Welding studs

Drawn arc stud welding
Capacitor discharge stud welding
Short cycle stud welding

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1. Certificates and approvals

1.1 EC Declaration of conformity for shear connectors

EC Declaration of Conformity

CE
0762

Producer: AS Schöler + Bolte GmbH
Gewerkenstraße 1
D-58456 Witten

Trade name: Schöler + Bolte-Kopfbolzen

The product complies with the essential requirements of the Construction Products Directive (CPD 89/106/EEC, amended by the Council Directive 93/68/EEC and the Regulation (EC) No 1882/2003).

The above mentioned product observes the following European Standards and Approvals and therefore complies with the above mentioned directives:

DIN EN 10025-1:2005-02 “Hot rolled products of structural steels - Part 1: General technical delivery conditions”

DIN EN 10025-2:2005-04 “Hot rolled products of structural steels - Part 2: Technical delivery conditions for non-alloy structural steels”

ETA-11/0120 “Steel plate with cast-in anchor(s)“

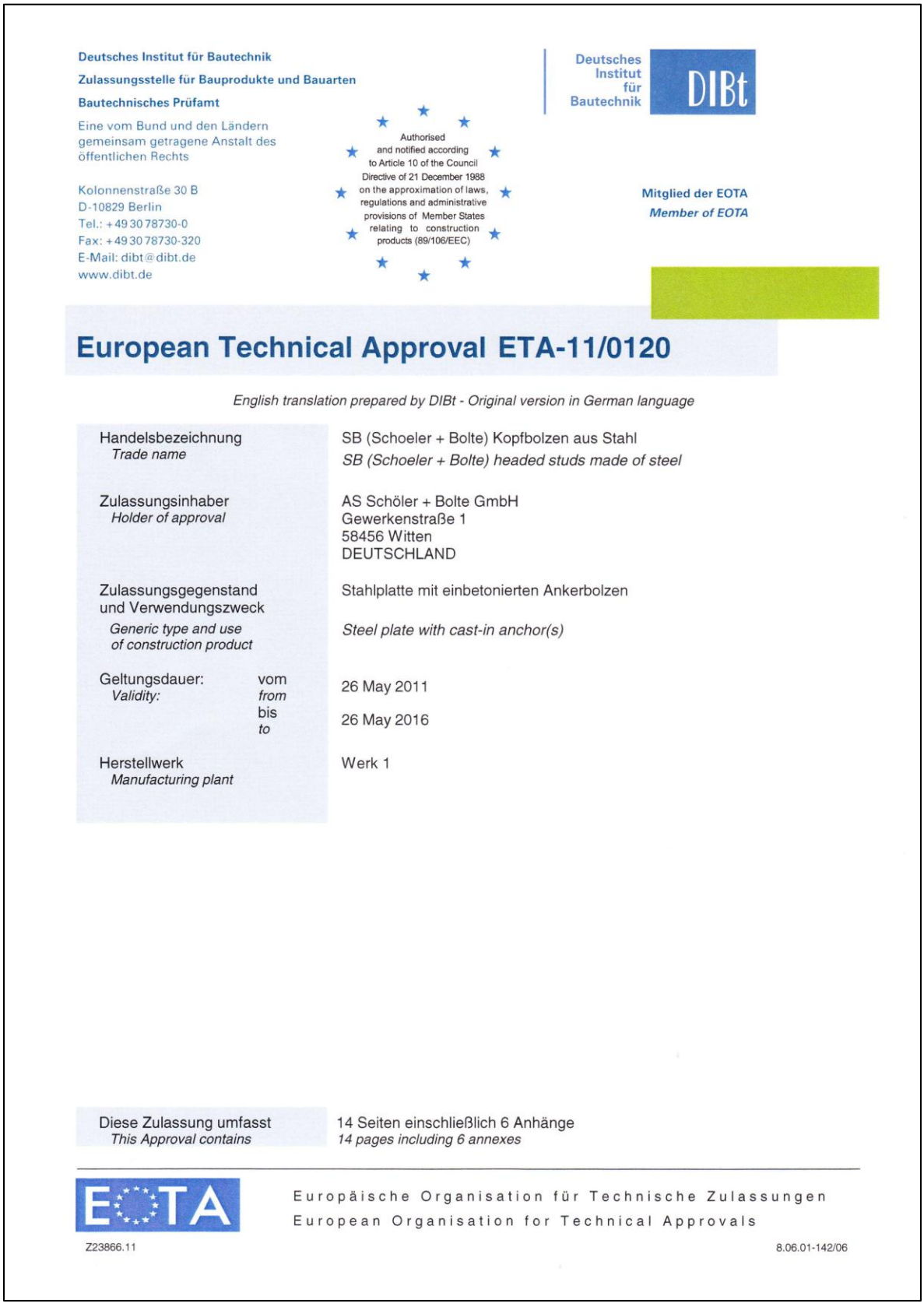
Affixing of CE-mark: Ja

Issuer: AS Schöler + Bolte GmbH
Gewerkenstraße 1
D-58456 Witten

Witten, 27-05-11	Rüdiger Bolte	Friedrich-Peter Schöler
Place, Date	Managing director	Managing director

AS Schöler + Bolte GmbH ▪ Gewerkenstraße 1 ▪ D-58456 Witten ▪ Tel.: +49 (0)2303 970050 ▪ Fax: +49 (0)2302 73009
eMail: info@as-schoeler-bolte.com ▪ as-schoeler-bolte.com

1.2 European Technical Approval for shear connectors



Deutsches Institut für Bautechnik
Zulassungsstelle für Bauprodukte und Bauarten
Bautechnisches Prüfamt
Eine vom Bund und den Ländern gemeinsam getragene Anstalt des öffentlichen Rechts

Kolonnenstraße 30 B
D-10829 Berlin
Tel.: +49 30 78730-0
Fax: +49 30 78730-320
E-Mail: dibt@dibt.de
www.dibt.de

Authorised and notified according to Article 10 of the Council Directive of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products (89/106/EEC)

Deutsches Institut für Bautechnik

DIBt

Mitglied der EOTA
Member of EOTA

European Technical Approval ETA-11/0120

English translation prepared by DIBt - Original version in German language

Handelsbezeichnung *Trade name*	SB (Schoeler + Bolte) Kopfbolzen aus Stahl *SB (Schoeler + Bolte) headed studs made of steel*
Zulassungsinhaber *Holder of approval*	AS Schöler + Bolte GmbH Gewerkenstraße 1 58456 Witten DEUTSCHLAND
Zulassungsgegenstand und Verwendungszweck *Generic type and use of construction product*	Stahlplatte mit einbetonierten Ankerbolzen *Steel plate with cast-in anchor(s)*
Geltungsdauer: *Validity:* vom *from* bis *to*	26 May 2011 26 May 2016
Herstellwerk *Manufacturing plant*	Werk 1
Diese Zulassung umfasst *This Approval contains*	14 Seiten einschließlich 6 Anhänge *14 pages including 6 annexes*

EOTA

Europäische Organisation für Technische Zulassungen
European Organisation for Technical Approvals

Z23866.11 8.06.01-142/06

1.3 Certificate of compliance ÜHP

Gesellschaft für Schweißtechnik International mbH
Schweißtechnische Lehr- und Versuchsanstalt SLV Duisburg

GSI SLV
Duisburg

Reg.-Nr. 2009 701 5005

Durchführung einer erstmaligen Prüfung von Bauprodukten im Übereinstimmungsnachweisverfahren

Ü H P

nach Bauregelliste A Teil 1 Ausgabe 2009/1

AS Schöler + Bolte GmbH
Gewerkenstraße 1
58456 Witten

entsprechend den Bestimmungen des § 24 (2) der MBO.

Die Ergebnisse der Prüfungen erfüllen die technischen Regeln der Bauregelliste A Teil 1 Ausgabe 2009/1.

Folgende Bauprodukte wurden durch die Prüfung erfasst:

lfd. Nr. 4.8.17 Bolzen und Stifte zum Lichtbogenbolzenschweißen

Die oben genannte Firma darf das Übereinstimmungszeichen Ü auf den vorgenannten Bauprodukten anbringen. Dieser Prüfbericht gilt unbefristet, sofern keine Änderungen an den Produktionsanlagen, den Anforderungen der maßgebenden technischen Regelwerke und Prüfungen gegenüber der erstmaligen Prüfung des Bauproduktes vorgenommen werden.

Änderungen sind der Prüfstelle unverzüglich mitzuteilen, damit geprüft werden kann, ob die Prüfbedingungen und die Prüfergebnisse für das geänderte Bauprodukt noch zutreffen.

Duisburg, den 17. November 2009/Klotzki/Ms
Ort Datum

Dipl.-Ing. Märtlein
Name und Unterschrift des Leiters der Prüfstelle/Siegel der Prüfstelle

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Schweißtechnische Lehr- und Versuchsanstalt
SLV Duisburg, Niederlassung der GSI mbH
Postfach 101262, 47012 Duisburg
Bismarckstraße 85, 47057 Duisburg
Niederlassungsleiter: Dr.-Ing. Steffen Keitel

Tel.: +49 203 3781-0
Fax: +49 203 3781-228
E-Mail: info@slv-duisburg.de
Internet: www.slv-duisburg.de
Abteilung Qualitätssicherung, Fax: +49 203 3781-350

DVS

2. Welding studs for drawn arc stud welding

2.1 Technical information

Materials

Non-alloyed steels

Our threaded studs, internally threaded studs, non-threaded studs and similar welding elements are made from steel, strength class 4.8 (suitable for welding) (according to DIN EN ISO 898-1) with excellent weldability. Mechanical properties: yield strength (R_{el}) ≥ 340 N/mm^2, tensile strength (R_m) ≥ 420 N/mm^2, elongation (A_5) ≥ 14%.

Shear connectors are made from S235J2+C450. Mechanical properties: yield strength (R_{el}) ≥ 350 N/mm^2, tensile strength (R_m) ≥ 450 N/mm^2, elongation (A_5) ≥ 15%.

Stainless steels

Our threaded studs, internally threaded studs, non-threaded studs and similar welding elements are made from A2-50 (suitable for welding) according to DIN EN ISO 3506-1 (mechanical properties: yield point ($R_{p0,2}$) ≥ 210 N/mm^2, tensile strength (R_m) ≥ 500 N/mm^2, elongation (A_L) ≥ 0,6d) as well as from 1.4571, 1.4541 and 1.5415 (16Mo3).

The material specifications conform with DIN EN ISO 13918 and DIN EN ISO 14555. For welding studs from other materials please send us your inquiry or contact us.

On demand, the material properties can be verified by an inspection document (test report, inspection certificate) according to DIN EN 10204.

We are pleased to inform you about weldability to different base materials and welding parameters.

Dimensions

Welding studs dimensions are given in the measurement tables (all dimensions in mm). All standardised welding studs conform to DIN EN ISO 13918. Not standardised welding studs are supplied according to DIN EN ISO 13918. Special welding elements, which are not described, are delivered upon request.

Dimensions that are not listed in the measurement tables are delivered upon request.

The nominal length (l_2) always corresponds to the length after welding. Depending on the diameter the length before welding (l_1) is larger by a weld allowance of 1 to 5 mm.

Flux (aluminium ball) and weld pool backing

According to DIN EN ISO 13918 welding studs for drawn arc stud welding standardly have an aluminium ball at the welding tip. This serves as flux for improved ignition and stabilization of the electric arc as well as for deoxidising the weld pool.

For weld pool backing standardly ceramic ferrules are used. Accordingly, suitable ceramic ferrules are included in every stud shipment. A ceramic ferrule can only be used once; it is removed from the stud after welding by striking at it.

Up to a diameter of 10 mm shielding gas can be used as an alternative for weld pool backing. Upon request, we therefore deliver studs without aluminium ball at the welding tip and without ceramic ferrules.

Surface protection

Usually our welding studs are supplied in bright condition. On demand, the following surface treatments are possible (coating thicknesses according to DIN EN ISO 4042):

1. galvanically zinc-plated
2. galvanically zinc-plated and yellow chromated
3. hot zinc dipped
4. galvanically copper-base-coated and nickel-plated
5. galvanically copper-plated

The surface treatments 1, 2 and 3 have a negative impact on the welding quality and are therefore removed from the welding tip.

Threads
The threads of the studs are cold rolled (tolerance limit 6g). For surface-treated studs the tolerance limit 6h can be reached.

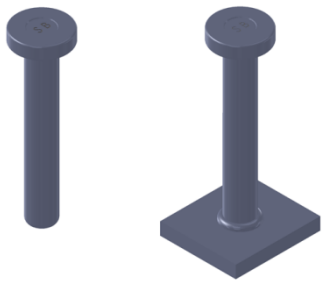
The thread of hot zinc dipped studs is not true to gauge. For hot zinc dipped studs nuts with allowance for interference have to be used.

We deliver studs with special threads upon request.

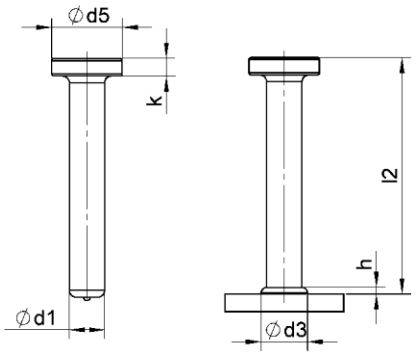
Weld fillet
During drawn arc stud welding a fillet forms between welding element and base material. The dimensions of the weld fillet are defined by the used ceramic ferrule and the welding parameters. The dimensions that are given in the measurement tables are approximate values. The diameter of the weld fillet is always bigger than the nominal diameter of the welding element.

Accessories for stud welding guns
Accessories for stud welding guns (chuck, ferrule grip, foot piece etc.) have to be adjusted to the welding element. The accessories which are to be used for the individual welding studs can be found in chapter 5.

2.2 Shear connector (type SD1 acc. to DIN EN ISO 13918)



before welding / after welding



before welding / after welding

CE 0762

CE-conform. Schöler + Bolte shear connectors fulfill all essential requirements of the Construction Products Directive (CPD89/106/EEC, amended by the Council Directive 93/68/EEC and the Regulation (EC) No 1882/2003).

ETA 11/0120

European Technical Approval ETA-11/0120 of the European Organisation for Technical Approvals (EOTA) issued by the German Institute of Civil Engineering (DIBt)
(Product and intended use: Steel plate with cast-in anchor(s))

Ü

Compliance mark (Ü-mark) (ÜHP according to building rules list A part 1 issue 2009/1)

Dimensions						Material (item number)	Ceramic ferrule
d_1	l_2	d_5	k	d_3^*	h^*	S235J2+C450	
10	50	19	7,1	13	2,5	75-10-050	UFN 10
10	75	19	7,1	13	2,5	75-10-075	UFN 10
10	100	19	7,1	13	2,5	75-10-100	UFN 10
10	125	19	7,1	13	2,5	75-10-125	UFN 10
10	150	19	7,1	13	2,5	75-10-150	UFN 10
10	175	19	7,1	13	2,5	75-10-175	UFN 10
10	200	19	7,1	13	2,5	75-10-200	UFN 10
10	225	19	7,1	13	2,5	75-10-225	UFN 10
10	250	19	7,1	13	2,5	75-10-250	UFN 10
13	50	25	8	17	3	75-13-050	UF 13
13	75	25	8	17	3	75-13-075	UF 13
13	100	25	8	17	3	75-13-100	UF 13
13	125	25	8	17	3	75-13-125	UF 13
13	150	25	8	17	3	75-13-150	UF 13
13	175	25	8	17	3	75-13-175	UF 13
13	200	25	8	17	3	75-13-200	UF 13
13	225	25	8	17	3	75-13-225	UF 13
13	250	25	8	17	3	75-13-250	UF 13
16	50	32	8	21	4,5	75-16-050	UF 16
16	75	32	8	21	4,5	75-16-075	UF 16
16	100	32	8	21	4,5	75-16-100	UF 16

Dimensions						Material (item number)	Ceramic ferrule
d_1	l_2	d_5	k	d_3^*	h^*	S235J2+C450	
16	125	32	8	21	4,5	75-16-125	UF 16
16	150	32	8	21	4,5	75-16-150	UF 16
16	175	32	8	21	4,5	75-16-175	UF 16
16	200	32	8	21	4,5	75-16-200	UF 16
16	225	32	8	21	4,5	75-16-225	UF 16
16	250	32	8	21	4,5	75-16-250	UF 16
16	275	32	8	21	4,5	75-16-275	UF 16
16	300	32	8	21	4,5	75-16-300	UF 16
19	50	32	10	23	6	75-19-050	UF 19
19	60	32	10	23	6	75-19-060	UF 19
19	75	32	10	23	6	75-19-075	UF 19
19	80	32	10	23	6	75-19-080	UF 19
19	90	32	10	23	6	75-19-090	UF 19
19	100	32	10	23	6	75-19-100	UF 19
19	125	32	10	23	6	75-19-125	UF 19
19	150	32	10	23	6	75-19-150	UF 19
19	175	32	10	23	6	75-19-175	UF 19
19	200	32	10	23	6	75-19-200	UF 19
19	225	32	10	23	6	75-19-225	UF 19
19	250	32	10	23	6	75-19-250	UF 19
19	275	32	10	23	6	75-19-275	UF 19
19	300	32	10	23	6	75-19-300	UF 19
22	75	35	10	29	6	75-22-075	UF 22
22	90	35	10	29	6	75-22-090	UF 22
22	100	35	10	29	6	75-22-100	UF 22
22	125	35	10	29	6	75-22-125	UF 22
22	150	35	10	29	6	75-22-150	UF 22
22	175	35	10	29	6	75-22-175	UF 22
22	200	35	10	29	6	75-22-200	UF 22
22	225	35	10	29	6	75-22-225	UF 22
22	250	35	10	29	6	75-22-250	UF 22
22	275	35	10	29	6	75-22-275	UF 22
22	300	35	10	29	6	75-22-300	UF 22
25	75	41	12	31	7	75-25-075	UF 25
25	100	41	12	31	7	75-25-100	UF 25
25	125	41	12	31	7	75-25-125	UF 25
25	150	41	12	31	7	75-25-150	UF 25
25	175	41	12	31	7	75-25-175	UF 25
25	200	41	12	31	7	75-25-200	UF 25
25	225	41	12	31	7	75-25-225	UF 25
25	250	41	12	31	7	75-25-250	UF 25
25	275	41	12	31	7	75-25-275	UF 25
25	300	41	12	31	7	75-25-300	UF 25

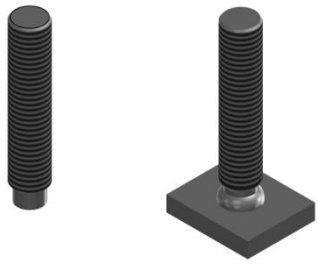
*d_3 and h are approximate values

Explanations to the used material can be found in chapter 2.1.

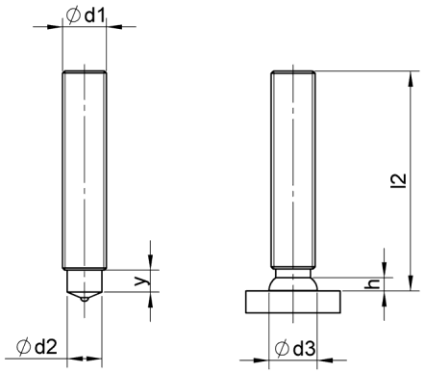
Special ceramic ferrules for shear connectors can be found in chapter 2.33, padded rings in chapter 2.32.

