BOLTE

WELDING STUDS

FOR DRAWN ARC STUD WELDING WITH CERAMIC FERRULE

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Contents


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1. Welding studs for drawn arc stud welding with ceramic ferrule

1.1 Technical information

Flux (aluminium ball) and weld pool backing
According to DIN EN ISO 13918 (Welding – Studs and ceramic ferrules for arc stud welding) welding studs for drawn arc stud welding standardly have a pressed-in 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.
(Exceptions: Insulation pins (type ISMS, ISA, ISB), bimetallic insulation pins (type VBS-MS, VBS) as well as balls do not have a pressed-in aluminium ball. Rectangular studs (type A, B and C) standardly do not have a pressed-in aluminium ball, but can be produced with aluminium ball on demand.)

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.

As an alternative to ceramic ferrules shielding gas can be used for weld pool backing. In this case according to DIN EN ISO 13918 welding studs without pressed-in aluminium ball at the welding tip are used (see catalogue **Welding studs – Drawn arc stud welding with shielding gas**).

Materials
We produce our welding studs from the following materials with excellent weldability:

Threaded studs, internally threaded studs, non-threaded studs and similar welding elements:

Material group/strength class	Norm
Steel 4.8	ISO 898-1
A2-50, A2-70 A5-50, A5-70	ISO 3506-1

Shear connectors:

Material group/strength class	Norm
Killed steel acc. to material group 1 within limits acc. to DIN EN ISO 13918:2018: C ≤ 0,2%, CEV ≤ 0,38, Al ≤ 0,02% (e.g. S235J2+C470 acc. to EN 10025:2019)	ISO/TR 15608
Stainless steel 1.4301	EN 10088:2014

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.

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. hot zinc dipped
3. zinc flake coated flZnnc-600h
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 mechanically removed from the welding tip. Through this:

- the tolerance for the diameter at the welding tip (d_2 resp. d_1) changes to -0,6/+0,1
- the tolerance for the dimension y changes to -1/+0,5

deviant to the measurement tables in this catalogue.

Threads
The threads of the studs are cold rolled acc. to DIN 13-1 (tolerance limit 6g). For surface-treated studs the tolerance limit 6h can be reached.

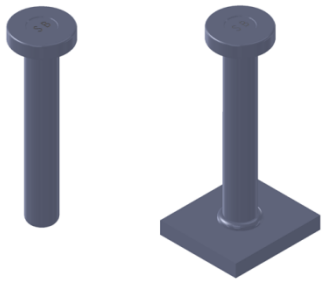
The thread of hot zinc dipped studs is not true to gauge. For hot zinc dipped studs nuts with allowance for interference have to be used.

We deliver studs with special threads upon request.

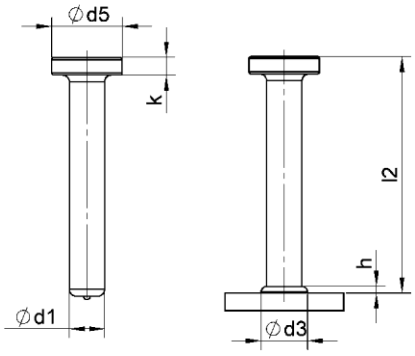
Weld fillet
During drawn arc stud welding a fillet forms between welding element and base material. The dimensions of the weld fillet are defined by the used ceramic ferrule and the welding parameters. The dimensions that are given in the measurement tables are approximate values. The diameter of the 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 2.

1.2 Shear connector (type SD1 and SD3 acc. to DIN EN ISO 13918)



before welding / after welding



before welding / after welding

CE
2323

CE-conform. Our shear connectors (head marking: SB (for S235J2+C470) resp. A (for 1.4301)) fulfil all essential requirements of regulation (EU) Nr. 305/2011/EU (Construction Products Regulation).

ETA
11/0120

European Technical Assessment ETA-11/0120 of the European Organisation for Technical Approvals (EOTA) issued by the German Institute of Civil Engineering (DIBt).

Dimensions						Material (item number)		Ceramic ferrule
d_1 -0,4/0,4	l_2	d_5	k	d_3*	h*	S235J2+C470	1.4301	
10	50	19	7,1	13	2,5	75-10-050	75-2-10-050	UFN 10
10	75	19	7,1	13	2,5	75-10-075	75-2-10-075	UFN 10
10	100	19	7,1	13	2,5	75-10-100	75-2-10-100	UFN 10
10	125	19	7,1	13	2,5	75-10-125	75-2-10-125	UFN 10
10	150	19	7,1	13	2,5	75-10-150	75-2-10-150	UFN 10
10	175	19	7,1	13	2,5	75-10-175	75-2-10-175	UFN 10
10	200	19	7,1	13	2,5	75-10-200	75-2-10-200	UFN 10
10	225	19	7,1	13	2,5	75-10-225	75-2-10-225	UFN 10
10	250	19	7,1	13	2,5	75-10-250	75-2-10-250	UFN 10
13	50	25	8	17	3	75-13-050	75-2-13-050	UF 13
13	75	25	8	17	3	75-13-075	75-2-13-075	UF 13
13	100	25	8	17	3	75-13-100	75-2-13-100	UF 13
13	125	25	8	17	3	75-13-125	75-2-13-125	UF 13
13	150	25	8	17	3	75-13-150	75-2-13-150	UF 13
13	175	25	8	17	3	75-13-175	75-2-13-175	UF 13
13	200	25	8	17	3	75-13-200	75-2-13-200	UF 13
13	225	25	8	17	3	75-13-225	75-2-13-225	UF 13
13	250	25	8	17	3	75-13-250	75-2-13-250	UF 13
16	50	32	8	21	4,5	75-16-050	75-2-16-050	UF 16
16	75	32	8	21	4,5	75-16-075	75-2-16-075	UF 16
16	100	32	8	21	4,5	75-16-100	75-2-16-100	UF 16
16	125	32	8	21	4,5	75-16-125	75-2-16-125	UF 16

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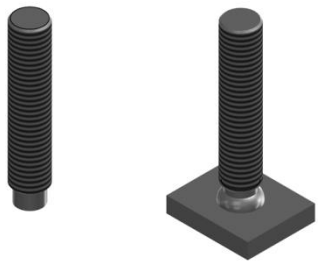
Dimensions						Material (item number)		Ceramic ferrule
d_1 -0,4/0,4	l_2	d_5	k	d_3*	h*	S235J2+C470	1.4301	
16	150	32	8	21	4,5	75-16-150	75-2-16-150	UF 16
16	175	32	8	21	4,5	75-16-175	75-2-16-175	UF 16
16	200	32	8	21	4,5	75-16-200	75-2-16-200	UF 16
16	225	32	8	21	4,5	75-16-225	75-2-16-225	UF 16
16	250	32	8	21	4,5	75-16-250	75-2-16-250	UF 16
16	275	32	8	21	4,5	75-16-275	75-2-16-275	UF 16
16	300	32	8	21	4,5	75-16-300	75-2-16-300	UF 16
19	50	32	10	23	6	75-19-050	75-2-19-050	UF 19
19	60	32	10	23	6	75-19-060	75-2-19-060	UF 19
19	75	32	10	23	6	75-19-075	75-2-19-075	UF 19
19	80	32	10	23	6	75-19-080	75-2-19-080	UF 19
19	90	32	10	23	6	75-19-090	75-2-19-090	UF 19
19	100	32	10	23	6	75-19-100	75-2-19-100	UF 19
19	125	32	10	23	6	75-19-125	75-2-19-125	UF 19
19	150	32	10	23	6	75-19-150	75-2-19-150	UF 19
19	175	32	10	23	6	75-19-175	75-2-19-175	UF 19
19	200	32	10	23	6	75-19-200	75-2-19-200	UF 19
19	225	32	10	23	6	75-19-225	75-2-19-225	UF 19
19	250	32	10	23	6	75-19-250	75-2-19-250	UF 19
19	275	32	10	23	6	75-19-275	75-2-19-275	UF 19
19	300	32	10	23	6	75-19-300	75-2-19-300	UF 19
22	75	35	10	29	6	75-22-075	75-2-22-075	UF 22
22	90	35	10	29	6	75-22-090	75-2-22-090	UF 22
22	100	35	10	29	6	75-22-100	75-2-22-100	UF 22
22	125	35	10	29	6	75-22-125	75-2-22-125	UF 22
22	150	35	10	29	6	75-22-150	75-2-22-150	UF 22
22	175	35	10	29	6	75-22-175	75-2-22-175	UF 22
22	200	35	10	29	6	75-22-200	75-2-22-200	UF 22
22	225	35	10	29	6	75-22-225	75-2-22-225	UF 22
22	250	35	10	29	6	75-22-250	75-2-22-250	UF 22
22	275	35	10	29	6	75-22-275	75-2-22-275	UF 22
22	300	35	10	29	6	75-22-300	75-2-22-300	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 materials can be found in chapter 1.1.

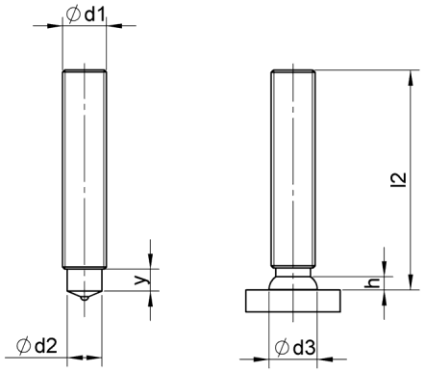
Special ceramic ferrules for shear connectors can be found in chapter 1.32, padded rings in chapter 1.31.

Not listed dimensions and materials available upon request.

1.3 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 MD/PD/FD. Thus - if necessary - the next bigger diameter should be chosen.

Dimensions						Material (item number)			Ceramic ferrule
d_1	l_2	y^1 -0/2P²	d_2 -0,1/0,1	d_3*	h*	Steel 4.8	A2-50	A5-50	
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 8³)
M10	15-100	5	7,9	11,5	3	41-10-**XXX**	42-10-**XXX**	43-10-**XXX**	RF 10 (KSR-F 10³)
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	16,8	5	41-16-**XXX**	42-16-**XXX**	43-16-**XXX**	RF 16
M16	25-100	11	13,2	16,1	5	41-16-**XXX**-LY	42-16-**XXX**-LY	43-16-**XXX**-LY	RF 16 (flat form)
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]P = thread pitch acc. to DIN 13-1

[3]for l_2 < 20 mm

*d_3 and h are approximate values.

