Certificates

Maintaining electrical functionality

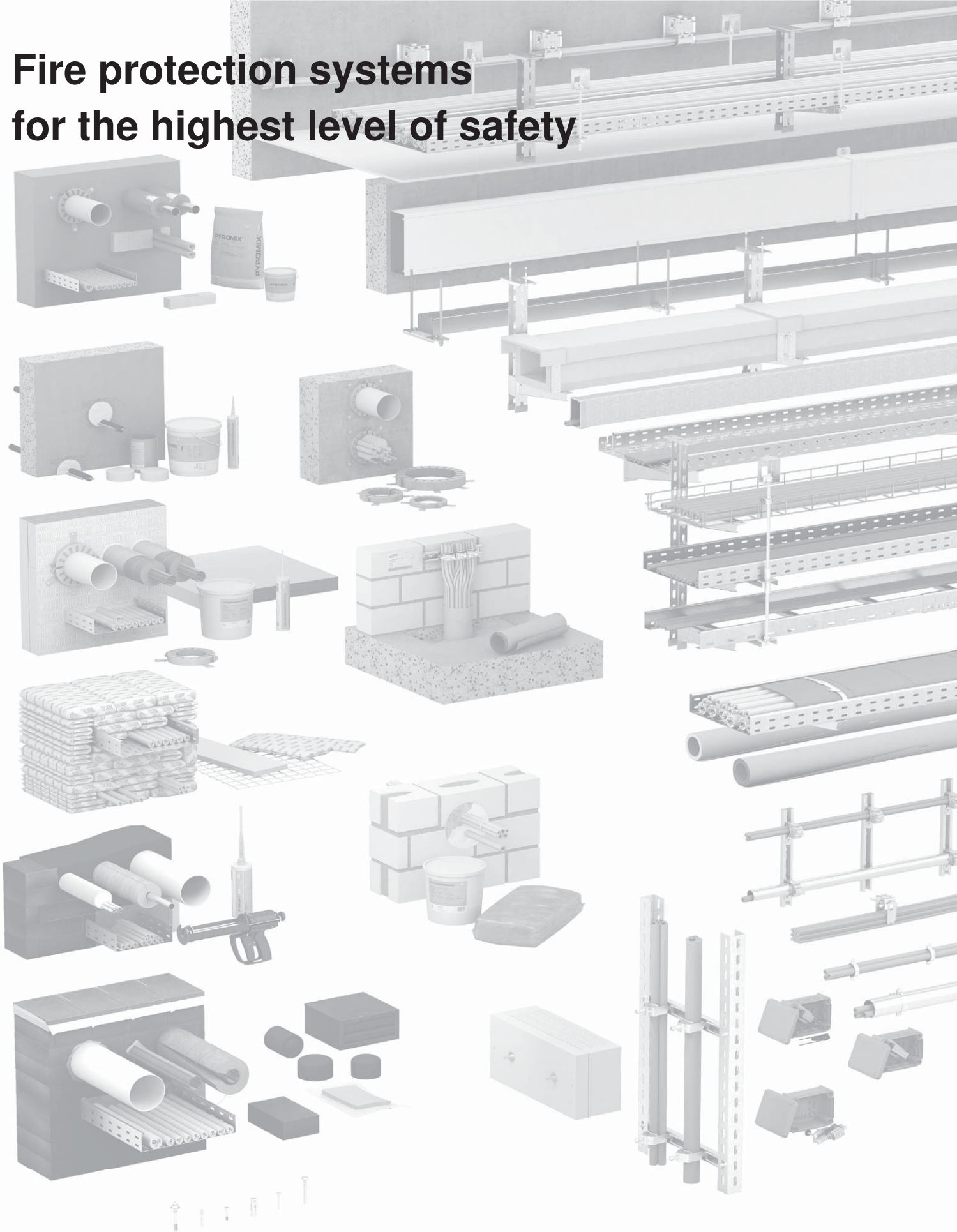
Standard support construction - vertical ladders LG, SLM, SLS on walls

Expert opinion no. 2401/809/22-CM, valid until 01.02.2028

This is a translation of the original German version, which has neither been checked nor approved by the MPA Braunschweig Testing Office.
The original German version applies exclusively.

OBO BETTERMANN

Fire protection systems for the highest level of safety



Be it in a residential building or an industrial complex – OBO has the appropriate solution for fireproof electrical installations. Our tested and certified fire protection systems cover all the relevant fire protection guidelines and provide you with an electrical installation that really serves its purpose.
We will be happy to provide you with more details – on our website or personally.

EXPERT OPINION

Document no.:	(2401/809/22) – CM dated 01.02.2023
Client:	OBO BETTERMANN Produktion Deutschland GmbH & Co. KG Hüingser Ring 52 D-58710 Menden
Order date:	29.11.2022
Order number:	Order no. 06O013635
Order receipt:	29.11.2022
Content of the order:	Assessment of cable support constructions from OBO BETTERMANN Produktion Deutschland GmbH & Co. KG, Menden, regarding the assessment as “standard support construction” according to DIN 4102-12: 1998-11 („Cable support systems for the vertical routing of cables”)

This expert opinion has 11 pages incl. cover sheet and 5 annexes.

