MFPA Leipzig GmbH

Testing, inspection and certification body for
building materials, building products and building systems

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Advisory opinion no. GS 3.2/18-174-1

from 24 May 2018
1st copy

Subject matter:	Advisory opinion on the reaction to fire behaviour of cable systems with an integrated circuit integrity maintenance of the classes E 30 to E 90 in accordance with DIN 4102-12: 1998-11 which are installed in cable clamps or multiple cable holders and mounted to solid parts using "PULSA special nails HC6" for construction projects in Germany
Client:	ITW Befestigungssysteme GmbH Carl-Zeiss-Str. 19 30966 Hemmingen Germany
Date of order:	24 April 2018
Person in charge:	Dr.-Ing. P. Nause

This document consists of 8 pages and 4 enclosures.

Gesellschaft für Materialforschung und Prüfungsanstalt für das Bauwesen Leipzig mbH (MFPA Leipzig GmbH)

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1 Objective and request

On 24 April 2018, MFPA Leipzig GmbH was commissioned by the company ITW Befestigungssysteme GmbH to issue an advisory opinion on the reaction to fire behaviour of cable systems with an integrated circuit integrity maintenance of the classes E 30 to E 90 in accordance with DIN 4102-12: 1998-11 which are installed in cable clamps or multiple cable holders and mounted to solid parts using "PULSA special nails HC6" for construction projects in Germany.

The fire protection assessment is required since the reaction to fire of "PULSA special nail HC6" for the fastening of cable clamps and multiple cable holders at solid parts which are assessed in this advisory opinion is not directly covered by appraisal certificates of usability (e. g. general appraisal certificates or DIN 4102-12).

2 Basis and documents for the fire protection assessment

The following documents are used as a basis for the fire protection assessment:

[1] Test report PB 3.2/17-202-1 MFPA Leipzig GmbH from 15/02/2018 regarding PULSA special nail HC6-17 - Testing based on the Technical Report TR020 to determine the fire-resistance period under tensile stress, ITW Befestigungssysteme GmbH, Hemmingen,

[2] Test report no. PB 3.2/17-202-3 MFPA Leipzig GmbH from 15 February 2018 regarding PULSA special nail HC6-17 and PULSA special nail HC6-32 Testing in accordance with DIN EN 1363-1:2012-10 to determine the fire-resistance period under tensile stress. ITW Befestigungssysteme GmbH, Hemmingen

[3] Test report PB 3.2/18-070-1 PULSA MFPA Leipzig GmbH from 26/02/2018 regarding special nail HC6-22 - Testing based on the Technical Report TR020 to determine the fire-resistance period under tensile stress, ITW Befestigungssysteme GmbH, Hemmingen,

[4] Advisory opinion no. GS 3.2/17-202-2 MFPA Leipzig from 15 February 2018 regarding the summary and evaluation of the test results for the PULSA special nail HC6-17, installed using the SPIT gas nail gun PULSA 800E, PULSA 800P and PULSA 800P+, issued for ITW Befestigungssysteme GmbH, Hemmingen,

[5] Advisory opinion no. GS 3.2/18-070-2 MFPA Leipzig from 15 February 2018 regarding the summary and evaluation of the test results for the PULSA special nail HC6-22, installed using the SPIT gas nail gun PULSA 800E, PULSA 800P and PULSA 800P+, issued for ITW Befestigungssysteme GmbH, Hemmingen,

[6] TR 020:2004-05 Evaluation of the fire resistance rating of anchors in concrete,

[7] General appraisal certificate no. P-MPA-E-17-005 MPA NRW from 30/03/2016 regarding a cable system with integrated circuit integrity maintenance of the classes E 30 to E 90 in accordance with DIN 4102-12: 1998-11, issued for OBO Bettermann GmbH & Co. KG, Menden,

[8] General appraisal certificate no. P-MPA-E-09-007 MPA NRW from 06/05/2014 regarding a cable system with integrated circuit integrity maintenance of the classes "E 30", "E 60" and "E 90" in accordance with DIN 4102-12: 1998-11, issued for OBO Bettermann GmbH & Co. KG, Menden,