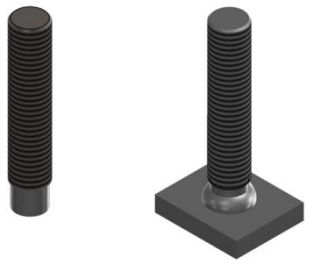
In the item number **XXX** has to be replaced by the respective welding element length l_2 (e.g. 030 for 30 mm).

Explanations to the used materials can be found in chapter 1.1.

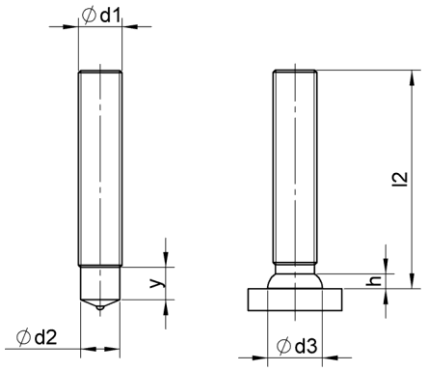
Available surface treatments can be found in chapter 1.1.

Not listed dimensions and materials available upon request.

1.4 Threaded stud with practically complete thread (type MD acc. to DIN EN ISO 13918, before: type MPF)



before welding / after welding



before welding / after welding

With the revision of April 2018 the stud type MD was included into DIN EN ISO 13918:2018 for the first time. The stud type MD acc. to DIN EN ISO 13918:2018 is mostly identic to the not standardised stud type MPF which we already produced for many years. There are only deviations regarding the dimension y (non-threaded part) for M6 (before: 3 mm), M10 (before: 7 mm) and M12 (before: 8 mm).

The threaded stud type MD 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.

Dimensions						Material (item number)			Ceramic ferrule
d_1	l_2	y -0/+0,5	d_2 -0,1/0,1	d_3*	h*	Steel 4.8	A2-50	A5-50	
M6	15-100	5,5	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	MF 8
M10	15-100	6,5	8,95	12,5	3,4	46-10-**XXX**-MPF	47-10-**XXX**-MPF	48-10-**XXX**-MPF	MF 10
M12	20-100	7,5	10,8	14,5	4,2	46-12-**XXX**-MPF	47-12-**XXX**-MPF	48-12-**XXX**-MPF	MF 12
M16	30-100	11	14,6	17,8	5,8	46-16-**XXX**-MPF	47-16-**XXX**-MPF	48-16-**XXX**-MPF	MF 16
M20	35-100	13	18,3	22,5	6,6	46-20-**XXX**-MPF	47-20-**XXX**-MPF	48-20-**XXX**-MPF	MF 20
M24	35-100	23,5	22	29	6	46-24-**XXX**-MPF	47-24-**XXX**-MPF	48-24-**XXX**-MPF	UF 22

*d_3 and h are approximate values.

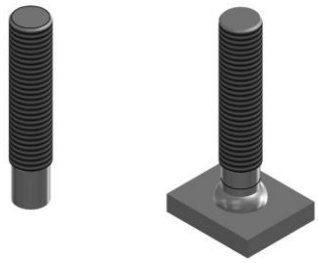
In the item number **XXX** has to be replaced by the respective welding element length l_2 (e.g. 030 for 30 mm).

Explanations to the used materials can be found in chapter 1.1.

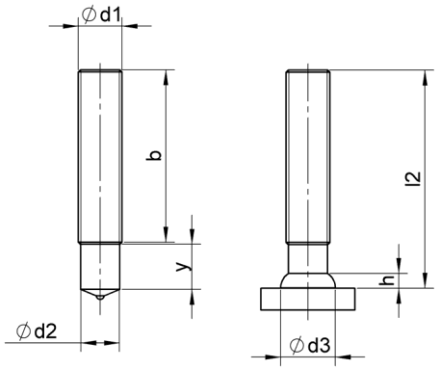
Available surface treatments can be found in chapter 1.1.

Not listed dimensions and materials available upon request.

1.5 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.

Dimensions							Material (item number)			Ceramic ferrule
d_1	l_2	y -0/2P[1]	b	d_2 -0,1/0,1	d_3*	h*	Steel 4.8	A2-50	A5-50	
M6	15 ≤ l_2 < 35 35 ≤ l_2 < 65 65 ≤ 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 l_2 ≥ 160	9 - -	- 40 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 < 70 70 ≤ l_2 < 100 100 ≤ l_2 ≤ 160	13,5 - - -	- 40 50 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 < 70 70 ≤ 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**	MF 20
M24	50 ≤ l_2 < 55 55 ≤ l_2 < 70 70 ≤ l_2 < 100 100 ≤ l_2 < 150 150 ≤ l_2 ≤ 160	20 - - - -	- 30 50 70 100	22	30	10	46-24-**XXX**	47-24-**XXX**	48-24-**XXX**	UF 22

[1]P = thread pitch acc. to DIN 13-1

*d_3 and h are approximate values.

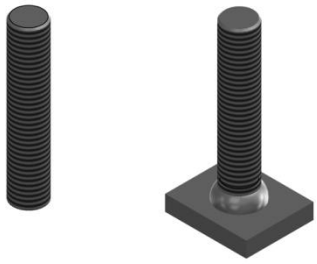
In the item number **XXX** has to be replaced by the respective welding element length l_2 (e.g. 030 for 30 mm).

Explanations to the used materials can be found in chapter 1.1.

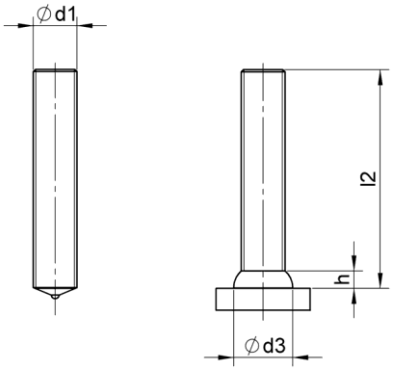
Available surface treatments can be found in chapter 1.1.

Not listed dimensions and materials available upon request.

1.6 Threaded stud with full thread (type FD acc. to DIN EN ISO 13918)



before welding / after welding



before welding / after welding

The threaded stud type FD is threaded 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.

Dimensions				Material (item number)			Ceramic ferrule
d_1	l_2	d_3*	h*	Steel 4.8	A2-50	A5-50	
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.

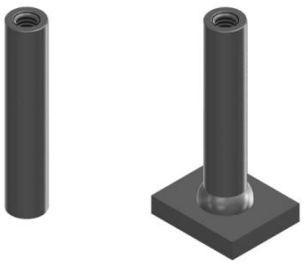
In the item number **XXX** has to be replaced by the respective welding element length l_2 (e.g. 030 for 30 mm).

Explanations to the used materials can be found in chapter 1.1.

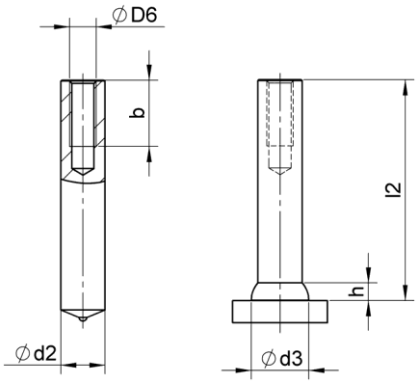
Available surface treatments can be found in chapter 1.1.

Not listed dimensions and materials available upon request.

1.7 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 +2P[1]	d_2 -0,1/0,1	l_2	d_3*	h*	Steel 4.8	A2-50	A5-50	
M5	7	10	15-100	13	4	61-10-**XXX-**M5X7	62-10-**XXX-**M5X7	62-3-10-**XXX-**M5X7	UF 10 (KSN-F 10[2])
M6	9 (7[2])	10	15-100	13	4	61-10-**XXX**-M6X7[2] 61-10-**XXX**-M6X9	62-10-**XXX**-M6X7[2] 62-10-**XXX**-M6X9	62-3-10-**XXX**-M6X7[2] 62-3-10-**XXX**-M6X9	UF 10 (KSN-F 10[2])
M8	12 (8[2])	12	15-100	16	5	61-12-**XXX**-M8X8[2] 61-12-**XXX**-M8X12	62-12-**XXX**-M8X8[2] 62-12-**XXX**-M8X12	62-3-12-**XXX**-M8X8[2] 62-3-12-**XXX**-M8X12	UF 12 (KSN-F 12[2])
M8	12 (8[2])	14,6	15-100	18,5	6	61-14,6-**XXX**-M8X8[2] 61-14,6-**XXX**-M8X12	62-14,6-**XXX**-M8X8[2] 62-14,6-**XXX**-M8X12	62-3-14,6-**XXX**-M8X8[2] 62-3-14,6-**XXX**-M8X12	MF 16
M10	15 (8[3])	14,6	15-100	18,5	6	61-14,6-**XXX**-M10X8[3] 61-14,6-**XXX**-M10X15	62-14,6-**XXX**-M10X8[3] 62-14,6-**XXX**-M10X15	62-3-14,6-**XXX**-M10X8[3] 62-3-14,6-**XXX**-M10X15	MF 16
M10	15 (8[3])	16	20-100	21	7	61-16-**XXX**-M10X8[3] 61-16-**XXX**-M10X15	62-16-**XXX**-M10X8[3] 62-16-**XXX**-M10X15	62-3-16-**XXX**-M10X8[3] 62-3-16-**XXX**-M10X15	UF 16
M12	18	18,3	25-100	23	7	61-18,3-**XXX**-M12X18	62-18,3-**XXX**-M12X18	62-3-18,3-**XXX**-M12X18	MF 20
M16	24	22	40-100	28	10	61-22-**XXX**-M16X24	62-22-**XXX**-M16X24	62-3-22-**XXX**-16X24	UF 22

[1]P = thread pitch acc. to DIN 13-1

[2]for l_2 < 20 mm, [3]for l_2 < 25 mm

*d_3 and h are approximate values.

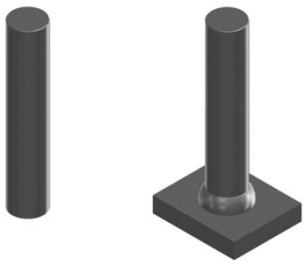
In the item number **XXX** has to be replaced by the respective welding element length l_2 (e.g. 030 for 30 mm).