1 Occasion and order

OBO BETTERMANN Produktion Deutschland GmbH & Co. KG, Menden, placed an order with "Materialprüfanstalt für das Bauwesen (MPA)" by letter dated 29.11.2022 to prepare an expert opinion for cable support systems ("cable systems for the vertical routing of cables with vertical ladders") of OBO BETTERMANN Produktion Deutschland GmbH & Co. KG, Menden.

2 Documents and basis of the expert opinion

The expert opinion is carried out on basis of the following documents:

(1) DIN 4102-12: 1998-11, Fire resistance tests part 1: General requirements,
(2) Technical data sheets to the cable support systems from OBO BETTERMANN Produktion Deutschland GmbH & Co. KG, Menden, as well as
(3) Test certificates and test reports for fire tests on cable systems with integrated functional maintenance according to DIN 4102-12:1998-11.

In addition to these documents, extensive testing experience from "Materialprüfanstalt für das Bauwesen (MPA)" on cable systems in accordance with DIN 4102-12: 1998-11 is also included in the assessment regarding fire protection.

3 Description of the construction

3.1 General

The building elements of the cable support systems consist of steel. All descriptions of the construction details which are to be evaluated are based on the information provided by "OBO BETTERMANN Produktion Deutschland GmbH & Co. KG, Menden". Only the details that are important with regard to fire protection are described below.

The cable support systems are only loaded with the cable's own weight.

All building elements subjected to tension or shear stress (e.g. suspensions and fastenings of the cable support systems) must be designed in such a way that a maximum calculated tensile stress (steel stress related to the stress cross section) of $\sigma \leq 9$ N/mm² und $\tau \leq 15$ N/mm² (fire resistance duration 30 or 60 minutes) or $\sigma \leq 6$ N/mm² und $\tau \leq 10$ N/mm² (fire resistance duration 90 minutes) is maintained.

The fastening to the wall is made with fasteners proven in terms of fire protection (see also section 6).

All screw connections are made with screws (strength class 8.8) and nuts (strength class 8). If fastenings are made with other steel qualities, this is stated accordingly.

3.2 Description of the supporting construction

3.2.1 Description of the supporting construction with OBO cable ladder „LG 620 VS to LG 640 VS“ (KTS 1)

The cable support systems for the vertical routing of cables essentially consist of vertically arranged vertical ladders that are frictional connected to rigid wall constructions. Fastening to the rigid wall constructions at a distance a ≤ 1200 mm is carried out on both sides of the cable ladder.

The cables are attached to the cable ladders using clamp clips from OBO BETTERMANN Produktion Deutschland GmbH & Co. KG, Menden, (see also table 1). The clamp clips are arranged in the rungs of the cable ladders at a distance of ≤ 300 mm. The clamp clips are only loaded with the cable’s own weight.

The cable ladders are made up of the side rails, which are frictional connected to corresponding rungs using rivets. The following table describes the construction details of the vertical routing of cables.

Table 1: Constructive structure with vertical ladder „LG 620 VS to LG 640 VS“ (see also annexes 1 and 2)

Vertical routing		**with vertical ladder „LG 620 VS to LG 640 VS“**		
Wall mounting		with fastening bracket „TYP BW 10“		in the side rail of the cable ladder
Fastening		**Cable ladder – fastening bracket** 2 x 1 fastening type FRS 8x25		**Cable ladder – rigid wall** 2 x 1 fastener ≥ M8 (see also section 6)
		Fastening bracket – rigid wall: 2 x 1 fastener ≥ M8 (see also section 6)		
Cable ladder		**„LG 620 VS to LG 640 VS“**		
Ladder width	width in mm	**200**	**300**	**400**
Side rail / profile height	height in mm	60		
Side rail thickness	thickness in mm	1.5		
Rung	width x height x thickness in mm	30x15x1.5		
Distance between rungs	distance in mm	≤ 300		
Load on the cable ladder	m/l in kg/m	≤ 20		
Joint connector		„LVG 60“		
Length x height x material thickness	length x height x thickness in mm	150 x 62 x 1.5	150 x 62 x 1.5	150 x 62 x 1.5
Fastening		„LVG 60“ with 2 x 2 TYP FRS 8x16 each		
Cable clamp		The fastening was carried out using clamp clips from OBO BETTERMANN Production Deutschland GmbH & Co. KG, Menden, which must be proven as a standard support construction in conjunction with a corresponding C-profile (see above, design rung).		
Distance between cable clamps	distance in mm	≤ 300		

Further details on the structural design can be found in the annexes.

3.2.2 Description of the support construction with vertical routing of cables „SLM50C40F 20 to SLM50C40F 60“ (KTS 2)

The cable support systems for the vertical routing of cables essentially consist of vertical arranged vertical ladders that are frictional connected to rigid wall constructions. The fastening to the rigid wall constructions at a distance ≤ 1200 mm is carried out on both sides of the vertical ladder.

The cables are attached to the vertical ladder using clamp clips from OBO BETTERMANN Production Deutschland GmbH & Co. KG, Menden, (see also table 2). The clamp clips are arranged in the rungs of the vertical ladders at a distance of ≤ 300 mm. The cable clamps are only loaded with the cable’s own weight.

The vertical ladders are made up of the side steel profiles, which are frictional connected to the corresponding rungs using M10 screws (fastened in an oblong hole, stop at the bottom). The following table describes the construction details of the vertical routing of cables.