Not listed dimensions and materials available upon request.

2.3 Threaded stud with reduced shaft (type RD acc. to DIN EN ISO 13918)



before welding / after welding



before welding / after welding

The threaded stud type RD is threaded almost to the top of the welding tip which is reduced to about the core diameter of the thread. Thus the fillet diameter will only be slightly (0,5-1 mm) bigger than the external diameter of the thread. It is worthy of note that the reduction of the welding tip diminishes the bearing force of the stud by approximately 15% in comparison to the type MPF/PD/MD. Thus - if necessary - the next bigger diameter should be chosen.

Dimensions						Material (item number)			Ceramic ferrule
d_1	l_2	y_{min}[1]	d_2	d_3*	h*	Steel 4.8	A2-50	1.4571	
M6	15-100	4	4,7	7	2,5	41-06-**XXX**	42-06-**XXX**	43-06-**XXX**	RF 6
M8	15-100	4	6,2	9	2,5	41-08-**XXX**	42-08-**XXX**	43-08-**XXX**	RF 8 (KSR-F 8[2])
M10	15-100	5	7,9	11,5	3	41-10-**XXX**	42-10-**XXX**	43-10-**XXX**	RF 10 (KSR-F 10[2])
M12	20-100	6	9,5	13,5	4	41-12-**XXX**	42-12-**XXX**	43-12-**XXX**	RF 12
M16	25-100	7,5	13,2	18	5	41-16-**XXX**	42-16-**XXX**	43-16-**XXX**	RF 16
M20	30-100	13	16,5	23	6	41-20-**XXX**	42-20-**XXX**	43-20-**XXX**	RF 20 (flat Form)
M24	50-100	15	20	28	7	41-24-**XXX**	42-24-**XXX**	43-24-**XXX**	UF 20

[1]Other y-dimensions available upon request.

[2]for l_2 < 20 mm

*d_3 and h are approximate values

Upon request: without aluminium ball at the welding tip (as standard according to DIN EN ISO 13918 with aluminium ball (see explanation in chapter 2.1)).

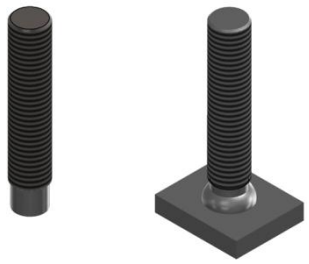
In the item number **XXX** has to be replaced by the respective welding element length l_2 (e.g. 030 for 30 mm).

Explanations to the used materials can be found in chapter 2.1.

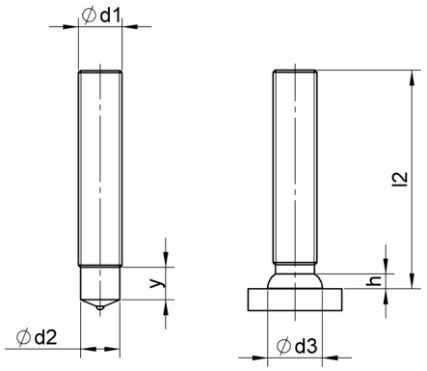
Available surface treatments can be found in chapter 2.1.

Not listed dimensions and materials available upon request.

2.4 Threaded stud (type MPF)



before welding / after welding



before welding / after welding

The threaded stud type MPF is threaded to approximately the top of the welding tip. The diameter of the unthreaded stud section on the welding tip corresponds to the pitch diameter of the thread. Thus the diameter of the weld-fillet is approximately 3-4 mm larger than the external diameter of the thread. The maximum load is identical to the load of a 4.8 screw.

Dimensions						Material (item number)			Ceramic ferrule
d_1	l_2	y -0/+0,5	d_2	d_3*	h*	Steel 4.8	A2-50	1.4571	
M6	15-100	3	5,3	8,5	4	46-06-**XXX**-MPF	47-06-**XXX**-MPF	48-06-**XXX**-MPF	UF 6
M8	15-100	6	7,1	10	3	46-08-**XXX**-MPF	47-08-**XXX**-MPF	48-08-**XXX**-MPF	KSP-F 8
M10	15-100	7	8,95	12,5	3,4	46-10-**XXX**-MPF	47-10-**XXX**-MPF	48-10-**XXX**-MPF	KSP-F 10
M12	20-100	8	10,8	14,5	4,2	46-12-**XXX**-MPF	47-12-**XXX**-MPF	48-12-**XXX**-MPF	KSP-F 12
M16	30-100	11	14,6	17,8	5,8	46-16-**XXX**-MPF	47-16-**XXX**-MPF	48-16-**XXX**-MPF	KSP-F 16
M20	35-100	13	18,3	22,5	6,6	46-20-**XXX**-MPF	47-20-**XXX**-MPF	48-20-**XXX**-MPF	KSP-F 20

*d_3 and h are approximate values

Upon request: without aluminium ball at the welding tip (as standard according to DIN EN ISO 13918 with aluminium ball (see explanation in chapter 2.1)).

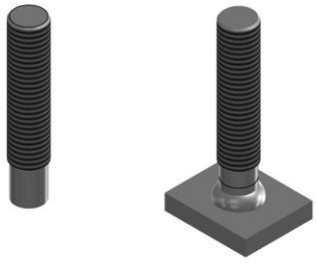
In the item number **XXX** has to be replaced by the respective welding element length l_2 (e.g. 030 for 30 mm).

Explanations to the used materials can be found in chapter 2.1.

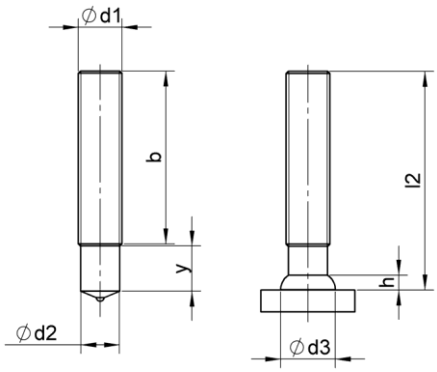
Available surface treatments can be found in chapter 2.1.

Not listed dimensions and materials available upon request.

2.5 Threaded stud with partial thread (type PD acc. to DIN EN ISO 13918)



before welding / after welding



before welding / after welding

The threaded stud type PD has a partial thread. The diameter of the unthreaded stud section on the welding tip corresponds to the pitch diameter of the thread. Thus the diameter of the weld-fillet is approximately 3-4 mm larger than the external diameter of the thread. The maximum load is identical to the load of a 4.8 screw.

Dimensions							Material (item number)			Ceramic ferrule
d_1	l_2	y_{min}	b	d_2	d_3*	h*	Steel 4.8	A2-50	1.4571	
M6	15 ≤ l_2 < 35 35 ≤ l_2 < 60 60 ≤ l_2 < 160	9 - -	- 20 40	5,3	8,5	3,5	46-06-**XXX**	47-06-**XXX**	48-06-**XXX**	PF 6
M8	20 ≤ l_2 < 50 50 ≤ l_2 < 160	9 -	- 40	7,1	10	3,5	46-08-**XXX**	47-08-**XXX**	48-08-**XXX**	PF 8
M10	20 ≤ l_2 < 50 50 ≤ l_2 < 140 140 ≤ l_2 < 160	9,5 - -	- 40 80	8,95	12,5	4	46-10-**XXX**	47-10-**XXX**	48-10-**XXX**	PF 10
M12	25 ≤ l_2 < 50 50 ≤ l_2 < 140 140 ≤ l_2 < 160	11,5 - -	- 40 80	10,8	15,5	4,5	46-12-**XXX**	47-12-**XXX**	48-12-**XXX**	PF 12
M16	30 ≤ l_2 < 55 55 ≤ l_2 < 100 100 ≤ l_2 < 160	13,5 - -	- 40 80	14,6	19,5	6	46-16-**XXX**	47-16-**XXX**	48-16-**XXX**	PF 16
M20	35 ≤ l_2 < 50 50 ≤ l_2 < 55 55 ≤ l_2 < 80 80 ≤ l_2 < 100 100 ≤ l_2 < 160	15,5 - - - -	- 35 40 50 70	18,3	24,5	7	46-20-**XXX**	47-20-**XXX**	48-20-**XXX**	PF 20
M24	50 ≤ l_2 < 55 55 ≤ l_2 < 60 60 ≤ l_2 < 70 70 ≤ l_2 < 100 100 ≤ l_2 < 160	20 - - - -	- 30 40 50 70	22	30	10	46-24-**XXX**	47-24-**XXX**	48-24-**XXX**	PF 24

*d_3 and h are approximate values

Upon request: without aluminium ball at the welding tip (as standard according to DIN EN ISO 13918 with aluminium ball (see explanation in chapter 2.1)).

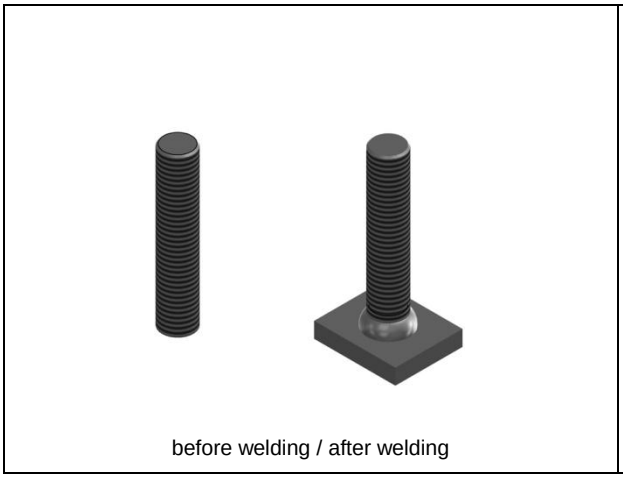
In the item number **XXX** has to be replaced by the respective welding element length l_2 (e.g. 030 for 30 mm).

Explanations to the used materials can be found in chapter 2.1.

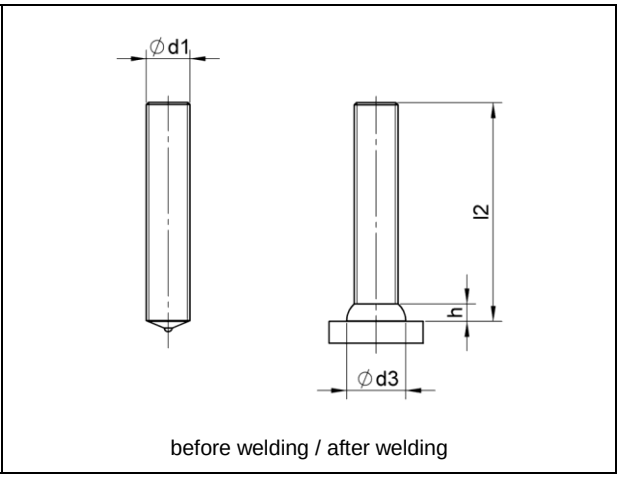
Available surface treatments can be found in chapter 2.1.

Not listed dimensions and materials available upon request.

2.6 Threaded stud with full thread (type MD)



before welding / after welding



before welding / after welding

The threaded stud type MD corresponds to the threaded studs MPF and PD, but is threaded almost to the top of the welding tip. Thus after welding the stud is threaded up to the weld-fillet. The diameter of the weld-fillet is approximately 3-4 mm larger than the external diameter of the thread. The maximum load is identical to the load of a 4.8 screw.

Dimensions				**Material (item number)**			**Ceramic ferrule**
d_1	**l_2**	**d_3***	**h***	**Steel 4.8**	**A2-50**	**1.4571**	
M6	15-100	8,5	4	44-06-**XXX**	54-06-**XXX**	54-1-06-**XXX**	UF 6
M8	15-100	11	4	44-08-**XXX**	54-08-**XXX**	54-1-08-**XXX**	UF 8
M10	15-100	13	4	44-10-**XXX**	54-10-**XXX**	54-1-10-**XXX**	UF 10
M12	20-100	16	5	44-12-**XXX**	54-12-**XXX**	54-1-12-**XXX**	UF 12
M16	25-100	21	7	44-16-**XXX**	54-16-**XXX**	54-1-16-**XXX**	UF 16
M20	30-100	26	7	44-20-**XXX**	54-20-**XXX**	54-1-20-**XXX**	UF 20

*d_3 and h are approximate values

Upon request: without aluminium ball at the welding tip (as standard according to DIN EN ISO 13918 with aluminium ball (see explanation in chapter 2.1)).

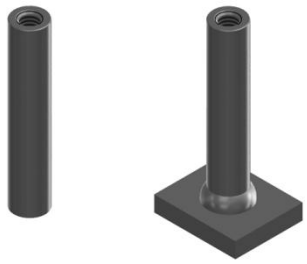
In the item number **XXX** has to be replaced by the respective welding element length l_2 (e.g. 030 for 30 mm).

Explanations to the used materials can be found in chapter 2.1.

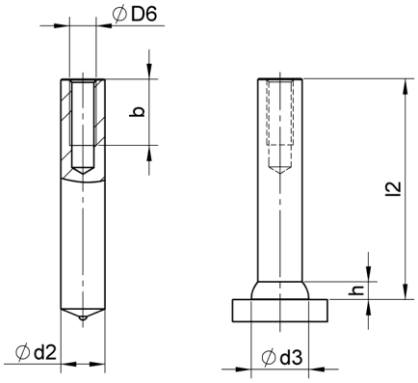
Available surface treatments can be found in chapter 2.1.

Not listed dimensions and materials available upon request.

2.7 Internally threaded stud (type ID acc. to DIN EN ISO 13918)



before welding / after welding



before welding / after welding

Dimensions						Material (item number)			Ceramic ferrule
D_6	b	d_2	l_2	d_3*	h*	Steel 4.8	A2-50	1.4571	
M5	7	10	15-100	13	4	61-50-**XXX**	62-50-**XXX**	62-3-50-**XXX**	UF 10 (KSN-F 10[1])
M6	9	10	15-100	13	4	61-60-**XXX**	62-60-**XXX**	62-3-60-**XXX**	UF 10 (KSN-F 10[1])
M8	12 (8[1])	12	15-100	16	5	61-82-**XXX**	62-82-**XXX**	62-3-82-**XXX**	UF 12 (KSN-F 12[1])
M8	15 (10[2])	14,6	20-100	18,5	6	61-04,6-**XXX**-M8	62-04,6-**XXX**-M8	62-3-04,6-**XXX**-M8	PF 16
M10	15 (10[2])	14,6	20-100	18,5	6	61-04,6-**XXX**	62-04,6-**XXX**	62-3-04,6-**XXX**	PF 16
M10	15 (10[2])	16	30-100	21	7	61-06-**XXX**	62-06-**XXX**	62-3-06-**XXX**	UF 16
M12	18	18,3	25-100	23	7	61-12-**XXX**	62-12-**XXX**	62-3-12-**XXX**	KSP-F 20
M16	24	22	40-100	28	10	61-16-**XXX**	62-16-**XXX**	62-3-16-**XXX**	UF 22

[1]for l_2 < 20 mm, [2]for l_2 < 30 mm

*d_3 and h are approximate values

Upon request: without aluminium ball at the welding tip (as standard according to DIN EN ISO 13918 with aluminium ball (see explanation in chapter 2.1)).

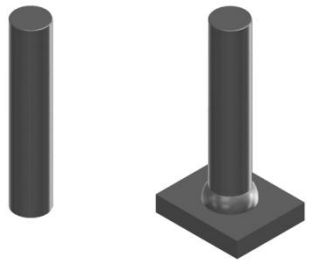
In the item number **XXX** has to be replaced by the respective welding element length l_2 (e.g. 030 for 30 mm).

Explanations to the used materials can be found in chapter 2.1.

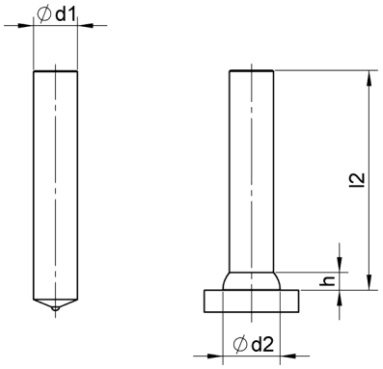
Available surface treatments can be found in chapter 2.1.

Not listed dimensions and materials available upon request.

2.8 Non-threaded stud (type UD acc. to DIN EN ISO 13918)



before welding / after welding



before welding / after welding

Dimensions				Material (item number)			Ceramic ferrule
d_1	l_2	d_3*	h*	Steel 4.8	A2-50	1.4571	
6	15-100	8,5	4	56-06-**XXX**	57-06-**XXX**	58-06-**XXX**	UF 6
8	15-100	11	4	56-08-**XXX**	57-08-**XXX**	58-08-**XXX**	UF 8
10	15-100	13	4	56-10-**XXX**	57-10-**XXX**	58-10-**XXX**	UF 10 (KSN-F 10[1])
12	15-100	16	5	56-12-**XXX**	57-12-**XXX**	58-12-**XXX**	UF 12 (KSN-F 12[1])
14,6	20-100	18,5	6	56-14,6-**XXX**	57-14,6-**XXX**	58-14,6-**XXX**	PF 16
16	30-100	21	7	56-16-**XXX**	57-16-**XXX**	58-16-**XXX**	UF 16
20	40-100	26	9	56-20-**XXX**	57-20-**XXX**	58-20-**XXX**	UF 20
22	40-100	28	10	56-22-**XXX**	57-22-**XXX**	58-22-**XXX**	UF 22

[1]for l_2 < 20 mm

*d_2 and h are approximate values

Upon request: without aluminium ball at the welding tip (as standard according to DIN EN ISO 13918 with aluminium ball (see explanation in chapter 2.1)).

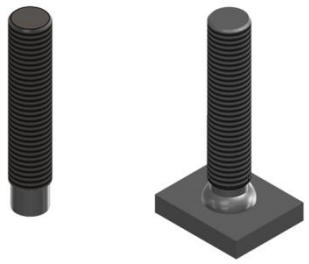
In the item number **XXX** has to be replaced by the respective welding element length l_2 (e.g. 030 for 30 mm).

Explanations to the used materials can be found in chapter 2.1.

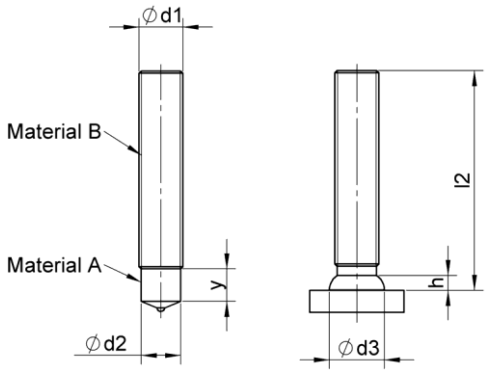
Available surface treatments can be found in chapter 2.1.

Not listed dimensions and materials available upon request.

2.9 Threaded stud from two different materials (type MPF-DUO)



before welding / after welding



before welding / after welding

The threaded stud type MPF-DUO consists of two different materials. It is threaded to approximately the top of the welding tip. The diameter of the unthreaded stud section on the welding tip corresponds to the pitch diameter of the thread. Thus the diameter of the weld-fillet is approximately 3-4 mm larger than the external diameter of the thread. The maximum load is identical to the load of a 4.8 screw.