Explanations to the used materials can be found in chapter 1.1.

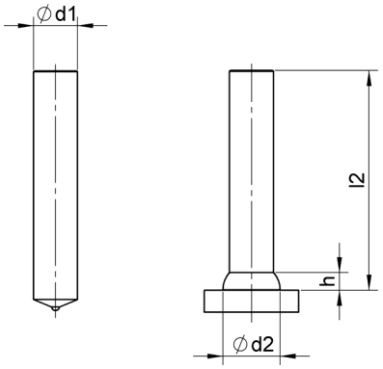
Available surface treatments can be found in chapter 1.1.

Not listed dimensions and materials available upon request.

1.8 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 -0,1/0,1	l_2	d_2*	h*	Steel 4.8	A2-50	A5-50	
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**	MF 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.

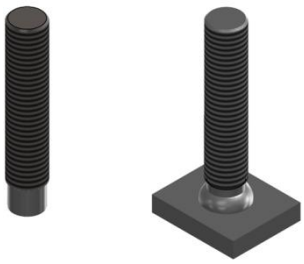
In the item number **XXX** has to be replaced by the respective welding element length l_2 (e.g. 030 for 30 mm).

Explanations to the used materials can be found in chapter 1.1.

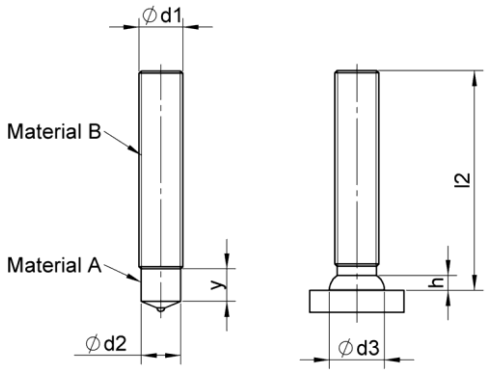
Available surface treatments can be found in chapter 1.1.

Not listed dimensions and materials available upon request.

1.9 Bimetallic threaded stud with practically complete thread (type MD-DUO, before: type MPF-DUO)



before welding / after welding



before welding / after welding

The threaded stud type MD-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.

Dimensions						Material (item number)		Ceramic ferrule
d_1	l_2	y -0/+0,5	d_2 -0,1/0,1	d_3*	h*	A: steel 4.8, B: A5-50	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	MF 8
M10	20-100	6,5	8,95	12,5	3,4	78-14-10-**XXX**-PF	78-12-10-**XXX**-PF	MF 10
M12	20-100	7,5	10,5	14,5	4,2	78-14-12-**XXX**-PF	78-12-12-**XXX**-PF	MF 12
M16	30-100	11	14,6	17,8	5,8	78-14-16-**XXX**-PF	78-12-16-**XXX**-PF	MF 16

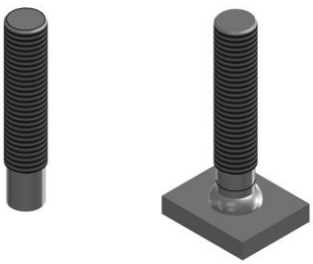
*d_3 and h are approximate values.

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

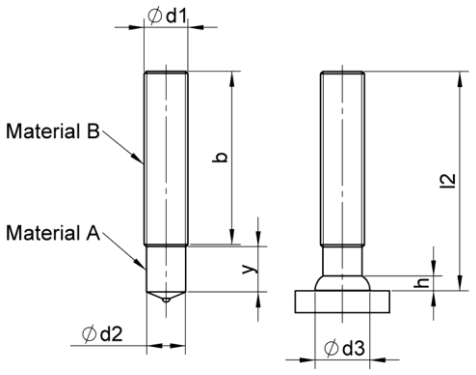
Explanations to the used materials can be found in chapter 1.1.

Not listed dimensions and materials available upon request.

1.10 Bimetallic threaded stud with partial thread (type PD-DUO)



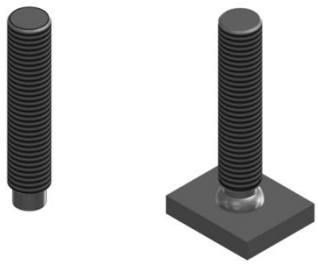
before welding / after welding



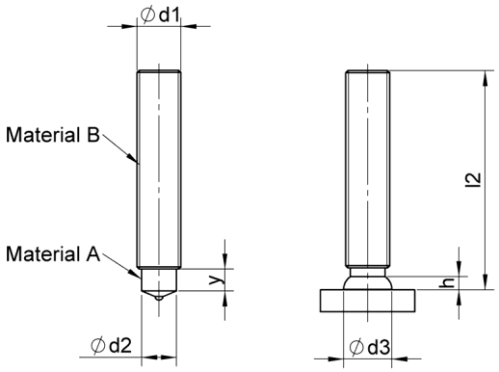
before welding / after welding

The threaded stud type PD-DUO consists of two different materials. It 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. **Available dimensions and materials available upon request.**

1.11 Bimetallic threaded stud with reduced shaft (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 MD/PD/FD. Thus - if necessary - the next bigger diameter should be chosen.

Dimensions						Material (item number)		Ceramic ferrule
d_1	l_2	y^1 -0/P²	d_2 -0,1/0,1	d_3*	h*	A: steel 4.8, B: A5-50	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 8³)
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	16,8	5	78-14-16-**XXX**-R	78-12-16-**XXX**-R	RF 16
M16	25-100	11	13,2	16,1	5	78-14-16-**XXX**-R	78-12-16-**XXX**-R	RF 16 (flat form)

[1]Other y-dimensions available upon request. [2]P = thread pitch acc. to DIN 13-1. [3]for l_2 < 20 mm

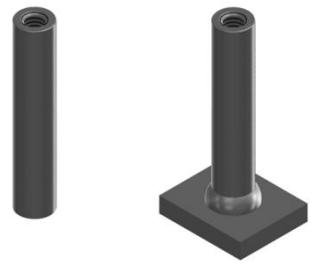
*d_3 and h are approximate values.

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

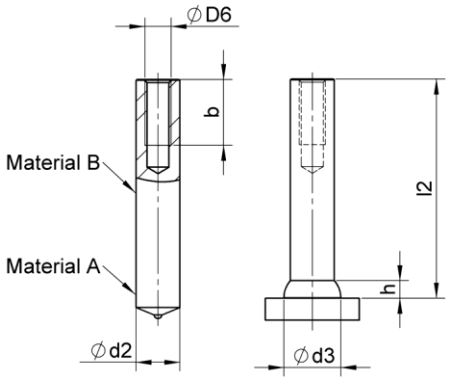
Explanations to the used materials can be found in chapter 1.1.

Not listed dimensions and materials available upon request.

1.12 Bimetallic internally threaded stud (type ID-DUO)



before welding / after welding

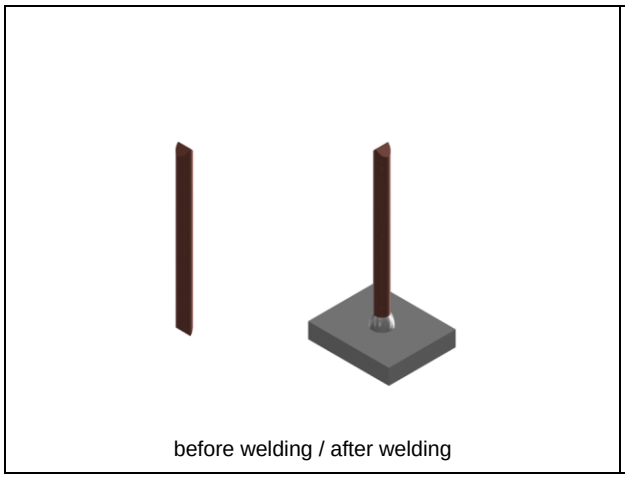


before welding / after welding

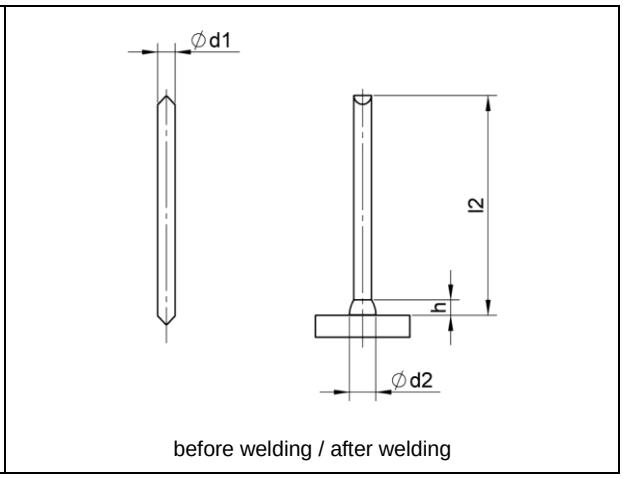
Available dimensions and materials available upon request.

1.13 Insulation pins and clips

1.13.1 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**-MS	67-03-**XXX**-MS	70-03-**XXX**-MS	74-03-**XXX**-MS	68-03-**XXX**-MS	[UF 4[1] / K 5[1]]
4	60-450	6	3,5	66-04-**XXX**-MS	-	-	-	-	[UF 4[1] / K 5[1]]
5	60-120	8	3,5	66-05-**XXX**-MS	-	-	-	-	[UF 5[1] / K 5[1]]

*d_2 and h are approximate values.

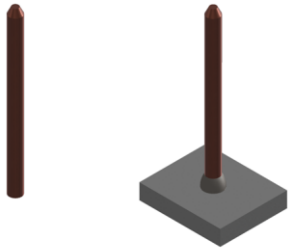
[1]Insulation pins are generally welded without ceramic ferrules. Ceramic ferrules are only used for special applications. If ceramic ferrules shall be used, either type UF or type K can be chosen.

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

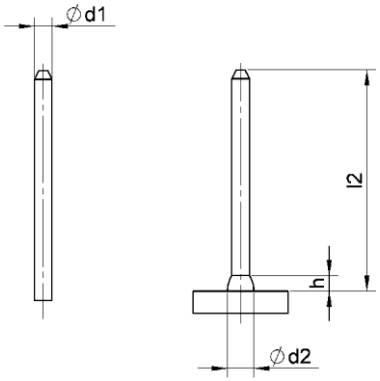
Explanations to the used materials can be found in chapter 1.1.