[9] General appraisal certificate no. P-3846/ 9913 MPA BS from 17/12/2014 regarding a cable system with integrated circuit integrity maintenance of the class "E 30" in accordance with DIN 4102-12: 1998-11, issued for OBO Bettermann GmbH & Co. KG, Menden,

[10] General appraisal certificate no. P-MPA-E-15-002 MPA NRW from 30/01/2015 regarding a cable system with integrated circuit integrity maintenance of the classes "E 30", "E 60" and "E 90" in accordance with DIN 4102-12: 1998-11, issued for Niedax GmbH & Co. KG, Linz am Rhein,

[11] General appraisal certificate no. P-MPA-E-15-003 MPA NRW from 30/03/2016 regarding a cable system with integrated circuit integrity maintenance of the classes "E 30", "E 60" and "E 90" in accordance with DIN 4102-12: 1998-11, issued for Niedax GmbH & Co. KG, Linz am Rhein,

[12] General appraisal certificate no. P-MPA-E MPA NRW from 15/06/2015 regarding a cable system with integrated circuit integrity maintenance of the classes E 30 to E 90 in accordance with DIN 4102-12: 1998-11, issued for PUK Werke KG Kunststoff-Stahlverarbeitungs GmbH & Co., Berlin,

[13] DIN EN 1363-1: 2012-10,

[14] DIN 4102-2: 1977-09,

[15] DIN 4102-4: 2016-05,

[16] DIN 4102-12: 1998-11,

[17] DIN EN 206:2014-07 respectively,

[18] DIN EN 1992-1-2:2010-12,

[19] Technical documents and engineering drawings by Niedax GmbH & Co. KG, Linz am Rhein, by OBO Bettermann GmbH & Co. KG, Menden, and by PUK Group GmbH & Co. KG, Berlin, and

[20] Technical documents, engineering drawings and processing instructions by ITW Befestigungssysteme GmbH, Hemmingen, (see also enclosure 1 to 4 of this advisory opinion)

In addition, this assessment is based on the extensive testing experiences of MFPA Leipzig GmbH regarding the reaction to fire behaviour of cable systems with integrated circuit integrity maintenance and of fasteners

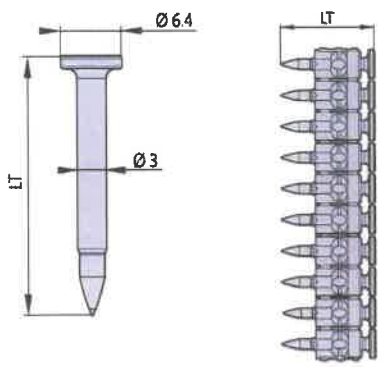
3 Description of the constructions to be assessed

3.1 Fasteners

The fastener "PULSA special nail HC6", which is assessed in this advisory opinion, is a nail made of high-strength carbon steel with a shaft diameter of d_0 = 3 mm, a head diameter of 6.4 mm and total lengths of 15, 17, 22, 27 or 32 mm (see also enclosure 1). The nail is installed in concrete or reinforced concrete surfaces using a gas nail gun. When the nail enters the concrete, it pushes away soft components and heats up to up to 900 °C in the process. The surface of the nail shaft melts as a result and the nail is roughened and digs itself into the concrete.

The basic dimensions or geometry is shown in fig. 1. Holding strips made of plastic are used for the installation of the nails using SPIT PULSA gas nail guns.

Figure 1: View of "PULSA special nail HC6"



Based on the performed fire tests, see [1] and [2], and on the technical report TR 020:2004-05, see [6], characteristic tension resistance values for PULSA HC6-17 special nails (length = 17 mm) with a minimum anchoring depth ≥ 15 mm according to table 1 below are indicated in the advisory opinion GS 3.2/17-202-2, see [4].

Table 1: Characteristic tension resistance values for PULSA HC6-17 special nails

Total length	LT	[mm]	17
Minimum anchoring depth	h_{ef}	[mm]	≥ 15
Exposure to fire for **30 min**	$N_{Rk,s,fi(30)}$	[kN]	0.073
Exposure to fire for **60 min**	$N_{Rk,s,fi(60)}$	[kN]	0.057
Exposure to fire for **90 min**	$N_{Rk,s,fi(90)}$	[kN]	0.042
Exposure to fire for **120 min**	$N_{Rk,s,fi(120)}$	[kN]	0.034

Based on the performed fire tests, see [2] and [3], and on the technical report TR 020:2004-05, see [6], characteristic tension resistance values for PULSA HC6-22 special nails (length = 22 mm) with a minimum anchoring depth ≥ 18 mm according to table 2 below are indicated in the advisory opinion GS 3.2/18-070-2, see [5].