Dimensions						Material (item number)		Ceramic ferrule
d_1	l_2	y	d_2	d_3^*	h^*	A: steel 4.8, B: 1.4571	A: steel 4.8, B: A2-50	
M8	15-100	6	7,1	10	3	78-14-08-**XXX**-PF	78-12-08-**XXX**-PF	KSP-F 8
M10	20-100	7	8,95	12,5	3,4	78-14-10-**XXX**-PF	78-12-10-**XXX**-PF	KSP-F 10
M12	20-100	8	10,5	14,5	4,2	78-14-12-**XXX**-PF	78-12-12-**XXX**-PF	KSP-F 12
M16	30-100	11	14,6	17,8	5,8	78-14-16-**XXX**-PF	78-12-16-**XXX**-PF	KSP-F 16

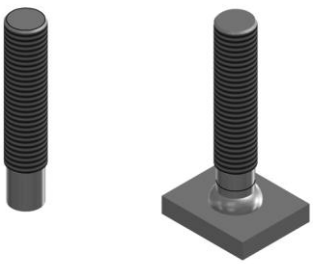
*d_3 and h are approximate values

In the item number **XXX** has to be replaced by the respective welding element length l_2 (e.g. 030 for 30 mm).

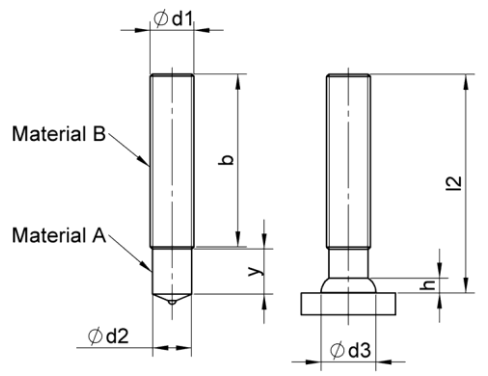
Explanations to the used materials can be found in chapter 2.1.

Not listed dimensions and materials available upon request.

2.10 Threaded stud with partial thread from two different materials (type PD-DUO)



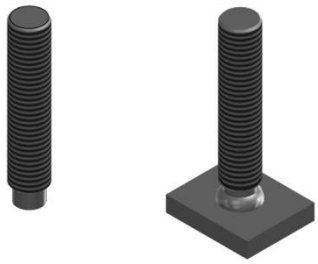
before welding / after welding



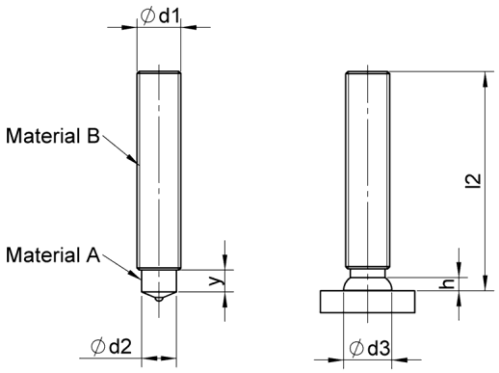
before welding / after welding

Available dimensions and materials available upon request.

2.11 Threaded stud with reduced shaft from two different materials (type RD-DUO)



before welding / after welding



before welding / after welding

The threaded stud type RD-DUO consists of two different materials. It is threaded almost to the top of the welding tip which is reduced to about the core diameter of the thread. Thus the fillet diameter will only be slightly (0,5-1 mm) bigger than the external diameter of the thread. It is worthy of note that the reduction of the welding tip diminishes the bearing force of the stud by approximately 15% in comparison to the type MPF/PD/MD. Thus - if necessary - the next bigger diameter should be chosen.

Dimensions						Material (item number)		Ceramic ferrule
d_1	l_2	y_{min}[1]	d_2	d_3*	h*	A: steel 4.8, B: 1.4571	A: steel 4.8, B: A2-50	
M8	15-100	4	6,2	9	2,5	78-14-08-**XXX**-R	78-12-08-**XXX**-R	RF 8 (KSR-F 8[2])
M10	20-100	5	7,9	11,5	3	78-14-10-**XXX**-R	78-12-10-**XXX**-R	RF 10
M12	20-100	6	9,5	13,5	4	78-14-12-**XXX**-R	78-12-12-**XXX**-R	RF 12
M16	25-100	7,5	13,2	18	5	78-14-16-**XXX**-R	78-12-16-**XXX**-R	RF 16

[1]Other y-dimensions available upon request.

[2]for l_2 < 20 mm

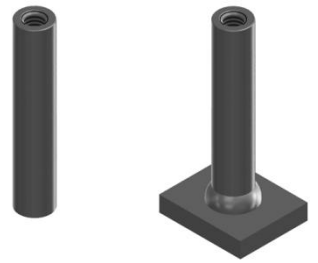
*d_3 and h are approximate values

In the item number **XXX** has to be replaced by the respective welding element length l_2 (e.g. 030 for 30 mm).

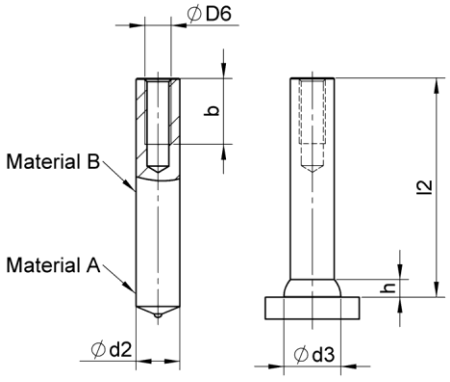
Explanations to the used materials can be found in chapter 2.1.

Not listed dimensions and materials available upon request.

2.12 Internally threaded stud from two different materials (type ID-DUO)



before welding / after welding

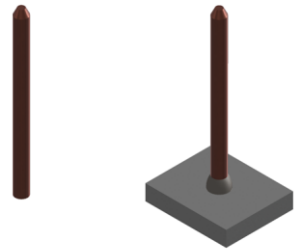


before welding / after welding

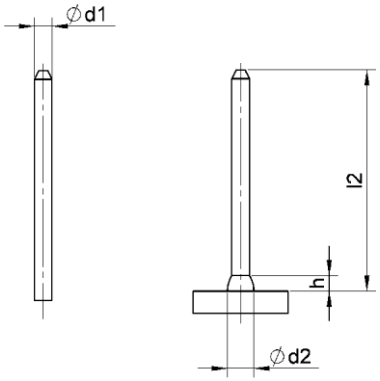
Available dimensions and materials available upon request.

2.13 Insulation pins and clips

2.13.1 Insulation pin (type ISA)



before welding / after welding



before welding / after welding

Insulation pin - one-sided with grinded tip

Dimensions				Material (item number)					[Ceramic ferrule[1]]
d_1	l_2	d_2*	h*	Steel 4.8 copper-plated	1.4301	1.4541	1.4571	1.5415 (16Mo3)	
3	35-450	6	3,5	66-03-**XXX**	67-03-**XXX**	70-03-**XXX**	74-03-**XXX**	68-03-**XXX**	[UF 4[1] / K 5[1]]
4	60-450	6	3,5	66-04-**XXX**	67-04-**XXX**	70-04-**XXX**	74-04-**XXX**	68-04-**XXX**	[UF 4[1] / K 5[1]]
5	60-450	8	3,5	66-05-**XXX**	67-05-**XXX**	70-05-**XXX**	74-05-**XXX**	68-05-**XXX**	[UF 5[1] / K 5[1]]
6	60-450	8,5	4	66-06-**XXX**	67-06-**XXX**	70-06-**XXX**	74-06-**XXX**	68-06-**XXX**	[UF 6[1] / K 6[1]]

*d_2 and h are approximate values

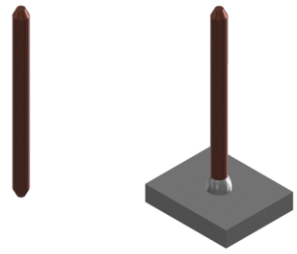
[1]Insulation pins are generally welded without ceramic ferrules. Ceramic ferrules are only used for special applications. If ceramic ferrules shall be used, either type UF or type K can be chosen.

In the item number **XXX** has to be replaced by the respective welding element length l_2 (e.g. 030 for 30 mm).

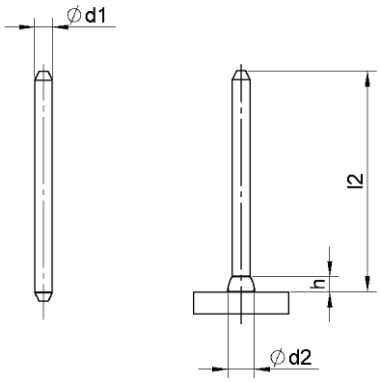
Explanations to the used materials can be found in chapter 2.1.

Not listed dimensions and materials available upon request.

2.13.2 Insulation pin (type ISB)



before welding / after welding



before welding / after welding

Insulation pin - two-sided with grinded tip

Dimensions				Material (item number)					[Ceramic ferrule[1]]
d_1	l_2	d_2*	h*	Steel 4.8 copper-plated	1.4301	1.4541	1.4571	1.5415 (16Mo3)	
3	50-450	6	3,5	66-03-**XXX**-BS	67-03-**XXX**-BS	70-03-**XXX**-BS	74-03-**XXX**-BS	68-03-**XXX**-BS	[UF 4[1] / K 5[1]]
4	50-450	6	3,5	66-04-**XXX**-BS	67-04-**XXX**-BS	70-04-**XXX**-BS	74-04-**XXX**-BS	68-04-**XXX**-BS	[UF 4[1] / K 5[1]]
5	50-450	8	3,5	66-05-**XXX**-BS	67-05-**XXX**-BS	70-05-**XXX**-BS	74-05-**XXX**-BS	68-05-**XXX**-BS	[UF 5[1] / K 5[1]]
6	50-450	8,5	4	66-06-**XXX**-BS	67-06-**XXX**-BS	70-06-**XXX**-BS	74-06-**XXX**-BS	68-06-**XXX**-BS	[UF 6[1] / K 6[1]]

*d_2 and h are approximate values

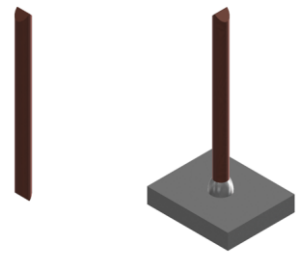
[1]Insulation pins are generally welded without ceramic ferrules. Ceramic ferrules are only used for special applications. If ceramic ferrules shall be used, either type UF or type K can be chosen.

In the item number **XXX** has to be replaced by the respective welding element length l_2 (e.g. 030 for 30 mm).

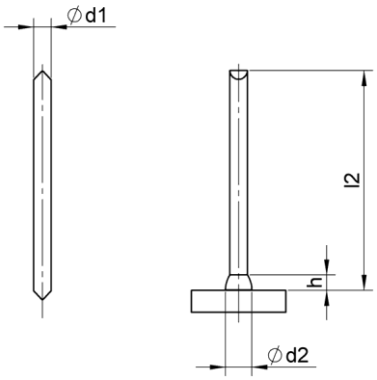
Explanations to the used materials can be found in chapter 2.1.

Not listed dimensions and materials available upon request.

2.13.3 Insulation pin (type ISMS)



before welding / after welding



before welding / after welding

Insulation pin - two-sided with chisel tip

Dimensions				Material (item number)					[Ceramic ferrule[1]]
d_1	l_2	d_2*	h*	Steel 4.8 copper-plated	1.4301	1.4541	1.4571	1.5415 (16Mo3)	
3	20-450	6	3,5	66-03-**XXX**-B-NAGELSPI	67-03-**XXX**-B-NAGELSPI	70-03-**XXX**-B-NAGELSPI	74-03-**XXX**-B-NAGELSPI	68-03-**XXX**-B-NAGELSPI	[UF 4[1] / K 5[1]]
4	60-450	6	3,5	66-04-**XXX**-B-NAGELSPI	-	-	-	-	[UF 4[1] / K 5[1]]
5	60-120	8	3,5	66-05-**XXX**-B-NAGELSPI	-	-	-	-	[UF 5[1] / K 5[1]]

*d_2 and h are approximate values

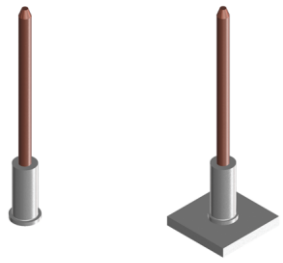
[1]Insulation pins are generally welded without ceramic ferrules. Ceramic ferrules are only used for special applications. If ceramic ferrules shall be used, either type UF or type K can be chosen.

In the item number **XXX** has to be replaced by the respective welding element length l_2 (e.g. 030 for 30 mm).

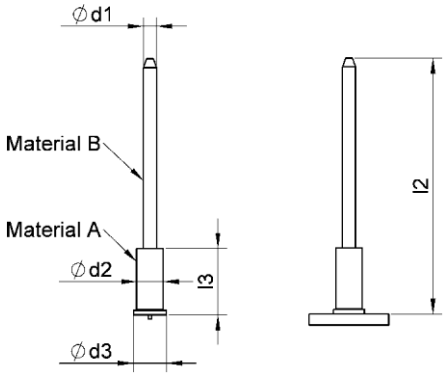
Explanations to the used materials can be found in chapter 2.1.

Not listed dimensions and materials available upon request.

2.13.4 Bimetallic insulation pin (type VBS)



before welding / after welding



before welding / after welding

The bimetallic insulation pin VBS consists of an aluminium tapped blind hole stud with a pressed-in insulation pin.

Application area: insulation on aluminium base material

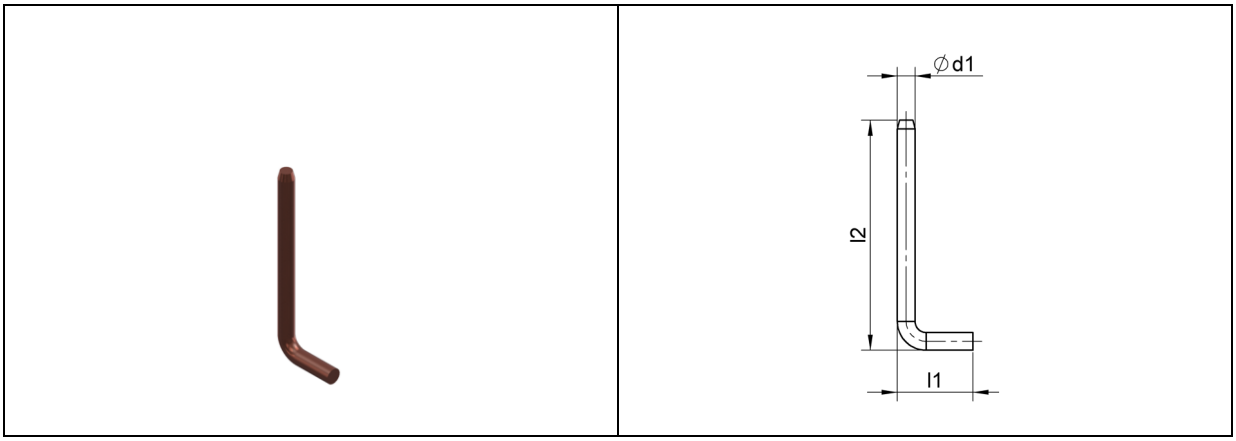
Dimensions					Material (item number)		
d_1	l_2	d_2	l_3	d_3	A: AlMg3, B: Steel 4.8 copper-plated	A: AlMg3, B: 1.4301	A: AlMg3, B: 1.4571
3	30-200	6	15	7,5	241-03-**XXX**	242-03-**XXX**	247-03-**XXX**

In the item number **XXX** has to be replaced by the respective welding element length l_2 (e.g. 030 for 30 mm).

Explanations to the used materials can be found in chapter 2.1.

Not listed dimensions and materials available upon request.

2.13.5 Insulation pin (type ISH)



Insulation pin - angled (for manual welding)

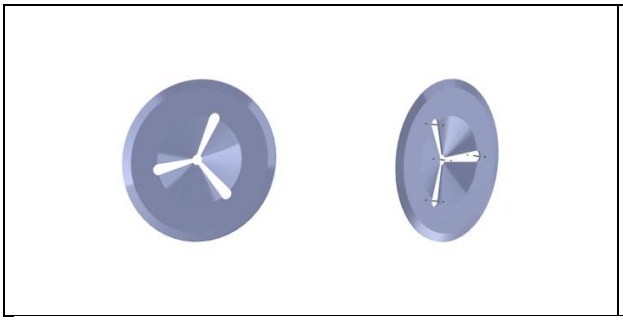
Dimensions			Material (item number)				
d_1	**l_2**	**l_1**	**Steel 4.8 copper-plated**	**1.4301**	**1.4541**	**1.4571**	**1.5415 (16Mo3)**
3	upon request	upon request	66-03-**XXX**-ISH-**XX**	67-03-**XXX**-ISH-**XX**	70-03-**XXX**-ISH-**XX**	74-03-**XXX**-ISH-**XX**	68-03-**XXX**-ISH-**XX**
4	upon request	upon request	66-04-**XXX**-ISH-**XX**	67-04-**XXX**-ISH-**XX**	70-04-**XXX**-ISH-**XX**	74-04-**XXX**-ISH-**XX**	68-04-**XXX**-ISH-**XX**
5	upon request	upon request	66-05-**XXX**-ISH-**XX**	67-05-**XXX**-ISH-**XX**	70-05-**XXX**-ISH-**XX**	74-05-**XXX**-ISH-**XX**	68-05-**XXX**-ISH-**XX**

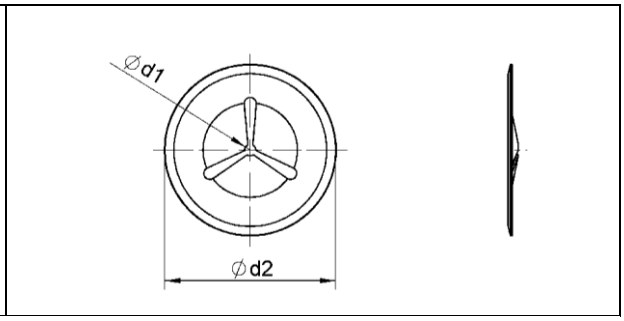
In the item number **XXX** has to be replaced by the respective welding element length l_2 (e.g. 030 for 30 mm) and **XX** by the respective angled length l_1.

Explanations to the used materials can be found in chapter 2.1.

Not listed dimensions and materials available upon request.

2.13.6 Clip for insulation pin (type R)

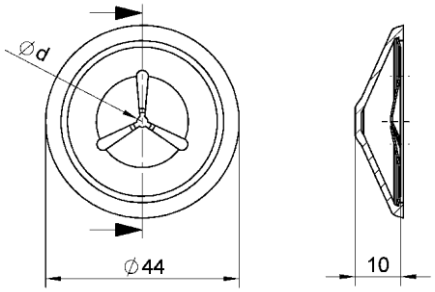




Dimensions		Material (item number)	
d_1	d_2	Steel zinc-plated	1.4310
2	38	49-12-002	49-22-002
3	38	49-13-003	49-23-003
4	38	49-14-004	49-24-004
5	38	49-15-005	49-25-005
6	38	49-16-006	49-26-006
8	38	49-18-008	49-28-008
9,5	38	49-19-009,5	49-29-009,5
12	38	49-12-012	49-22-012
3	60	49-13-003-ST2K70-D60	49-23-003-4301-D60
4	60	49-14-004-ST2K70-D60	49-24-004-4301-D60
5	60	49-15-005-ST2K70-D60	49-25-005-4301-D60
6	60	49-16-006-ST2K70-D60	49-26-006-4301-D60

Not listed dimensions and materials available upon request.