Table 2: Constructive structure with vertical ladder „SLM50C40F 20 to SLM50C40F“ (see also annexes 3 and 4)

Vertical routing		**with vertical ladder „SLM50C40F 20 to SLM50C40F 60“**	
Wall mounting		with fastening bracket „TYP BW 10“	in the side rail of the cable ladder
Fastening		**Cable ladder – fastening bracket** 2 x 1 fastening type FRS 10x25 **Fastening bracket – rigid wall:** 2 x 1 fastener ≥ M10 (see also section 6)	**Cable ladder – rigid wall** 2 x 1 fastener ≥ M10 (see also section 6)
Vertical ladder		**„ SLM50C40F 20 to SLM50C40F 60 “**	
Ladder width	width in mm	**200 to 600**	
Side rail / profile height	height in mm	50	
Side rail thickness	thickness in mm	2,5	
Rung	width x height x thickness in mm	40x22.5x2.0 (type CPS 4)	
Distance between rungs	distance in mm	≤ 300	
Load on the cable ladder	m/l in kg/m	≤ 20	
Joint connector		„VUS 5“[1)]	
Länge x Höhe x Materialstärke	length x height x thickness in mm	190 x 44 x 43.5 x 2.5	
Fastening		„VUS 5“ with 2 x 3 x 2 TYPE FRS 10x20 each	
Cable clamp		The fastening was carried out using clamp clips from OBO BETTERMANN Production Deutschland GmbH & Co. KG, Menden, which must be proven as a standard support construction in conjunction with a corresponding C-profile (see above, design rung).	
Distance between cable clamps	distance in mm	≤ 300	

Further details on the structural design can be found in the annexes.

3.2.3 Description of the supporting construction with vertical routing of cables „SLS80C40F 40 bis SLS80C40F 60“ (KTS 3)

The cable support systems for the vertical routing of cables essentially consist of vertical arranged vertical ladders that are frictional connected to rigid wall constructions. The fastening to the rigid wall constructions at a distance ≤ 1200 mm takes place on both sides of the vertical ladder.

The cables are attached to the vertical ladder using clamp clips from OBO BETTERMANN Production Deutschland GmbH & Co. KG, Menden, (see also table 3). The clamp clips are arranged in the rungs of the vertical ladders at a distance of ≤ 300 mm. The cable clamps are only loaded with the cable’s own weight.

The vertical ladders are made up of the side steel profiles, which are frictional connected to the corresponding rungs using M10 screws (fastened in an oblong hole, stop at the bottom). The following table describes the construction details for the vertical routing of cables.

Table 3: Constructive structure with vertical ladder „SLS80C40F 40 to SLS80C40F 60“ (see also annex 5)

Vertical routing		**with vertical ladder „SLS80C40F 40 to SLS80C40F 60“**
Wall mounting		with fastening bracket „TYP BW 80 55“
Fastening		**Cable ladder – fastening bracket** 2 x 1 fastening Type FRS 12x25
		Fastening bracket – rigid wall: 2 x 1 fastener ≥ M12 (see also section 6)
Vertical ladder		**„SLS80C40F 40 to SLS80C40F 60“**
Ladder width	width in mm	400 bis 600
Side rail / profile height	height in mm	80
Side rail thickness	thickness in mm	“Doppel T Profil”
Rung	width x height x thickness in mm	40x22.5x2.0 (type CK40)
Distance between rungs	distance in mm	≤ 300
Load on the cable ladder	m/l in kg/m	≤ 20
Joint connector		Fastening with screws M12 and fastening bracket “TYPE BW 80 55“ in slotted hole (stop at the top)
Cable clamp		The fastening was carried out using clamp clips from OBO BETTERMANN Production Deutschland GmbH & Co. KG, Menden, which must be proven as a standard supporting construction in conjunction with a corresponding C-profile (see above, design rung).
Distance between cable clamps	distance in mm	≤ 300

Further details on the structural design can be found in the annexes.

4 Assessment of the construction

4.1 Assessment of the cable support systems in conjunction with the vertical routing of cables

The following tables summarize the essential construction features of the supporting construction to be assessed. The supporting constructions to be assessed according to section 3 can be referred to as “standard supporting constructions” in accordance with DIN 4102-12: 1998-11 if the boundary conditions specified in the tables below are met.

In accordance with DIN 4102-12 1998-11 effective supports must be provided at a distance of 3500 mm, each.

4.2 Vertical routing of cables in conjunction with clamp clips (KTS 1)

Table 4: Compilation of the construction features of the cable support system in conjunction with OBO cable ladders (KTS 1)

Manufacturer of the cable support construction		OBO BETTERMANN Produktion Deutschland GmbH & Co. KG, Menden
Cable support system		Screwed, design according to sections 3.1 and 3.2
Wall mounting		Design according to sections 3.1 and 3.2
Cable ladders		„LG 620 VS to LG 640 VS“
Max. load	**m/l in kg/m**	≤ 20
Width	**width in mm**	200 to 400
Material thickness	**thickness in mm**	1.5
Joint connector		„LVG 60“
Cable clamp		According to table 1
Distance between cable clamps	**distance in mm**	≤ 300

4.3 Vertical routing of cables in conjunction with clamp clips (KTS 2)

Table 5: Compilation of the construction features of the cable support system in conjunction with OBO cable ladders (KTS 2)