Table 2: Characteristic tension resistance values for PULSA HC6-22 special nails

Total length	LT	[mm]	22
Minimum anchoring depth	h_{ef}	[mm]	≥ 18
Exposure to fire for **30 min**	$N_{Rk,s,fi(30)}$	[kN]	0.126
Exposure to fire for **60 min**	$N_{Rk,s,fi(60)}$	[kN]	0.107
Exposure to fire for **90 min**	$N_{Rk,s,fi(90)}$	[kN]	0.088
Exposure to fire for **120 min**	$N_{Rk,s,fi(120)}$	[kN]	0.079

According to [5], the information in table 2 above also applies to longer PULSA HC6 special nails with lengths up to 32 mm (HC6-32).

3.2 Cable clamps or multiple cable holders and their fastening

The PULSA HC6 special nails which are described in section 3.1 are intended for the wall and ceiling installation of cable clamps or multiple cable holders, which are made of steel sheet with a thickness ≥ 0,6 mm (see fig. 2 a. 3), of cable systems with integrated circuit integrity maintenance.

Figure 2: Example of cable clamp (here type 2033 M, OBO Bettermann GmbH & Co. KG) 1 = clamp, 2 = spacer

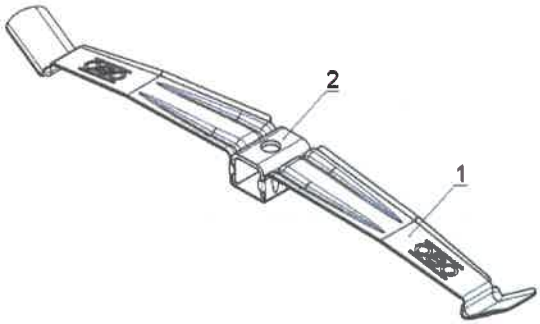


Figure 3: Examples of multiple cable holders (here types GRIP "M" 30 or GRIP "M" 70, OBO Bettermann GmbH & Co. KG)

The cable clamps or multiple cable holders for the installation in walls and ceilings which are made of concrete or reinforced concrete have to correspond to the specifications of any applicable appraisal certificate of usability (general appraisal certificate), see [7] to [12], and have to be used in accordance with the conditions or design principles which are indicated there - unless otherwise described in the following. The fire-resistance period of the mounting surface (above-mentioned solid walls and solid ceilings "F 30", "F 60", "F 90") has to be at least equal to the fire-resistance period of the attached cable systems with integrated circuit integrity maintenance ("E 30", E 60 or "E 90").

The special nail is installed in combination with the above-mentioned cable clamps or multiple cable holders using SPIT PULSA gas nail guns (PULSA 700E and PULSA 700P, PULSA 800E, PULSA 800P and PULSA 800P+), see enclosures 2 and 3, in uncracked and cracked, reinforced and unreinforced concrete of compressive strength class C 20/25 to C 60/75 in accordance with DIN EN 206:2014-07. Depending on the attached loads, the minimum nail penetration depths $h_{ef} \geq 15$ mm for smaller loads in accordance with section 3.1, table 1, or $h_{ef} \geq 18$ mm for larger loads in accordance with section 3.1, table 2, which are specified in the advisory opinions GS 3.2/17-202-2 and GS 3.2/18-070-2, see [4] and [5], are to be observed regarding the anchoring depths of the special nails.

Depending on the type of mounting, the "PULSA special nail HC6" is exposed to different loads (central tension, transverse tension and diagonal tension). The nails may also protrude from the anchoring surface – even though the minimum nail penetration depths are observed.

