall be binding for load connection to the rail.

3 Requirements to be met by the minimum distance of Würth VARIFIX® 41 C-mounting rail systems, taking the requirements of the Specimen Conduit Guideline (German designation: MLAR 11/20059 into account)

3.1 General requirements

In applications where Würth VARIFIX® 41 C-mounting rail systems are used in areas between ceilings (between the suspended and main structural ceiling) and the suspended ceiling is of relevance to fire protection requirements, a minimum clearance distance (min. a) between the top side of the suspended ceiling and the underside of the rails (see fig. 1) must be defined in order to rule out negative effects on the suspended ceiling structure as a result of temperature-dependent vertical deformation of the rail and changes in the length of the threaded rods. As the usable height in areas

above suspended ceilings of relevance to fire protection requirements is limited, and the requirements of the Specimen Conduit Guideline (*MLAR*), version dated 17/11/2005, section 3.5.3, must be adhered to, it is often necessary – with fire exposure according to the standard temperature-time curve – to adhere to the minimum distances min. a.

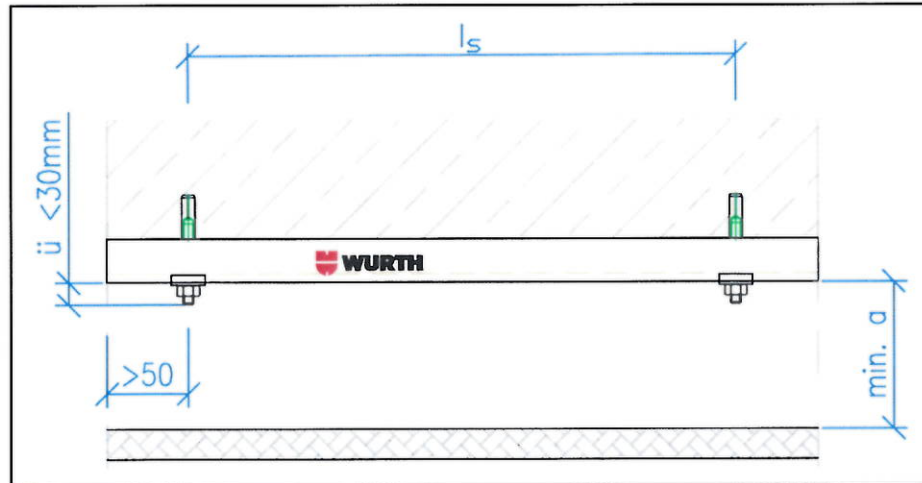


Fig. 1: Schematic diagram showing the use of Würth rail systems in areas above suspended ceilings of relevance to fire protection requirements

It is furthermore assumed for rail systems that the **maximum projection for nuts and threaded rods** does not exceed $\ddot{u} = 30 \text{ mm}$ below the rails. In case of larger projections ($\ddot{u}_{\text{act}} > 30 \text{ mm}$) for threaded rods, the value of $\ddot{u}_{\text{act}} - 30 \text{ mm}$ is to be added to the stated values for minimum distances min. a from the related Tables in the sections below.

All distances given (Annex 5) are applicable only to the mounting system under assessment. Further deformations, for example, as a result of the items installed (e.g., pipes) must be taken into account separately.

3.2 Additional requirements to be met by items installed at the underside (according to Section 2.2)

For combined installations consisting of mounting rails and pipe clamps suspended on the underside (according to Section 2.2), the necessary minimum distances min. a for the individual items installed must be added resulting in the **total minimum distance** min. a_{total}.

Example: Mounting system in conjunction with fire-rated pipe clamps

$$\text{min. a}_{\text{total}} = \text{min. a}_{\text{rail}} + \text{min. a}_{\text{clamp}}$$

min. a_{total} : total distance

min. a_{rail} : distance in accordance with the following sections

min. a_{clamp} : distance in accordance with the corresponding test report or expert opinion

4 Assessment for directly mounted rails (single-span systems) using Würth VARIFIX® 41 C-mounting rail systems (Annex B)

The directly mounted Würth C-mounting rail systems VARIFIX® 41/22/1,80, VARIFIX® 41/22/2,50 and VARIFIX® 41/41/2,50 are executed with installations suspended at the underside.

The design constraints to be adhered to in terms of fire protection can taken from Section 2. The sizing tables can be taken from Appendix B (Annexes 4 and 5), which also contains examples for installation situations.