Manufacturer of the cable support construction		OBO BETTERMANN Produktion Deutschland GmbH & Co. KG, Menden
Cable support system		Screwed, design according to sections 3.1 and 3.2
Wall mounting		Design according to sections 3.1 and 3.2
Cable ladders		„SLM50C40F 20 bis SLM50C40F 60“
Max. load	**m/l in kg/m**	≤ 20
Width	**width in mm**	200 to 600
Material thickness	**thickness in mm**	≥ 2.0
Joint connector		„VUS 5“
Cable clamp		According to table 2
Distance between cable clamps	**distance in mm**	≤ 300

4.4 Vertical routing of cables in conjunction with clamp clips (KTS 3)

Table 6: Compilation of the construction features of the cable support system in conjunction with OBO cable ladders (KTS 3)

Manufacturer of the cable support construction		OBO BETTERMANN Produktion Deutschland GmbH & Co. KG, Menden
Cable support system		Screwed, design according to sections 3.1 and 3.2
Wall mounting		Design according to sections 3.1 and 3.2
Cable ladders		„SLS80C40F 40 to SLS80C40F 60“
Max. load	**m/l in kg/m**	≤ 20
Width	**width in mm**	400 to 600
Material thickness	**thickness in mm**	≥ 2.0
Joint connector		„Screw connection with wall bracket “Type BW 80 55“
Cable clamp		According to table 3
Distance between cable clamps	**distance in mm**	≤ 300

5 Summary

The constructions listed in section 4 meet the requirements of a “standard supporting construction” with regard to their essential construction features according to DIN 4102-12: 1998-11, section 7.3.3.3.

When using cable systems with integrated functional maintenance as standard support construction, it must be checked in each individual case whether the functional maintenance classes of the cable systems with integrated functional maintenance listed in a valid “allgemeinen bauaufsichtlichen Prüfzeugnis” have been verified with supporting constructions (cable support systems for the vertical routing of cables) that also correspond to the "standard support construction" of DIN 4102 -12 : 1998-11.

6 Special information

6.1 This expert opinion is not subject to notification and does not replace a classification report.

6.2 This expert opinion does not constitute proof of usability in in the process by building authorities. The expert opinion can, for example, serve for general preliminary planning or to support the evaluation of the implementation principle or construction. The manufacturer/builder of the construction is responsible for providing appropriate evidence**.**

6.3 When applying for a project-related type approval (vBG), it is necessary to prepare a project-related expert opinion taking into account the individual planning conditions.

6.4 This expert opinion only applies with regard to fire protection. Further requirements may arise from the technical building regulations applicable to the cable systems and the respective state building regulations (Landesbauordnung LBO) or the regulations for special buildings - e.g. building physics, statics, electrical engineering, ventilation technology, etc.

6.5 The supporting construction must be made with steel dowels (e.g. steel screws / steel dowels, nail anchors) ≥ M10 (stress cross-sectional area ≥ 58 mm² each) that are suitable for the substrate and the application and which correspond to the information in the valid “allgemeinen bauaufsichtlichen Zulassungen” (abZ) or “allgemeiner Bauartgenehmigungen” (aBG) of “Deutsches Institut für Bautechnik, Berlin” or an “europäisch technischen Bewertung” (ETA).

If the approval or assessment does not make any statements about the required fire resistance period of the fasteners, when connecting to reinforced concrete, fasteners made of steel with a minimum size of M10 with twice the setting depth (e.g. 2hef) - but at least 60 mm deep - and a maximum calculated tensile load per dowel of 500 N are required to be used (see DIN 4102-4: 2016-05, section 11.2.6.3). The effective setting depth (h_{ef}) can be found in the valid approval, type approval or assessment. The load on the dowels can be applied as a centric tensile load (N), transverse load (V) or as a combination of both (diagonal tensile load).

Alternatively, dowels may be used whose suitability for fire protection has been verified through a test and assessment of the required fire resistance period by an accredited testing laboratory.

Dowels must be installed in accordance with the technical documents (e.g. assembly guidelines) and in accordance with the approval or assessment requirements (abZ, aBG or ETA). In any case, the suitability of the dowels for the respective substrate and the application also

for a cold installation status must be permitted and proven. The specifications for the installation condition continue to apply without restriction.

6.6 The evaluated constructions may be mounted to floors (minimum thickness = 125 mm) made of reinforced concrete or aerated concrete as well as to walls (minimum thickness = 100 mm) made of masonry, concrete or reinforced concrete or aerated concrete whose fire resistance in each case corresponds at least to the fire resistance of the cable supporting system.
The assessment only applies when the floor's or wall's stiffening and supporting building elements have at least the same fire resistance as the cable supporting system in terms of their stiffening and supporting effect.

6.7 It must be ensured that the constructions being evaluated are not negatively affected by falling building elements.

6.8 Amendments and additions to construction details (derived from this expert opinion) are only possible after consultation with the "Materialprüfanstalt für das Bauwesen (MPA)".

6.9 The correct execution is the sole responsibility of the executing companies.

6.10 The construction details shown in the annexes are binding for the above-mentioned assessment. Only the details important for the assessment regarding fire protection were checked.

6.11 The validity of the expert opinion no. (2401/809/22) – CM dated 01.02.2023 ends on 01.02.2028 at the latest. The period of validity can be extended depending on the state of art.