2.13.7 Clip with plastic cap for insulation pin (type W)

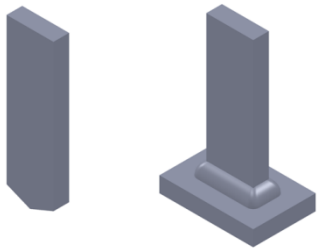


Dimensions	Material (item number)			
d	Steel zinc-plated with plastic cap (white)	Steel zinc-plated with plastic cap (black)	1.4310 with plastic cap (white)	1.4310 with plastic cap (black)
2	49-52-002	49-52-002-SCHWARZ	49-62-002	49-62-002-SCHWARZ
3	49-53-003	49-53-003-SCHWARZ	49-63-003	49-63-003-SCHWARZ
4	49-54-004	49-54-004-SCHWARZ	49-64-004	49-64-004-SCHWARZ
5	49-55-005	49-55-005-SCHWARZ	49-65-005	49-65-005-SCHWARZ

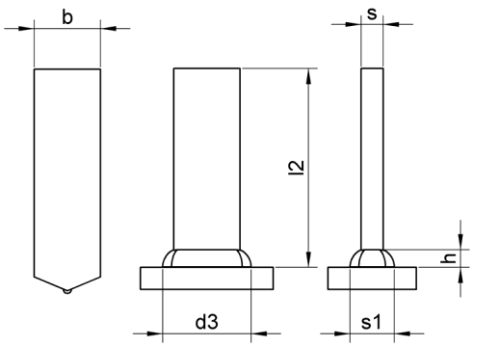
Plastic cap: halogen free, flame-retardant

Not listed dimensions and materials available upon request.

2.14 Rectangular stud (type A)



before welding / after welding



before welding / after welding

Dimensions						Material (item number)		Ceramic ferrule
b	**s**	**l_2**	**d_3***	**h***	**s_1***	**Steel 4.8**	**A2-50**	
15	3	20-100	18	4	6	38-1-15-3-**XXX**-A	38-2-15-3-**XXX**-A	KF 15x3
15	5	20-100	20	4	10	38-1-15-5-**XXX**-A	38-2-15-5-**XXX**-A	KF 15x5
25	3	25-100	28	4	6	38-1-25-3-**XXX**-A	38-2-25-3-**XXX**-A	KF 25x3

*d_3, h and s_1 are approximate values

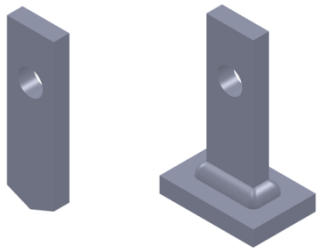
In the item number **XXX** has to be replaced by the respective welding element length l_2 (e.g. 030 for 30 mm).

Explanations to the used materials can be found in chapter 2.1.

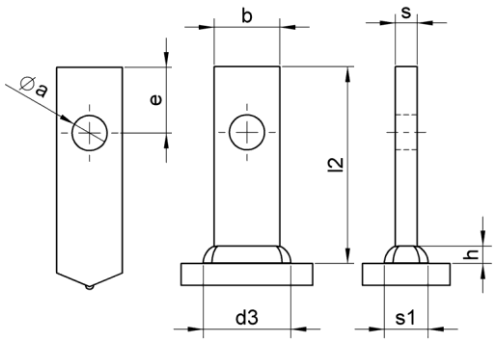
Available surface treatments can be found in chapter 2.1.

Not listed dimensions and materials available upon request.

2.15 Rectangular stud (type B)



before welding / after welding



before welding / after welding

Dimensions								Material (item number)		Ceramic ferrule
b	**s**	**l_2**	**a**	**e**	**d_3***	**h***	**s_1***	**Steel 4.8**	**A2-50**	
15	3	20-100	6	15 (10^1)	18	4	6	38-1-15-3-**XXX**-B	38-2-15-3-**XXX**-B	KF 15x3
15	5	20-100	8	15 (10^1)	20	4	10	38-1-15-5-**XXX**-B	38-2-15-5-**XXX**-B	KF 15x5
25	3	25-100	8	15	28	4	6	38-1-25-3-**XXX**-B	38-2-25-3-**XXX**-B	KF 25x3

[1]for l_2 < 25 mm

*d_3, h and s_1 are approximate values

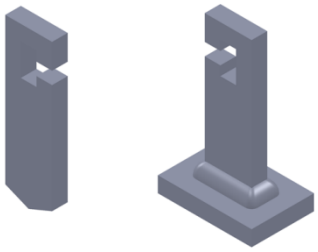
In the item number **XXX** has to be replaced by the respective welding element length l_2 (e.g. 030 for 30 mm).

Explanations to the used materials can be found in chapter 2.1.

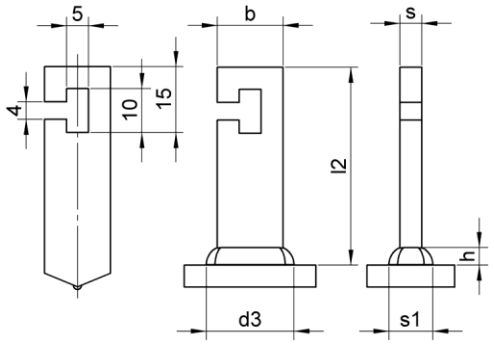
Available surface treatments can be found in chapter 2.1.

Not listed dimensions and materials available upon request.

2.16 Rectangular stud (type C)



before welding / after welding



before welding / after welding

Dimensions						Material (item number)		Ceramic ferrule
b	**s**	**l_2**	**d_3***	**h***	**s_1***	**Steel 4.8**	**A2-50**	
15	3	20-100	18	4	6	38-1-15-3-**XXX**-C	38-2-15-3-**XXX**-C	KF 15x3
15	5	20-100	20	4	10	38-1-15-5-**XXX**-C	38-2-15-5-**XXX**-C	KF 15x5
25	3	25-100	28	4	6	38-1-25-3-**XXX**-C	38-2-25-3-**XXX**-C	KF 25x3

*d_3, h and s_1 are approximate values

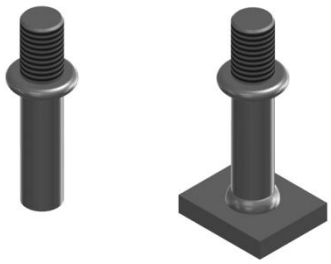
In the item number **XXX** has to be replaced by the respective welding element length l_2 (e.g. 030 for 30 mm).

Explanations to the used materials can be found in chapter 2.1.

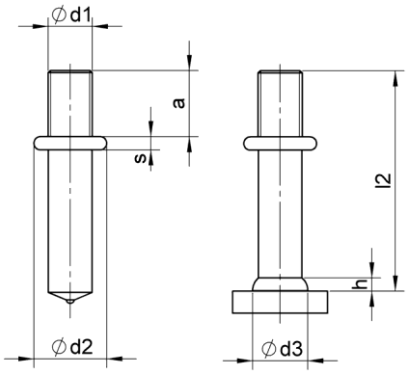
Available surface treatments can be found in chapter 2.1.

Not listed dimensions and materials available upon request.

2.17 Threaded collar stud (type KRB)



before welding / after welding



before welding / after welding

Dimensions							Material (item number)		Ceramic ferrule
d_1	l_2	a	d_2	s	d_3^*	h^*	Steel 4.8	A2-50	
M8	40-100	15	upon request	upon request	10	3,5	50-KRB-2-08-**XXX**	50-KRB-1-08-**XXX**	PF 8
M10	40-100	15	upon request	upon request	12,5	4	50-KRB-2-10-**XXX**	50-KRB-1-10-**XXX**	PF 10
M12	40-100	15	upon request	upon request	15,5	4,5	50-KRB-2-12-**XXX**	50-KRB-1-12-**XXX**	PF 12

*d_3 and h are approximate values

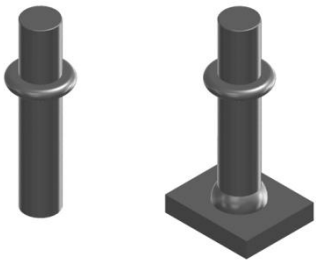
In the item number **XXX** has to be replaced by the respective welding element length l_2 (e.g. 030 for 30 mm).

Explanations to the used materials can be found in chapter 2.1.

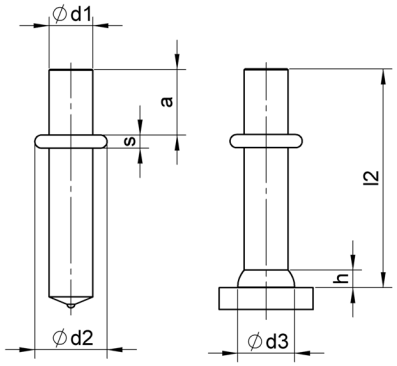
Available surface treatments can be found in chapter 2.1.

Not listed dimensions and materials available upon request.

2.18 Collar stud (type KRS)



before welding / after welding



before welding / after welding

Dimensions							Material (item number)		Ceramic ferrule
d_1	l_2	a	d_2	s	d_3*	h*	Steel 4.8	A2-50	
8	30-60	15	upon request	upon request	11	4	50-KRS-2-08-**XXX**	50-KRS-1-08-**XXX**	UF 8
10	30-60	15	upon request	upon request	13	4	50-KRS-2-10-**XXX**	50-KRS-1-10-**XXX**	UF 10
12	30-60	15	upon request	upon request	16	5	50-KRS-2-12-**XXX**	50-KRS-1-12-**XXX**	UF 12

*d_3 and h are approximate values

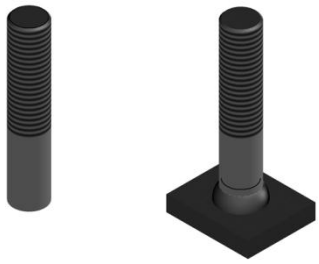
In the item number **XXX** has to be replaced by the respective welding element length l_2 (e.g. 030 for 30 mm).

Explanations to the used materials can be found in chapter 2.1.

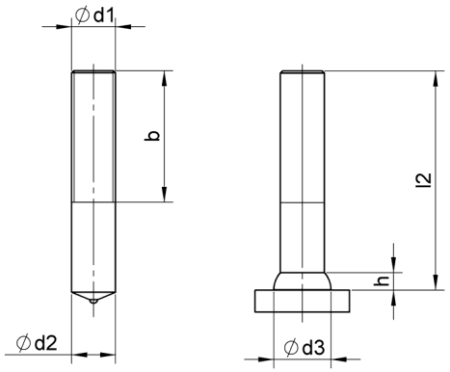
Available surface treatments can be found in chapter 2.1.

Not listed dimensions and materials available upon request.

2.19 Threaded stud (type M)



before welding / after welding



before welding / after welding

Dimensions						Material (item number)			Ceramic ferrule
d_1	l_2	d_2	b	d_3^*	h^*	Steel 4.8	A2-50	1.4571	
M8	upon request	8	upon request	11	4	46-08-**XXX**-**XX**-M	47-08-**XXX**-**XX**-M	48-08-**XXX**-**XX**-M	UF 8
M10	upon request	10	upon request	13	4	46-10-**XXX**-**XX**-M	47-10-**XXX**-**XX**-M	48-10-**XXX**-**XX**-M	UF 10
M12	upon request	12	upon request	16	5	46-12-**XXX**-**XX**-M	47-12-**XXX**-**XX**-M	48-12-**XXX**-**XX**-M	UF 12
M16	upon request	16	upon request	21	7	46-16-**XXX**-**XX**-M	47-16-**XXX**-**XX**-M	48-16-**XXX**-**XX**-M	UF 16
M20	upon request	20	upon request	26	9	46-20-**XXX**-**XX**-M	47-20-**XXX**-**XX**-M	48-20-**XXX**-**XX**-M	UF 20

*d3 and h are approximate values

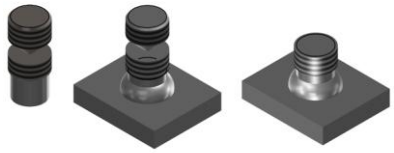
In the item number **XXX** has to be replaced by the respective welding element length l_2 (e.g. 030 for 30 mm) and **XX** by the respective thread length b.

Explanations to the used materials can be found in chapter 2.1.

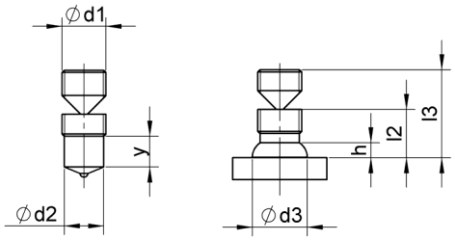
Available surface treatments can be found in chapter 2.1.

Not listed dimensions and materials available upon request.

2.20 Threaded knock-off stud (type AB-MPF)



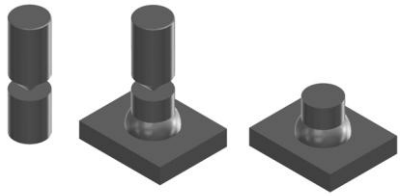
before welding / after welding



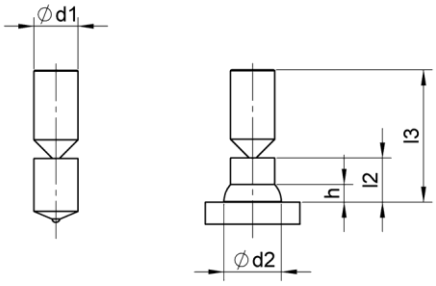
before welding / after welding

Available dimensions and materials as well as other stud types (e.g. RD, MD) available upon request.

2.21 Knock-off stud



before welding / after welding

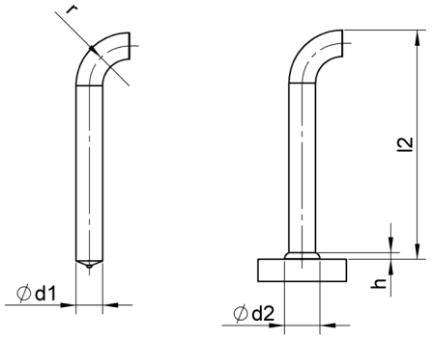


before welding / after welding

Available dimensions and materials available upon request.

2.22 Curved stud

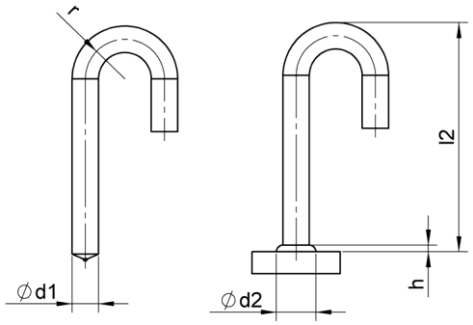
before welding / after welding



before welding / after welding

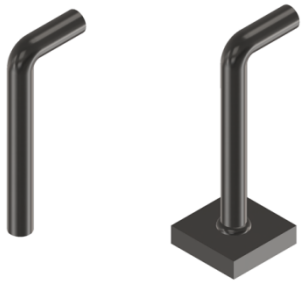
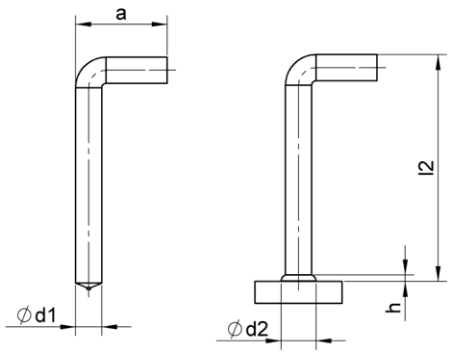
Available dimensions and materials available upon request.

2.23 J-bolt stud

	
before welding / after welding	before welding / after welding

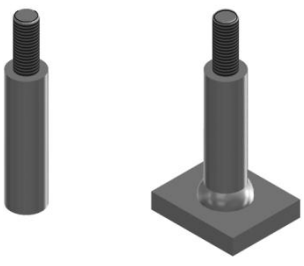
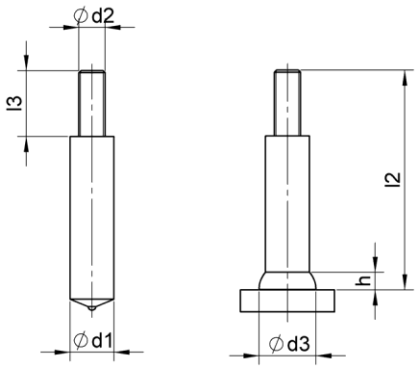
Available dimensions and materials available upon request.

2.24 Bent stud

	
before welding / after welding	before welding / after welding

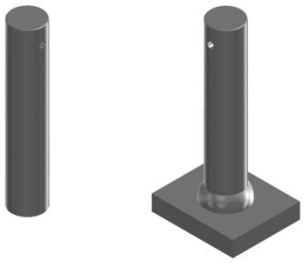
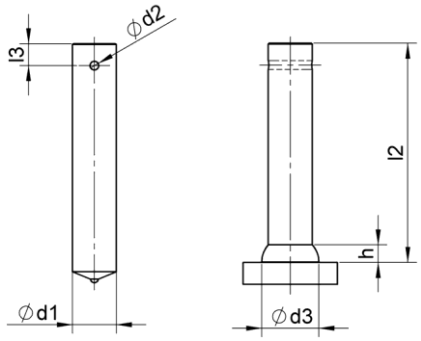
Available dimensions and materials available upon request.

2.25 Stepped stud

	
before welding / after welding	before welding / after welding

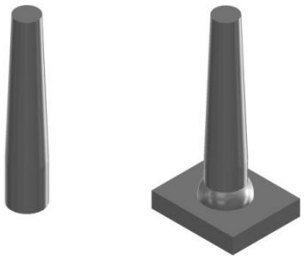
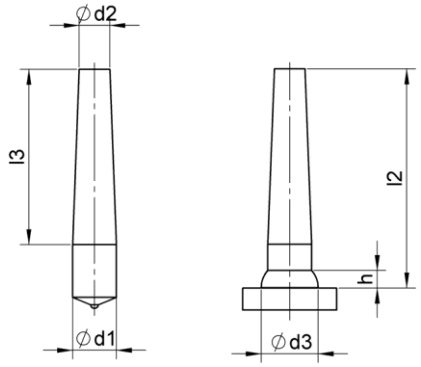
Available dimensions and materials available upon request.