For a nail penetration depth of at least 18 mm and if large loads are assumed in accordance with [5], see also section 3.1, table 2, the SPIT round steel plate, Ø 25 mm, is to be used for fastening up to a thickness of < 1.5 mm of the steel part to be installed. With steel parts with fastening thicknesses of the steel part ≥ 1.5 mm, the additional SPIT round steel plate, Ø 25 mm, may be omitted. From a thickness of 2 mm, however, the steel part must be pre-drilled using a Ø 3 mm drill.

If "small" loads are assumed in accordance with [4], see also section 3.1, table 1, the round steel plate is not required for fastening through the material if the material thickness of the steel part which is to be installed (cable clamp or multiple cable holder) is ≥ 0.6 mm.

The cable systems with integrated circuit integrity maintenance of class "E 30", "E 60" and "E 90" will not be described here. It is assumed that a general appraisal certificate of usability according to the required fire-resistance period is available for them and that their design is based on this certificate (see [7] to [12]).

4 Fire protection assessment

With respect to fire protection, MFPA Leipzig does not have any concerns regarding the use of the PULSA special nail HC6, which is described in section 3 and shown in figure 1, for the fastening of cable clamps or multiple cable holders for cable systems with integrated circuit integrity maintenance when the fasteners are subject to tension, shear stress and diagonal tension. In this regard, the required minimum anchoring depths h_{ef} ≥ 15 mm for smaller loads in accordance with section 3.1, table 1, or h_{ef} ≥ 18 mm for larger loads in accordance with section 3.1, table 2, apply to the fastening in cracked or non-cracked, reinforced or unreinforced concrete of stability class C20/25 to C50/60.

In a fire test according to test report no. PB 3.2/17-202-3, see [2], PULSA special nails HC6 were tested in combination with 12 multiple cable holders and 12 cable clamps which were made of steel sheet and designated as Grip M15, Grip M30 and 2033 M and 2034 M by co. OBO Bettermann GmbH in accordance with DIN EN 1363-1: 2012-10 with attached "dead weights" (central tension, tensile strength depending on fastening version 20 or 30 N for multiple cable holders and 12 to 30 N for cable clamps). For this test, the nails were directly driven into the material using a gas nail gun with SPIT round steel plate (Ø = 25 mm) through the fastening hole of the cable clamps and multiple cable holders or without round steel plate directly through the material of the multiple cable holders into the concrete so that the penetration depth was approx. 15 mm. With an exposure to fire as per the time/temperature curve in accordance with DIN EN 1363-1, it was proven for a total test duration of 182 minutes that neither a failure of the fastener nor concrete break-out or tearing of the cable holder as reasons for premature failure occurred. The earliest case of failure for all 24 fastenings of the cable holders occurred after approx. 104 minutes.

Based on the above-mentioned test results in [2] and the other insights from part testing according to [1] and [3], it can be derived in summary that, regarding fire protection, the PULSA special nails HC6 with penetration depths (anchoring depths) in the concrete of 15 mm or 18 mm are suitable for the fastening of cable clamps or multiple cable holders for cable systems with integrated circuit integrity maintenance of the classes " E 30", "E 60" and "E 90" provided that the characteristic tension resistance values which were determined in the above-mentioned part tests and are indicated in section 3.1 in tables 1 and 2 are not exceeded depending on the exposure to fire.

Since the material properties, dimensions and geometries are comparable to the tested versions of cable clamps or multiple cable holders according to [7] to [9] by co. OBO Bettermann GmbH & Co. KG, the above-mentioned assessment can also be transferred to the cable clamps or multiple cable holders of other manufacturers in accordance with the specifications in [10] to [13].

Regarding fire protection, there are no concerns due to the protrusion of nails from the anchoring surface provided that the required minimum nail penetration depths are still observed. If the minimum nail penetration depths will be covered, then the characteristic tension resistance values for all PULSA HC6 special nails (length 15 until 32 mm), given in section 3.1, table 1 and 2, are value. This means that with reference to advisory opinions [4] and [5], the statement is approved since in the fire tests, see [1] to [3], the fastening with PULSA HC6 special nails failed due to concrete break-out or the fact that the fastening structures were pulled over the nail head.