On behalf

Dr.-Ing. Gary Blume
Head of department

on behalf

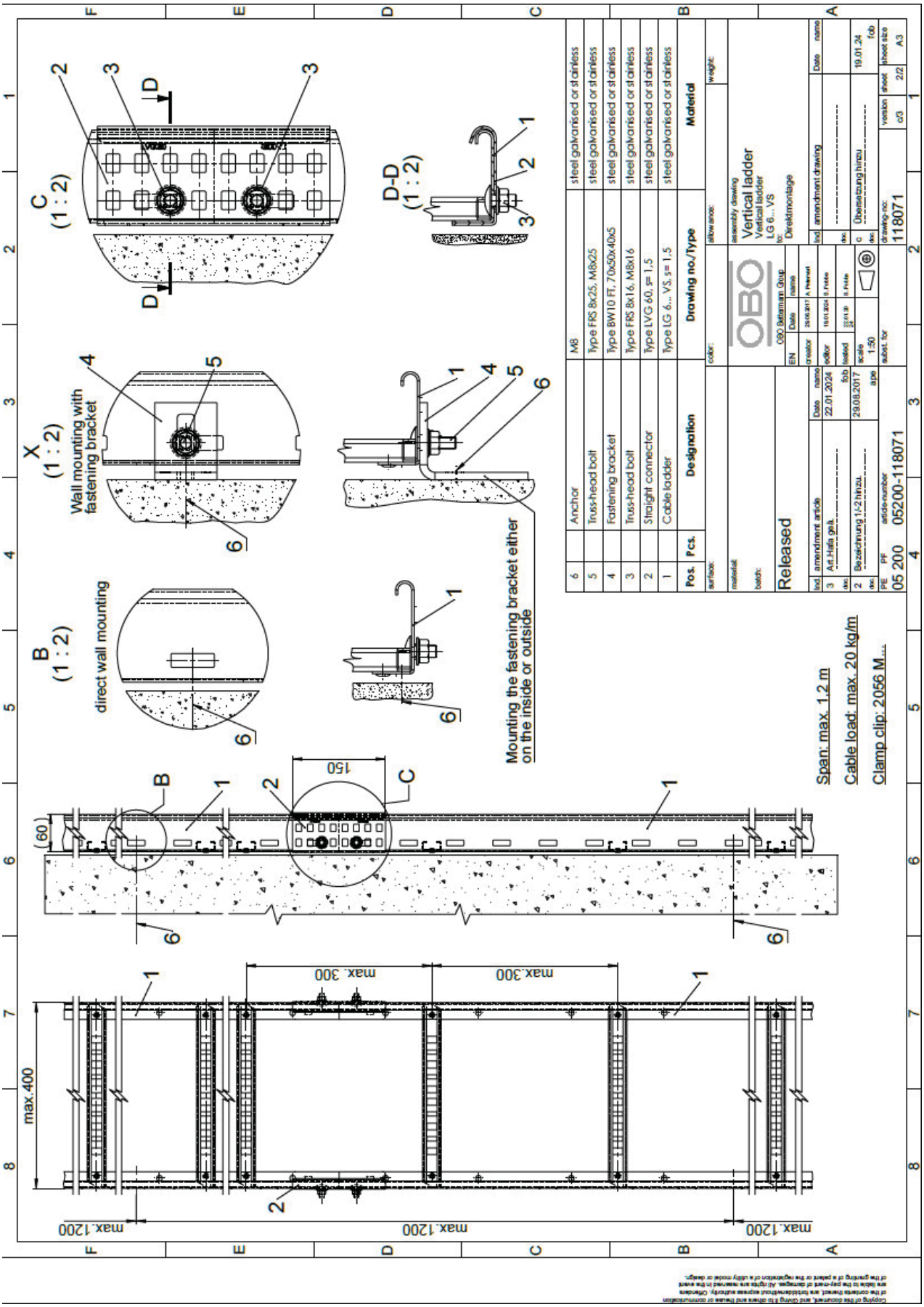
Dipl.-Ing. Christian Maertins
Administration