Not listed dimensions and materials available upon request.

1.13.2 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.

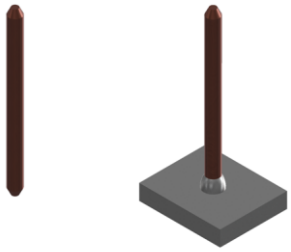
[1]Insulation pins are generally welded without ceramic ferrules. Ceramic ferrules are only used for special applications. If ceramic ferrules shall be used, either type UF or type K can be chosen.

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

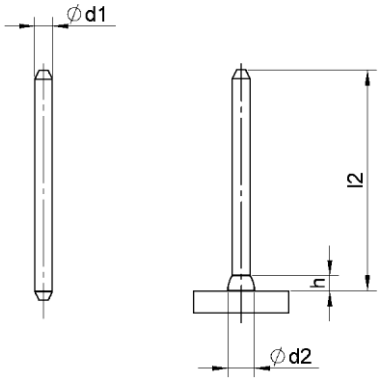
Explanations to the used materials can be found in chapter 1.1.

Not listed dimensions and materials available upon request.

1.13.3 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.

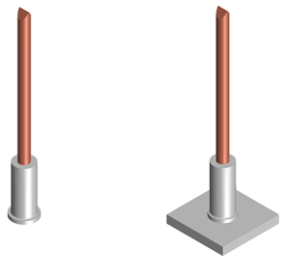
[1]Insulation pins are generally welded without ceramic ferrules. Ceramic ferrules are only used for special applications. If ceramic ferrules shall be used, either type UF or type K can be chosen.

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

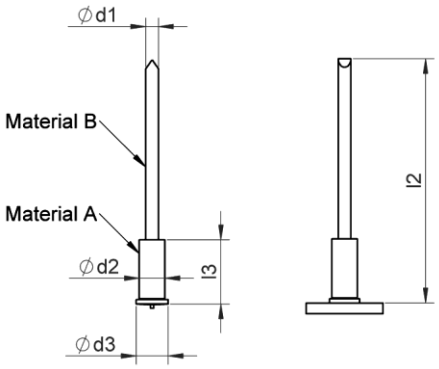
Explanations to the used materials can be found in chapter 1.1.

Not listed dimensions and materials available upon request.

1.13.4 Bimetallic insulation pin (type VBS-MS)



before welding / after welding



before welding / after welding

The bimetallic insulation pin VBS-MS consists of an aluminium tapped blind hole stud with a pressed-in insulation pin one-sided with chisel tip.

Application area: insulation on aluminium base material

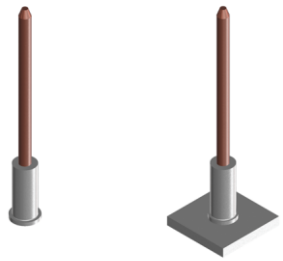
Dimensions					Material (item number)		
d_1	l_2	d_2	l_3	d_3	**A: AlMg3, B: Steel 4.8 copper-plated**	**A: AlMg3, B: 1.4301**	**A: AlMg3, B: 1.4571**
3	30-200	6	15	7,5	241-03-**XXX**-MS	242-03-**XXX**-MS	247-03-**XXX**-MS

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

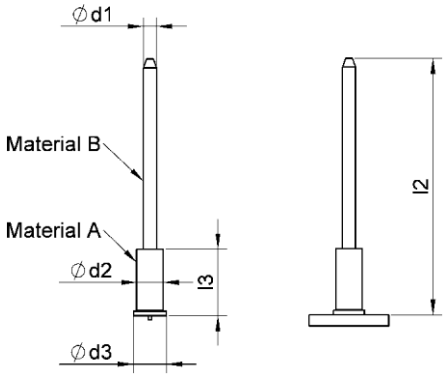
Explanations to the used materials can be found in chapter 1.1.

Not listed dimensions and materials available upon request.

1.13.5 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 one-sided with grinded tip.

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**

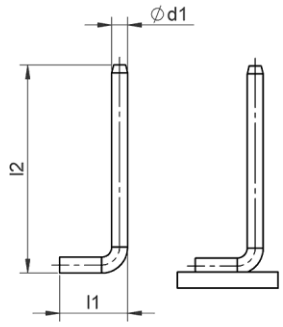
In the item number **XXX** has to be replaced by the respective welding element length l_2 (e.g. 030 for 30 mm).

Explanations to the used materials can be found in chapter 1.1.

Not listed dimensions and materials available upon request.

1.13.6 Insulation pin (type ISH)

vor dem Schweißen / nach dem Schweißen



vor dem Schweißen / nach dem Schweißen

Insulation pin - angled (for manual welding)

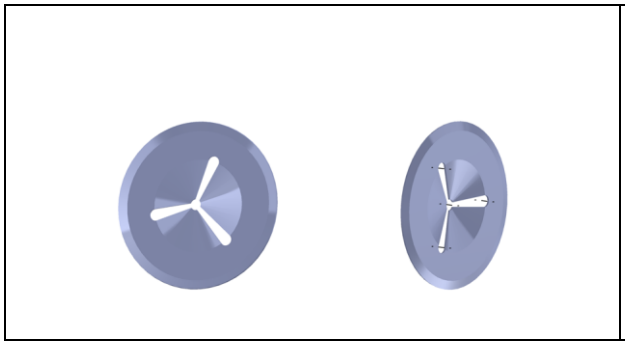
Dimensions			Material (item number)				
d_1	**l_2**	**l_1**	**Steel 4.8 copper-plated**	**1.4301**	**1.4541**	**1.4571**	**1.5415 (16Mo3)**
3	upon request	upon request	66-03-**XXX**-ISH-**XX**	67-03-**XXX**-ISH-**XX**	70-03-**XXX**-ISH-**XX**	74-03-**XXX**-ISH-**XX**	68-03-**XXX**-ISH-**XX**
4	upon request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

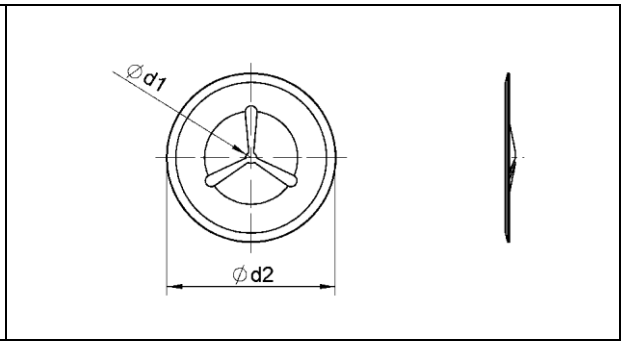
In the item number **XXX** has to be replaced by the respective welding element length l_2 (e.g. 030 for 30 mm) and **XX** by the respective angled length l_1.

Explanations to the used materials can be found in chapter 1.1.

Not listed dimensions and materials available upon request.

1.13.7 Clip for insulation pin (type R)

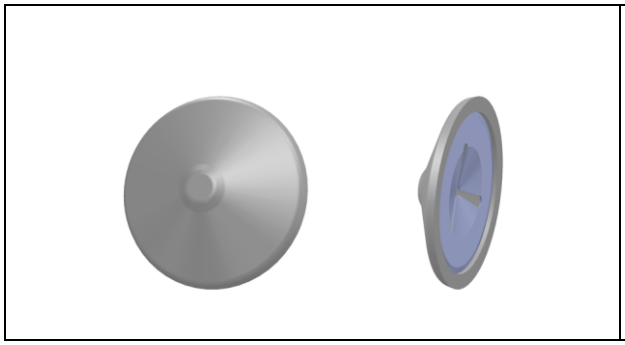


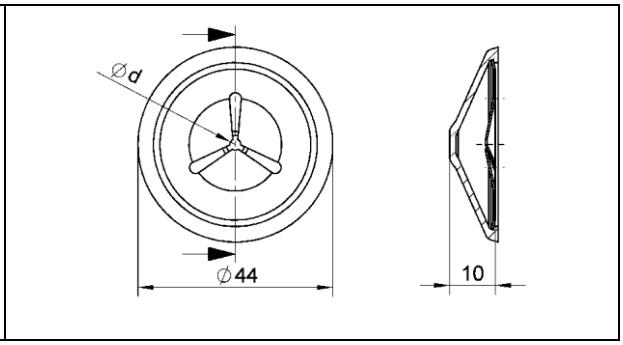


Dimensions		Material (item number)	
d_1	d_2	Steel zinc-plated	1.4310
2	38	49-12-002	49-22-002
3	38	49-13-003	49-23-003
4	38	49-14-004	49-24-004
5	38	49-15-005	49-25-005
6	38	49-16-006	49-26-006
8	38	49-18-008	49-28-008
9,5	38	49-19-009,5	49-29-009,5
12	38	49-12-012	49-22-012
3	60	49-13-003-ST2K70-D60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

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



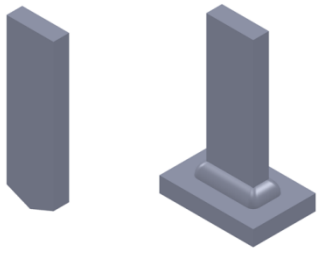


Dimensions	Material (item number)			
d	Steel zinc-plated with plastic cap (white)	Steel zinc-plated with plastic cap (black)	1.4310 with plastic cap (white)	1.4310 with plastic cap (black)
2	49-52-002	49-52-002-SCHWARZ	49-62-002	49-62-002-SCHWARZ
3	49-53-003	49-53-003-SCHWARZ	49-63-003	49-63-003-SCHWARZ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

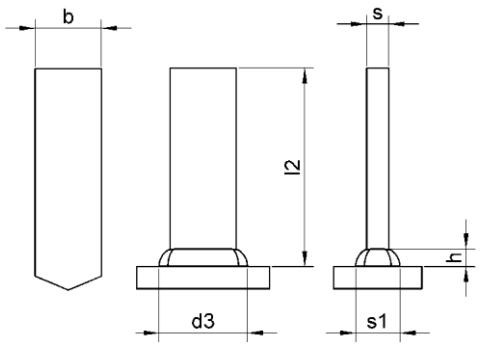
Plastic cap: halogen free, self-extinguishing

Not listed dimensions and materials available upon request.