In accordance with section 3.2, a SPIT round steel plate, Ø 25 mm, is to be used for fastening with a nail penetration depth of at least 18 mm and up to a thickness of the steel part which is to be installed of < 1.5 mm. In this way, the pulling of the nail head through the installed steel part (cable clamp or multiple cable holder) is prevented based on the performed part tests [1] to [3] if larger loads are assumed in accordance

with section 3.1, table 2. For steel parts with fastening thicknesses of the steel part ≥ 1.5 mm, the additional SPIT round steel plate, Ø 25 mm, may be omitted since the larger material thickness or strength prevents pulling off. For steel parts with fastening thicknesses of the steel part > 2 mm it has to be pre-drilled using a Ø 3 mm drill.

Also with reference to the above-mentioned part tests or the advisory opinion GS 3.2/17-202-2 MFPA Leipzig, see [4], section 2, the additional round steel plate can be omitted with smaller loads according to section 3.1, table 1, in case of fastening through the material if the material thickness is ≥ 0.6 mm.

In summary, MFPA Leipzig can confirm that the "PULSA special nails HC6" in combination with cable clamps or multiple cable holders for cable systems with integrated circuit integrity maintenance have a sufficient load-carrying capacity in case of an exposure to fire of the fasteners as per the time/temperature curve in accordance with DIN EN 1363-1 for an exposure to fire for 30, 60, 90 or 120 minutes, if the required minimum anchoring depth h_{ef} ≥ 15 mm for smaller loads in accordance with section 3.1, table 1, or h_{ef} ≥ 18 mm for larger loads in accordance with section 3.1, table 2, is observed for the installation in reinforced or unreinforced concrete of stability class C20/25 to C50/60 and the characteristic load-carrying capacities according to the specifications in section 3, tables 1 and 2, are not exceeded.

It is assumed that the conditions or design principles of the certificates of usability for the cable systems with integrated circuit integrity maintenance (general appraisal certificates, see [7] to [12]) as well as the processing instructions of the manufacturers are observed for the design.

5 Special notes

The information in section 4 only applies if the design is in accordance with the conditions of this advisory opinion and it is ensured that apart from that the conditions of the relevant appraisal certificates are adhered to.

For the processing of the "PULSA special nails HC6", the processing instructions of ITW Befestigungssysteme GmbH are to be observed. In addition, the processing instructions of the relevant manufacturers apply regarding the mentioned cable clamps and multiple cable holders.

The assessment above only applies to the PULSA special nail HC6 when it is installed according to the mounting instructions of the company ITW Befestigungssysteme GmbH and using SPIT PULSA gas nail guns (PULSA 700E and PULSA 700P, PULSA 800E, PULSA 800P and PULSA 800P+).

Furthermore, the assessment applies to uncracked and cracked, reinforced and unreinforced concrete with compressive strength classes C 20/25 up to and including C 60/75 with the corresponding anchoring depth h_{ef} ≥ 15 mm. The results of the test can be transferred to nails with larger anchoring depths.

The nail may also protrude from the concrete surface where it is exposed to the fire without protection. The loads specified in section 3.1 also apply to transverse tension and/or diagonal tension.

The assessment only applies in connection with concrete of stability class 2: C 20/25 up to and including ≤ C 60/75 according to DIN EN 206:2014-07 [17], which has a fire-resistance rating which corresponds to the fire-resistance period of the nails. In addition, the notes contained in DIN EN 1992-1- 2:2010-12 [18] (see section 4.5) on the avoidance of concrete spallation also apply. This means that the moisture content must be less than three % by weight (or four according to the National Annex).

The validity of this advisory opinion will expire on 24/05/2023 or when the European Technical Approval mentioned in section 2 expires.

This advisory opinion is only valid for construction projects in Germany and only in combination with general appraisal certificates for cable systems with integrated circuit integrity maintenance.

This document does not replace any certificate of conformity or usability as defined by the building regulations (national/European).