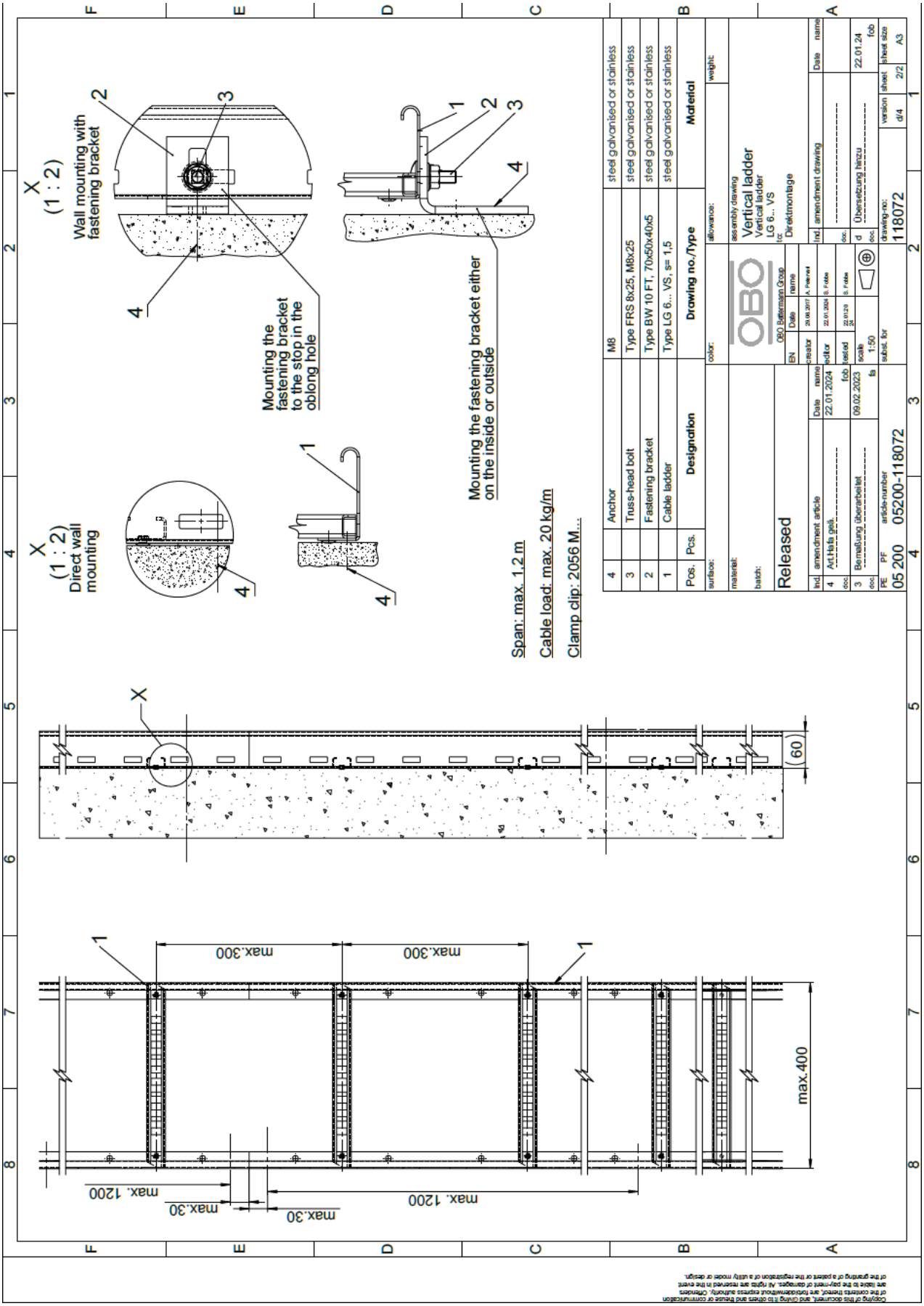
The translation of the original German version is not checked by the "Materialprüfanstalt für das Bauwesen, Braunschweig".

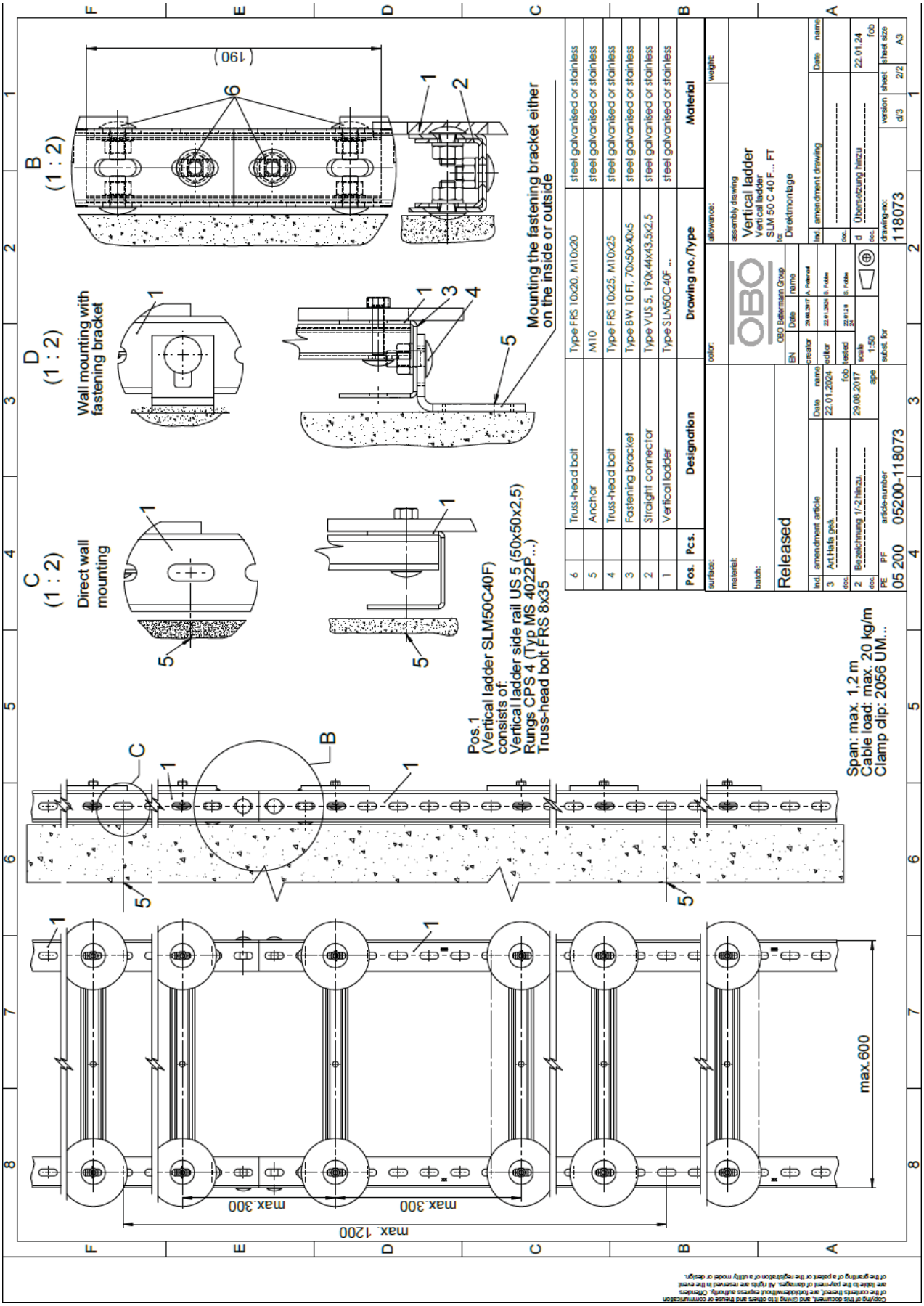
This translation is only for better understanding in other countries. In cases of doubt, the original German version of the expert opinion applies exclusively.