2.26 Locking stud

	
before welding / after welding	before welding / after welding

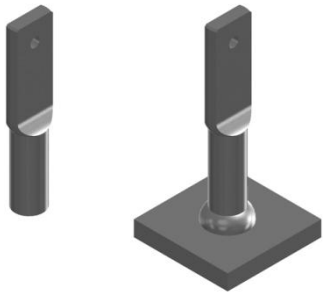
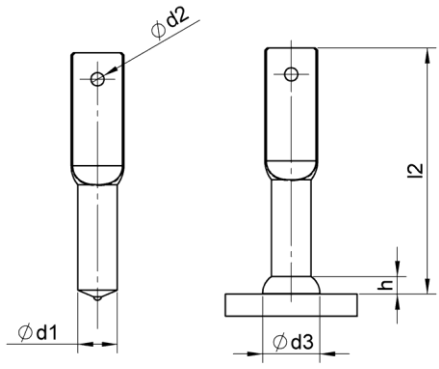
Available dimensions and materials available upon request.

2.27 Cone stud

	
before welding / after welding	before welding / after welding

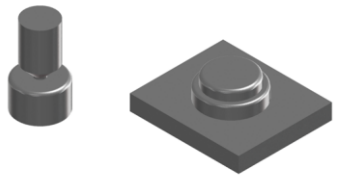
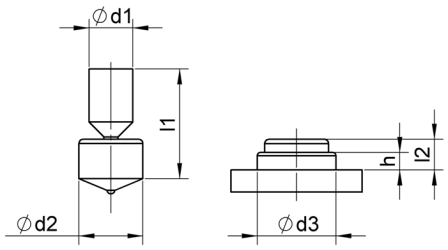
Available dimensions and materials available upon request.

2.28 Flat-ended stud

	
before welding / after welding	before welding / after welding

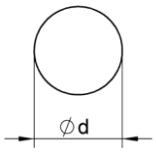
Available dimensions and materials available upon request.

2.29 Anti-skid knock-off stud

	
before welding / after welding	before welding / after welding

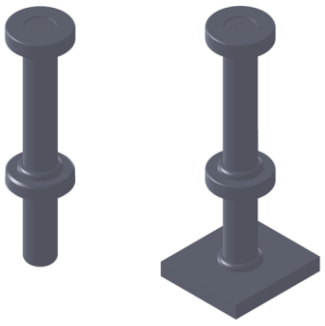
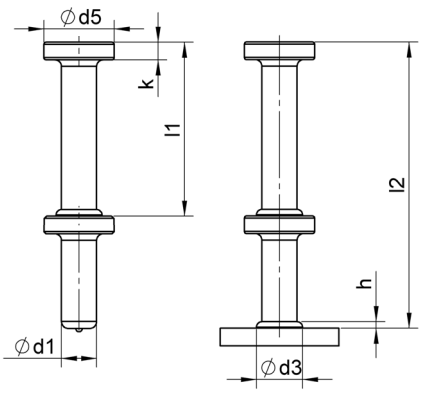
Available dimensions and materials available upon request.

2.30 Ball

	
before welding / after welding	before welding / after welding

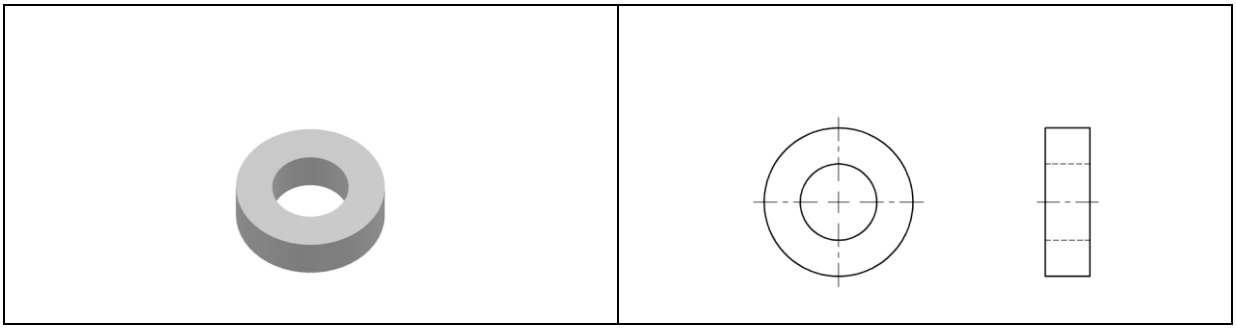
Available dimensions and materials available upon request.

2.31 Double shear connector

	
before welding / after welding	before welding / after welding

Available dimensions and materials available upon request.

2.32 Padded ring for shear connectors

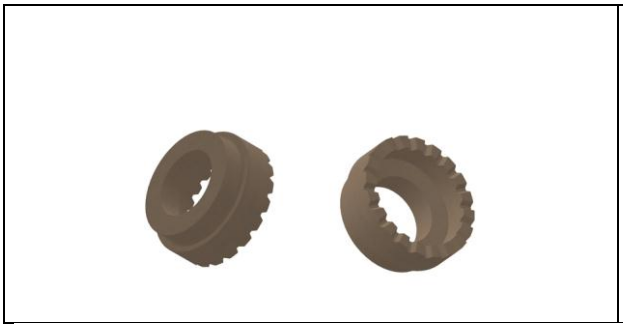


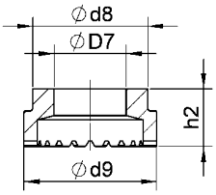
According to our European Technical Approval ETA-11/0120 it is permitted to use two shear connectors welded one on top of the other by drawn arc stud welding. Thereby a padded ring is to be placed under the head of the first shear connector.

Shear connector diameter (d_1)	Item number
10	75-00-PR-10
13	75-00-PR-13
16	75-00-PR-16
19	75-00-PR-19
22	75-00-PR-22
25	75-00-PR-25

2.33 Ceramic ferrules

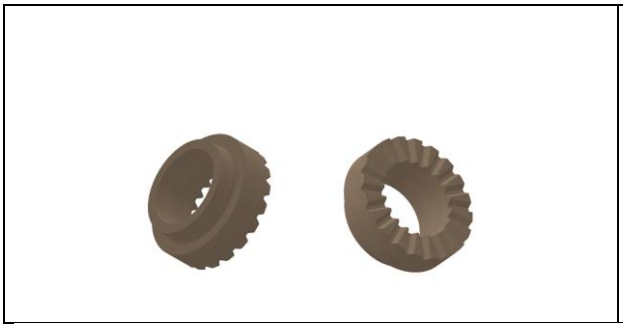
2.33.1 Ceramic ferrule for shear connectors (type UF acc. to DIN EN ISO 13918)

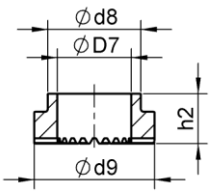




Description	Dimensions				Item number
	D_7 -0/+0,5	d_8 -1/+1	d_9 -1/+1	h_2	
UF 10	10,2	15	17,8	≈ 10	73-00-010
UFN 10	10,2	16,5	20	≈ 9,9	75-00-010-N
UF 13	13,1	20	22,2	≈ 11	75-00-013
UF 16	16,3	26	30	≈ 13	75-00-016
UF 19	19,4	26	30,8	≈ 16,7	75-00-019
UF 22	22,8	30,7	38,5	≈ 18,5	75-00-022
UF 25	26,0	35,5	41	≈ 21	75-00-025

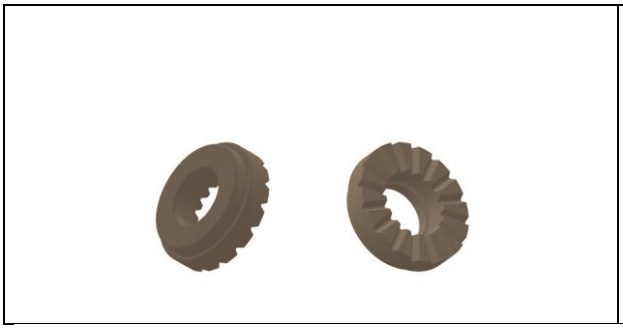
2.33.2 Ceramic ferrule for threaded studs with reduced shaft (type RF acc. to DIN EN ISO 13918)

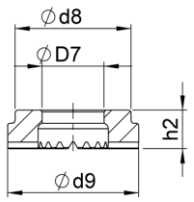




Description	Dimensions				Item number
	D_7 -0/+0,4	d_8 -1/+1	d_9 -1/+1	h_2	
RF 6	6,2	9,5	12,2	≈ 10	71-00-006
RF 8	8,2	12	15,3	≈ 9	71-00-008
RF 10	10,2	15	18,5	≈ 11,5	71-00-010
RF 12	12,2	17	20	≈ 13	71-00-012
RF 16	16,3	20,5	26,5	≈ 15,3	71-00-016
RF 20	20,3	26,2	32	≈ 22	71-00-020
RF 24	24,3	26,2	33	≈ 25	71-00-024

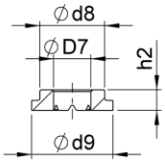
2.33.3 Ceramic ferrule for threaded studs with reduced shaft, flat form (type RF (flat form) acc. to DIN EN ISO 13918)





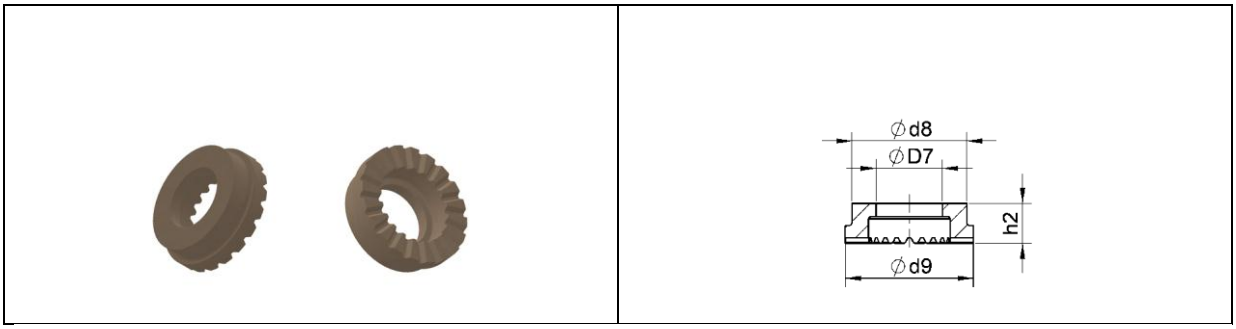
Description	Dimensions				Item number
	D_7 -0/+0,4	d_8 -1/+1	d_9 -1/+1	h_2	
RF 16 (flat form)	14	26,2	32,5	≈ 8,8	71-00-016-F
RF 20 (flat form)	17,5	28,5	32	≈ 9	71-00-020-F

2.33.4 Ceramic ferrule for threaded studs with reduced shaft (type KSR-F)



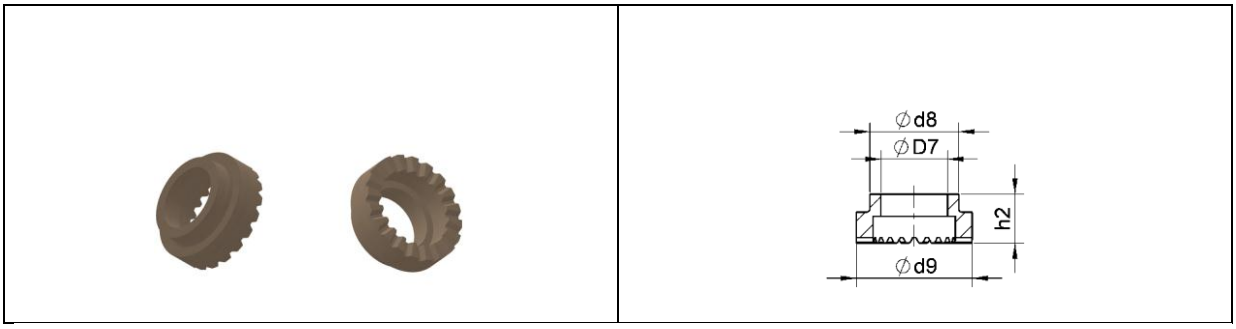
Description	Dimensions				Item number
	D_7 -0/+0,4	d_8 -1/+1	d_9 -1/+1	h_2	
KSR-F 8	8,4	14,8	17,8	≈ 4,7	71-00-008-F-N
KSR-F 10	10,3	14,5	19	≈ 6,7	71-00-010-F-N

2.33.5 Ceramic ferrule for threaded studs (type KSP-F)



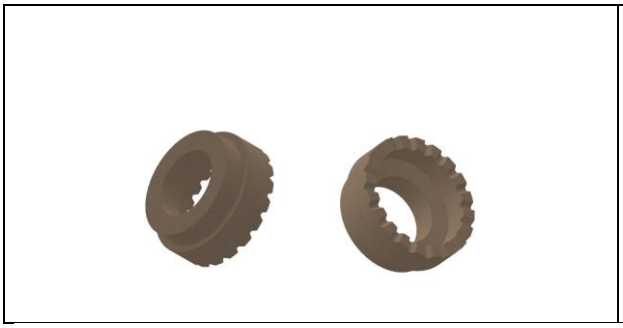
Description	Dimensions				Item number
	D_7 -0,4/+0,4	d_8 -1/+1	d_9 -1/+1	h_2	
KSP-F 8	7,8	14,6	17,6	≈ 5	72-00-008-F
KSP-F 10	9,6	16,5	20	≈ 5,5	72-00-010-F
KSP-F 12	11	20	23,4	≈ 5,7	72-00-012-F
KSP-F 16	15,5	26	29	≈ 9	72-00-016-F-H
KSP-F 20	19,3	30,7	33,8	≈ 10	72-00-020-F

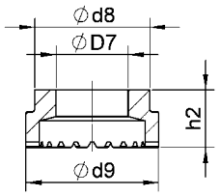
2.33.6 Ceramic ferrule for threaded studs (type PF acc. to DIN EN ISO 13918)



Description	Dimensions				Item number
	D_7 -0/+0,5	d_8 -1/+1	d_9 -1/+1	h_2	
PF 6	5,6	9,5	11,5	≈ 6,5	72-00-006
PF 8	7,4	11,5	15	≈ 6,5	72-00-008
PF 10	9,2	15	17,8	≈ 6,5	72-00-010
PF 12	11,1	16,5	20	≈ 9	72-00-012
PF 16	15,0	20	26	≈ 11	72-00-016
PF 20	18,6	30,7	33,8	≈ 10	72-00-020
PF 24	22,8	30,7	38,5	≈ 18,5	72-00-024

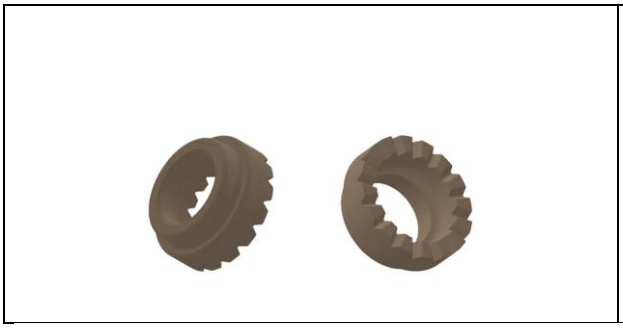
2.33.7 Ceramic ferrule for internally threaded studs and non-threaded studs (type UF acc. to DIN EN ISO 13918)

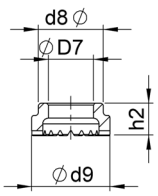




Description	Dimensions				Item number
	D_7 -0/+0,5	d_8 -1/+1	d_9 -1/+1	h_2	
UF 4	4,2	9,5	11,5	≈ 8,7	73-00-004
UF 5	5,2	9,5	11,5	≈ 8,7	73-00-005
UF 6	6,2	9,5	11,5	≈ 8,7	73-00-006
UF 8	8,2	11	15	≈ 8,7	73-00-008
UF 10	10,2	15	17,8	≈ 10	73-00-010
UF 12	12,2	16,5	20	≈ 10,7	73-00-012
UF 16	16,3	26	30	≈ 13	73-00-016
UF 20	20,4	26,1	32,8	≈ 14,2	73-00-020
UF 22	22,8	30,7	38,5	≈ 18,5	73-00-022

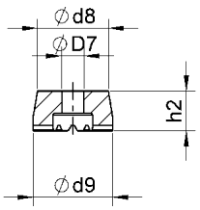
2.33.8 Ceramic ferrule for internally threaded studs and non-threaded studs (type KSN-F)





Description	Dimensions				Item number
	D_7 -0/+0,5	d_8 -1/+1	d_9 -1/+1	h_2	
KSN-F 10	10,25	14,8	17,8	≈ 7,4	73-00-010-F
KSN-F 12	12,25	20	23,2	≈ 6,3	73-00-012-F

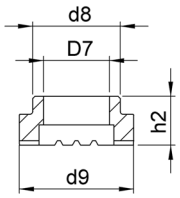
2.33.9 Permanent ceramic ferrule for insulation pins (type K)



A permanent ceramic ferrule can be used for approx. 100 weldings of insulation pins.

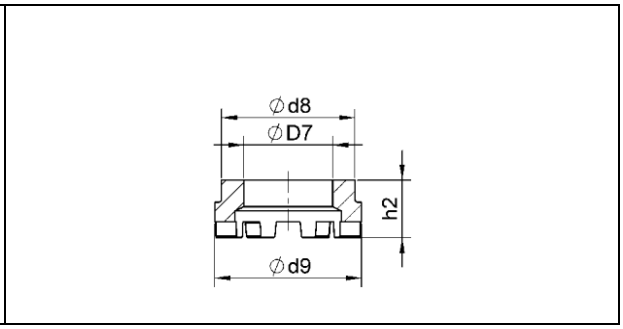
Description	Dimensions				Item number
	D_7 -0/+0,5	d_8 -1/+1	d_9 -1/+1	h_2	
K 5	5,3	16,2	18	≈ 9	73-00-005-K5
K 6	6,3	16,2	18	≈ 9	73-00-006-K6

2.33.10 Ceramic ferrule for rectangular studs (type KF)



Description	Dimensions				Item number
	D_7 -0,7/+0,7	d_8 -1/+1	d_9 -1/+1	h_2	
KF 15x3	16	20,5	26,5	≈ 11	71-00-153
KF 15x5	16	20,5	26,5	≈ 11	71-00-155
KF 25x3	25,5	30,5	35,5	≈ 13	71-00-253
KF 25x5	25,5	30,5	35,5	≈ 13	71-00-255

2.33.11 Special ceramic ferrule (welding through metal deck) for shear connectors (type UFD)



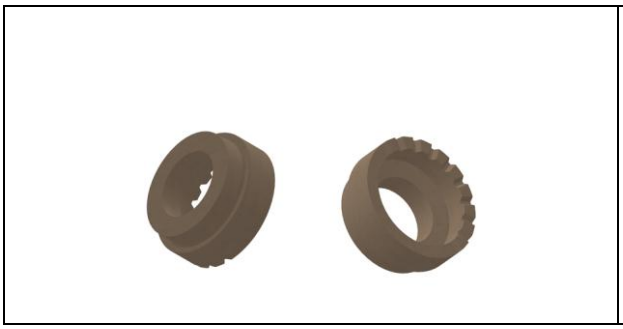
Special ceramic ferrule for welding through metal deck (welding of shear connectors through thin, mostly zinc-plated deck sheets onto the top belt of a steel beam).