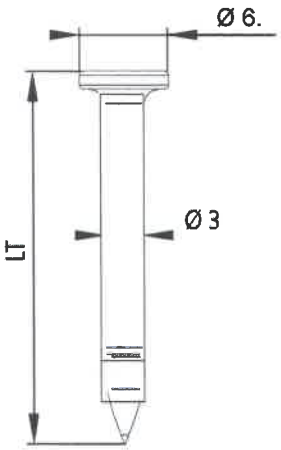
Leipzig, 24 May 2018

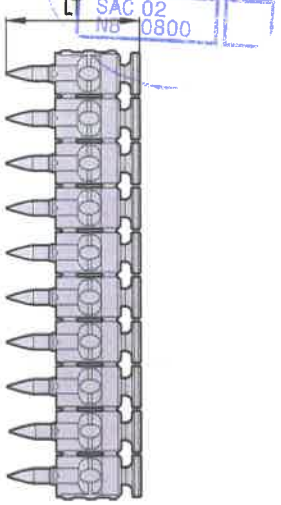
MFPA Leipzig GmbH III
SAC 02
NB 0800

Dipl.-Ing. S. Hauswaldt
Head of Division

Dr.-Ing. R. Nause
Person in charge

SPIT HC6





DESCRIPTION

Use in hard material to increase the success rate

MATERIAL PROPERTIES

Shaft made of carbon steel, total length 15, 17, 22, or 27 mm
magazine - orange
HC6 - 17, 22, 27
Mechanical zinc layer, min. zinc coating 10 µm
Hardness ≥ 56 HRc
HC6 - 15
Galvanised, min. zinc coating 5 µm
Hardness: 53 to 56 HRc

TOOLS

PULSA: 700E - 700P - 800E - 800P - 800P+

REGULATION

CSTB technical approval 3/06 - 460

SELECTION OF THE NAIL LENGTH

HC6 selection	Shaft length	Orange strips 500 pcs/box	Orange strips 1500 pcs/box	Countersunk nails* 500 pcs/box
HC6-15	15	053206	053208	
HC6-17	17	011876		053893
HC6-22	22	011891		053204
HC6-27	27	011877		053205
HC6-32	32	053207		

* does not leave any plastic residues after fastening

RECOMMENDED LOADS

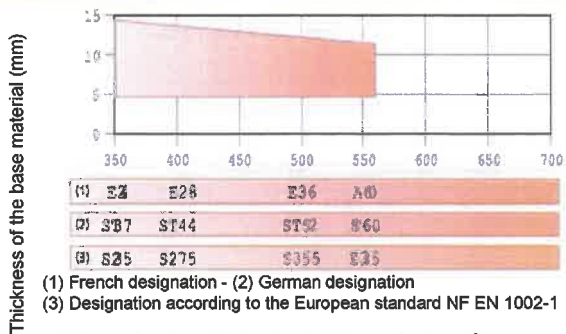
HC6 selection	H_{nom}	Characteristic load N_{Rk} (kN)	Characteristic load V_{Rk} (kN)	Recommended load N_{Rec} (kN)	Recommended load V_{Rec} (kN)
C20/25 to C60/70	H_{nom} = 10 mm	0.34	0.75	0.10	0.25
	H_{nom} = 15 mm	0.87		0.30	
	H_{nom} = 18 mm	1.19		0.40	
	H_{nom} = 20 mm	1.41		0.47	
f_{uk} = 410 - 450 N/mm²	H_{nom} = 6.3	5.0	3.6	1.5	1.2
f_{uk} = 500 - 550 N/mm²					

APPLICATION RESTRICTION

Concrete: C50/60

Fastening base - Finished floor C60/70

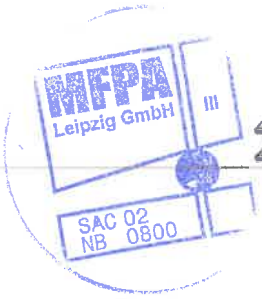
Steel

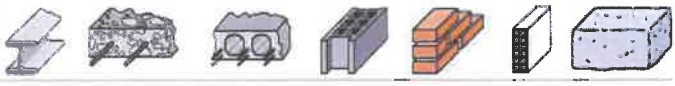


(1) French designation - (2) German designation
(3) Designation according to the European standard NF EN 1002-1

Maximum breaking strength of the base material (N/mm²)

SPIT P800E





In accordance with:

EN 12549

EN 792-13 + A1:2008E

Machinery directive:

2006/42/EC

2011/65/UE

1999/5/EC

CEM 2004/108/EC

Fuel cell: 75/324/EC

Battery: 2006/66/EC

Charger:

2006/95/EC

CEM 2004/1 08/EC

Device specifications	
Designation	SPIT PULSA 800 E
Installation power (J)	82
Weight (kg)	3.8
Dimensions L/W/H (mm)	385/114/309
Energy supply	Fuel cell & battery
Nail length (mm)	15 to 40 mm magazine

Features
Special nose piece for mounting accessories
Fully automatic tool (1000 installations per hour)
Magazine: 20 or 50 nails (special accessory)
Low contact pressure (4.5 kg)
Gas / battery control LED
Start & Go - automatic device shut-down
Automatic power control
Automatic injection system (operating temperature -15°C to + 49°C)
Charging time: complete in 90 minutes, 500 installations in 25 minutes
Fuel cell capacity: 750 installations (at 20°C)
Battery capacity: Max. 3000 installations

Safety specifications
CE certificate
The complete contact pressure is required to initiate the installation process
Visual safety by LED indicator "ON" / "OFF"
Sound pressure level, EN 12549: LWA,1s = 108 dB(A) / LpA,1s,1m = 95 dB(A) / LpA,1s,0 = 101 dB(A)
Vibration, EN ISO 8662-11: 4.5 m/s²

SPIT P800P

In accordance with:

EN 12549

EN 792-13 + A1: 2008E

Machinery directive:

2006/42/EC

2011/65/UE

1999/5/EC

CEM 2004/108/EC

Fuel cell: 75/324/EC

Battery: 2006/66/EC

Charger:

2006/95/ EC

CEM 2004/108/EC

Device specifications	
Designation	SPIT PULSA 800 P
Installation power (J)	82
Weight (kg)	3.8
Dimensions L/W/H mm)	385/114/309
Energy supply	Fuel cell & battery
Nail lengths (mm)	15 to 40 mm magazine

Features
Special nose piece for profile attachment
Fully automatic tool (1000 installations per hour)
Magazine: 20 or 50 nails (special accessory)
Low contact pressure (4.5 kg)
Gas / battery control LED
Start & Go - automatic device shut-down Automatic power control
Automatic injection system (operating temperature -15°C to + 49°C)
Charging time: complete in 90 minutes, 500 installations in 25 minutes
Fuel cell capacity: 750 installations (at 20°C)
Battery capacity: Max. 3000 installations

Safety specifications
CE certificate
The complete contact pressure is required to initiate the installation process
Visual safety by LED indicator "ON" / "OFF"
Sound pressure level. EN 12549: LWA,1s = 108 dB(A) / LpA,1s,1m = 95 dB(A) / LpA,1s,0 = 101 dB(A)
Vibration, EN ISO 8662-11: 4.5 m/s2

SPIT P800P+

In accordance with: EN 12549

EN 792-13 + A1: 2008E

Machinery directive:

2006/42/EC

2011/65/UE

1999/5/EC

CEM 2004/108/EC

Fuel cell: 75/324/EC

Battery: 2006/66/EC

Charger:

2006/95/EC

CEM 2004/108/EC

Device specifications	
Designation	SPIT PULSA 800 P+
Installation power (J)	100
Weight (kg)	3.8
Dimensions L/W/H (mm)	396/114/309
Energy supply	Fuel cell & battery
Nail lengths (mm)	15 to 40 mm magazine

Features
Special nose piece for profile attachment
Fully automatic tool (1000 installations per hour)
Magazine: 20 or 50 nails (special accessory)
Low contact pressure (4.5 kg)
Gas / battery control LED
Start & Go - automatic device shut-down
Automatic power control
Automatic injection system (operating temperature -15°C to + 49°C)
Charging time: complete in 90 minutes, 500 installations in 25 minutes
Fuel cell capacity: 600 installations (at 20°C)
Battery capacity: Max. 3000 installations

Safety specifications
CE certificate
The complete contact pressure is required to initiate the installation process
Visual safety by LED indicator “ON” / “OFF”
Sound pressure level, EN 12549: LWA,1s = 109 dB(A) / LpA,1s,1m = 95 dB(A) / LpA,1s,0 = 102 dB(A)
Vibration, EN ISO 8662-11: 4.6 m/s²