5 Special notes

- 5.1** This Expert Opinion is no substitute for the certificate of suitability for use (abP, abZ, ETA) in accordance with German supervisory authority approval requirements.
- 5.2** This Expert Opinion applies only to the Würth VARIFIX® 41 C-mounting rail systems tested here, taking the constraints of the technical data sheets from the test report or the applicable technical data sheets issued by Adolf Würth GmbH & Co. KG into account.
- 5.3** This Expert Opinion for the above mentioned rail systems applies only in conjunction with the corresponding threaded rods (strength class ≥ 4.8) and with components that can be classified in at least the same fire resistance class as the mounting system.
- 5.4** Fasteners with the appropriate fire rating (fire resistance classification) have to be used to fasten the rail mounting systems to structural ceilings or wall structures of the corresponding fire resistance class.

Anchors have to be suitable for the subfloor and the type of application and have to comply with the applicable requirements of the national technical approvals (abZ) issued by the DIBt (German Institute for Construction Technology), Berlin or a European Technical Approval (ETA). If the abZ approval or ETA does not specify the fire behaviour of the fasteners, these are to be installed with $2h_{ef}$ (twice the usual setting depth) – however, at least with a depth of 6 cm – and a maximum computational tensile load per anchor of 500 N (see DIN 4102-4: 1994-03, Section 8.5.7.5). The effective setting depth (h_{ef}) is to be taken from the applicable approval. Alternatively, those anchors may be used the suitability of which in terms of fire protection has been proven through a fire protection certificate (e.g., test and assessment by an accredited inspection authority).

Anchors are to be installed in accordance with the technical documentation (assembly directives), normally in accordance with the requirements as stated in the approval (abZ or ETA). In any case, the suitability of the anchors for the subfloor and the type of application has to be proved also for the normal purpose of use (cold as-installed condition).

5.5 The validity of this Expert Opinion No. (3417/307/14) – CM ends on 17/10/2019.

This document is the translated version of Expert Opinion No. 3417/307/14 – CM dated 17/10/2014. The legally binding text is the aforementioned German Expert Opinion.

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Braunschweig, 17/10/2014

List of appendices

Appendix A: Technical data and design examples

Appendix B: Design of Würth VARIFIX® 41 C-mounting rail systems (directly mounted), maximum loads (acc. to Sections 2 and 4)

Appendix B-1: Design of Würth VARIFIX® 41 C-mounting rail systems (directly mounted), minimum distances min. a

Annex A: Technical data and design examples

Table 1: Range of products for Würth VARIFIX® 41 C-mounting rails (table of materials)

Line	Designation	Remark	Würth art. no.	Material / surface	Strength class
1	Varifix® 41/22/1.8	Mounting rail	0862001233 0862001235	Steel Surface: electro-galvanized	-
1	Varifix® 41/22/2.5	Mounting rail	0862001005 0862001225 0862001229	Steel Surface: electro-galvanized	-
2	Varifix® 41/41/2.5	Mounting rail	0862001006 0862001226 0862001231	Steel Surface: electro-galvanized	-
4	Threaded rod M10	Suspension or load connection	0958 10	Steel Surface: electro-galvanized	4.8
5	Nuts M10	Node/load connection	0317 10	Steel DIN 934 Surface: electro-galvanized	8
6	Retaining clip	Retaining clip	0862005152	Steel Surface: electro-galvanized	No manufacturer information
7	Systemfix 41	Channel nut	0862104002	Steel Surface: electro-galvanized	No manufacturer information

Annex A: Technical data and design examples

Table 2: Range of products for Würth VARIFIX® 41 C-mounting rails

Schienenprofil	Länge mm	Art.-Nr.
41/22/1,8	3.000	0862 001 233
41/22/1,8	6.000	0862 001 235

Schienenprofil	Länge mm	Art.-Nr.
41/22/2,5	2.000	0862 001 005
41/22/2,5	3.000	0862 001 225
41/22/2,5	6.000	0862 001 229

Schienenprofil	Länge mm	Art.-Nr.
41/41/2,5	2.000	0862 001 006
41/41/2,5	3.000	0862 001 226
41/41/2,5	6.000	0862 001 231