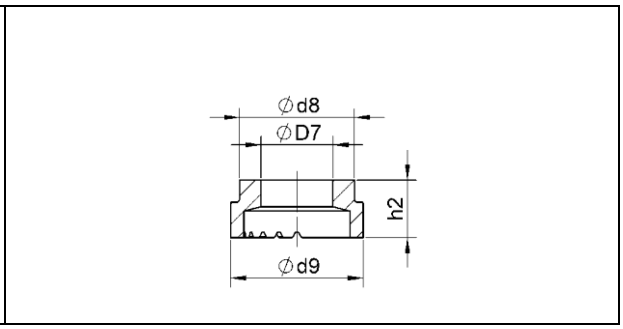
When welding through zinc-plated deck sheets there are high amounts of degasification through zinc evaporation. The special ceramic ferrule type UFD with larger combustion chamber and larger degasification slots considerably improves the welding result.

Description	Dimensions				Item number
	D_7 -0/+0,5	d_8 -1/+1	d_9 -1/+1	h_2	
UFD 19	20,5	30,8	33,8	≈ 15,2	75-00-019-D

Not listed dimensions available upon request.

2.33.12 Special ceramic ferrule (welding to vertical surfaces) for shear connectors (type HSG)



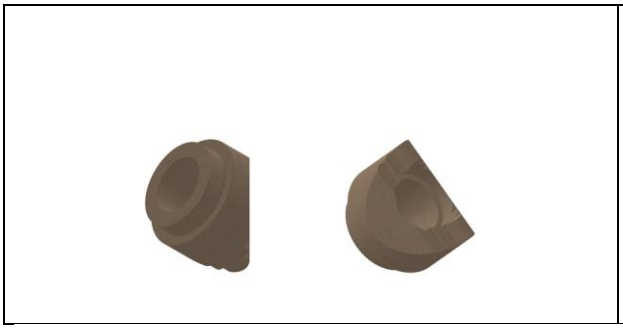


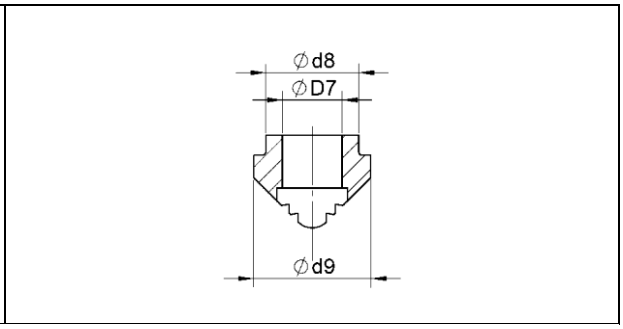
Half-sided closed special ceramic ferrule type HSG for welding shear connectors to vertical surfaces.

Description	Dimensions				Item number
	D_7 -0/+0,5	d_8 -1/+1	d_9 -1/+1	h_2	
HSG 19	19,4	26	30,8	≈ 16,7	75-00-019-HSG

Not listed dimensions available upon request.

2.33.13 Special ceramic ferrule (welding into angles) for shear connectors (type IWKR)

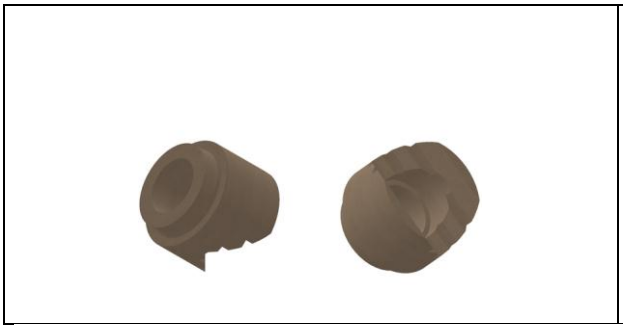


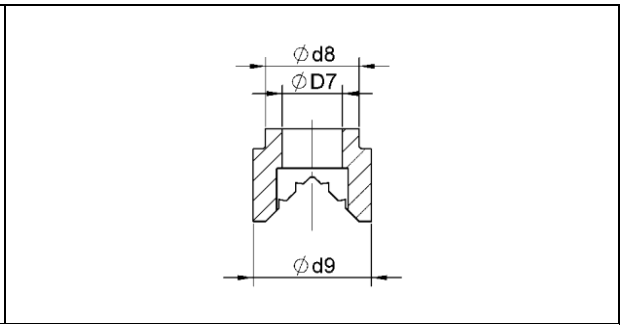


Description	Dimensions			Item number
	D_7 -0/+0,5	d_8 -1/+1	d_9 -1/+1	
IWKR 10	10,2	13	16,5	75-00-010-IWKR
IWKR 13	13,1	16,5	20,5	75-00-013-IWKR

Not listed dimensions available upon request.

2.33.14 Special ceramic ferrule (welding onto angles) for shear connectors (type AWKR)



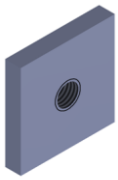
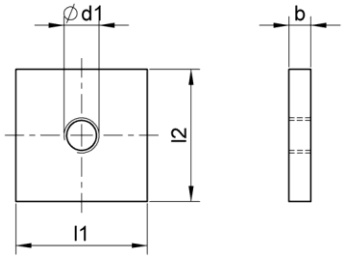


Description	Dimensions			Item number
	D_7 -0/+0,5	d_8 -1/+1	d_9 -1/+1	
AWKR 10	10,2	14,5	18	75-00-010-AWKR
AWKR 13	13,1	20,6	26,5	75-00-013-AWKR

Not listed dimensions available upon request.

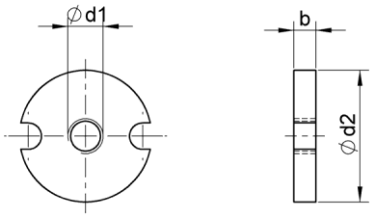
2.34 Fixing accessories

2.34.1 Threaded plate

Available dimensions and materials available upon request.

2.34.2 Disk nut

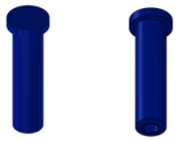
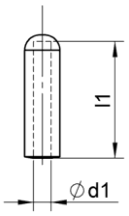
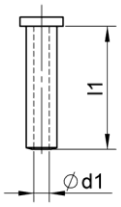
	

Available dimensions and materials available upon request.

2.35 Silicone cover caps

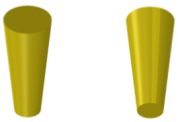
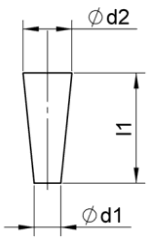
Silicone cover caps protect the mechanical important areas of the welding elements during painting and powder coating as well as during the burning-in process (permanent temperature ≤ 210° C, short temperature ≤ 300° C).

2.35.1 Silicone cover caps for threaded studs and non-threaded studs

Available dimensions available upon request.

2.35.2 Silicone cover caps for internally threaded studs

Available dimensions available upon request.

3. Welding studs for capacitor discharge stud welding

3.1 Technical information

Materials
Our welding studs are standardly made from the following materials:

- steel, strength class 4.8 (suitable for welding) (according to DIN EN ISO 898-1) with excellent weldability
  Mechanical properties: yield strength (R_e) ≥ 340 N/mm^2, tensile strength (R_m) ≥ 420 N/mm^2, elongation (A_5) ≥ 14%
- stainless steel A2-50 (suitable for welding) according to DIN EN ISO 3506-1
  Mechanical properties: yield point ($R_{p0,2}$) ≥ 210 N/mm^2, tensile strength (R_m) ≥ 500 N/mm^2, elongation (A_L) ≥ 0,6d
- Aluminium AlMg3
  Mechanical properties: tensile strength (R_m) ≥ 100 N/mm^2
- Messing CuZn37
  Mechanical properties: tensile strength (R_m) ≥ 370 N/mm^2

The material specifications conform with DIN EN ISO 13918 and DIN EN ISO 14555. For welding studs from other materials please send us your inquiry or contact us.

On demand, the material properties can be verified by an inspection document (test report, inspection certificate) according to DIN EN 10204.

We are pleased to inform you about weldability to different base materials and welding parameters.

Dimensions
Welding studs dimensions are given in the measurement tables (all dimensions in mm). All standardised welding studs conform to DIN EN ISO 13918. Not standardised welding studs are supplied according to DIN EN ISO 13918. Special welding elements, which are not described, are delivered upon request.

Dimensions that are not listed in the measurement tables are delivered upon request.

Surface protection
Standardly our welding studs made from steel 4.8 are supplied with an electrolytic copper plating of 4-8 µm (according to DIN EN ISO 4042) as corrosion protection. Other surface treatments are possible upon request.

Threads
The threads of the studs are cold rolled (tolerance limit 6g). For surface-treated studs the tolerance limit 6h can be reached. We deliver studs with special threads upon request.

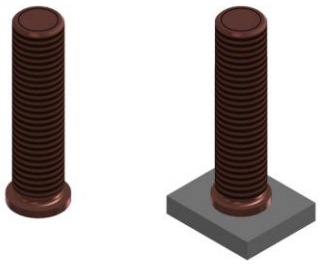
Stud flange
Welding studs for capacitor discharge stud welding have a cold formed flange. The diameter of the flange is always bigger than the external diameter of the welding element (see following drawings and measurement tables). The flange prevents the electric arc to flash over to the cylindrical part of the welding element and increases the welding area. By this, a high strength of the stud welded joint is guaranteed.

Upon request, it is possible to deliver welding studs with flange dimensions other than the ones listed and welding studs without flange. However, we can only recommend the limited use of welding studs without flange – depending on the welded joint requirements. Please contact us for this.

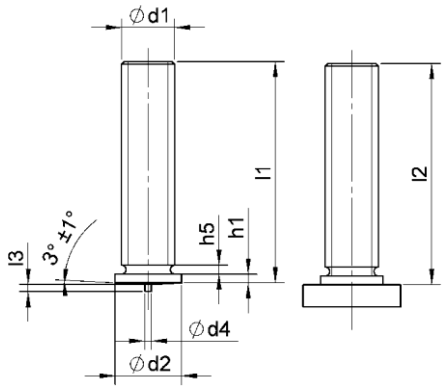
Welding pip
Welding studs for capacitor discharge stud welding have a cold formed calibrated welding pip with length and diameter tolerances closely controlled. At the welding pip the welding process is initiated and it determines the length of the welding time. Therefore exact dimensions of the welding pip are decisive for proper welding results.

Accessories for stud welding guns
Accessories for stud welding guns have to be adjusted to the welding element. The accessories which are to be used for the individual welding studs can be found in chapter 6.

3.2 Threaded stud (type PT acc. to DIN EN ISO 13918)



before welding / after welding



before welding / after welding

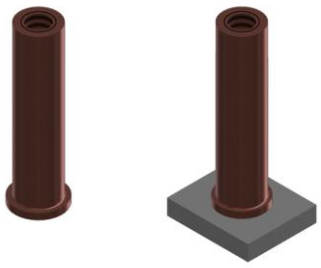
Dimensions								Material (item number)			
d_1	l_1	d_2 ±0,2	d_4 ±0,08	l_3 ±0,05	h_5 max.	h_1	l_2	Steel 4.8 copper-plated	A2-50	AlMg3	CuZn37
M3	6-30	4,5	0,6	0,55	0,6	0,7-1,4	≈ l_1-0,3	11-03-**XXX**	12-03-**XXX**	14-03-**XXX**	13-03-**XXX**
M4	6-40	5,5	0,65	0,55	0,6	0,7-1,4	≈ l_1-0,3	11-04-**XXX**	12-04-**XXX**	14-04-**XXX**	13-04-**XXX**
M5	6-45	6,5	0,75	0,8	1,0	0,7-1,4	≈ l_1-0,3	11-05-**XXX**	12-05-**XXX**	14-05-**XXX**	13-05-**XXX**
M6	8-60	7,5	0,75	0,8	1,0	0,7-1,4	≈ l_1-0,3	11-06-**XXX**	12-06-**XXX**	14-06-**XXX**	13-06-**XXX**
M8	10-60	9	0,75	0,85	1,5	0,8-1,4	≈ l_1-0,3	11-08-**XXX**	12-08-**XXX**	14-08-**XXX**	13-08-**XXX**
M10	12-60	10,7	0,75	0,75	3	1,2-1,6	≈ l_1-0,3	11-10-**XXX**	12-10-**XXX**	-	-

In the item number **XXX** has to be replaced by the respective welding element length l_1 (e.g. 030 for 30 mm).

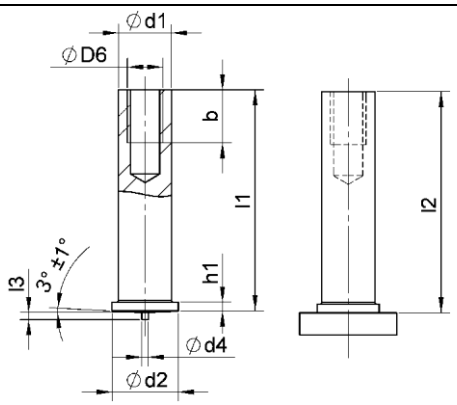
Explanations to the used materials can be found in chapter 3.1.

Not listed dimensions and materials available upon request.

3.3 Internally threaded stud (type IT acc. to DIN EN ISO 13918)



before welding / after welding



before welding / after welding

Dimensions									Material (item number)			
d_1 ±0,1	l_1	D_6	b	d_2 ±0,2	d_4 ±0,08	l_3 ±0,05	h_1	l_2	**Steel 4.8 copper-plated**	**A2-50**	**AlMg3**	**CuZn37**
5	6-30	M3	5 (4[1])	6,5	0,75	0,8	0,7-1,4	≈ l_1-0,3	31-35-**XXX**	32-35-**XXX**	34-35-**XXX**	33-35-**XXX**
6	8-40	M4	6	7,5	0,75	0,8	0,7-1,4	≈ l_1-0,3	31-46-**XXX**	32-46-**XXX**	34-46-**XXX**	33-46-**XXX**
7,1	10-40	M5	7,5	9	0,75	0,85	0,8-1,4	≈ l_1-0,3	31-57-**XXX**	32-57-**XXX**	34-57-**XXX**	33-57-**XXX**

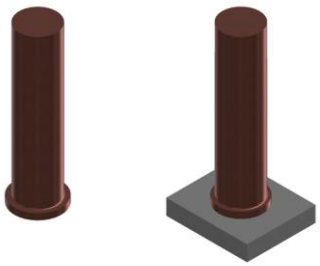
[1]for l_2 < 8 mm

In the item number **XXX** has to be replaced by the respective welding element length l_1 (e.g. 030 for 30 mm).

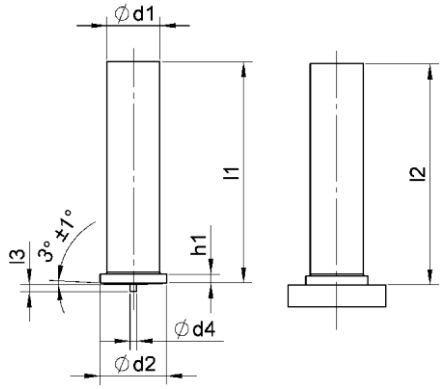
Explanations to the used materials can be found in chapter 3.1.

Not listed dimensions and materials available upon request.

3.4 Non-threaded stud (type UT acc. to DIN EN ISO 13918)



before welding / after welding



before welding / after welding

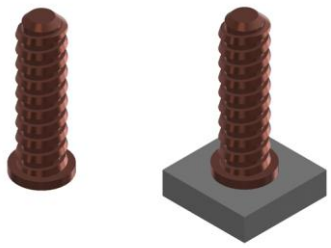
Dimensions							Material (item number)			
d_1 ±0,1	l_1	d_2 ±0,2	d_4 ±0,08	l_3 ±0,05	h_1	l_2	**Steel 4.8 copper-plated**	**A2-50**	**AlMg3**	**CuZn37**
3	6-30	4,5	0,6	0,55	0,7-1,4	≈ l_1-0,3	21-03-**XXX**	22-03-**XXX**	24-03-**XXX**	23-03-**XXX**
4	6-40	5,5	0,65	0,55	0,7-1,4	≈ l_1-0,3	21-04-**XXX**	22-04-**XXX**	24-04-**XXX**	23-04-**XXX**
5	6-45	6,5	0,75	0,8	0,7-1,4	≈ l_1-0,3	21-05-**XXX**	22-05-**XXX**	24-05-**XXX**	23-05-**XXX**
6	8-60	7,5	0,75	0,8	0,7-1,4	≈ l_1-0,3	21-06-**XXX**	22-06-**XXX**	24-06-**XXX**	23-06-**XXX**
7,1	10-60	9	0,75	0,85	0,8-1,4	≈ l_1-0,3	21-07-**XXX**	22-07-**XXX**	24-07-**XXX**	23-07-**XXX**

In the item number **XXX** has to be replaced by the respective welding element length l_1 (e.g. 030 for 30 mm).

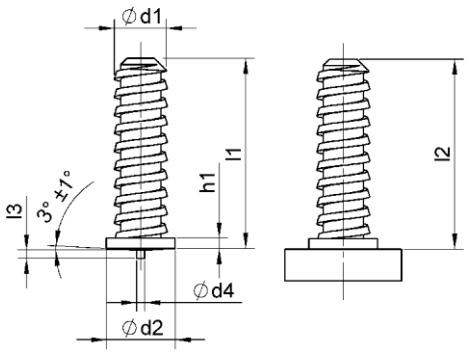
Explanations to the used materials can be found in chapter 3.1.

Not listed dimensions and materials available upon request.

3.5 Fir tree stud



before welding / after welding



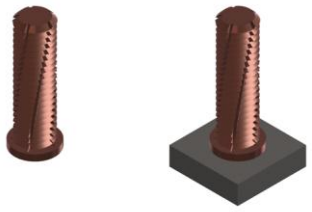
before welding / after welding

Dimensions							Material (item number)		
d_1	l_1	d_2 ±0,2	d_4 ±0,08	l_3 ±0,05	h_1	l_2	**Steel 4.8 copper-plated**	**A2-50**	**AlMg3**
5	9	6,5	0,75	0,8	0,7-1,4	≈ l_1-0,3	01-05-009-M.P.	02-05-009-M.P.	04-05-009-M.P.
5	14,2	6,5	0,75	0,8	0,7-1,4	≈ l_1-0,3	01-05-014,2-M.P.	02-05-014,2-M.P.	04-05-014,2-M.P.
5	18	6,5	0,75	0,8	0,7-1,4	≈ l_1-0,3	01-05-018-M.P.	02-05-018-M.P.	04-05-018-M.P.
5	25	6,5	0,75	0,8	0,7-1,4	≈ l_1-0,3	01-05-025-M.P.	02-05-025-M.P.	04-05-025-M.P.

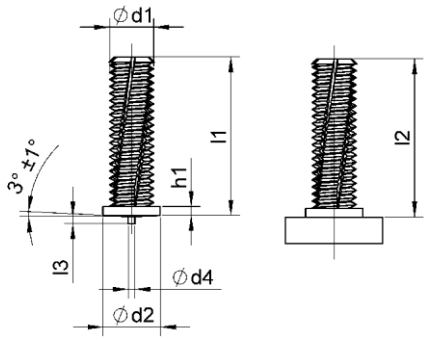
Explanations to the used materials can be found in chapter 3.1.