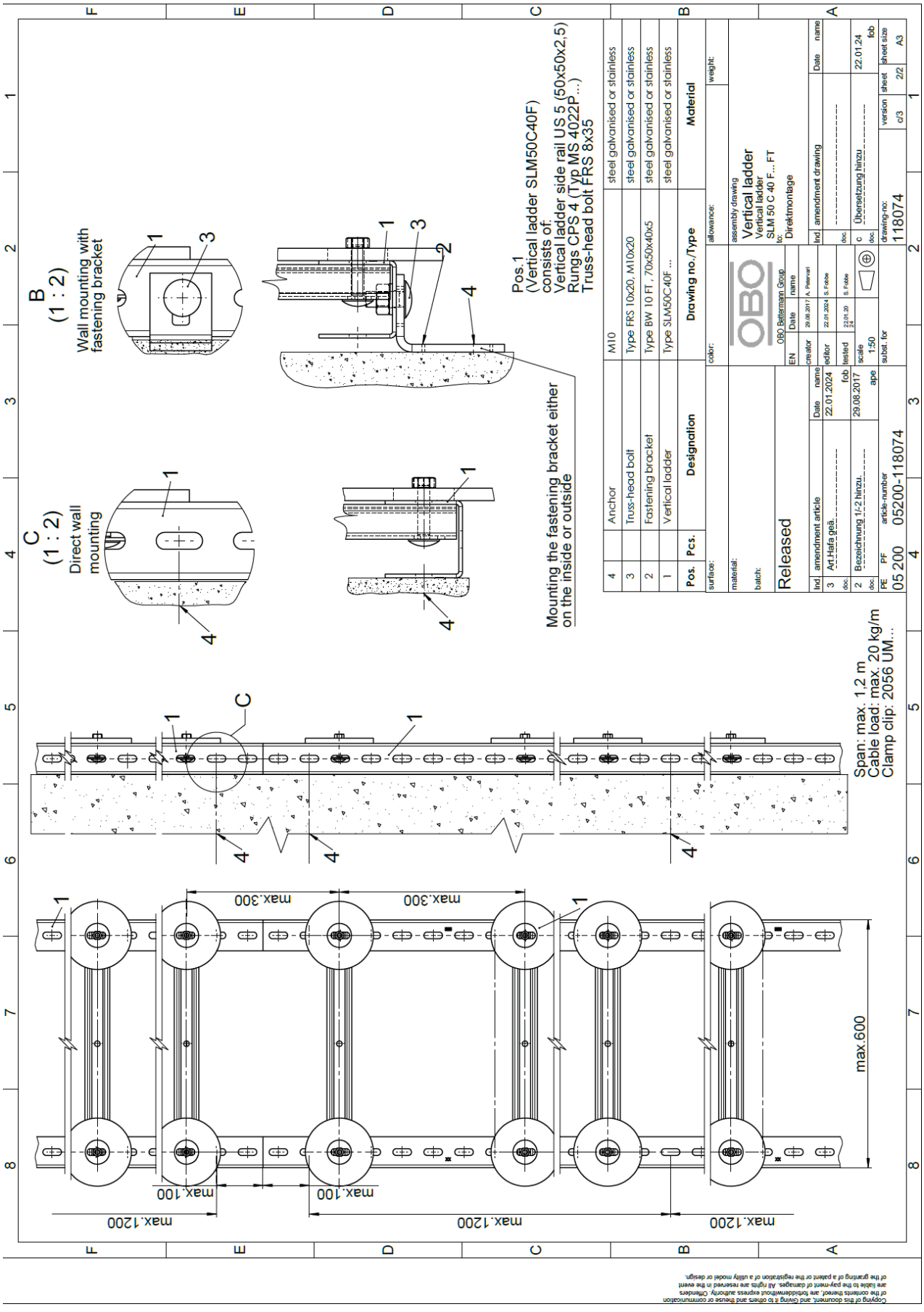
Date of translation of this Expert Opinion: 5 February 2024