1.14 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	77-15-3-**XXX**-OK	77-2-15-3-**XXX**-OK	KF 15x3
15	5	20-100	20	4	10	77-15-5-**XXX**-OK	77-2-15-5-**XXX**-OK	KF 15x5
25	3	25-100	28	4	6	77-25-3-**XXX**-OK	77-2-25-3-**XXX**-OK	KF 25x3
25	5	25-100	28	4	10	77-25-5-**XXX**-OK	77-2-25-5-**XXX**-OK	KF 25x5

*d_3, h and s_1 are approximate values.

Rectangular studs (type A) standardly do not have a pressed-in aluminium ball, but can be produced with aluminium ball on demand.

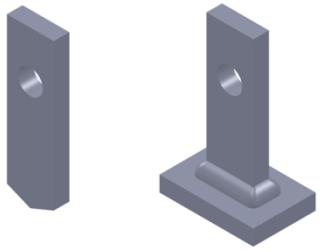
In the item number **XXX** has to be replaced by the respective welding element length l_2 (e.g. 030 for 30 mm).

Explanations to the used materials can be found in chapter 1.1.

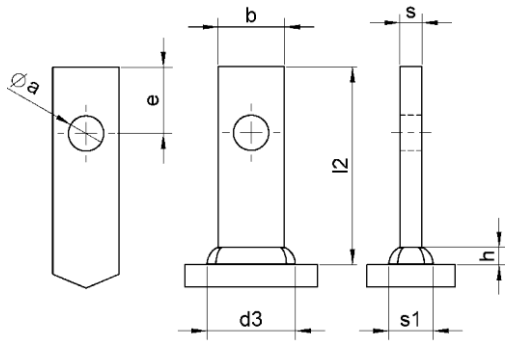
Available surface treatments can be found in chapter 1.1.

Not listed dimensions and materials available upon request.

1.15 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	77-15-3-**XXX**-**a**-**e**-OK	77-2-15-3-**XXX**-**a**-**e**-OK	KF 15x3
15	5	20-100	8	15 (10^1)	20	4	10	77-15-5-**XXX**-**a**-**e**-OK	77-2-15-5-**XXX**-**a**-**e**-OK	KF 15x5
25	3	25-100	8	15	28	4	6	77-25-3-**XXX**-**a**-**e**-OK	77-2-25-3-**XXX**-**a**-**e**-OK	KF 25x3
25	5	25-100	8	15	28	4	10	77-25-5-**XXX**-**a**-**e**-OK	77-2-25-5-**XXX**-**a**-**e**-OK	KF 25x5

[1]for l_2 < 25 mm

*d_3, h and s_1 are approximate values.

Rectangular studs (type B) standardly do not have a pressed-in aluminium ball, but can be produced with aluminium ball on demand.

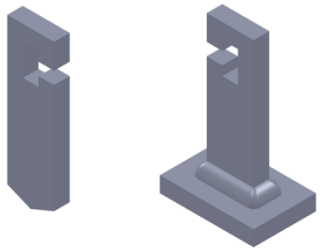
In the item number **XXX** has to be replaced by the respective welding element length l_2 (e.g. 030 for 30 mm).

Explanations to the used materials can be found in chapter 1.1.

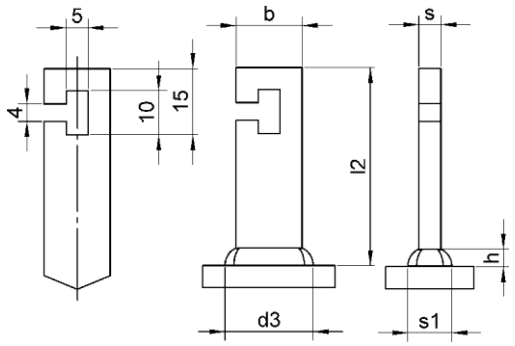
Available surface treatments can be found in chapter 1.1.

Not listed dimensions and materials available upon request.

1.16 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	77-15-3-**XXX**-C-OK	77-2-15-3-**XXX**-C-OK	KF 15x3
15	5	20-100	20	4	10	77-15-5-**XXX**-C-OK	77-2-15-5-**XXX**-C-OK	KF 15x5
25	3	25-100	28	4	6	77-25-3-**XXX**-C-OK	77-2-25-3-**XXX**-C-OK	KF 25x3
25	5	25-100	28	4	10	77-25-5-**XXX**-C-OK	77-2-25-5-**XXX**-C-OK	KF 25x5

*d_3, h and s_1 are approximate values.

Rectangular studs (type C) standardly do not have a pressed-in aluminium ball, but can be produced with aluminium ball on demand.

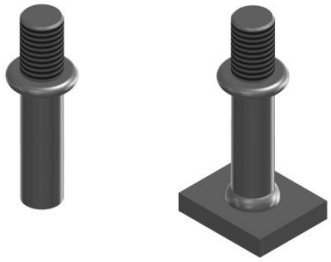
In the item number **XXX** has to be replaced by the respective welding element length l_2 (e.g. 030 for 30 mm).

Explanations to the used materials can be found in chapter 1.1.

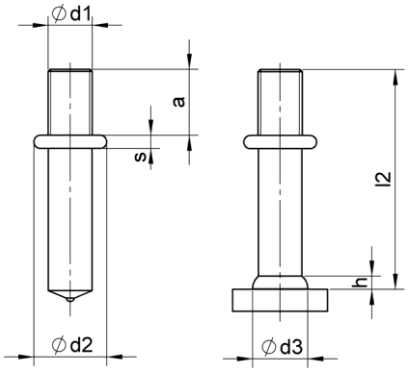
Available surface treatments can be found in chapter 1.1.

Not listed dimensions and materials available upon request.

1.17 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.

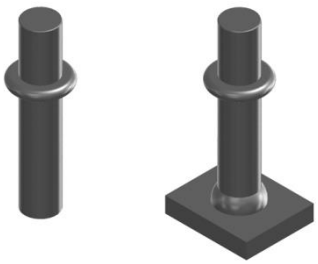
In the item number **XXX** has to be replaced by the respective welding element length l_2 (e.g. 030 for 30 mm).

Explanations to the used materials can be found in chapter 1.1.

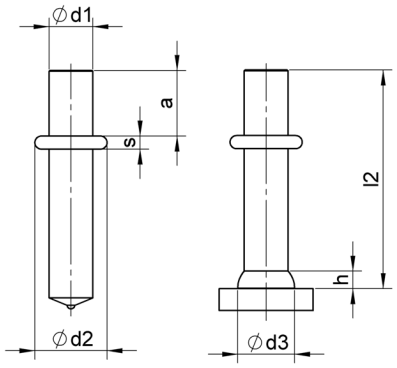
Available surface treatments can be found in chapter 1.1.

Not listed dimensions and materials available upon request.

1.18 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.

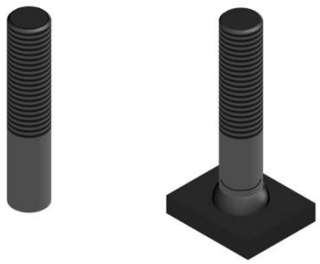
In the item number **XXX** has to be replaced by the respective welding element length l_2 (e.g. 030 for 30 mm).

Explanations to the used materials can be found in chapter 1.1.

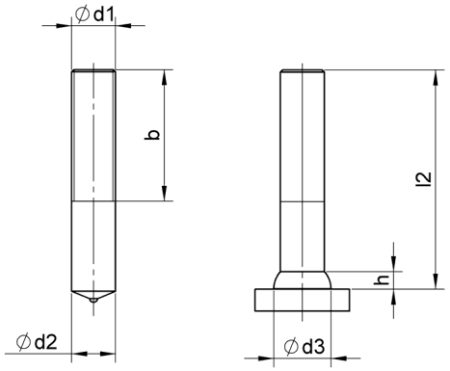
Available surface treatments can be found in chapter 1.1.

Not listed dimensions and materials available upon request.

1.19 Threaded stud (type M)



before welding / after welding



before welding / after welding

Dimensions						Material (item number)			Ceramic ferrule
d_1	l_2	d_2 -0,1/0,1	b	d_3*	h*	Steel 4.8	A2-50	A5-50	
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

*d_3 and h are approximate values.

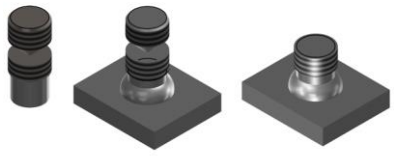
In the item number **XXX** has to be replaced by the respective welding element length l_2 (e.g. 030 for 30 mm) and **XX** by the respective thread length b.

Explanations to the used materials can be found in chapter 1.1.

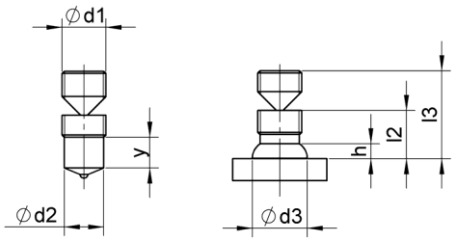
Available surface treatments can be found in chapter 1.1.

Not listed dimensions and materials available upon request.

1.20 Threaded knock-off stud (type AB-MD, before: AB-MPF)



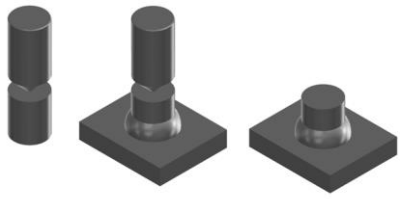
before welding / after welding



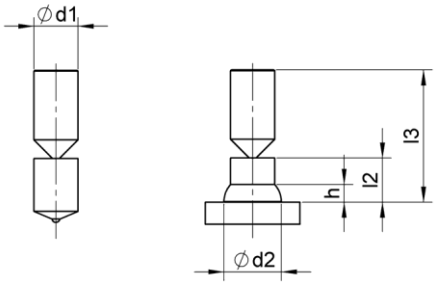
before welding / after welding

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

1.21 Knock-off stud



before welding / after welding

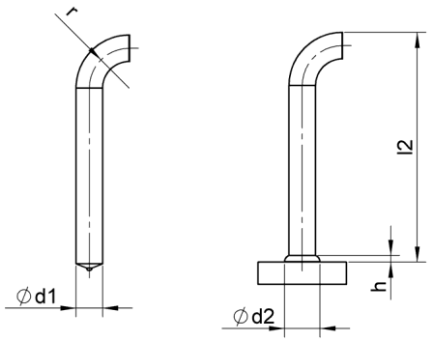


before welding / after welding

Available dimensions and materials available upon request.