Not listed dimensions and materials available upon request.

3.6 Colour groove stud



before welding / after welding



before welding / after welding

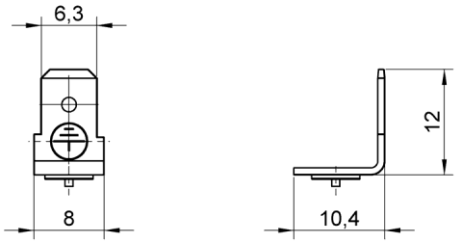
Dimensions							Material (item number)			
d_1	l_1	d_2 ±0,2	d_4 ±0,08	l_3 ±0,05	h_1	l_2	Steel 4.8 copper-plated	A2-50	AlMg3	CuZn37
M4	upon request	5,5	0,65	0,55	0,7-1,4	≈ l_1-0,3	11-LN-04-**XXX**	12-LN-04-**XXX**	14-LN-04-**XXX**	13-LN-04-**XXX**
M5	upon request	6,5	0,75	0,8	0,7-1,4	≈ l_1-0,3	11-LN-05-**XXX**	12-LN-05-**XXX**	14-LN-05-**XXX**	13-LN-05-**XXX**
M6	upon request	7,5	0,75	0,8	0,7-1,4	≈ l_1-0,3	11-LN-06-**XXX**	12-LN-06-**XXX**	14-LN-06-**XXX**	13-LN-06-**XXX**
M8	upon request	9	0,75	0,85	0,8-1,4	≈ l_1-0,3	11-LN-08-**XXX**	12-LN-08-**XXX**	14-LN-08-**XXX**	13-LN-08-**XXX**

In the item number **XXX** has to be replaced by the respective welding element length l_1 (e.g. 030 for 30 mm).

Explanations to the used materials can be found in chapter 3.1.

Not listed dimensions and materials available upon request.

3.7 Earth plug

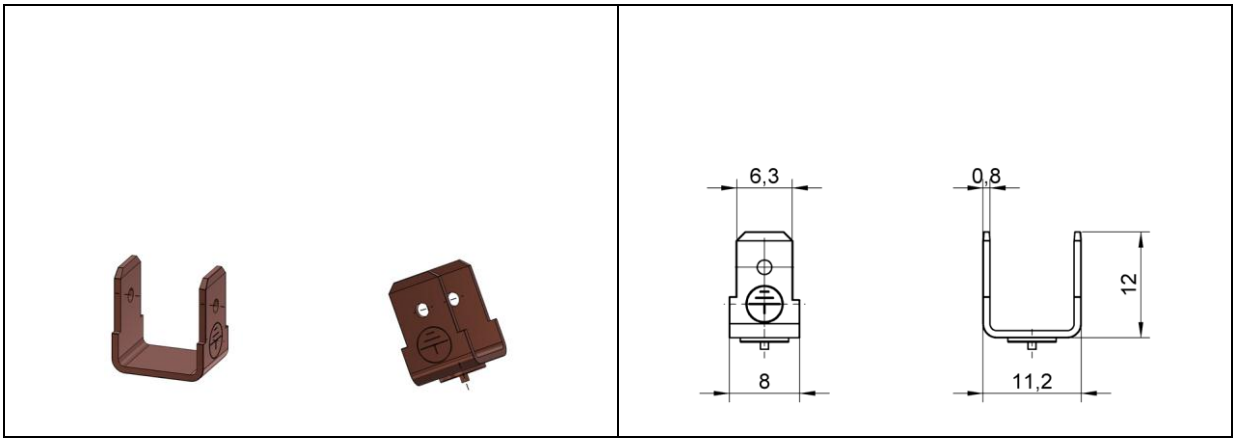


Material (item number)			
Steel 4.8 copper-plated	**A2-50**	**AlMg3**	**CuZn37**
30-10-063-PA	30-20-063-PA	30-40-063-PA	30-30-063-PA

Explanations to the used materials can be found in chapter 3.1.

Not listed dimensions and materials available upon request.

3.8 Double earth plug

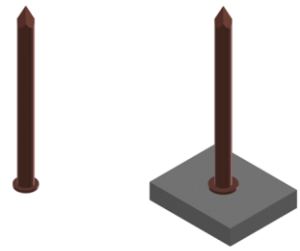


Material (item number)			
Steel 4.8 copper-plated	**A2-50**	**AlMg3**	**CuZn37**
30-11-063-PA	30-22-063-PA	30-44-063-PA	30-33-063-PA

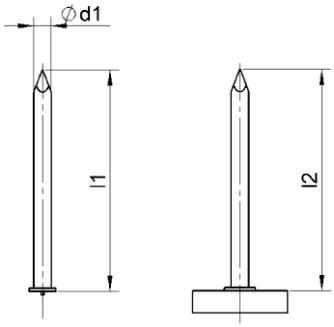
Explanations to the used materials can be found in chapter 3.1.

Not listed dimensions and materials available upon request.

3.9 Insulation nail



before welding / after welding



before welding / after welding

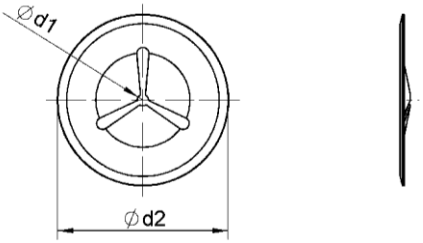
Dimensions			Material (item number)		
d_1 ±0,06	l_1 ±2,00	l_2	Steel 4.8 copper-plated	A2-50	AlMg3
2	20-150	≈ l_1-0,3	41-02-**XXX**	42-02-**XXX**	44-02-**XXX**
3	20-150	≈ l_1-0,3	41-03-**XXX**	42-03-**XXX**	44-03-**XXX**

In the item number **XXX** has to be replaced by the respective welding element length l_1 (e.g. 030 for 30 mm).

Explanations to the used materials can be found in chapter 3.1.

Not listed dimensions and materials available upon request.

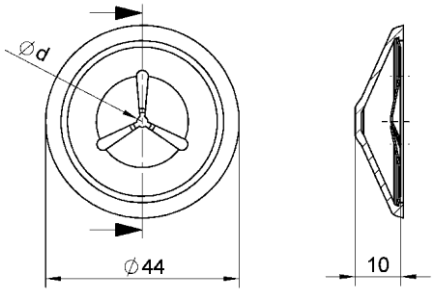
3.10 Clip for insulation nail (type R)



Dimensions		Material (item number)	
d_1	d_2	Steel zinc-plated	1.4310
2	38	49-12-002	49-22-002
3	38	49-13-003	49-23-003
3	60	49-13-003-ST2K70-D60	49-23-003-4301-D60

Not listed dimensions and materials available upon request.

3.11 Clip with plastic cap for insulation nail (type W)

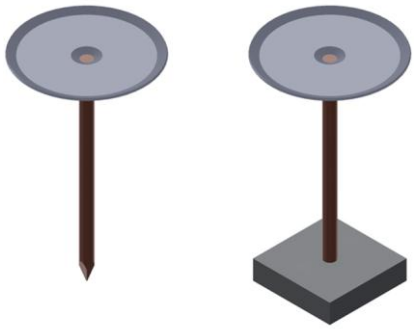


Dimensions	Material (item number)			
d	Steel zinc-plated with plastic cap (white)	Steel zinc-plated with plastic cap (black)	1.4310 with plastic cap (white)	1.4310 with plastic cap (black)
2	49-52-002	49-52-002-SCHWARZ	49-62-002	49-62-002-SCHWARZ
3	49-53-003	49-53-003-SCHWARZ	49-63-003	49-63-003-SCHWARZ

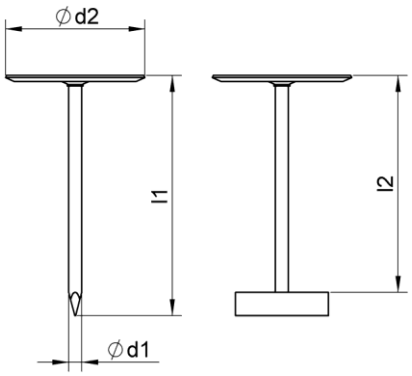
Plastic cap: halogen free, flame-retardant

Not listed dimensions and materials available upon request.

3.12 Cupped head pin



before welding / after welding



before welding / after welding

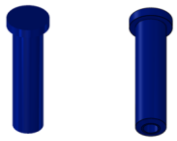
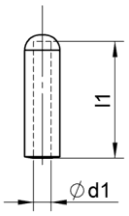
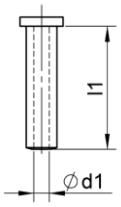
Dimensions			Material (item number)
d_1	l_1	d_2	**Shaft: steel 4.8 copper-plated, head: steel zinc-plated**
2,7	9,5-203,2	30	41-02,7-**XXX**

In the item number **XXX** has to be replaced by the respective welding element length l_1 (e.g. 030 for 30 mm).
Explanations to the used materials can be found in chapter 3.1.
Not listed dimensions and materials available upon request.

3.13 Silicone cover caps

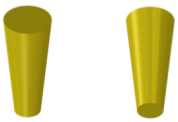
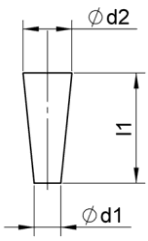
Silicone cover caps protect the mechanical important areas of the welding elements during painting and powder coating as well as during the burning-in process (permanent temperature ≤ 210° C, short temperature ≤ 300° C).

3.13.1 Silicone cover caps for threaded studs and non-threaded studs

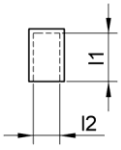
Available dimensions available upon request.

3.13.2 Silicone cover caps for internally threaded studs

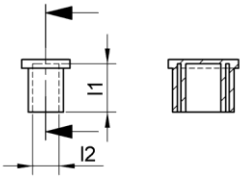
	

Available dimensions available upon request.

3.13.3 Silicone cover caps for earth plugs

3.13.4 Silicone cover caps for double earth plugs

4. Welding studs for short cycle stud welding

4.1 Technical information

Materials
Our welding studs are standardly made from the following materials:

- steel, strength class 4.8 (suitable for welding) (according to DIN EN ISO 898-1) with excellent weldability
  Mechanical properties: yield strength (R_e) ≥ 340 N/mm^2, tensile strength (R_m) ≥ 420 N/mm^2, elongation (A_5) ≥ 14%
- stainless steel A2-50 (suitable for welding) according to DIN EN ISO 3506-1
  Mechanical properties: yield point ($R_{p0,2}$) ≥ 210 N/mm^2, tensile strength (R_m) ≥ 500 N/mm^2, elongation (A_L) ≥ 0,6d

The material specifications conform with DIN EN ISO 13918 and DIN EN ISO 14555. For welding studs from other materials please send us your inquiry or contact us.

On demand, the material properties can be verified by an inspection document (test report, inspection certificate) according to DIN EN 10204.

We are pleased to inform you about weldability to different base materials and welding parameters.

Dimensions
Welding studs dimensions are given in the measurement tables (all dimensions in mm). All standardised welding studs conform to DIN EN ISO 13918. Not standardised welding studs are supplied according to DIN EN ISO 13918. Special welding elements, which are not described, are delivered upon request.

Dimensions that are not listed in the measurement tables are delivered upon request.

Surface protection
Standardly our welding studs made from steel 4.8 are supplied with an electrolytic copper plating of 4-8 µm (according to DIN EN ISO 4042) as corrosion protection. Other surface treatments are possible upon request.

Threads
The threads of the studs are cold rolled (tolerance limit 6g). For surface-treated studs the tolerance limit 6h can be reached. We deliver studs with special threads upon request.

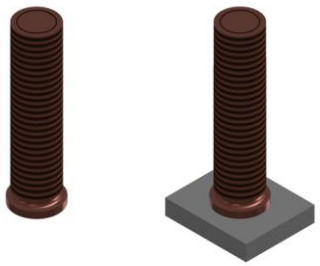
Stud flange
Welding studs for short cycle stud welding have a closely tolerated cold formed flange. The diameter of the flange is always bigger than the external diameter of the welding element (see following drawings and measurement tables). The flange increases the surface area of the stud. Consequently, the stress at the point of weld is reduced and this results in a higher quality of the stud welded joint.

Upon request, it is possible to deliver welding studs with flange dimensions other than the ones listed and welding studs without flange. However, we can only recommend the limited use of welding studs without flange – depending on the welded joint requirements. Please contact us for this.

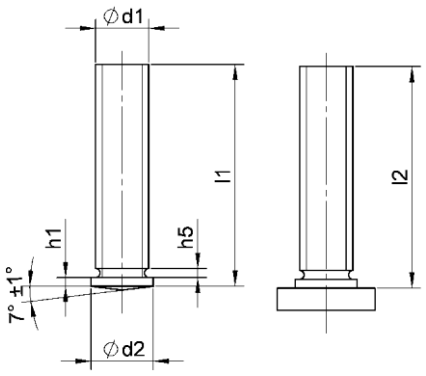
Welding face
Welding studs for short cycle stud welding have a cold formed conical welding face with dimensions closely controlled. The exact dimensions of the welding face are decisive for proper welding results.

Accessories for stud welding guns
Accessories for stud welding guns have to be adjusted to the welding element. The accessories which are to be used for the individual welding studs can be found in chapter 7.

4.2 Threaded stud (type PS acc. to DIN EN ISO 13918)



before welding / after welding



before welding / after welding

Dimensions					Material (item number)	
d_1	l_1	d_2 ±0,2	h_5 max.	h_1	**Steel 4.8 copper-plated**	**A2-50**
M3	6-30	4	0,6	0,7-1,4	17-03-**XXX**	18-03-**XXX**
M4	6-40	5	0,6	0,7-1,4	17-04-**XXX**	18-04-**XXX**
M5	6-45	6	1,0	0,7-1,4	17-05-**XXX**	18-05-**XXX**
M6	8-60	7	1,0	0,7-1,4	17-06-**XXX**	18-06-**XXX**
M8	10-60	9	1,5	0,8-1,4	17-08-**XXX**	18-08-**XXX**
M10	15-60	11	2,0	0,8-1,4	17-10-**XXX**	18-10-**XXX**

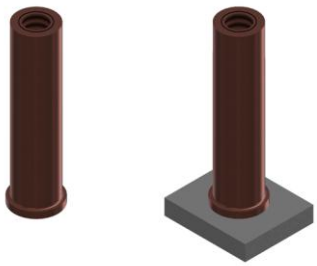
*l_2 (length after welding) depends on l_1 and the welding energy

In the item number **XXX** has to be replaced by the respective welding element length l_1 (e.g. 030 for 30 mm).

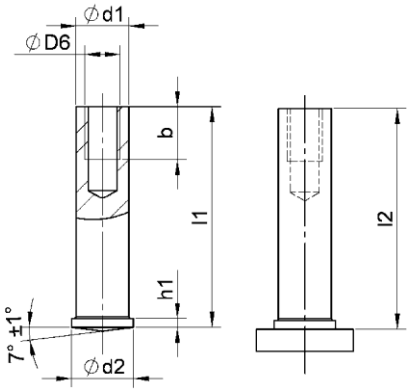
Explanations to the used materials can be found in chapter 4.1.

Not listed dimensions and materials available upon request.

4.3 Internally threaded stud (type IS acc. to DIN EN ISO 13918)



before welding / after welding



before welding / after welding

Dimensions						Material (item number)	
d_1 ±0,1	**l_1**	**D_6**	**b** min.	**d_2** ±0,2	**h_1**	**Steel 4.8 copper-plated**	**A2-50**
5	6-30	M3	5 (4[1])	6,0	0,7-1,4	37-35-**XXX**	38-35-**XXX**
6	8-40	M4	5	7,0	0,7-1,4	37-46-**XXX**	38-46-**XXX**
7,1	10-40	M5	6	9,0	0,8-1,4	37-57-**XXX**	38-57-**XXX**
8	15-40	M6	10	9,0	0,8-1,4	37-68-**XXX**	38-68-**XXX**

[1]for l_2 < 8 mm

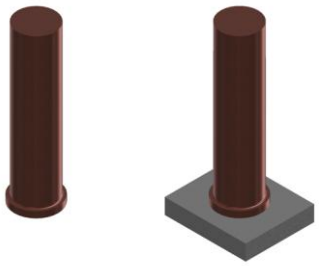
*l_2 (length after welding) depends on l_1 and the welding energy

In the item number **XXX** has to be replaced by the respective welding element length l_1 (e.g. 030 for 30 mm).

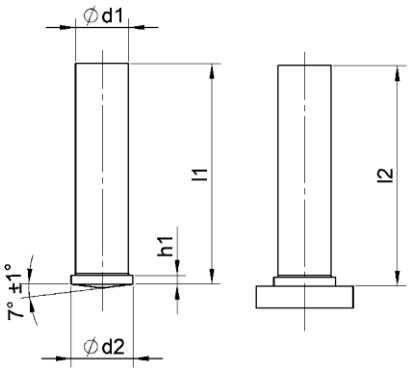
Explanations to the used materials can be found in chapter 4.1.

Not listed dimensions and materials available upon request.

4.4 Non-threaded stud (type US acc. to DIN EN ISO 13918)



before welding / after welding



before welding / after welding

Dimensions				Material (item number)	
d_1	l_1	d_2 ±0,2	h_1	**Steel 4.8 copper-plated**	**A2-50**
3	6-30	4	0,7-1,4	27-03-**XXX**	28-03-**XXX**
4	6-40	5	0,7-1,4	27-04-**XXX**	28-04-**XXX**
5	6-45	6	0,7-1,4	27-05-**XXX**	28-05-**XXX**
6	8-60	7	0,7-1,4	27-06-**XXX**	28-06-**XXX**
7,1	10-60	9	0,8-1,4	27-07,1-**XXX**	28-07,1-**XXX**
8	15-60	9	0,8-1,4	27-08-**XXX**	28-08-**XXX**

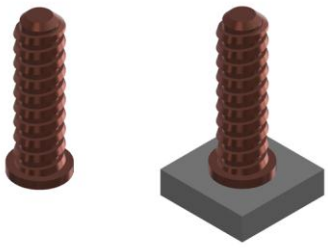
*l_2 (length after welding) depends on l_1 and the welding energy

In the item number **XXX** has to be replaced by the respective welding element length l_1 (e.g. 030 for 30 mm).

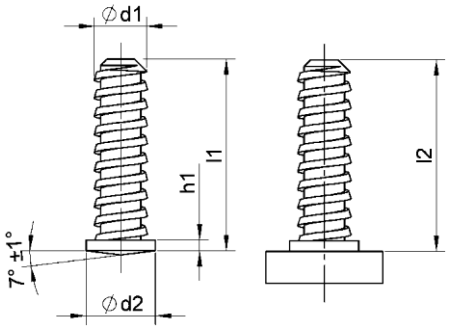
Explanations to the used materials can be found in chapter 4.1.

Not listed dimensions and materials available upon request.