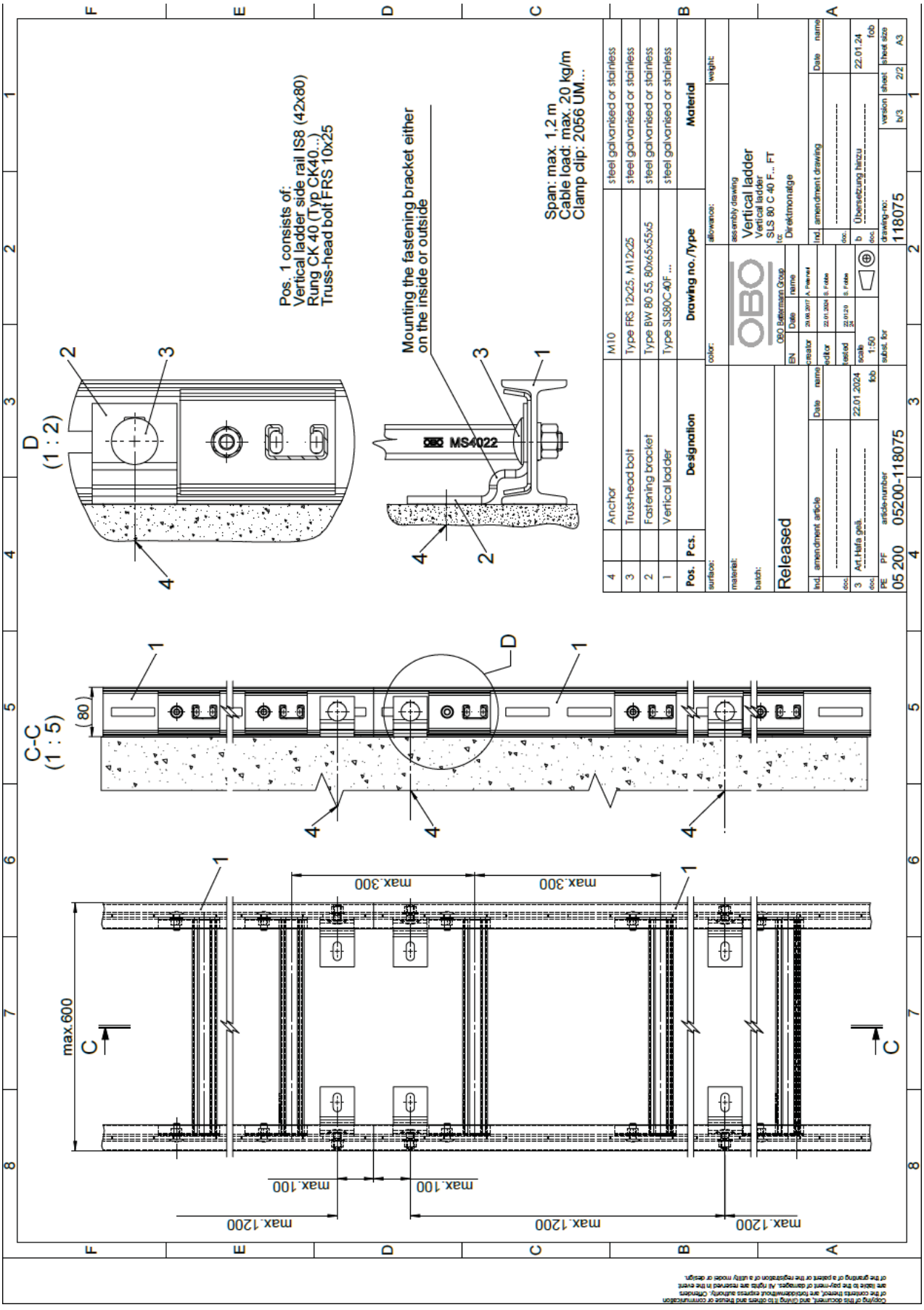
(This English version of the expert opinion has 13 pages incl. cover sheet and 5 annexes)


C (1 : 2)
D-D (1 : 2)
X (1 : 2)
Wall mounting with fastening bracket
B (1 : 2)
direct wall mounting
Mounting the fastening bracket either on the inside or outside
Span: max. 1,2 m
Cable load: max. 20 kg/m
Clamp clip: 2056 M...
max.400
max.300
max.1200
150
60
Released
OBO Bettermann Group
Vertical ladder
Vertical ladder
LG 6... VS
Direktmontage
05200-118071
118071
05 200
Übersetzung hinzu
amendment drawing
amendment article
Art.-Hafo geä.
Bezeichnung 1/-2 hinzu.
Anchor
Truss-head bolt
Fastening bracket
Truss-head bolt
Straight connector
Cable ladder
Designation
Drawing no./Type
Material
steel galvanised or stainless
M8
Type FRS 8x25, M8x25
Type BW10 FT, 70x50x40x5
Type FRS 8x16, M8x16
Type LVG 60, s= 1,5
Type LG 6... VS, s= 1,5








Pos. 1 consists of:
Vertical ladder side rail IS8 (42x80)
Rung CK 40 (Typ CK40...)
Truss-head bolt FRS 10x25
Mounting the fastening bracket either on the inside or outside
Span: max. 1,2 m
Cable load: max. 20 kg/m
Clamp dip: 2056 UM...
D (1 : 2)
C-C (1 : 5)
MS4022
max.600
max.300
max.100
max.1200
Released
Vertical ladder
SLS 80 C 40 F... FT
Direktmontage
05200-118075
118075

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Building Connections