1.22 Curved stud

before welding / after welding

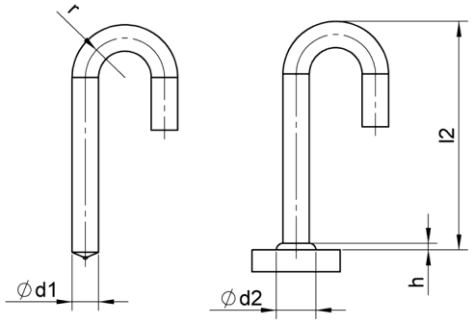


before welding / after welding

Available dimensions and materials available upon request.

1.23 J-bolt stud

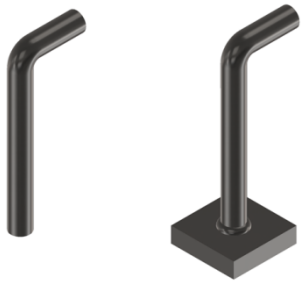
before welding / after welding



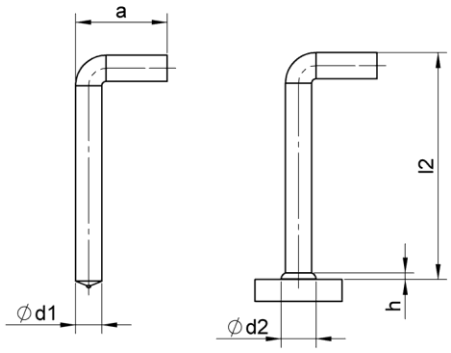
before welding / after welding

Available dimensions and materials available upon request.

1.24 Bent stud



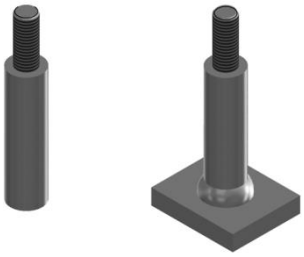
before welding / after welding



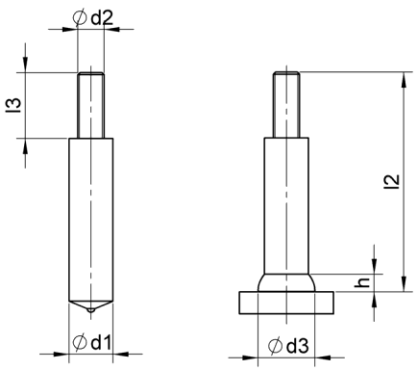
before welding / after welding

Available dimensions and materials available upon request.

1.25 Stepped stud



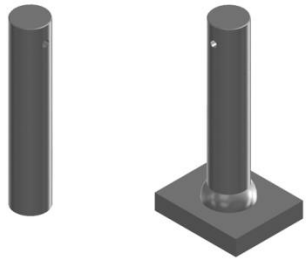
before welding / after welding



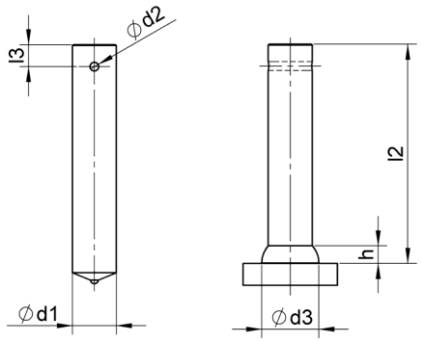
before welding / after welding

Available dimensions and materials available upon request.

1.26 Locking stud



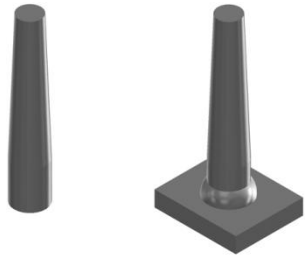
before welding / after welding



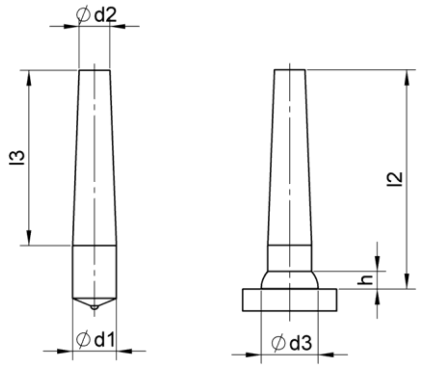
before welding / after welding

Available dimensions and materials available upon request.

1.27 Cone stud



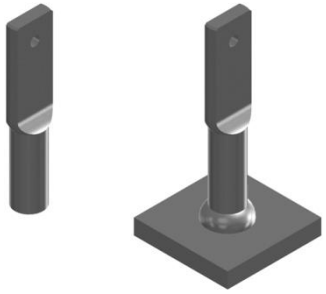
before welding / after welding



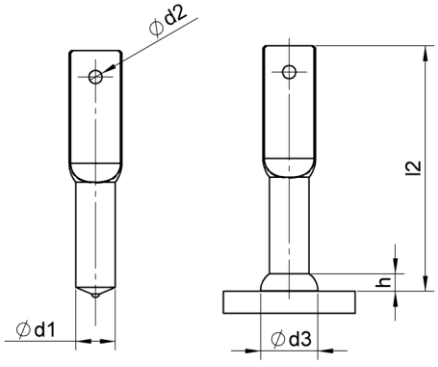
before welding / after welding

Available dimensions and materials available upon request.

1.28 Flat-ended stud



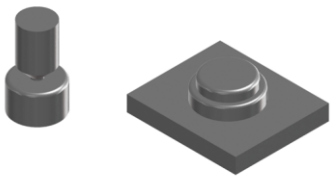
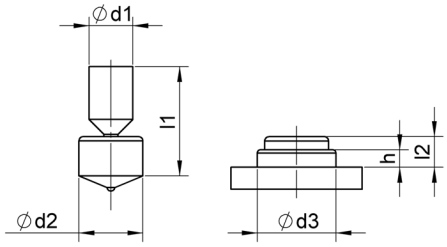
before welding / after welding



before welding / after welding

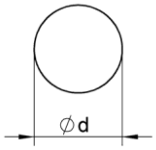
Available dimensions and materials available upon request.

1.29 Anti-skid knock-off stud

	
before welding / after welding	before welding / after welding

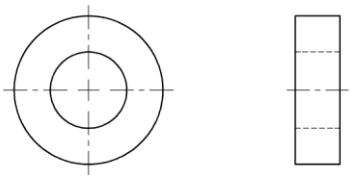
Available dimensions and materials available upon request.

1.30 Ball

	
before welding	before welding

Available dimensions and materials available upon request.

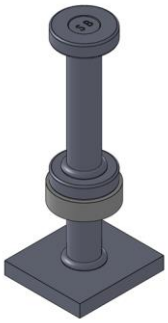
1.31 Padded ring for shear connectors

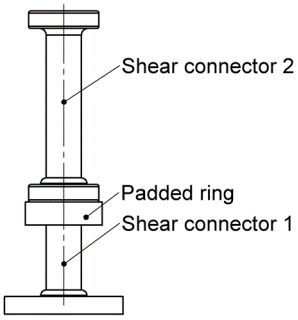


According to our European Technical Assessment ETA-11/0120 it is permitted to use two shear connectors welded one on top of the other by drawn arc stud welding. Thereby a padded ring is to be placed under the head of the first shear connector.

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

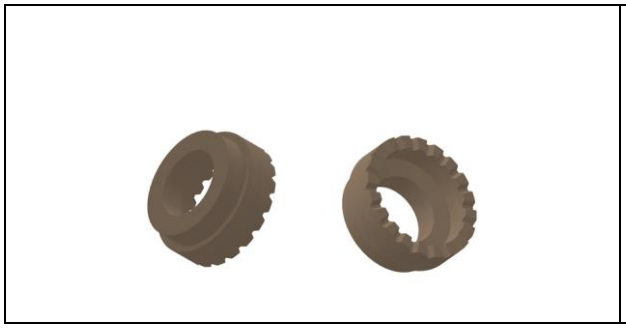
Placement of the padded ring:

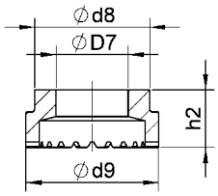




1.32 Ceramic ferrules

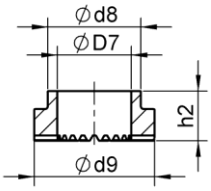
1.32.1 Ceramic ferrule for shear connectors, internally threaded studs and non-threaded studs (type UF acc. to DIN EN ISO 13918)





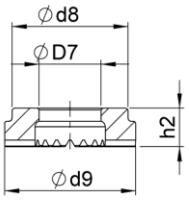
Description	Dimensions				Item number
	D_7 -0/+0,5	d_8 -1/+1	d_9 -1/+1	h_2	
UF 4	4,2	9,5	11,5	≈ 8,7	75-00-004
UF 5	5,2	9,5	11,5	≈ 8,7	75-00-005
UF 6	6,2	9,5	11,5	≈ 8,7	75-00-006
UF 8	8,2	11	15	≈ 8,7	75-00-008
UF 10	10,2	15	17,8	≈ 10	75-00-010
UFN 10	10,2	16,5	20	≈ 9,9	75-00-010-N
UF 12	12,2	16,5	20	≈ 10,7	75-00-012
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 20	20,4	26,1	32,8	≈ 14,2	75-00-020
UF 22 flat	22,8	30,7	38,5	≈ 14	75-00-022-F
UF 22	22,8	30,7	38,5	≈ 18,5	75-00-022
UF 25	26,0	35,5	41	≈ 21	75-00-025

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



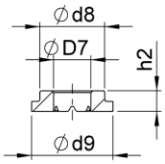
Description	Dimensions				Item number
	D_7 -0/+0,4	d_8 -1/+1	d_9 -1/+1	h_2	
RF 5	5,2	9,5	11,5	≈ 7,9	71-00-005
RF 6	6,2	9,5	12,2	≈ 10	71-00-006
RF 8	8,2	12	15,3	≈ 9	71-00-008
RF 10	10,2	15	18,5	≈ 11,5	71-00-010
RF 12	12,2	17	20	≈ 13	71-00-012
RF 16	16,3	20,5	26,5	≈ 15,3	71-00-016