Würth VARIFIX® 41/22/1.80 C-mounting rail




Varifix® retaining clip HK



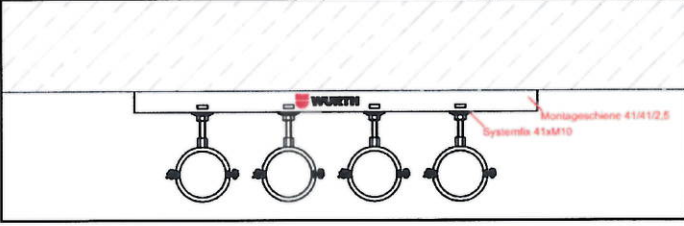
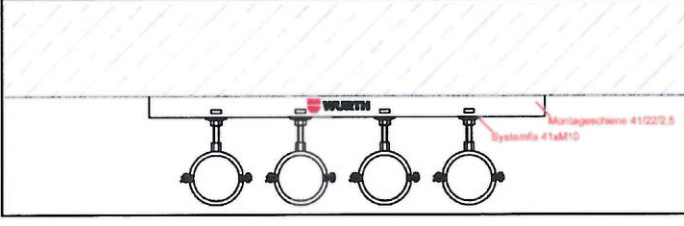
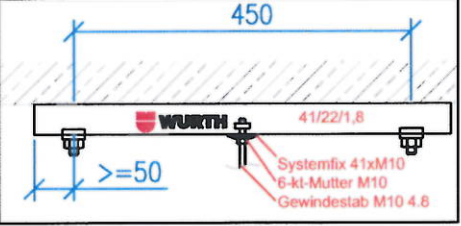
VARIFIX® Systemfix 41

Annex A: Technical data and design examples

Fixing to the subfloor must be made using fire-rated fasteners.

 <p>Montageschiene Halteklammer Befestigung über Brandschutzgeprüften Dübel (Bsp. FAZ/S M10-50)</p>	<p>Detail: Connection by direct mounting</p>
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Installation examples for Würth VARIFIX® 41 C-mounting rail systems¹⁾

	<p>Direct mounting</p> <p>Schematic view of directly mounted Würth VARIFIX® 41 C-mounting rail system, fastened with threaded rods and fire-rated nuts, screws and anchors of $\geq M10$.</p>
	<p>Schematic view of directly mounted Würth VARIFIX® 41 C-mounting rail system, fastened with threaded rods and fire-rated nuts, screws and anchors of $\geq M10$.</p>
	<p>Schematic view of directly mounted Würth VARIFIX® 41 C-mounting rail system, fastened with threaded rods and fire-rated nuts, screws and anchors of $\geq M10$.</p>

¹⁾ The installed items shown (e.g. pipe clamps) are not part of this assessment.

Annex B: Design of Würth VARIFIX® 41 C-mounting rail systems (directly mounted) in conjunction with VARIFIX® Systemfix 41, maximum loads (acc. to Sections 2 and 4)

The tables show the **maximum loads** for the **directly mounted** Würth C-mounting rail systems VARIFIX® 41/22/1.80, VARIFIX® 41/22/2.50 and VARIFIX® 41/41/2.50 in conjunction with VARIFIX® Systemfix 41.

Table B- 1: Maximum loads for directly mounted Würth VARIFIX® 41/41/2.50 C-mounting rail system, for fire resistance times from 30 to 90 minutes

Maximum loads as a function of the fire resistance time		
Span [mm]		Max. load
450		F [kN]
Fire resistance time	30 minutes	0.90
	60 minutes	0.46
	90 minutes	0.30

Table B- 2: Maximum loads for directly mounted Würth VARIFIX® 41/41/2.50 C-mounting rail system, for fire resistance times from 30 to 120 minutes

Maximum loads as a function of the fire resistance time		
Span [mm]		Max. load
450		F [kN]
Fire resistance time	30 minutes	0.90
	60 minutes	0.47
	90 minutes	0.31
	120 minutes	0.23

Annex B-1: Design of Würth VARIFIX® 41 C-mounting rail systems (directly mounted), minimum distance min. a

The tables show the **minimum distances min. a**, referred to the mounting rails, to the components below, as a function of the span and load for the rail systems.

Table B- 3: Minimum distances min. a for directly mounted Würth C-mounting rail systems VARIFIX® 41/22/1.80 and VARIFIX® 41/22/2.50 for fire resistance times from 30 to 90 minutes

Minimum distance a [mm] as a function of the fire resistance time and the maximum load			
Span [mm]		Max. load	Minimum distance
450		F [kN]	a [mm]
Fire resistance time	30 minutes	0.90	70
	60 minutes	0.46	88
	90 minutes	0.30	88

The minimum distances may be applied only to the Würth VARIFIX® 41 C-mounting rail system. Further distances resulting (e.g., from pipe clamps) must be considered separately.

Table B- 4: Minimum distances min. a for directly mounted Würth VARIFIX® 41/41/2.50 C-mounting rail system, for fire resistance times from 30 to 120 minutes

Minimum distance a [mm] as a function of the fire resistance time and the maximum load			
Span [mm]		Max. load	Minimum distance
450		F [kN]	a [mm]
Fire resistance time	30 minutes	0.87	48
	60 minutes	0.47	65
	90 minutes	0.31	68
	120 minutes	0.23	68

The minimum distances may be applied only to the Würth VARIFIX® 41 C-mounting rail system. Further distances resulting (e.g., from pipe clamps) must be considered separately.