4.5 Fir tree stud



before welding / after welding



before welding / after welding

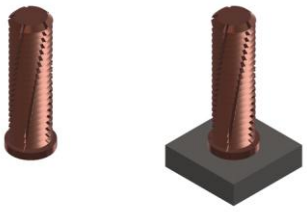
Dimensions				Material (item number)	
d_1	l_1	d_2 ±0,2	h_1	**Steel 4.8 copper-plated**	**A2-50**
5	9	6	0,7-1,4	01-05-009	02-05-009
5	14,2	6	0,7-1,4	01-05-014,2	02-05-014,2
5	18	6	0,7-1,4	01-05-018	02-05-018
5	25	6	0,7-1,4	01-05-025	02-05-025

*l_2 (length after welding) depends on l_1 and the welding energy

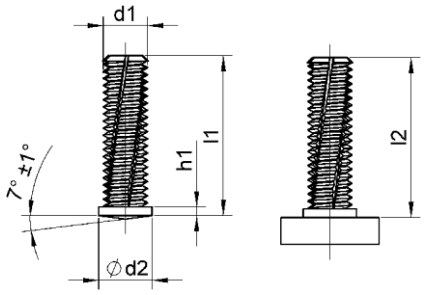
Explanations to the used materials can be found in chapter 4.1.

Not listed dimensions and materials available upon request.

4.6 Colour groove stud



before welding / after welding



before welding / after welding

Dimensions				Material (item number)	
d_1	l_1	d_2 ±0,2	h_1	**Steel 4.8 copper-plated**	**A2-50**
M4	upon request	5	0,7-1,4	17-LN-04-**XXX**	18-LN-04-**XXX**
M5	upon request	6	0,7-1,4	17-LN-05-**XXX**	18-LN-05-**XXX**
M6	upon request	7	0,7-1,4	17-LN-06-**XXX**	18-LN-06-**XXX**
M8	upon request	9	0,8-1,4	17-LN-08-**XXX**	18-LN-08-**XXX**

*l_2 (length after welding) depends on l_1 and the welding energy

In the item number **XXX** has to be replaced by the respective welding element length l_1 (e.g. 030 for 30 mm).

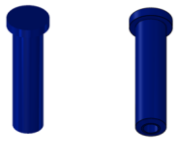
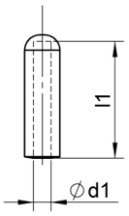
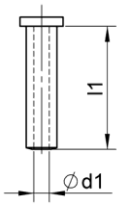
Explanations to the used materials can be found in chapter 4.1.

Not listed dimensions and materials available upon request.

4.7 Silicone cover caps

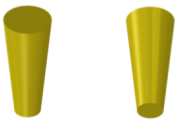
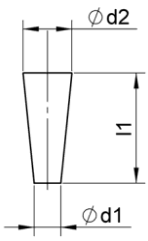
Silicone cover caps protect the mechanical important areas of the welding elements during painting and powder coating as well as during the burning-in process (permanent temperature ≤ 210° C, short temperature ≤ 300° C).

4.7.1 Silicone cover caps for threaded studs and non-threaded studs

Available dimensions available upon request.

4.7.2 Silicone cover caps for internally threaded studs

Available dimensions available upon request.

Annex: Accessories and wear parts for stud welding guns

5. Accessories and wear parts for stud welding guns for drawn arc welding studs

5.1 Shear connector (type SD1)

Stud dimensions		Gun accessories		
d_1	l_2	Chuck (item number)	Ferrule grip (item number)	Foot piece (Gun type: item number)
10	$l_2 \leq 50$ $l_2 > 50$	83-65-190	83-45-165 83-46-165	PHM-160/161, GD 16/19/22/25: 83-42-029
13	$l_2 \leq 50$ $l_2 > 50$	83-65-254	83-45-199 83-46-199	PHM-160/161, GD 16/19/22/25: 83-42-044
16	$l_2 \leq 50$ $l_2 > 50$	83-65-317[1] / 83-71-317[2]	83-45-261 83-46-261	PHM-160/161, GD 16/19/22/25: 83-42-044
19	$l_2 \geq 50$	83-65-317[1] / 83-71-317[2]	83-46-261	GD 19/22/25: 83-42-044
22	$l_2 \geq 75$	83-65-349[1] / 83-71-349[2]	83-46-307	GD 22/25: 83-42-044
25	$l_2 \geq 75$	83-65-409[1] / 83-71-409[2]	83-46-355	GD 25: 83-42-044

[1]Chuck made of steel nickel-plated, [2]chuck made of copper

5.2 Threaded stud (type RD, RD-DUO)

Stud dimensions		Gun accessories		
d_1	l_2	Chuck (item number)	Ferrule grip (item number)	Foot piece (Gun type: item number)
M6	$l_2 < 20$ $l_2 \geq 20$	83-50-006-4 83-50-006	65-07-00	PHM-12: 83-41-022 PHM-160/161, GD 16/19/22/25: 83-40-022
M8	$l_2 < 20$ $l_2 \geq 20$	83-50-008	65-09-00 65-46-00	PHM-12: 83-41-022 PHM-160/161, GD 16/19/22/25: 83-40-022
M10	$l_2 < 20$ $l_2 \geq 20$	25-30-00 83-50-010	65-09-00	PHM-12: 83-41-022 PHM-160/161, GD 16/19/22/25: 83-40-022
M12	$l_2 < 20$ $l_2 \geq 20$	25-31-00 83-55-012	65-10-00	PHM-12: 83-41-022 PHM-160/161, GD 16/19/22/25: 83-40-022
M16	$l_2 \geq 25$	25-99-00	65-11-00	PHM-12: 83-41-029 PHM-160/161, GD 16/19/22/25: 83-40-029
M20	$l_2 \geq 30$	83-55-020	65-12-00	GD 19/22/25: 83-40-029
M24	$l_2 \geq 50$	25-46-00	65-12-00	GD 22/25: 83-40-029

5.3 Threaded stud (type MPF, MPF-DUO)

Stud dimensions		Gun accessories		
d_1	l_2	Chuck (item number)	Ferrule grip (item number)	Foot piece (Gun type: item number)
M6	$l_2 < 20$ $l_2 \geq 20$	83-50-006-4 83-50-006	65-07-00	PHM-12: 83-41-022 PHM-160/161, GD 16/19/22/25: 83-40-022
M8	$l_2 < 20$ $l_2 \geq 20$	25-29-00 83-50-008	65-09-00	PHM-12: 83-41-022 PHM-160/161, GD 16/19/22/25: 83-40-022
M10	$l_2 < 20$ $l_2 \geq 20$	25-30-00 83-50-010	65-10-00	PHM-12: 83-41-022 PHM-160/161, GD 16/19/22/25: 83-40-022
M12	$l_2 < 25$ $l_2 \geq 25$	25-31-00 83-55-012	65-11-00	PHM-12: 83-41-029 PHM-160/161, GD 16/19/22/25: 83-40-029
M16	$l_2 < 30$ $l_2 \geq 30$	25-99-00 83-55-016	65-12-00	PHM-160/161, GD 16/19/22/25: 83-40-029
M20	$l_2 \geq 35$	83-55-020	65-13-00	GD 19/22/25: 83-40-044

5.4 Threaded stud (type PD)

Stud dimensions		Gun accessories		
d_1	l_2	Chuck (item number)	Ferrule grip (item number)	Foot piece (Gun type: item number)
M6	> 15	83-50-006	65-07-00	PHM-12: 83-41-022 PHM-160/161, GD 16/19/22/25: 83-40-022
M8	> 20	83-50-008	65-08-00	PHM-12: 83-41-022 PHM-160/161, GD 16/19/22/25: 83-40-022
M10	> 20	83-50-010	65-09-00	PHM-12: 83-41-022 PHM-160/161, GD 16/19/22/25: 83-40-022
M12	> 25	83-55-012	65-10-00	PHM-12: 83-41-029 PHM-160/161, GD 16/19/22/25: 83-40-029
M16	> 30	83-55-016	65-11-00	PHM-160/161, GD 16/19/22/25: 83-40-029
M20	> 35	83-55-020	65-13-00	GD 19/22/25: 83-40-044
M24	> 50	25-46-00	65-13-00	GD 22/25: 83-40-044

5.5 Threaded stud (type MD)

Stud dimensions		Gun accessories		
d_1	l_2	Chuck (item number)	Ferrule grip (item number)	Foot piece (Gun type: item number)
M6	15-100	83-50-006	65-07-00	PHM-12: 83-41-022 PHM-160/161, GD 16/19/22/25: 83-40-022
M8	15-100	83-50-008	65-09-00	PHM-12: 83-41-022 PHM-160/161, GD 16/19/22/25: 83-40-022
M10	15-100	83-50-010	65-09-00	PHM-12: 83-41-022 PHM-160/161, GD 16/19/22/25: 83-40-022
M12	20-100	83-55-012	65-11-00	PHM-12: 83-41-029 PHM-160/161, GD 16/19/22/25: 83-40-029
M16	25-100	83-55-016	65-12-00	PHM-160/161, GD 16/19/22/25: 83-40-029
M20	30-100	83-55-020	65-12-00	GD 19/22/25: 83-40-044

5.6 Internally threaded stud (type ID), non-threaded stud (type UD)

Stud dimensions		Gun accessories		
d_1	l_2	Chuck (item number)	Ferrule grip (item number)	Foot piece (Gun type: item number)
6	$l_2 < 20$ $l_2 \geq 20$	83-50-006-4 83-50-006	65-07-00	PHM-12: 83-41-022 PHM-160/161, GD 16/19/22/25: 83-40-022
8	$l_2 < 20$ $l_2 \geq 20$	83-50-008-4 83-50-008	65-09-00	PHM-12: 83-41-022 PHM-160/161, GD 16/19/22/25: 83-40-022
10	$l_2 < 20$ $l_2 \geq 20$	25-97-00 83-50-010	65-09-00	PHM-12: 83-41-022 PHM-160/161, GD 16/19/22/25: 83-40-022
12	$l_2 < 25$ $l_2 \geq 25$	25-31-00 83-55-012	65-11-00	PHM-12: 83-41-029 PHM-160/161, GD 16/19/22/25: 83-40-029
14,6	$l_2 < 30$ $l_2 \geq 30$	26-90-00 26-48-00	65-11-00	PHM-160/161, GD 16/19/22/25: 83-40-029
16	$l_2 < 30$ $l_2 \geq 30$	83-55-016	65-12-00	PHM-160/161, GD 16/19/22/25: 83-40-029
18,3	$l_2 < 30$ $l_2 \geq 30$	26-21-00 25-13-00	65-13-00	GD 19/22/25: 83-40-029
20	$l_2 \geq 40$	83-55-020	65-12-00	GD 22/25: 83-40-029
22	$l_2 \geq 40$	25-15-00	65-13-00	GD 22/25: 83-40-044

5.7 Insulation pin (type ISA, ISB, ISMS)

Stud dimensions		Gun accessories			
d_1	l_2	Chuck (item number)	Supporting tube (item number)	Teflon insert (item number)	Foot piece (Gun type: item number)
3	$20 \le l_2 < 65$ $65 \le l_2 < 110$ $l_2 \ge 110$	83-25-003 83-45-003 83-90-003	80-11-002	80-11-003	PHM-12: 83-41-035 PHM-160/161, GD 16/19/22/25: 83-40-035
4	$50 \le l_2 < 110$ $l_2 \ge 110$	83-25-004 83-85-004	80-11-002	80-11-003	PHM-12: 83-41-035 PHM-160/161, GD 16/19/22/25: 83-40-035
5	$50 \le l_2 < 65$ $65 \le l_2 < 110$ $l_2 \ge 110$	83-25-005 83-40-005 83-85-005	80-11-002	80-11-003	PHM-12: 83-41-035 PHM-160/161, GD 16/19/22/25: 83-40-035
6	$50 \le l_2 < 110$ $l_2 \ge 110$	83-50-006-25 83-85-006	80-11-002	80-11-003	PHM-12: 83-41-035 PHM-160/161, GD 16/19/22/25: 83-40-035

Alternatively, when using ceramic ferrules type UF:

Stud dimensions		Gun accessories		
d_1	l_2	Chuck (item number)	Ferrule grip (item number)	Foot piece (Gun type: item number)
3	$20 \le l_2 < 65$ $65 \le l_2 < 110$ $l_2 \ge 110$	83-25-003 83-45-003 83-90-003	65-07-00	PHM-12: 83-41-022 PHM-160/161, GD 16/19/22/25: 83-40-022
4	$50 \le l_2 < 110$ $l_2 \ge 110$	83-25-004 83-85-004	65-07-00	PHM-12: 83-41-022 PHM-160/161, GD 16/19/22/25: 83-40-022
5	$50 \le l_2 < 65$ $65 \le l_2 < 110$ $l_2 \ge 110$	83-25-005 83-40-005 83-85-005	65-07-00	PHM-12: 83-41-022 PHM-160/161, GD 16/19/22/25: 83-40-022
6	$50 \le l_2 < 110$ $l_2 \ge 110$	83-50-006-25 83-85-006	65-07-00	PHM-12: 83-41-022 PHM-160/161, GD 16/19/22/25: 83-40-022

Alternatively, when using permanent ceramic ferrules type K:

Stud dimensions		Gun accessories		
d_1	l_2	Chuck (item number)	Ferrule grip (item number)	Foot piece (Gun type: item number)
3	$20 \le l_2 < 65$ $65 \le l_2 < 110$ $l_2 \ge 110$	83-25-003 83-45-003 83-90-003	65-31-01	PHM-12: 83-41-022-M22
4	$50 \le l_2 < 110$ $l_2 \ge 110$	83-25-004 83-85-004	65-31-01	PHM-12: 83-41-022-M22
5	$50 \le l_2 < 65$ $65 \le l_2 < 110$ $l_2 \ge 110$	83-25-005 83-40-005 83-85-005	65-31-01	PHM-12: 83-41-022-M22
6	$50 \le l_2 < 110$ $l_2 \ge 110$	83-50-006-25 83-85-006	65-31-01	PHM-12: 83-41-022-M22

5.8 Bimetallic insulation pin (type VBS)

Stud dimensions		Gun accessories			
d_1	l_2	Chuck (item number)	Supporting tube (item number)	Teflon insert (item number)	Foot piece (Gun type: item number)
3	$20 \le l_2 < 65$ $65 \le l_2 < 110$ $l_2 \ge 110$	83-25-003 83-45-003 83-90-003	80-11-002	80-11-003	PHM-12: 83-41-035 PHM-160/161, GD 16/19/22/25: 83-40-035

5.9 Rectangular stud (type A, B, C)

Stud dimensions			Gun accessories		
b	**s**	**l_2**	**Chuck (item number)**	**Ferrule grip (item number)**	**Foot piece (Gun type: item number)**
15	3	≥ 20	83-03-015	65-11-00	PHM-160/161, GD 16/19/22/25: 83-40-029
15	5	≥ 20	83-05-015	65-11-00	PHM-160/161, GD 16/19/22/25: 83-40-029
25	3	≥ 20	83-03-025	65-13-00	PHM-160/161, GD 16/19/22/25: 83-40-044

5.10 Threaded stud (type M)

Stud dimensions		Gun accessories		
d_1	**l_2**	**Chuck (item number)**	**Ferrule grip (item number)**	**Foot piece (Gun type: item number)**
M8	≥ 15	83-50-008	65-09-00	PHM-12: 83-41-022 PHM-160/161, GD 16/19/22/25: 83-40-022
M10	≥ 20	83-50-010	65-09-00	PHM-12: 83-41-022 PHM-160/161, GD 16/19/22/25: 83-40-022
M12	≥ 20	83-55-012	65-11-00	PHM-12: 83-41-029 PHM-160/161, GD 16/19/22/25: 83-40-029
M16	≥ 30	83-55-016	65-12-00	PHM-160/161, GD 16/19/22/25: 83-40-029
M20	≥ 40	83-55-020	65-12-00	GD 19/22/25: 83-40-029

6. Accessories and wear parts for stud welding guns for capacitor discharge welding studs

6.1 Threaded stud (type PT), internally threaded stud (type IT), non-threaded stud (type UT), fir tree stud, colour groove stud

For stud welding guns PKM-1B, PHM-1A:

Stud dimensions		Gun accessories	
d_1	l_2	Chuck (item number)	Intermediate ring (item number)
M3 / 3	$l_2 \leq 40$ $l_2 > 40$	82-50-003	- B-80-40-1128
M4 / 4	$l_2 \leq 40$ $l_2 > 40$	82-50-004	- B-80-40-1128
M5 / 5	$l_2 \leq 40$ $l_2 > 40$	82-50-005	- B-80-40-1128
M6 / 6	$l_2 \leq 40$ $l_2 > 40$	82-50-006	- B-80-40-1128
7,1	$l_2 \leq 40$ $l_2 > 40$	82-50-071	- B-80-40-1128
M8 / 8	$l_2 \leq 40$ $l_2 > 40$	82-50-008	- B-80-40-1128
M10	$l_2 \leq 25$ $25 < l_2 \leq 40$ $40 < l_2 \leq 55$ $55 < l_2 \leq 70$	82-50-010	B-80-40-1128 B-80-40-1128 (2 pieces) B-80-40-1128 (3 pieces) B-80-40-1128 (4 pieces)

6.2 Earth plug, double earth plug

For stud welding guns PKM-1B, PHM-1A:

Type	Gun accessories
	Chuck (item number)
Earth plug	82-50-050
Double earth plug	82-50-050

6.3 Insulation nail

For stud welding guns PKM-1B, PHM-1A:

Stud dimensions		Gun accessories	
d_1	l_2	Chuck (item number)	Intermediate ring (item number)
2	$l_2 \leq 135$ $135 < l_2 \leq 150$	82-50-020	- B-80-40-1128
3	$l_2 \leq 135$ $135 < l_2 \leq 150$	82-50-030	- B-80-40-1128

6.4 Cupped head pin

For stud welding gun PIM-1B:

Stud dimensions			Gun accessories
d_1	d_2	l_1	Chuck (item number)
2,7	30	$l_2 \geq 9,5$	82-50-0311
2,7	38	$l_2 \geq 9,5$	82-50-308

7. Accessories and wear parts for stud welding guns for short cycle welding studs

7.1 Threaded stud (type PS), internally threaded stud (type IS), non-threaded stud (type US), fir tree stud, colour groove stud

For stud welding gun PHM-10:

Stud dimensions		Gun accessories
d_1	l_2	Chuck (item number)
M3 / 3	$l_2 \leq 40$ $l_2 > 40$[1]	82-50-003
M4 / 4	$l_2 \leq 40$ $l_2 > 40$[1]	82-50-004
M5 / 5	$l_2 \leq 40$ $l_2 > 40$[1]	82-50-005
M6 / 6	$l_2 \leq 40$ $l_2 > 40$[1]	82-50-006
7,1	$l_2 \leq 40$ $l_2 > 40$[1]	82-50-071
M8 / 8	$l_2 \leq 40$ $l_2 > 40$[1]	82-50-008
M10	$l_2 \leq 15$[1]	82-50-010

[1]Besides chucks additional special accessories are necessary (for M3-M8 resp. Ø3-8 for lengths > 40 mm, for M10 for all lengths). Please contact us for this.

AS Schöler + Bolte GmbH

Gewerkenstraße 1
D-58456 Witten
Tel.: +49 (0)2302 97005-0
Fax: +49 (0)2302 73009

Ohmstraße 3
D-85221 Dachau
Tel.: +49 (0)8131 5159-0
Fax: +49 (0)8131 5159-11

info@as-schoeler-bolte.com
as-schoeler-bolte.com