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



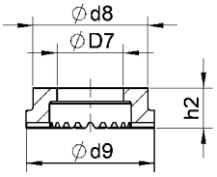
Description	Dimensions				Item number
	D_7 -0/+0,4	d_8 -1/+1	d_9 -1/+1	h_2	
RF 16 (flat form)	14	26,2	30	≈ 8,8	71-00-016-F
RF 20 (flat form)	17,5	26,2	32,5	≈ 9	71-00-020-F

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



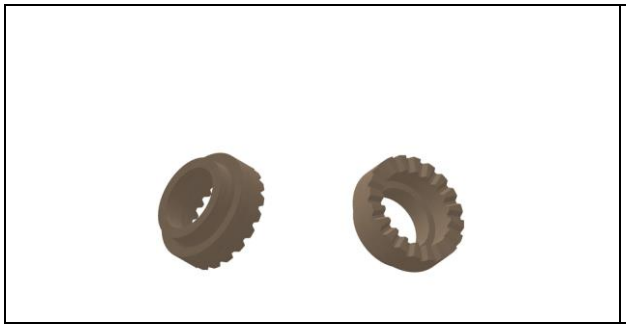
Description	Dimensions				Item number
	D_7 -0/+0,4	d_8 -1/+1	d_9 -1/+1	h_2	
KSR-F 8	8,4	14,8	17,8	≈ 4,7	71-00-008-F-N
KSR-F 10	10,3	14,5	19	≈ 6,7	71-00-010-F-N

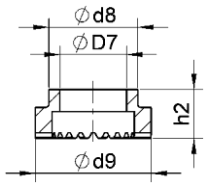
1.32.5 Ceramic ferrule for threaded studs (type MF acc. to DIN EN ISO 13918, before: type KSP-F)



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

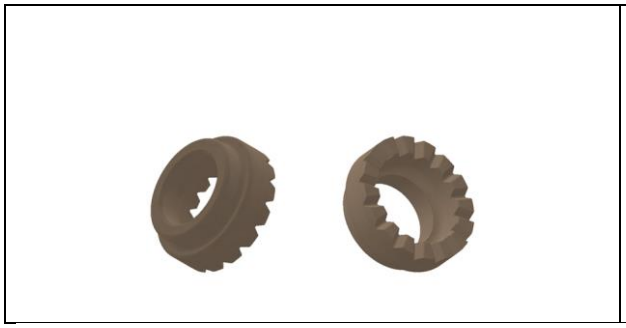
1.32.6 Ceramic ferrule for threaded studs (type PF acc. to DIN EN ISO 13918)

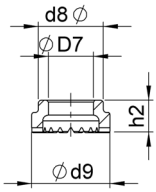




Description	Dimensions				Item number
	D_7 -0/+0,5	d_8 -1/+1	d_9 -1/+1	h_2	
PF 6	5,6	9,5	11,5	≈ 6,5	72-00-006
PF 8	7,4	11,5	15	≈ 6,5	72-00-008
PF 10	9,2	15	17,8	≈ 6,5	72-00-010
PF 12	11,1	16,5	20	≈ 9	72-00-012
PF 16	15,0	20	26	≈ 11	72-00-016

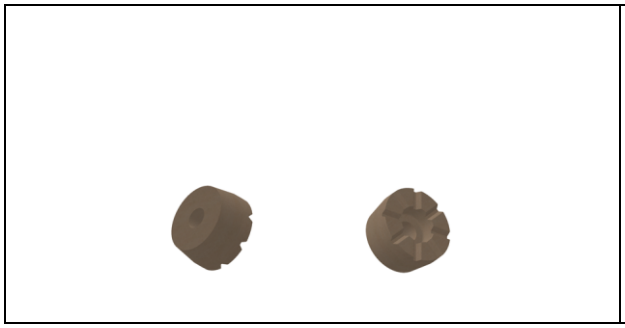
1.32.7 Ceramic ferrule for internally threaded studs and non-threaded studs (type KSN-F)

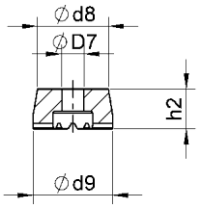




Description	Dimensions				Item number
	D_7 -0/+0,5	d_8 -1/+1	d_9 -1/+1	h_2	
KSN-F 8	8,25	14,8	18,3	≈ 4,8	75-00-008-F
KSN-F 10	10,25	14,8	17,8	≈ 7,4	75-00-010-F
KSN-F 12	12,25	20	23,2	≈ 6,3	75-00-012-F

1.32.8 Permanent ceramic ferrule for insulation pins (type K)

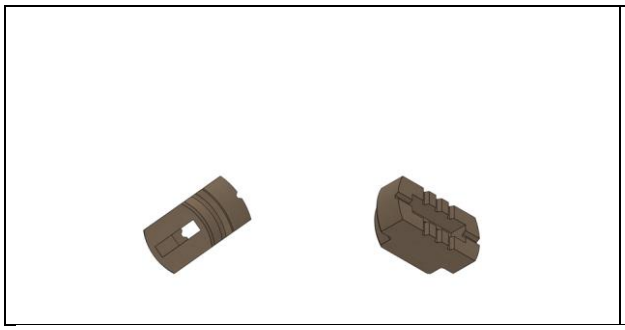


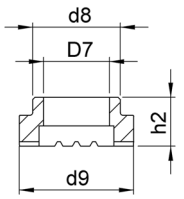


A permanent ceramic ferrule can be used for approx. 100 weldings of insulation pins.

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	75-00-005-K5
K 6	6,3	16,2	18	≈ 9	75-00-006-K6

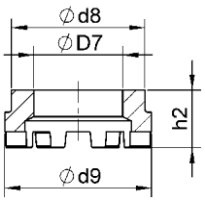
1.32.9 Ceramic ferrule for rectangular studs (type KF)





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	75-00-153
KF 15x5	16	20,5	26,5	≈ 11	75-00-155
KF 25x3	25,5	30,5	35,5	≈ 13	75-00-253
KF 25x5	25,5	30,5	35,5	≈ 13	75-00-255

1.32.10 Special ceramic ferrule (welding through metal deck) for shear connectors (type DF acc. to DIN EN ISO 13918)



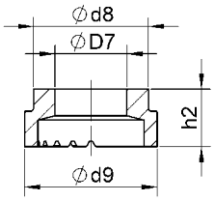
Special ceramic ferrule for welding through metal deck (welding of shear connectors through thin, mostly zinc-plated deck sheets onto the top belt of a steel beam).

When welding through zinc-plated deck sheets there are high amounts of degasification through zinc evaporation. The special ceramic ferrule type DF 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	
DF 16	16,5	25,5	30,2	≈ 17,7	75-00-016-D
DF 19	20,5	30,8	33,8	≈ 15,2	75-00-019-D

Not listed dimensions available upon request.

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

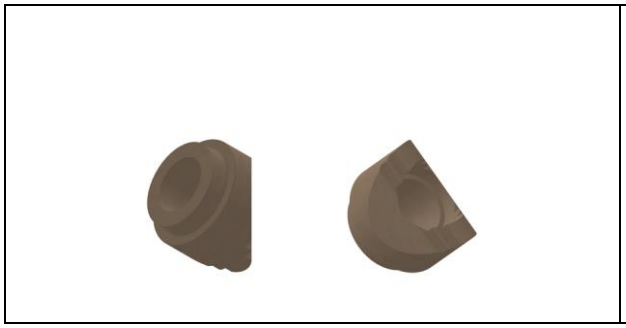


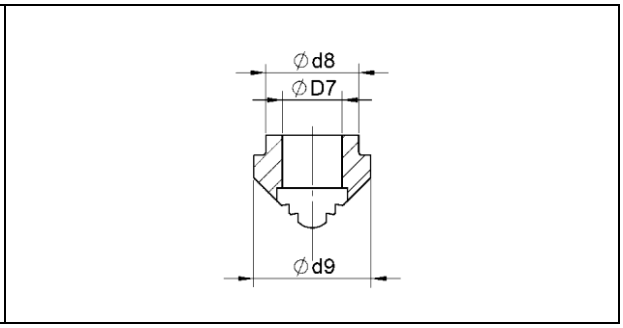
Half-sided closed special ceramic ferrule for welding shear connectors to vertical surfaces.

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.

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

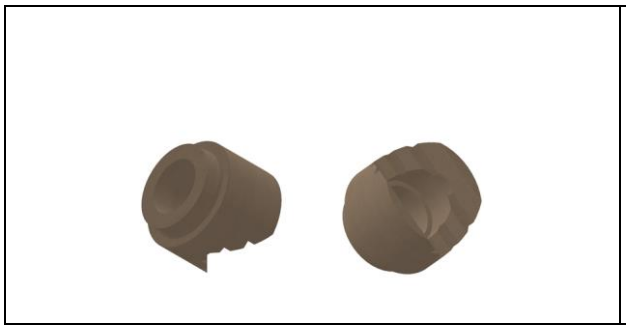


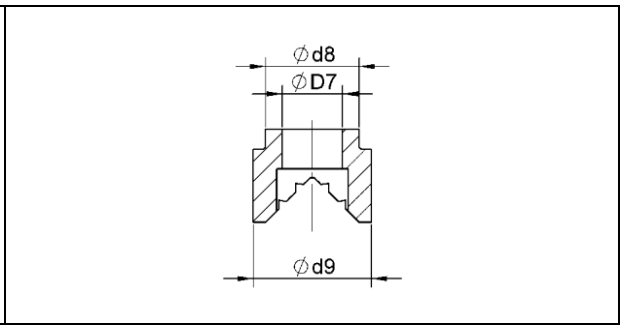


Description	Dimensions			Item number
	D_7 -0/+0,5	d_8 -0,5/+0,5	d_9 -1/+1	
IWKR 10	10,4	13	16,5	75-00-010-IWKR
IWKR 13	13,4	17	20,5	75-00-013-IWKR

Not listed dimensions available upon request.

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

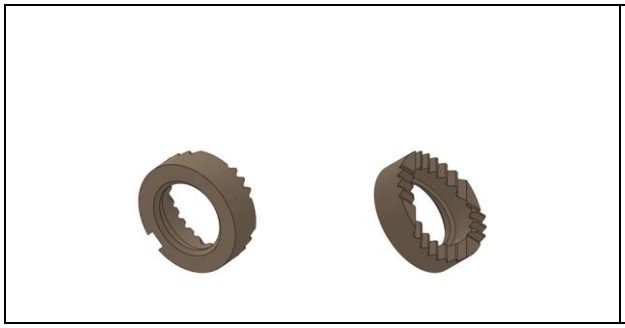


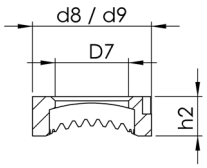


Description	Dimensions			Item number
	D_7 -0/+0,5	d_8 -0,5/+0,5	d_9 -1/+1	
AWKR 10	10,4	14,8	18	75-00-010-AWKR
AWKR 13	13,4	20,5	26,5	75-00-013-AWKR

Not listed dimensions available upon request.

1.32.14 Special ceramic ferrule (welding to convex surfaces) for shear connectors (type ABKR)





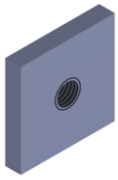
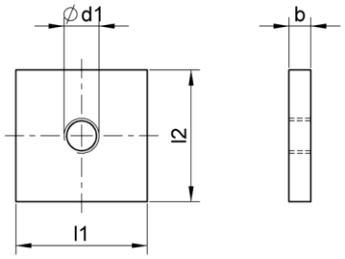
Special ceramic ferrule for welding shear connectors to convex surfaces (tubes etc.).

Description	Dimensions				Item number
	D_7 -0/+0,5	d_8 -1/+1	d_9 -1/+1	h_2	
ABKR 16	16,3	26,5	26,5	≈ 9	75-00-016-ABKR
ABKR 19	19,4	29,5	29,5	≈ 9	75-00-019-ABKR

Not listed dimensions available upon request.

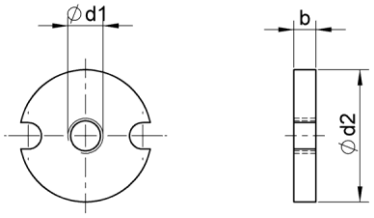
1.33 Fixing accessories

1.33.1 Threaded plate

Available dimensions and materials available upon request.

1.33.2 Disk nut

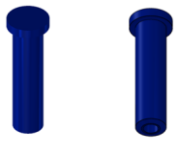
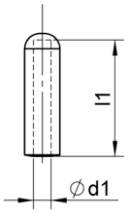
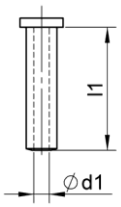
	

Available dimensions and materials available upon request.

1.34 Silicone cover caps

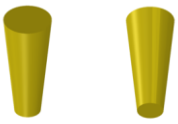
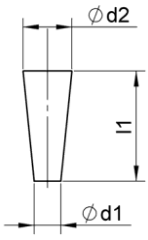
Silicone cover caps protect the mechanical important areas of the welding elements during painting and powder coating as well as during the burning-in process (permanent temperature ≤ 210° C, short temperature ≤ 300° C).

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

Available dimensions upon request.

1.34.2 Silicone cover caps for internally threaded studs

Available dimensions upon request.

Annex: Accessories and wear parts for stud welding guns

2. Accessories and wear parts for stud welding guns

2.1 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

2.2 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, GD 12/15: 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 65-08-00	PHM-12, GD 12/15: 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, GD 12/15: 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, GD 12/15: 83-41-022 PHM-160/161, GD 16/19/22/25: 83-40-022
M16 ($y \geq 7,5$)	$l_2 < 30$ $l_2 \geq 30$	25-99-00 83-55-016	65-11-00	PHM-12, GD 12/15: 83-41-029 PHM-160/161, GD 16/19/22/25: 83-40-029
M16 ($y \geq 11$)	$l_2 < 30$ $l_2 \geq 30$	25-99-00 83-55-016	65-12-00	PHM-12, GD 12/15: 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

2.3 Threaded stud (type MD, MD-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, GD 12/15: 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, GD 12/15: 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, GD 12/15: 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, GD 12/15: 83-41-029 PHM-160/161, GD 16/19/22/25: 83-40-029
M16	$l_2 \geq 30$	83-55-016	65-12-00	GD 15: 83-41-029 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
M24	> 50	25-46-00	65-13-00	GD 22/25: 83-40-044

2.4 Threaded stud (type PD, PD-DUO)

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, GD 12/15: 83-41-022 PHM-160/161, GD 16/19/22/25: 83-40-022
M8	> 20	83-50-008	65-08-00	PHM-12, GD 12/15: 83-41-022 PHM-160/161, GD 16/19/22/25: 83-40-022
M10	> 20	83-50-010	65-09-00	PHM-12, GD 12/15: 83-41-022 PHM-160/161, GD 16/19/22/25: 83-40-022
M12	> 25	83-55-012	65-10-00	PHM-12, GD 12/15: 83-41-022 PHM-160/161, GD 16/19/22/25: 83-40-022
M16	> 30	83-55-016	65-11-00	GD 15: 83-41-029 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

2.5 Threaded stud (type FD)

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, GD 12/15: 83-41-022 PHM-160/161, GD 16/19/22/25: 83-40-022
M8	15-100	83-50-008	65-08-00	PHM-12, GD 12/15: 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, GD 12/15: 83-41-022 PHM-160/161, GD 16/19/22/25: 83-40-022
M12	20-100	83-55-012	65-10-00	PHM-12, GD 12/15: 83-41-022 PHM-160/161, GD 16/19/22/25: 83-40-022
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: 83-40-029

2.6 Internally threaded stud (type ID, ID-DUO), 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, GD 12/15: 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	65-08-00	PHM-12, GD 12/15: 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, GD 12/15: 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	65-10-00	PHM-12, GD 12/15: 83-41-022 PHM-160/161, GD 16/19/22/25: 83-40-022
14,6	$l_2 < 30$ $l_2 \geq 30$	26-90-00 26-48-00	65-12-00	GD 15: 83-41-029 PHM-160/161, GD 16/19/22/25: 83-40-029
16	$l_2 < 30$ $l_2 \geq 30$	25-99-00 83-55-016	65-12-00	PHM-160/161, GD 16/19/22/25: 83-40-029
18,3	$l_2 < 30$ $l_2 \geq 30$	83-55-018-5 83-55-018	65-13-00	GD 19/22/25: 83-40-044
20	$l_2 \geq 40$	83-55-020	65-12-00	GD 22/25: 83-40-044
22	$l_2 \geq 40$	83-55-022-15	65-13-00	GD 22/25: 83-40-044

2.7 Insulation pin (type ISA, ISB, ISMS)

For welding without ceramic ferrules:

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	$20 \leq l_2 < 65$ $65 \leq l_2 < 110$ $l_2 \geq 110$	83-25-003 83-45-003 83-90-003	80-11-002	80-11-003	PHM-12, GD 12/15: 83-41-035 PHM-160/161, GD 16/19/22/25: 83-40-035
4	$50 \leq l_2 < 110$ $l_2 \geq 110$	83-25-004 83-85-004	80-11-002	80-11-003	PHM-12, GD 12/15: 83-41-035 PHM-160/161, GD 16/19/22/25: 83-40-035
5	$50 \leq l_2 < 65$ $65 \leq l_2 < 110$ $l_2 \geq 110$	83-25-005 83-40-005 83-85-005	80-11-002	80-11-003	PHM-12, GD 12/15: 83-41-035 PHM-160/161, GD 16/19/22/25: 83-40-035
6	$50 \leq l_2 < 110$ $l_2 \geq 110$	83-50-006-25 83-85-006	80-11-002	80-11-003	PHM-12, GD 12/15: 83-41-035 PHM-160/161, GD 16/19/22/25: 83-40-035

For welding with 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	$20 \leq l_2 < 65$ $65 \leq l_2 < 110$ $l_2 \geq 110$	83-25-003 83-45-003 83-90-003	65-06-00	PHM-12, GD 12/15: 83-41-022 PHM-160/161, GD 16/19/22/25: 83-40-022
4	$50 \leq l_2 < 110$ $l_2 \geq 110$	83-25-004 83-85-004	65-06-00	PHM-12, GD 12/15: 83-41-022 PHM-160/161, GD 16/19/22/25: 83-40-022
5	$50 \leq l_2 < 65$ $65 \leq l_2 < 110$ $l_2 \geq 110$	83-25-005 83-40-005 83-85-005	65-07-00	PHM-12, GD 12/15: 83-41-022 PHM-160/161, GD 16/19/22/25: 83-40-022
6	$50 \leq l_2 < 110$ $l_2 \geq 110$	83-50-006-25 83-85-006	65-07-00	PHM-12, GD 12/15: 83-41-022 PHM-160/161, GD 16/19/22/25: 83-40-022

For welding with 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, GD 12/15: 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, GD 12/15: 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, GD 12/15: 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, GD 12/15: 83-41-022-M22

2.8 Bimetallic insulation pin (type VBS, VBS-MS)

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, GD 12/15: 83-41-035 PHM-160/161, GD 16/19/22/25: 83-40-035

2.9 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	≥ 25	83-03-025	65-13-00	PHM-160/161, GD 16/19/22/25: 83-40-044
25	5	≥ 25	83-05-025	65-13-00	PHM-160/161, GD 16/19/22/25: 83-40-044

2.10 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	65-08-00	PHM-12, GD 12/15: 83-41-022 PHM-160/161, GD 16/19/22/25: 83-40-022
M10	≥ 20	83-50-010	65-09-00	PHM-12, GD 12/15: 83-41-022 PHM-160/161, GD 16/19/22/25: 83-40-022
M12	≥ 20	83-55-012	65-10-00	PHM-12, GD 12/15: 83-41-022 PHM-160/161, GD 16/19/22/25: 83-40-022
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

Bolte GmbH

Flurstraße 25
D-58285 Gevelsberg

Tel.: +49 (0)2332 55106-0
Fax: +49 (0)2332 55106-11

Ohmstraße 3
D-85221 Dachau

Tel.: +49 (0)8131 5159-0
Fax: +49 (0)8131 5159-11

E-Mail: info@bolte.gmbh

www.bolte.gmbh